DOCKETED	
Docket Number:	25-BSTD-03
Project Title:	2028 Energy Code Pre-Rulemaking.
TN #:	273088
Document Title:	Pre-Rulemaking Draft Regulatory Text for the 2028 Energy Code
Description:	This document is a pre-rulemaking draft of the regulatory text for the 2028 update to the California Energy Code (Title 24, Part 6).
Filer:	Michael Shewmaker
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	10/12/2026 8:35:57 AM
Docketed Date:	10/12/2026

ADMINISTRATIVE REGULATIONS

CALIFORNIA CODE OF REGULATIONS
TITLE 24, PART 1
CHAPTER 10

DISCLAIMER #1

Staff members of the California *Energy Commission* prepared this draft regulatory text. As such, it does not necessarily represent the views of the *Energy Commission*, its employees, or the State of California. The *Energy Commission*, the State of California, its employees, contractors and subcontractors make no warrant, express or implied, and assume no legal liability for the information in this report; nor does any party represent that the uses of this information will not infringe upon privately owned rights. This draft regulatory text has not been approved or disapproved by the *Energy Commission* nor has the *Energy Commission* passed upon the accuracy or adequacy of the information in this draft regulatory text.

DISCLAIMER #2

General provisions were compiled from multiple subchapters of the adopted 2028 Energy Code and duplicative language was removed. Minor edits have been made to compile the general provisions that do not impact or change requirements.

ARTICLE 1 – ENERGY BUILDING REGULATIONS

10-101 – SCOPE

(a) This article contains administrative regulations relating to the energy building regulations in Title 24, Part 6. This article applies to all *residential* and *nonresidential* ~~*buildings*~~*use designations*.

(b) Nothing in this article lessens any necessary qualifications or responsibilities of licensed or registered building professionals or other designers or builders, or the duties of enforcement agencies that exist under state or local law.

(c) If any provision of the regulations in this article or the Energy Code, ~~Building Energy Efficiency Standards,~~ Title 24, Part 6, of the California Code of Regulations is found invalid by a court of competent jurisdiction, the remainder of these regulations shall remain in effect.

NOTE: Authority: Sections 25402 and 25402.1, Public Resources Code. Reference: Sections 25402 and 25402.1, Public Resources Code

10-102 – DEFINITIONS

In this article the following definitions apply:

ACCEPTANCE REQUIREMENTS are "acceptance requirements for code compliance" as defined in Section 201 [Section 100.1(b)] of Part 6.

ACCEPTANCE TEST TECHNICIAN (ATT) is a Field Technician as defined in Section 10-102 who is certified by an authorized Acceptance Test Technician Certification Provider to perform acceptance testing of either lighting controls or mechanical systems pursuant to the requirements of Title 24, Part 6, Sections 103.1 or 103.2 *[Sections 10-103.1 or 10-103.2]*, respectively. ATTs are authorized to perform only those acceptance tests for which they are certified by an ATTCP; ATTs certified to perform acceptance testing of lighting controls are sometimes referred to as “lighting control ATTs”, and ATTs certified to perform acceptance testing of mechanical systems are sometimes referred to as “mechanical ATTs”. (See “Field Technician” and “Acceptance Test Technician Certification Provider”.)

ACCEPTANCE TEST EMPLOYER (ATE) is a person or entity who employs an Acceptance Test Technician and is certified by an authorized Acceptance Test Technician Certification Provider pursuant to the requirements of Title 24, Part 6, Sections 103.1 or 103.2 *[Sections 10-103.1 or 10-103.2]*. ATEs are authorized to employ only those ATTs for which they are certified by an ATTCP; ATEs certified to employ ATTs that perform acceptance testing of lighting controls are sometimes referred to as “lighting control ATEs”, and ATEs certified to employ ATTs that perform acceptance testing of mechanical systems are sometimes referred to as “mechanical ATEs”. (See “Acceptance Test Technician” and “Acceptance Test Technician Certification Provider”.)

ACCEPTANCE TEST TECHNICIAN CERTIFICATION PROVIDER (ATTCP) is an agency, organization or entity approved by the Energy Commission to train, certify and oversee ATTs and ATEs relating to either lighting controls or mechanical systems according to the requirements of Title 24, Part 6, Sections 103.1 or 103.2 *[Sections 10-103.1 or 10-103.2]*, respectively. ATTCPs are authorized to certify only those ATTs and ATEs for which they are approved by the Energy Commission; ATTCPs approved to certify ATTs and ATEs relating to the acceptance testing of lighting controls are sometimes referred to as "lighting control ATTCPs", and ATTCPs approved to certify ATTs and ATEs relating to the acceptance testing of mechanical systems are sometimes referred to as "mechanical ATTCPs." (See "Acceptance Test Technician" and "Acceptance Test Employer").

~~**ACM** means~~ **ALTERNATIVE CALCULATION METHODS (ACM)** are "alternative calculation methods (ACM)" as defined in Section 201 *[100.1(b)]* of Part 6~~compliance software, or alternative component packages, or exceptional methods approved by the Commission under Sections 10-109 and 10-116. ACMs are also referred to as Compliance Software~~.

ACM REFERENCE MANUAL is the document establishing the procedures required to implement Section~~s~~ 102.5 *[Sections 140.1 and 150.1]* of ~~Title 24,~~ Part 6 of the California Code of Regulations in Compliance Software.

ADDITIONALITY is a property of solar offsets whereby the offset causes additional benefits beyond what would occur as a result of all other actions, and which would exclusively benefit the building or property for which the offset substitutes for compliance obligations that would otherwise be required for that building or property, and those benefits would not ever be transferred to other buildings or property.

ALTERNATIVE COMPONENT PACKAGE is a set of building measures whose aggregate calculated energy use is less than or equal to the maximum allowed Energy Budget.

APPLIANCE EFFICIENCY REGULATIONS are the regulations in Title 20, Section 1601 et. seq. of the California Code of Regulations.

APPROVED CALCULATION METHOD is compliance software, or alternative component packages, or exceptional methods approved under Section 10-109.

~~**BUILDING ENERGY EFFICIENCY STANDARDS** are those regulations contained in Title 24, Part 6 of the California Code of Regulations, also referenced as the Energy Code.~~

BUILDING PERMIT is an electrical, plumbing, mechanical, building, or other permit or approval, that is issued by an enforcement agency, and that authorizes any construction that is subject to Part 6.

~~**CALIFORNIA ENERGY COMMISSION** is the California State Energy Resources Conservation and Development Commission.~~

~~**COMMISSION** is "Commission" as defined in Section 201 *[Section 100.1(b)]* of Part 6the California State Energy Resources Conservation and Development Commission. Commission is also referred to as "Energy Commission," and "California Energy Commission."~~

COMPLEX MECHANICAL SYSTEMS are "complex mechanical systems" as defined in Section 201 [100.1(b)] of Part 6~~is defined here for the purposes of complying with the Design Phase~~

~~Review component of Section 10-103(a)1. Complex Mechanical Systems are systems that include 1) fan systems each serving multiple thermostatically controlled zones, or 2) built-up air handler systems (non-unitary or nonpackaged HVAC equipment), or 3) hydronic or steam heating systems, or 4) hydronic cooling systems. Complex systems are NOT the following: unitary or packaged equipment listed in Tables 400.5(1), 400.5(2), 400.5(3), and 400.5(4) [110.2-A, 110.2-B, 110.2-C, and 110.2-E], that each serve one zone, or two-pipe, heating only systems serving one or more zones~~.

COMPLIANCE APPROACH is any one of the allowable methods by which the design and construction of a building may be demonstrated to be in compliance with Part 6. The compliance approaches are the performance compliance approach and the prescriptive compliance approach. The requirements for each compliance approach are set forth in Section 100.4.3 *[Section 100.0(e)2]* of Part 6.

COMPLIANCE DATA EXCHANGE FILE is an Extensible Markup Language (XML) file that contains compliance data used to populate a Compliance Document. The Compliance Data Exchange File is part of the Compliance Registration Package.

COMPLIANCE DOCUMENT is any of the documents specified in Title 24, Part 6, Section 100.5.1 *[Section 10-103(a)]* utilized to demonstrate compliance with Part 6 (i.e., Certificate of Compliance, Certificate of Installation, Certificate of Acceptance, and Certificate of Verification).

COMPLIANCE REGISTRATION PACKAGE means digitally signed or encrypted digital data that is transmitted to or from a Data Registry that contains the data required for registering a Compliance Document with a Data Registry, including the Compliance Data Exchange File. A commonly used method is the Zip file format, a data compression and archiving specification that is in the public domain. Files transmitted to or from a Data Registry using the Zip file format shall be password protected as described in JA7.6.3.2.7.

COMPLIANCE SOFTWARE is "compliance software" ~~that has been approved pursuant to Section 10-109 of Part 1~~ as defined in Section 201 *[Section 100.1(b)]* of Part 6.

CONDITIONED FLOOR AREA is the "conditioned floor area" as defined in Section 201 *[Section 100.1(b)]* of Part 6.

CRRC-1 is "CRRC-1" as defined in Section 201 *[Section 100.1(b)]* of Part 6~~the Cool Roof Rating Council document titled "Product Rating Program"~~.

DATA REGISTRY is a web service with a user interface and database maintained by a Registration Provider that complies with the applicable requirements in Reference Joint Appendix JA7, with guidance from the Data Registry Requirements Manual, and provides for registration of residential or nonresidential compliance documentation used for demonstrating compliance with Part 6.

RESIDENTIAL DATA REGISTRY is a data registry that is maintained by an ECC-Provider that provides for registration, when required by Part 6 of all residential compliance documentation and the nonresidential Certificate of Verification, and complies with the data maintenance requirements of Title 24, Part 6, Section 103.3 *[Section 10-103.3]*.

NONRESIDENTIAL DATA REGISTRY is a data registry that is maintained by a Registration Provider approved by the Energy Commission that provides for registration, when required by Part 6 of all nonresidential compliance documentation, excluding all Certificates of Acceptance recorded by an acceptance test technician certification provider (Title 24, Part 6, Sections 103.1 and 103.2) *[~~(10-103.1 and 10-103.2).~~].* However, nonresidential data registries may not provide for registration of nonresidential Certificates of Verification.

DATA REGISTRY REQUIREMENTS MANUAL is a document that provides additional detailed guidance regarding the functional and technical aspects of the data registry requirements given in Joint Appendix JA7.

DOCUMENTATION AUTHOR is a person who prepares a Title 24 Part 6 compliance document that must subsequently be reviewed and signed by a responsible person in order to certify compliance with Part 6.

DWELLING UNIT is "dwelling unit" as defined in Section 201 *[Section 100.1(b)]* of Part 6.

ENERGY BUDGET is "energy budget" as defined in Section 201 [100.1(b)] of Part 6~~the maximum energy consumption that a proposed building, or portion of a building, can be designed to consume, calculated using Commission-approved compliance software as specified in Section 10-109 of the Energy Code and the Alternative Calculation Method Reference Manual. The Energy Budget for the newly constructed buildings is expressed in terms of the Long-Term System Cost (LSC) and Source Energy. The energy budget for additions and alterations is expressed in terms of LSC~~.

ENERGY CODE COMPLIANCE (ECC) PROGRAM is the program for field verification and diagnostic testing for residential construction as set forth in Title 24, Part 6, Section 103.3 *[Section 10-103.3]* to verify the newly constructed buildings and additions and alterations to existing buildings comply with the requirements of the Energy Code.

ECC-PROVIDER is an organization approved by the Energy Commission to administer the ECC program pursuant to the requirements of Title 24, Part 6, Section 103.3 *[Section 10-103.3]*.

ECC-RATER is a person trained, tested, and certified by an ECC-Provider to perform field verification and diagnostic testing for the ECC program pursuant to the requirements of Title 24, Part 6, Section 103.3 *[Section 10-103.3]*.

ECC-RATER COMPANY is an organization certified by an ECC-Provider to offer field verification and diagnostic testing services by the ECC-Rater Company's ECC-Raters for the ECC program pursuant to the requirements of Title 24, Part 6, Section 103.3 *[Section 10-103.3]*.

EXEMPLARY ECC-RATER is an ECC-Rater that has achieved the status of "Exemplary" as set forth in Title 24, Part 6, Section 103.3.4 Item 5.2 *[Section 10-103.3(d)5B]*.

ENERGY ~~ENERGY COMMISSION~~ ~~is the California State Energy Resources Conservation and Development Commission.~~

COMMISSION is "Energy Commission" as defined in Section 201 *[Section 100.1(b)]* of Part 6. Energy Commission is also referred to as "California Energy Commission."

ENFORCEMENT AGENCY is "enforcement agency" as defined in Section 201 *[Section 100.1(b)]* of Part 6~~the city, county, or state agency responsible for issuing a building permit~~.

EXCEPTIONAL METHOD is a method for estimating the energy performance of building features that cannot be adequately modeled using existing Compliance Software and that is approved ~~by the Executive Director~~under Section 10-110.

EXECUTIVE DIRECTOR is "Executive Director" as defined in Section 201 *[Section 100.1(b)]* of Part 6~~the Executive Director of the Commission~~.

FIELD TECHNICIAN is a person who performs acceptance tests in accordance with the specifications in Reference Nonresidential Appendix NA7, and reports the results of the acceptance tests on the Certificate of Acceptance in accordance with the requirements of Section 100.5.1.3 *[Section 10-103(a)4]*.

GUESTROOM is a room used or intended to be used by one or more guests for living or sleeping purposes. (*CBC* Title 24, Part 2, Chapter 2).

HVAC SYSTEM is the "HVAC system" as defined in Section 201 [100.1(b)] of Part 6.

LONG-TERM SYSTEM COST (LSC) is "L~~l~~ong-term S~~s~~ystem C~~c~~ost (LSC)" as defined in Section 201 *[Section 100.1(b)]* of Part 6~~the CEC-projected present value of costs to California's energy systems over a period of 30 years. LSC does not represent a prediction of individual utility bills~~.

MANUFACTURED DEVICE is the "manufactured device" as defined in Section 201 [100.1(b)] of Part 6.

NFRC 100 is "NFRC 100" as defined in Section 201 *[Section 100.1(b)]* of Part 6~~the National Fenestration Rating Council document titled "NFRC 100: Procedure for Determining Fenestration Product U-factors." (2017) NFRC 100 includes procedures for the Component Modeling Approach (CMA) and site-built fenestration formerly included in a separate document, NFRC 100-SB~~.

NFRC 200 is "NFRC 200" as defined in Section 201 *[Section 100.1(b)]* of Part 6.~~the National Fenestration Rating Council document titled "NFRC 200: Procedure for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidence." (2017),~~

NFRC 202 is "NFRC 202" as defined in Section 201 *[Section 100.1(b)]* of Part 6~~the National Fenestration Rating Council document titled "NFRC 202: Procedures for Determining Translucent Fenestration Product Visible Transmittance at Normal Incidence." (2017)~~.

NFRC 203 is "NFRC 203" as defined in Section 201 *[Section 100.1(b)]* of Part 6~~the National Fenestration Rating Council document titled "NFRC 203: Procedure for Determining Visible Transmittance of Tubular Daylighting Devices." (2017),~~

NFRC 400 is "NFRC 400" as defined in Section 201 *[Section 100.1(b)]* of Part 6~~the National Fenestration Rating Council document titled "NFRC 400: Procedure for Determining Fenestration Product Air Leakage." (2017)~~.

NONRESIDENTIAL BUILDING is "nonresidential building" as defined in Section 201 *[Section 100.1(b)]* of Part 6.

PART 6 is Title 24, Part 6 of the California Code of Regulations.

PUBLIC ADVISER is the Public Adviser of the Energy Commission.

R-VALUE is "R-value" as defined in Section 201 *[Section 100.1(b)]* of Part 6~~the measure of the thermal resistance of insulation or any material or building component expressed in ft^2 hr °F/Btu~~.

RECORD DRAWINGS are drawings that document the as installed location and performance data on all lighting and space conditioning system components, devices, appliances and equipment, including but not limited to wiring sequences, control sequences, duct and pipe distribution system layout and sizes, space conditioning system terminal device layout and airflow rates, hydronic system and flow rates, and connections for the space conditioning system. Record drawings are sometimes referred to as "as built" drawings.

REFERENCE APPENDICES are "Reference Appendices" as defined in Section 201 *[Section 100.1(b)]* of Part 6~~the support documents for the Building Energy Efficiency Standards. The documents consist of three sections: the Reference Joint Appendices (JA), the Reference Residential Appendices (RA), and the Reference Nonresidential Appendices (NA) currently adopted by the Energy Commission~~.

REFERENCE JOINT APPENDICES are the Reference Joint Appendices currently adopted by the Energy Commission.

REFERENCE NONRESIDENTIAL APPENDICES are the Reference Nonresidential Appendices currently adopted by the Energy Commission.

REFERENCE RESIDENTIAL APPENDICES are the Reference Residential Appendices currently adopted by the Energy Commission.

REGISTERED COMPLIANCE DOCUMENT is a compliance document that has been submitted to a residential or nonresidential Data Registry for retention, verified as valid with an XML schema approved by the Energy Commission, and has gone through the registration process so that the Registered Document displays all applicable electronic signatures as well as the Registration Provider's digital certificate and the document's unique registration number. The image of the registered document is accessible for printing or viewing by authorized users of the Data Registry. The registered document's unique visible registration number is appended onto the document image by the Data Registry.

REGISTRATION PROVIDER is an organization that administers a data registry service that conforms to the requirements in Reference Joint Appendix JA7.

Residential Use Designations

Hotel/Motel Use is "Hotel/Motel Use" as defined in Section 201 *[Section 100.1(b)]* of Part 6.

Multifamily Use: 3 Stories or less is "Multifamily Use: 3 Stories or less" as defined in Section 201 *[Section 100.1(b)]* of Part 6.

Multifamily Use: More than 3 Stories is "Multifamily Use: More than 3 Stories" as defined in Section 201 *[Section 100.1(b)]* of Part 6.

Single-family Use is "Single-Family Use" as defined in Section 201 *[Section 100.1(b)]* of Part 6.

SOURCE ENERGY is "Source Energy" as defined in Section 201 *[Section 100.1(b)]* of Part 6.

STANDARD DESIGN BUILDING is a "Standard Design Building" as defined in Section 201 *[Section 100.1(b)]* of Part 6.

TRIENNIAL CODE CYCLE is the three-year period for which a particular cycle of California's building codes is effective, as used and defined by State Building Standards Law and the California Building Standards Commission pursuant to Health and Safety Code Section 18901 et seq.

NOTE: Authority: Sections 25402 and 25402.1, and 25213, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402 and 25402.1, 25402.4, 25402.5, 25402.8 and 25943, Public Resources Code.

10-103 – PERMIT, CERTIFICATE, INFORMATIONAL, AND ENFORCEMENT REQUIREMENTS FOR DESIGNERS, INSTALLERS, BUILDERS, MANUFACTURERS, AND SUPPLIERS

Documentation and enforcement requirements to comply with Title 24, Part 6 are included in Title 24, Part 6, Section 100.5.

~~(a) **Documentation.** For all buildings other than healthcare facilities, the following documentation is required to demonstrate compliance with Part 6. This documentation shall meet the requirements of Section 10-103(a) or alternatives approved by the Executive Director. Healthcare facilities shall instead comply with the applicable provisions of Chapter 7.~~

~~1. **Certificate of Compliance.** For all buildings, the Certificate of Compliance described in Section 10-103 shall be signed by the person who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design (*responsible person*); and submitted in accordance with Sections 10-103(a)1 and 10-103(a)2 to certify conformance with Part 6. If more than one person has responsibility for the building design, each person shall sign the Certificate of Compliance document(s) applicable to that portion of the design for which the person is responsible. Alternatively, the person with chief responsibility for the building design shall prepare and sign the Certificate of Compliance document(s) for the entire building design. Subject to the requirements of Sections 10-103(a)1 and 10-103(a)2, persons who prepare Certificate of Compliance documents (*documentation authors*) shall sign a declaration statement on the documents they prepare to certify the information provided on the documentation is accurate and complete. In accordance with applicable requirements of 10-103(a)1, the signatures provided by *responsible persons* and *documentation authors* shall be original signatures on paper documents or electronic signatures on electronic documents conforming to the electronic signature specifications in Reference Joint Appendix JA7.~~

~~For all Nonresidential buildings, the Design Review Kickoff Certificate(s) of Compliance and the Construction Document Design Review Checklist Certificate(s) of Compliance shall be reviewed and signed by a licensed professional engineer or licensed architect, or a licensed contractor representing services performed by or under the direct supervision of a licensed engineer or architect, as specified in the provisions of Division 3 of the Business and Professions Code. For buildings less than 10,000 square feet, this signer may be the engineer or architect of record. For buildings greater than 10,000 square feet but less than 50,000 square feet, this signer shall be a qualified in-house engineer or architect with no other project involvement or a third-party engineer, architect, or contractor. For buildings greater than 50,000 square feet and all buildings with complex mechanical systems serving more than 10,000 square feet, this signer shall be a third-party engineer, architect, or contractor.~~

A. All Certificate of Compliance documentation shall conform to a format and informational order and content approved by the Energy Commission.

These documents shall:

i. Identify the energy features, performance specifications, materials, components, and manufactured devices required for compliance with Part 6.

ii. Identify the building project name and location. The building project name and location identification on the Certificate of Compliance shall be consistent with the building project name and location identification given on the other applicable building design plans and specifications submitted to the enforcement agency for approval with the building permit application.

iii. Display the unique registration number assigned by the data registry if Section 10-103(a)1 requires the document to be registered.

iv. Include a declaration statement to the effect that the building energy features, performance specifications, materials, components, and manufactured devices for the building design identified on the Certificate of Compliance indicate the building is in compliance with the requirements of Title 24, Parts 1 and 6, and the building design features identified on the Certificate of Compliance are consistent with the building design features identified on the other applicable compliance documents, worksheets, calculations, plans, and specifications submitted to the enforcement agency for approval with the building permit application.

v. Be signed by the *documentation author* to certify the documentation is accurate and complete. When document registration is required by Section 10-103(a)1, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

vi. Be signed by the *responsible person* eligible under Division 3 of the Business and Professions Code to accept responsibility for the design to certify conformance with Part 6. When document registration is required by Section 10-103(a)1, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

B. For all low-rise residential *buildings* for which compliance requires field verification, the person(s) responsible for the Certificate(s) of Compliance shall submit the Certificate(s) and their associated Compliance Registration Packages for registration and retention to an ECC-provider data registry in compliance with Section 10-103.3. The submittals to the ECC-provider data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.

Contingent upon availability and approval of an electronic document repository by the Executive Director, Certificate of Compliance documents and their associated

~~Compliance Registration Packages that are registered and retained by an ECC-provider data registry shall also be automatically transmitted by the data registry Section 10-103.3, to an electronic document repository for retention in accordance with the specifications in Reference Joint Appendix JA7.~~

~~C. For alterations to existing residential buildings for which field verification is not required, including but not limited to water heater and window replacements, and for additions to existing residential buildings that are less than 300 square feet for which field verification is not required, the enforcement agencies may at their discretion not require any Certificate of Compliance documentation, or may develop simplified Certificate of Compliance documentation for demonstrating compliance with the Standards.~~

~~Allowances by enforcement agencies to not require compliance documentation shall not be deemed to grant authorization for any work to be done in any manner in violation of this code or other provisions of law.~~

~~D. Contingent upon approval of data registry(s) by the Commission, all nonresidential *buildings, high-rise residential buildings, and hotels and motels*, when designated to allow use of an occupancy group or type regulated by Part 6 the person(s) responsible for the Certificate(s) of Compliance shall submit the Certificate(s) and their associated Compliance Registration Packages for registration and retention to a data registry approved by the Commission. The submittals to the approved data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.~~

~~Contingent upon availability and approval of an electronic document repository by the Executive Director, Certificate of Compliance documents and their associated Compliance Registration Packages that are registered and retained by an approved data registry shall also be automatically transmitted by the data registry to an electronic document repository for retention in accordance with the specifications in Reference Joint Appendix JA7.~~

~~2. **Application for a building permit.** Each application for a building permit subject to Part 6 shall contain at least one copy of the documents specified in Sections 10-103(a)2A, 10-103(a)2B, and 10-103(a)2C.~~

~~A. For all newly constructed buildings, additions, alterations, or repairs regulated by Part 6 the applicant shall submit the applicable Certificate(s) of Compliance to the enforcement agency for approval. The certificate(s) shall conform to the requirements of Section 10-103(a)1, and shall be approved by the local enforcement agency, in accordance with all applicable requirements of Section 10-103(d), by stamp or authorized signature prior to issuance of a building permit. A copy of the Certificate(s) of Compliance shall be included with the documentation the builder provides to the building owner at occupancy as specified in Section 10-103(b).~~

~~For alterations to existing residential buildings for which field verification is required, and when the enforcement agency does not require building design plans to be submitted with the application for a building permit, the applicable Certificate of Compliance documentation specified in Section 10-103(a)1 is not required to be approved by the enforcement agency prior to issuance of a building permit, but shall be approved by the enforcement agency prior to final inspection of the dwelling unit, and shall be made available to the enforcement agency for all applicable inspections, or made available for viewing on an approved data registry.~~

~~When the enforcement agency requires building design plans to be submitted with the application for a building permit, the applicable Certificate of Compliance documents shall be incorporated into the building design plans. When Section 10-103(a)1 requires document registration, the certificate(s) that are incorporated into the building design plans shall be copies of the registered Certificate of Compliance documents from an ECC-provider data registry, or a data registry approved by the Commission.~~

~~B. When the enforcement agency requires building design plans and specifications to be submitted with the application for a building permit, the plans shall conform to the specifications for the features, materials, components, and manufactured devices identified on the Certificate(s) of Compliance, and shall conform to all other applicable requirements of Part 6. Plans and specifications shall be submitted to the enforcement agency for any other feature, material, component, or manufactured device that Part 6 requires be indicated on the building design plans and specifications. Plans and specifications submitted with each application for a building permit for Nonresidential buildings, High-rise Residential buildings and Hotels and Motels shall provide acceptance requirements for code compliance of each feature, material, component or manufactured device when acceptance requirements are required under Part 6. Plans and specifications for Nonresidential buildings, High-rise Residential buildings and Hotels and Motels shall require, and indicate with a prominent note on the plans, that within 90 days after the Enforcement Agency issues a permanent final occupancy permit, record drawings be provided to the building owner.~~

~~For all buildings, if the specification for a building design feature, material, component, or manufactured device is changed before final construction or installation, such that the building may no longer comply with Part 6 the building must be brought back into compliance, and so indicated on amended plans, specifications, and Certificate(s) of Compliance that shall be submitted to the enforcement agency for approval. Such characteristics shall include the efficiency (or other characteristic regulated by Part 6) of each building design feature, material, component, or device.~~

~~C. The enforcement agency shall have the authority to require submittal of any supportive documentation that was used to generate the Certificate(s) of Compliance, including but not limited to the electronic input file for the compliance~~

software tool that was used to generate performance method Certificate(s) of Compliance; or any other supportive documentation that is necessary to demonstrate that the building design conforms to the requirements of Part 6.

3. **Certificate of Installation.** For all buildings, the person in charge of the construction or installation, who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the construction or installation of features, materials, components, or manufactured devices regulated by Part 6 or the Appliance Efficiency Regulations (*responsible person*) shall sign and submit Certificate of Installation documentation as specified in Section 10-103(a)3 to certify conformance with Part 6. If more than one person has responsibility for the construction or installation, each person shall sign and submit the Certificate of Installation documentation applicable to the portion of the construction or installation for which they are responsible; alternatively, the person with chief responsibility for the construction or installation shall sign and submit the Certificate of Installation documentation for the entire construction or installation scope of work for the project. Subject to the requirements of Section 10-103(a)3, persons who prepare Certificate of Installation documentation (*documentation authors*) shall sign a declaration statement on the documents they prepare to certify the information provided on the documentation is accurate and complete. In accordance with applicable requirements of 10-103(a)3, the signatures provided by *responsible persons* and *documentation authors* shall be original signatures on paper documents or electronic signatures on electronic documents conforming to the electronic signature specifications in Reference Joint Appendix JA7.

A. **Delegation of Signature Authority.** Except where prohibited by law, including but not limited to any requirements under Division 3 of the Business and Professions Code, the *Responsible Person* may delegate signature authority to third parties (*Authorized Representatives*) provided that there is a written agreement:

i. Between the *Responsible Person* and the person to be designated as the *Authorized Representative*.

ii. Specifying that the *Authorized Representative* may sign Certificates of Installation on behalf of the *Responsible Person*.

iii. Specifying that the legal responsibility for construction or installation in the applicable classification for the scope of work specified on the Certificate of Installation document(s) remains with the Responsible Person.

iv. That is signed by both the *Responsible Person* and the *Authorized Representative*.

v. That is retained by the ECC-provider to which all compliance documents are submitted for the building to which the Certificate of Installation documentation pertains.

vi. That is maintained in the ECC-provider data registry such that it is accessible for verification by, including but not limited to, the Energy Commission and enforcement agencies.

B. **Format.** All Certificate of Installation documentation shall conform to a format and informational order and content approved by the Energy Commission.

These documents shall:

i. Identify the features, materials, components, manufactured devices, and system performance diagnostic results required to demonstrate compliance with Part 6 and the Appliance Efficiency Regulations.

ii. State the number of the building permit under which the construction or installation was performed.

iii. Display the unique registration number assigned by the data registry if Section 10-103(a)3 requires the document to be registered.

iv. Include a declaration statement indicating that the constructed or installed features, materials, components or manufactured devices (the installation) identified on the Certificate of Installation conforms to all applicable codes and regulations, and the installation conforms to the requirements given on the plans and specifications approved by the enforcement agency.

v. Be signed by the *documentation author* to certify the documentation is accurate and complete. When document registration is required by Section 10-103(a)3, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

vi. Be signed by the *Responsible Person* eligible under Division 3 of the Business and Professions Code to accept responsibility for construction or installation in the applicable classification for the scope of work specified on the Certificate of Installation document(s), or shall be signed by their *Authorized Representative*. When document registration is required by Section 10-103(a)3, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

C. For all low-rise residential buildings, the person(s) responsible for the Certificate(s) of Installation, or their *Authorized Representative(s)*, shall submit the following Certificate of Installation documentation and their associated Compliance Registration Packages that are applicable to the building to an ECC-provider data registry for registration and retention in accordance with Section 10-103.3 and procedures specified in Reference Residential Appendix RA2:

i. All Certificates of Installation for which compliance requires field verification.

ii. All other Certificates of Installation, except those not required by the Energy Commission.

The submittals to the ECC-provider data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.

Contingent upon availability and approval of an electronic document repository by the Executive Director, Certificate of Installation documents and their associated Compliance Registration Packages that are registered and retained by an ECC-provider data registry in compliance with Section 10-103.3 shall also be automatically transmitted by the data registry to an electronic document repository for retention in accordance with the specifications in Reference Joint Appendix JA7.

D. For alterations to existing residential buildings for which field verification is not required, including but not limited to water heater and window replacements, and for additions to existing residential buildings that are less than 300 square feet for which field verification is not required, the enforcement agencies may, at their discretion, not require any Certificate of Installation documentation, or may develop simplified Certificate of Installation documentation for demonstrating compliance with the Standards.

Allowances by enforcement agencies to not require compliance documentation shall not be deemed to grant authorization for any work to be done in any manner in violation of this code or other provisions of law.

E. Contingent upon approval of data registry(s) by the Commission, all *nonresidential* buildings, high-rise residential buildings, and hotels and motels, when designated to allow use of an occupancy group or type regulated by Part 6 the person(s) responsible for the Certificate(s) of Installation, except those documents not required by the Energy Commission, shall submit the Certificate(s) and their associated Compliance Registration Packages for registration and retention to a data registry approved by the Commission. The submittals to the approved data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.

Contingent upon availability and approval of an electronic document repository by the Executive Director, Certificate of Installation documents and their associated Compliance Registration Packages that are registered and retained by an approved data registry shall also be automatically transmitted by the data registry to an electronic document repository for retention in accordance with the specifications in Reference Joint Appendix JA7.

F. **Availability.** For all buildings, a copy of the Certificate(s) of Installation shall be posted, or made available with the building permit(s) issued for the building, or made available for viewing on an approved data registry, and shall be made available to the enforcement agency for all applicable inspections. When document registration is required by Section 10-103(a)3, registered copies of the Certificate(s)

~~of Installation from an ECC-provider data registry or a data registry approved by the Commission shall be posted or made available with the building permit(s) issued for the building, and shall be made available to the enforcement agency for all applicable inspections. If construction on any portion of the building subject to Part 6 will be impossible to inspect because of subsequent construction, the enforcement agency may require the Certificate(s) of Installation to be posted upon completion of that portion. A copy of the Certificate(s) of Installation shall be included with the documentation the builder provides to the building owner at occupancy as specified in Section 10-103(b).~~

4. **Certificate of Acceptance.** For all *nonresidential buildi*ngs, high-rise residential buildings, and hotels and motels, when designated to allow use of an occupancy group or type regulated by Part 6 the person in charge of the acceptance testing, who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the applicable scope of system design, or construction, or installation of features, materials, components, or manufactured devices regulated by Part 6 or the Appliance Efficiency Regulations (*responsible person*), shall sign and submit all applicable Certificate of Acceptance documentation in accordance with Section 10-103(a)4 and Reference Nonresidential Appendix NA7 to certify conformance with Part 6. If more than one person has responsibility for the acceptance testing, each person shall sign and submit the Certificate of Acceptance documentation applicable to the portion of the construction or installation, for which they are responsible; alternatively, the person with chief responsibility for the system design, construction, or installation, shall sign and submit the Certificate of Acceptance documentation for the entire construction or installation scope of work for the project. Subject to the requirements of Section 10-103(a)4, persons who prepare Certificate of Acceptance documentation (*documentation authors*) shall sign a declaration statement on the documents they prepare to certify the information provided on the documentation is accurate and complete. Persons who perform acceptance test procedures in accordance with the specifications in Reference Nonresidential Appendix NA7, and report the results of the acceptance tests on the Certificate of Acceptance (*field technicians*) shall sign a declaration statement on the documents they submit to certify the information provided on the documentation is true and correct. In accordance with applicable requirements of Section 10-103(a)4, the signatures provided by *responsible persons*, *field technicians*, and *documentation authors* shall be original signatures on paper documents or electronic signatures on electronic documents conforming to the electronic signature specifications in Reference Joint Appendix JA7.

A. All Certificate of Acceptance documentation shall conform to a format and informational order and content approved by the Energy Commission.

These documents shall:

i. Identify the features, materials, components, manufactured devices, and system performance diagnostic results required to demonstrate compliance with the

~~acceptance requirements to which the applicant must conform as indicated in the plans and specifications submitted under Section 10-103(a)2, and as specified in Reference Nonresidential Appendix NA7.~~

~~ii. State the number of the building permit under which the construction or installation was performed.~~

~~iii. Display the unique registration number assigned by the data registry if Section 10-103(a)4 requires the document to be registered.~~

~~iv. Include a declaration statement indicating that the features, materials, components or manufactured devices identified on the Certificate of Acceptance conform to the applicable acceptance requirements as indicated in the plans and specifications submitted under Section 10-103(a), and with applicable acceptance requirements and procedures specified in the Reference Nonresidential Appendix NA7, and confirms that Certificate(s) of Installation described in Section 10-103(a)3 has been completed and is posted or made available with the building permit(s) issued for the building, or made available for viewing on an approved data registry.~~

~~v. Be signed by the *documentation author* to certify the documentation is accurate and complete. When document registration is required by Section 10-103(a)4, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.~~

~~vi. Be signed by the *field technician* who performed the acceptance test procedures and reported the results on the Certificate of Acceptance. When document registration is required by Section 10-103(a)4, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.~~

~~vii. Be signed by the *responsible person* in charge of the acceptance testing who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the system design, construction or installation in the applicable classification for the scope of work identified on the Certificate of Acceptance, or shall be signed by their authorized representative. When document registration is required by Section 10-103(a)4, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.~~

~~B. Contingent upon approval of data registry(s) by the Commission, for all nonresidential buildings, high-rise residential buildings, and hotels and motels, when designated to allow use of an occupancy group or type regulated by Part 6 the person(s) responsible for the Certificate(s) of Acceptance shall submit the Certificate(s) and their associated Compliance Registration Packages for registration and retention to a data registry approved by the Commission, excluding all~~

~~Certificates of Acceptance recorded by an acceptance test technician certification provider (10-103.1 and 10-103.2). The submittals to the approved data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.~~

~~Contingent upon availability and approval of an electronic document repository by the Executive Director, Certificate of Acceptance documents and their associated Compliance Registration Packages that are registered and retained by an approved data registry shall also be automatically transmitted by the data registry, to an electronic document repository for retention in accordance with the specifications in Reference Joint Appendix JA7.~~

~~C. A copy of the Certificate(s) of Acceptance shall be posted, or made available with the building permit(s) issued for the building, and shall be made available to the enforcement agency for all applicable inspections. If construction on any portion of the building subject to Part 6 will be impossible to inspect because of subsequent construction, the enforcement agency may require the Certificate(s) of Acceptance to be posted upon completion of that portion. A copy of the Certificate(s) of Acceptance shall be included with the documentation the builder provides to the building owner at occupancy as specified in Section 10-103(b).~~

~~5. **Certificate of Field Verification and Diagnostic Testing (Certificate of Verification).** For all buildings for which compliance requires field verification, a certified ECC-Rater shall conduct all required field verification and diagnostic testing in accordance with applicable procedures specified in Reference Appendices RA2, RA3, NA1, and NA2. All applicable Certificate of Verification documentation shall be completed, signed, and submitted by the certified ECC-Rater who performed the field verification and diagnostic testing services (*responsible person*) in accordance with the requirements of Section 10-103(a)5, and Reference Appendices RA2, and NA1, to certify conformance with Part 6. If more than one rater has responsibility for the verification for the building, each rater shall sign and submit the Certificate of Verification documentation applicable to the portion of the building for which they are responsible. Subject to the requirements of Section 10-103(a)5, persons who prepare Certificate of Verification documentation (*documentation authors*) shall sign a declaration statement on the documents they prepare to certify the information provided on the documentation is accurate and complete. The signatures provided by *responsible persons* and *documentation authors* shall be electronic signatures on electronic documents.~~

~~A. **Format.** All Certificate of Verification documentation shall conform to a format and informational order and content approved by the Energy Commission.~~

~~These documents shall:~~

~~i. Identify the installed features, materials, components, manufactured devices, or system performance diagnostic results that require verification for compliance with Part 6 as specified on the Certificate(s) of Compliance for the building.~~

ii. State the number of the building permit under which the construction or installation was performed,

iii. Display the unique registration number assigned by the ECC-provider data registry, and provide any additional information required by Reference Appendices RA2, RA3, NA1, and NA2.

iv. Include a declaration statement indicating that the installed features, materials, components or manufactured devices requiring verification conform to the applicable requirements in Reference Appendices RA2, RA3, NA1, NA2, and the requirements specified on the Certificate(s) of Compliance approved by the local enforcement agency, and confirms the same features, materials, components or manufactured devices are identified on the applicable Certificate(s) of Installation signed and submitted by the person(s) responsible for the construction or installation as described in Section 10-103(a)3.

v. Be signed by the *documentation author* to certify the documentation is accurate and complete. The signatures shall be electronic signatures on electronic documents in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

vi. Be signed by the ECC-Rater who performed the field verification and diagnostic testing services (*responsible person)*. The signatures shall be electronic signatures on electronic documents in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

B. For all buildings for which compliance requires field verification, the certified ECC-Rater responsible for the Certificate(s) of Verification shall submit the Certificates and their associated Compliance Registration Packages for registration and retention to a ECC-provider data registry in accordance with the applicable procedures in Reference Appendices RA2 and NA1, and in compliance with Section 10-103.3.

The submittals to the ECC-provider data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.

Contingent upon availability and approval of an electronic document repository by the Executive Director, Certificate of Verification documents and their associated Compliance Registration Packages that are registered and retained by an ECC-provider data registry in accordance with Section 10-103.3 shall also be automatically transmitted by the data registry, to an electronic document repository for retention in accordance with the specifications in Reference Joint Appendix JA7.

C. **Availability.** For all buildings, a copy of the registered Certificate(s) of Verification shall be posted, or made available with the building permit(s) issued for the building, or made available for viewing on an approved data registry, and shall be made available to the enforcement agency for all applicable inspections. If construction on any portion of the building subject to Part 6 will be impossible to inspect because of

subsequent construction, the enforcement agency may require the Certificate(s) of Verification to be posted upon completion of that portion. A copy of the registered Certificate(s) of Verification shall be included with the documentation the builder provides to the building owner at occupancy as specified in Section 10-103(b).

EXCEPTION to Section 10-103(a): Enforcing agencies may not require nonresidential buildings that have no more than 1,000 square feet of conditioned floor area in the entire building and an occupant load of 49 persons or less to comply with the documentation requirements of Section 10-103(a), provided a statement of compliance with Part 6 is submitted and signed by a licensed engineer or the licensed architect with chief responsibility for the design.

(b) **Compliance, Operating, Maintenance, and Ventilation Information to be provided by Builder.**

1. **Compliance information.**

A. For low-rise residential buildings, at final inspection, the enforcement agency shall require the builder to leave in the building, copies of the completed, signed, and submitted compliance documents for the building owner at occupancy. For low-rise residential buildings, such information shall, at a minimum, include copies of all Certificate of Compliance, Certificate of Installation, and Certificate of Verification documentation submitted. These documents shall be in paper or electronic format and shall conform to the applicable requirements of Section 10-103(a).

B. For *nonresidential* buildings, high-rise residential buildings and hotels and motels, at final inspection, the enforcement agency shall require the builder to leave in the building, copies of the completed, signed, and submitted compliance documents for the building owner at occupancy. For *nonresidential* buildings, high-rise residential buildings and hotels and motels, such information shall include copies of all Certificate of Compliance, Certificate of Installation, Certificate of Acceptance and Certificate of Verification documentation submitted. These documents shall be in paper or electronic format and shall conform to the applicable requirements of Section 10-103(a).

2. **Operating information.** At final inspection, the enforcement agency shall require the builder to leave in the building, for the building owner at occupancy, operating information for all applicable features, materials, components, and mechanical devices installed in the building. Operating information shall include instructions on how to operate the features, materials, components, and mechanical devices correctly and efficiently. The instructions shall be consistent with specifications set forth by the Executive Director. For low-rise residential buildings, such information shall be contained in a folder or manual which provides all information specified in Section 10-103(b). This operating information shall be in paper or electronic format.

For dwelling units, buildings or tenant spaces that are not individually owned and operated, or are centrally operated, such information shall be provided to the person(s)

responsible for operating the feature, material, component or mechanical device installed in the building. This operating information shall be in paper or electronic format.

3. **Maintenance information.** At final inspection, the enforcement agency shall require the builder to leave in the building, for the building owner at occupancy, maintenance information for all features, materials, components, and manufactured devices that require routine maintenance for efficient operation. Required routine maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label may be limited to identifying, by title and/or publication number, the operation and maintenance manual for that particular model and type of feature, material, component or manufactured device. For low-rise residential buildings, this information shall include a schedule of all interior luminaires and lamps installed to comply with Section 150.0(k).

   For dwelling units, buildings or tenant spaces that are not individually owned and operated, or are centrally operated, such information shall be provided to the person(s) responsible for maintaining the feature, material, component or mechanical device installed in the building. This information shall be in paper or electronic format.

4. **Ventilation information.**

   A. For *low-rise and high-rise residential buildings*, the enforcement agency shall require the builder to leave the following information in the building, for the building owner at occupancy:

      i. A description of the quantities of outdoor air that the whole-dwelling unit ventilation system(s) are designed to provide to the building's conditioned space, and instructions for proper operation and maintenance of the ventilation system.

      ii. Instructions for proper operation and maintenance of local exhaust systems, including instructions for conditions for which any occupant-controlled systems such as kitchen range hoods and bathroom exhaust fans should be used.

      iii. For systems in buildings or tenant spaces that are not individually owned and operated by the dwelling unit occupants, the building's owner or their representative shall provide a copy of the ventilation system information to dwelling occupants at the beginning of their occupancy. For systems in buildings or tenant spaces that are centrally operated, all applicable ventilation system information shall be provided to the person(s) responsible for operating and maintaining the feature, material, component, or mechanical ventilation device installed in the building. This information shall be in paper or electronic format.

   B. For *nonresidential* buildings, hotels, and motels, the enforcement agency shall require the builder to provide the building owner at occupancy a description of the quantities of outdoor and recirculated air that the ventilation systems are designed to provide to each area. For buildings or tenant spaces that are not individually owned and operated, or are centrally operated, such information shall be provided

to the person(s) responsible for operating and maintaining the feature, material, component or mechanical device installed in the building. This information shall be in paper or electronic format.

(c) **Equipment Information to be Provided by Manufacturer or Supplier.** The manufacturer or supplier of any manufactured device shall, upon request, provide to building designers and installers information about the device. The information shall include the efficiency (and other characteristics regulated by Part 6). This information shall be in paper or electronic format.

(d) **Enforcement Agency Requirements.**

1. **Permits.** An enforcement agency shall not issue a building permit for any construction unless the enforcement agency determines in writing that the construction is designed to comply with the requirements of Part 6 that are in effect on the date the building permit was applied for. The enforcement agency determination shall confirm that the documentation requirements of Sections 10-103(a)1 and 10-103(a)2 have been met.

   If a building permit has been previously issued, there has been no construction under the permit, and the permit has expired, the enforcement agency shall not issue a new permit unless the enforcement agency determines in writing that the construction is designed to comply with the requirements of Part 6 in effect on the date the new permit is applied for. The enforcement agency determination shall confirm that the documentation requirements of Sections 10-103(a)1 and 10-103(a)2 have been met.

   "Determines in writing" includes, but is not limited to, approval of a building permit with a stamp normally used by the enforcement agency.

2. **Inspection.** The enforcement agency shall inspect newly constructed buildings and additions, and alterations to existing buildings to determine whether the construction or installation is consistent with the agency's approved plans and specifications, and complies with Part 6. Final certificate of occupancy shall not be issued until such consistency and compliance is verified. For Occupancy Group R-3, final inspection shall not be complete until such consistency and compliance is verified.

   Such verification shall include determination that:

   A. All installed features, materials, components, or manufactured devices, regulated by the Appliance Efficiency Regulations or Part 6 are indicated, when applicable, on the Certificate(s) of Installation, Certificate(s) of Acceptance and Certificate(s) of Verification, and are consistent with such features, materials, components, or manufactured devices given in the plans and specifications and the Certificate(s) of Compliance approved by the local enforcement agency.

   B. All required Certificates of Installation are posted, or made available with the building permit(s) issued for the building, or made available for viewing on an approved data registry, and are made available to the enforcement agency for all

~~applicable inspections, and that all required Certificates of Installation conform to the specifications of Section 10-103(a)3.~~

~~C. All required Certificates of Acceptance are posted, or made available with the building permit(s) issued for the building, and are made available to the enforcement agency for all applicable inspections, and that all required Certificates of Acceptance conform to the specifications of Section 10-103(a)4.~~

~~D. All required Certificates of Verification are posted, or made available with the building permit(s) issued for the building, or made available for viewing on an approved data registry, and are made available to the enforcement agency for all applicable inspections, and that all required Certificates of Verification conform to the specifications of Section 10-103(a)5.~~

NOTE: Authority: Section 25402, 25402.1, Public Resources Code. Reference: Section 25402, Public Resources Code.

10-103.1 – NONRESIDENTIAL LIGHTING CONTROLS ACCEPTANCE TEST TRAINING AND CERTIFICATION

Nonresidential lighting controls acceptance testing training and certification requirements are included in Title 24, Part 6, Section 103.1.

~~(a) **Scope.** The requirements of this section apply to Acceptance Test Technicians (ATTs), Acceptance Test Employers (ATEs), and Acceptance Test Technician Certification Providers (ATTCPs) that perform work relating to the acceptance testing of nonresidential lighting systems and controls.~~

~~(b) **Industry Certification Threshold.** ATT and ATE certification requirements shall take effect when the Energy Commission finds that each of the following conditions are met. Until such time that Sections 10-103.1(b)1 and 10-103.1(b)2 are met, or if, subsequent to being met, they cease to be maintained, Field Technicians may complete acceptance testing as specified in Part 6, Sections 130.4 and 160.5(e) without meeting the certification requirements specified in Part 1, Section 10-103.1.~~

~~1. **Number of Certified ATTs.** There shall be no less than 300 ATTs certified to perform the lighting acceptance tests in Building Energy Efficiency Standards, Sections 130.4 and 160.5(e). The number of certified ATTs shall be submitted to the Energy Commission in the annual reports prepared by ATTCPs, as specified in Section 10-103.1(d)1.~~

~~2. **Industry Coverage by ATTCPs.** ATTCPs approved by the Energy Commission, in their entirety, shall provide reasonable access to certification to the following industry groups: electrical contractors, certified general electricians, licensed architects, professional engineers, controls installation and startup contractors and certified commissioning professionals who have verifiable training, experience and expertise in lighting controls and electrical systems. The Energy Commission will determine whether reasonable access to certification is provided by considering factors such as certification costs commensurate with the complexity of the training being provided, certification marketing materials, prequalification criteria, class location and availability, and curriculum.~~

~~(c) **Qualifications and Approval of ATTCPs.** ATTCPs shall submit a written application to the Energy Commission with a summary and the related background documents to explain how the following criteria and procedures have been met:~~

~~1. **Organizational Structure.** ATTCPs shall provide written explanations of the organization type, by-laws, and ownership structure. ATTCPs shall explain in writing how their certification program meets the qualification requirements of Title 24, Part 1, Section 10-103.1(c). ATTCPs shall explain in their application to the Energy Commission their organizational structure and their procedures for independent oversight, quality assurance, supervision and support of the acceptance test training and certification processes.~~

2. **Certification of ATEs.** The ATTCPs shall provide written explanations of their certification and oversight of ATEs. This explanation shall document how the ATTCP ensures that ATEs are providing quality control and appropriate supervision and support for their ATTs.

   A. **Recertification.** The ATTCP shall recertify all ATEs prior to the implementation of each adopted update to the Building Energy Efficiency Standards as these updates affect the acceptance test requirements. Recertification requirements and procedures shall only apply to those specific elements that are new or modified in future updates to Building Energy Efficiency Standards.

3. **Training and Certification Procedures.** ATTCPs shall include with their application a complete copy of all training and testing procedures, manuals, handbooks, and materials. ATTCPs shall explain in writing how their training and certification procedures include, but are not limited to, the following:

   A. **Training Scope.** The scope of the training shall include both hands-on experience and theoretical training to certify competency in the technologies and skills necessary to perform the acceptance tests.

   B. **ATT Training.**

      i. **Curricula.** ATTCP training curricula for ATTs shall include, but not be limited to, the analysis, theory, and practical application of the following:

         a. Lamp and ballast systems;

         b. Line voltage switching controls;

         c. Low voltage switching controls;

         d. Dimming controls;

         e. Occupancy sensors;

         f. Photosensors;

         g. Demand responsive signal inputs to lighting control systems;

         h. Building Energy Efficiency Standards required lighting control systems;

         i. Building Energy Efficiency Standards required lighting control system-specific analytical/problem solving skills;

         j. Integration of mechanical and electrical systems for Building Energy Efficiency Standards required lighting control installation and commissioning;

         k. Safety procedures for low-voltage retrofits (<50 volts) to control line voltage systems (120 to 480 volts);

         l. Accurate and effective tuning, calibration, and programming of Building Energy Efficiency Standards required lighting control systems;

m. Measurement of illuminance according to the Illuminating Engineering Society's measurement procedures as provided in the IES Lighting Library;

n. Building Energy Efficiency Standards lighting controls acceptance testing procedures; and

o. Building Energy Efficiency Standard**s** acceptance testing compliance documentation for lighting controls.

ii. **Hands-on training.** The ATTCP shall describe in its application the design and technical specifications of the laboratory boards, equipment and other elements that will be used to meet the hands-on requirements of the training and certification.

iii. **Prequalification.** Participation in the certification program shall be limited to persons who have at least three years of professional experience and expertise in lighting controls and electrical systems as determined by the Lighting Controls ATTCPs.

NOTE: ATTCPs may specify additional qualifications for participation in their programs, such as limiting participation to persons that are not currently listed as "decertified" by another ATTCP.

iv. **Instructor to Trainee Ratio.** The ATTCP shall document in its application to the Energy Commission why its instructor to trainee ratio is sufficient to ensure the integrity and efficacy of the curriculum and program based on industry standards and other relevant information.

v. **Tests.** The ATTCP shall describe the written and practical tests used to demonstrate each certification applicant's competence in all specified subjects. The ATTCPs shall retain all results of these tests for five years from the date of the test.

vi. **Recertification.** The ATTCP shall recertify all ATTs prior to the implementation of each adopted update to the Building Energy Efficiency Standards when these updates affect the acceptance test requirements. Recertification requirements and procedures shall only apply to those specific elements that are new or modified in future updates to Building Energy Efficiency Standards. The ATTCP shall develop recertification training curricula for ATTs consistent with training requirements in Sections 10-103.1(c)3A and 10-103.1(c)3B, and shall submit the proposed recertification training curricula to the Energy Commission for review and approval in the update report required under Section 10-103.1(d)2.

C. **ATE Training.** Training for ATEs shall consist of a single class or webinar consisting of at least four hours of instruction that covers the scope and process of the acceptance tests in Building Energy Efficiency Standards, Sections 130.4 and 160.5(e).

D. **Complaint Procedures.** The ATTCP shall describe in its applications to the Energy Commission procedures for accepting and addressing complaints regarding the performance of any ATT or ATE certified by the ATTCP, and explain how building departments and the public will be notified of these proceedings.

E. **Decertification Procedures.** The ATTCP shall describe in its applications to the Energy Commission procedures for revoking their certification of ATTs and ATEs based upon poor quality or ineffective work, failure to perform acceptance tests, falsification of documents, failure to comply with the documentation requirements of these regulations or other specified actions that justify decertification. The ATTCP shall also describe its general procedures for decertified ATTs or ATEs seeking to regain their certification status, including eligibility requirements for recertification (if any).

F. **Quality Assurance and Accountability.** The ATTCP shall describe in its application to the Energy Commission its procedures for conducting quality assurance and accountability activities, including but not limited to the following:

i. The ATTCP shall include quality assurance and accountability measures, including but not limited to independent oversight of the certification materials, processes and procedures, visits to building sites where certified technicians are completing acceptance tests, certification process evaluations, and expert review of the training curricula developed for Building Energy Efficiency Standards, Sections 130.4 and 160.5(e). Independent oversight may be demonstrated by accreditation under the ISO/IEC 17024 standard.

ii. The ATTCP shall review a random sample of no less than 1 percent of each ATT's completed compliance forms.

iii. The ATTCP shall perform audits by meeting either of the following:

a) The ATTCP shall perform randomly selected on-site audits of no less than 1 percent of each ATT's completed acceptance tests.

b) The ATTCP shall shadow audit each ATT at an ATTCP training facility at least once per code cycle where the ATTCP shall observe the performance of the ATT on at least five functional tests for which the ATT is certified. The shadow audit must replicate field conditions for installed equipment and controls in a building. The ATTCP training facility shall be setup to allow auditing of all functional tests for which the ATT is certified. The shadow audits must be in addition to any testing used for ATT recertification.

G. **Certification Identification Number and Verification of ATT and ATE Certification Status.** The ATTCP shall describe in its application to the Energy Commission its procedures for recording, tracking, and communicating certification status, including but not limited to the following:

i. Upon certification of an ATT or ATE, the ATTCP shall issue a unique certification identification number to the ATT or ATE.

ii. The ATTCP shall maintain an accurate public record of the certification status for all ATTs and ATEs that the ATTCP has certified, including any ATTs or ATEs who have been decertified as specified in Section 10-103.1(c)3E.

iii. The ATTCP shall provide verification of current ATT certification status upon request to authorized document Registration Provider personnel or enforcement agency personnel to determine the ATT's eligibility to sign Certificate of Acceptance documentation according to all applicable requirements in Sections 10-103.1, 10-102, 10-103(a)4, and the Reference Joint Appendix JA7.

H. **Electronic Database System**. The ATTCP shall maintain, or by suitable contractual requirements cause to be maintained, an electronic database system approved by the Energy Commission. The electronic database system shall be capable of all the following:

i. Support all activities for the ATTCP to comply with its quality assurance program as required by Section 10-103.1(c)3F.

ii. For no less than five years, record and preserve all certificates of acceptance offered for certification by the ATTCP and as performed by its own certified ATTs.

iii. Allow the transmission of electronic copies of each completed certificate of acceptance to the ATT that performed the test, the ATE associated with that ATT, or both.

a. Each page of each certificate of acceptance shall bear the logo of the ATTCP or other identifying insignia as approved by the Energy Commission.

b. The electronic copy shall be capable of being printed.

c. The ATTCP may apply to the Energy Commission for approval to use alternative compliance documents that differ from those approved for use by the Energy Commission but must demonstrate that these alternative compliance documents do not differ in format, informational order, or content from approved compliance documents.

iv. Provide a means of verifying any certificate of acceptance to the enforcement agency having jurisdiction as identified on the certificate of acceptance.

v. Provide the Energy Commission with any of the following project data or documents upon request: project address, permit numbers, acceptance test technician and acceptance test employee certification numbers, certificates of acceptance, compliance forms, installation forms, and record of quality assurance review. The Energy Commission may adopt an Application

Programming Interface (API) for providing data electronically. Within one year of development of an API, the ATTCP's electronic database system shall have the ability to transfer project data to the Energy Commission through the API upon completion of the project or at established intervals no longer than monthly.

I. Compliance Document Recording and Repository Reporting Requirement:

i. The ATTCP shall record all certificates of compliance (Section 10-103(a)1), certificates of installation (Section 10-103(a)3), and certificates of acceptance (Section 10-103(a)4) associated with any acceptance test specified in Part 6, Sections 130.4 and 160.5(e).

ii. Contingent upon Energy Commission approval of the threshold (Section 10-103.1(b)) and upon availability and approval of an electronic document repository by the Executive Director, the ATTCP shall submit monthly data transfer packets to the Energy Commission to an electronic document repository for retention consistent with Energy Commission instructions.

(d) **Requirements for ATTCPs to Provide Regular Reports.** The ATTCP shall provide the following regular reports to the Energy Commission:

1. **Annual Report.** The ATTCP shall provide an annual report to the Energy Commission that includes the following:

A. A summary of the certification services provided over the reporting period, including the total number of Acceptance Test Technicians and Employers certified by the ATTCP during the reporting period and to date.

B. A summary of all actions taken against any ATT or ATE as a result of the complaint or quality assurance procedures described by the ATTCP as required under Section 10-103.1(c)3D and 10-103.1(c)3F.

C. A summary of the quality assurance and accountability activities conducted over the reporting period, including the compliance forms reviewed and the on-site audits performed as required under Section 10-103.1(c)3Fii during the reporting period and to date.

D. A summary of the number and type of acceptance tests performed in each local jurisdiction over the reporting period and to date.

E. A signed certification to the Energy Commission that the ATTCP continues to meet the requirements of Section 10-103.1.

2. **Update Report**. The ATTCP shall have no less than six months following the adoption of an update to the Building Energy Efficiency Standards to prepare an Update Report. The ATTCP shall submit an Update Report to the Energy Commission no less than six months prior to the effective date of any newly adopted update to the Building Energy Efficiency Standards. The ATTCP shall report to the Energy Commission what application amendments are proposed, to address changes to the

Building Energy Efficiency Standards or to ensure training is reflective of the variety of lighting controls that are currently encountered in the field. All required update reports shall contain a signed certification that the ATTCP continues to meet the requirements of Section 10-103.1. Update reports shall be approved through the Amendment Process provided under Section 10-103.1(f).

All required reports shall contain a signed certification that the ATTCP has met all requirements for this program.

(e) **Application Review and Determination.** The Energy Commission shall review ATTCP applications according to the criteria and procedures in Section 10-103.1(c) to determine if such providers meet the specified requirements for providing acceptance testing certification services.

1. Energy Commission staff will review and validate all information received on ATTCP applications, and determine whether the application is complete and contains sufficient information to be evaluated by staff. Complete applications shall be evaluated by staff based on their contents.
2. The Executive Director may require that the applicant provide additional information as required by staff to fully evaluate the ATTCP application.
3. The Executive Director shall provide a copy of the staff evaluation to interested persons and provide a reasonable opportunity for public comment.
4. The Executive Director shall issue a written recommendation that the Energy Commission designate the applicant as an authorized ATTCP or deny the application.
5. The Energy Commission shall make a final decision on the application at a publicly noticed hearing.

(f) **Amendment Process.** The ATTCP may amend a submitted or approved application, as follows:

1. **Amendment Scope.**

A. **Nonsubstantive Changes.** A nonsubstantive change is a change that does not substantively alter the requirements of the application materials for the ATTCP, ATT, or ATE. For amendments making only nonsubstantive changes, the ATTCP shall submit the following:

i. A letter describing the change to the Energy Commission as an addendum to the application;

ii. A replacement copy of the affected sections of the ATTCP application with the changes incorporated; and

iii. A copy of the affected sections of the ATTCP application showing the changes in underline and strikeout format.

B. **Substantive Changes.** A substantive change is a change that substantively alters the requirements of the application materials for the ATTCP, ATT, or ATE. For

~~amendments making any substantive changes, the ATTCP shall submit the following:~~

~~i. A document describing the scope of the change to the application, the reason for the change and the potential impact to the ATTCP, ATT, and ATE as an addendum to the application;~~

~~ii. A replacement copy of the affected sections of the ATTCP application with the changes incorporated; and~~

~~iii. A copy of the affected sections of the ATTCP application showing the changes in underline and strikeout format.~~

~~2. **Amendment Review.** Amendments submitted prior to approval of an ATTCP application shall be included in the application's Application Review and Determination process specified in Section 10-103.1(e).~~

~~Amendments submitted after approval of an ATTCP's application that contain only nonsubstantive changes shall be reviewed by the Executive Director for consistency with Section 10-103.1. Amendments determined to be consistent with this Section shall be incorporated into the approval as errata.~~

~~Amendments submitted after approval of an ATTCP's application that contain any substantive changes shall be subject to the Application Review and Determination process specified in Section 10-103.1(e). If the Energy Commission finds that the amended application does not meet the requirements of Section 10-103.1, then the ATTCP shall either abide by the terms of their previously approved application or have their approval suspended.~~

~~(g) **Review by the Energy Commission.**~~

~~If the Energy Commission determines there is a violation of these regulations or that an ATTCP is no longer providing adequate certification services, the Energy Commission may revoke the authorization of the ATTCP pursuant to Section 1230 et seq. of Title 20 of the California Code of Regulations.~~

NOTE: Authority: Sections 25402, 25402.1, 25213, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8 and 25943, Public Resources Code.

10-103.2 – NONRESIDENTIAL MECHANICAL ACCEPTANCE TEST TRAINING AND CERTIFICATION

Nonresidential mechanical acceptance testing training and certification requirements are included in Title 24, Part 6, Section 103.2.

~~(a) **Scope.** The requirements of this section apply to Acceptance Test Technicians (ATTs), Acceptance Test Employers (ATEs), and Acceptance Test Technician Certification Providers (ATTCPs) that perform work relating to the acceptance testing of nonresidential mechanical systems and controls.~~

~~(b) **Industry Certification Threshold.** ATT and ATE certification requirements shall take effect when the Energy Commission finds that each of the following conditions are met. Until such time that Sections 10-103.2(b)1 and 10-103.2(b)2 are met, or if, subsequent to being met, they cease to be maintained, Field Technicians may complete acceptance testing as specified in Sections 120.5 and 160.3(d) without completing certification requirements specified in Part 1, Section 10-103.2.~~

~~1. **Number of Certified ATTs.**~~

~~A. There shall be no less than 300 ATTs certified to perform the complete set of mechanical acceptance tests in Building Energy Efficiency Standards, Sections 120.5 and 160.3(d), except as provided in Subsection 10-103.2(b)1B. The number of certified ATTs shall be submitted to the Energy Commission in the annual reports prepared by ATTCPs, as specified in Section 10-103.2(d)1.~~

~~B. If there are less than 300 ATTs certified to perform all of the acceptance tests in Building Energy Efficiency Standards, Sections 120.5 and 160.3(d), then there shall be at least 300 ATTs certified to complete the following tests:~~

~~i. NA7.5.1 Outdoor Air Ventilation Systems~~
~~ii. NA7.5.2 Constant Volume, Single Zone Unitary Air Conditioners and Heat Pumps~~
~~iii. NA7.5.4 Air Economizer Controls~~
~~iv. NA7.5.5 Demand Control Ventilation Systems~~
~~v. NA 7.5.6 Supply Fan Variable Flow Controls~~
~~vi. NA7.5.7, NA7.5.9 Hydronic System Variable Flow Controls~~
~~vii. NA7.5.10 Automatic Demand Shed Controls~~

~~2. **Industry Coverage by ATTCPs.** ATTCPs approved by the Energy Commission, in their entirety, provide reasonable access to certification to the following industry groups: Professional engineers, licensed architects, HVAC installers, mechanical contractors, Testing and Balancing (TAB) certified technicians, controls installation and startup contractors and certified commissioning professionals who have verifiable training, experience and expertise in HVAC systems. The Energy Commission will determine reasonable access by considering factors such as certification costs commensurate with the complexity of the training being provided, certification marketing materials, prequalification criteria, class availability and curriculum.~~

(c) **Qualifications and Approval of ATTCPs.** ATTCPs shall submit a written application to the Energy Commission with a summary and the necessary background documents to explain how the following criteria and procedures have been met:

1. **Organizational Structure.** ATTCPs shall provide written explanations of the organization type, by-laws, and ownership structure. ATTCPs shall explain in writing how their certification program meets the qualifications of Building Energy Efficiency Standards, Section 10-103.2(c). ATTCPs shall explain in their application to the Energy Commission their organizational structure and their procedures for independent oversight, quality assurance, supervision and support of the acceptance test training and certification processes.

2. **Certification of ATEs.** The ATTCPs shall provide written explanations of their certification and oversight of ATEs. This explanation shall document how the ATTCP ensures that ATEs are providing quality control and appropriate supervision and support for their ATTs.

A. **Recertification.** The ATTCP shall recertify all ATEs prior to the implementation of each adopted update to the Building Energy Efficiency Standards as these updates affect the acceptance test requirements. Recertification requirements and procedures shall only apply to those specific elements that are new or modified in future updates to Building Energy Efficiency Standards.

3. **Requirements for Applicant ATTCPs to Document Training and Certification Procedures.** ATTCPs shall include with their application a complete copy of all training and testing procedures, manuals, handbooks, and materials. ATTCPs shall explain in writing how their training and certification procedures include, but are not limited to, the following:

A. **Training Scope.** The scope of the training shall include both hands-on experience and theoretical training to certify competency in the technologies and skills necessary to perform the acceptance tests.

B. **ATT Training.**

i. **Curricula**. ATTCP training curricula for ATTs shall include, but not be limited to, the analysis, theory, and practical application of the following:

a. Constant volume system controls;

b. Variable volume system controls;

c. Air-side economizers;

d. Air distribution system leakage;

e. Demand controlled ventilation with CO_2 sensors;

f. Demand controlled ventilation with occupancy sensors;

g. Automatic demand shed controls;

h. Hydronic valve leakage;

i. Hydronic system variable flow controls;

j. Supply air temperature reset controls;

~~k. Condenser water temperature reset controls;~~

~~l. Outdoor air ventilation systems;~~

~~m. Supply fan variable flow controls;~~

~~n. Boiler and chiller isolation controls;~~

~~o. Fault detection and diagnostics for packaged direct-expansion units;~~

~~p. Automatic fault detection and diagnostics for air handling units and zone terminal units;~~

~~q. Distributed energy storage direct-expansion air conditioning systems;~~

~~r. Thermal energy storage systems;~~

~~s. Building Energy Efficiency Standards mechanical acceptance testing procedures; and~~

~~t. Building Energy Efficiency Standards acceptance testing compliance documentation for mechanical systems.~~

~~ii. **Hands-on training.** The ATTCP shall describe in its application the design and technical specifications of the laboratory boards, equipment and other elements that will be used to meet the hands-on requirements of the training and certification.~~

~~iii. **Prequalification.** Participation in the certification program shall be limited to persons who have at least three years of professional experience and expertise in mechanical controls and systems as determined by the Mechanical ATTCPs.~~

~~**NOTE:** ATTCPs may specify additional qualifications for participation in their programs, such as limiting participation to persons that are not currently listed as "decertified" by another ATTCP.~~

~~iv. **Instructor to Trainee Ratio.** The ATTCP shall document in its application to the Energy Commission why its instructor to trainee ratio is sufficient to ensure the integrity and efficacy of the curriculum and program based on industry standards and other relevant information.~~

~~v. **Tests.** The ATTCP shall describe the written and practical tests used to demonstrate each certification applicant's competence in all specified subjects. The ATTCPs shall retain all results of these tests for five years from the date of the test.~~

~~vi. **Recertification.** The ATTCP shall recertify all ATTs prior to the implementation of each adopted update to the Building Energy Efficiency Standards as these updates affect the acceptance test requirements. Recertification requirements and procedures shall only apply to those specific elements that are new or modified in future updates to Building Energy Efficiency Standards.~~

~~C. **ATE Training.** Training for ATEs shall consist of a single class or webinar consisting of at least four hours of instruction that covers the scope and process of the acceptance tests in Building Energy Efficiency Standards, Sections 120.5 and 160.3(d).~~

~~D. **Complaint Procedures.** Procedures described in writing for notifying building departments and the public that the ATTCP will accept complaints regarding the performance of any certified ATT or ATE, and procedures for how the ATTCP will address these complaints.~~

E. **Decertification Procedures.** The ATTCP shall describe in its application to the Energy Commission procedures for revoking their certification of ATTs and ATEs based upon poor quality or ineffective work, failure to perform acceptance tests, falsification of documents, failure to comply with the documentation requirements of these regulations or other specified actions that justify decertification. The ATTCP shall also describe its general procedures for decertified ATTs or ATEs seeking to regain their certification status, including eligibility requirements for recertification (if any).

F. **Quality Assurance and Accountability.** The ATTCP shall describe in its applications to the Energy Commission procedures for conducting quality assurance and accountability activities, including but not limited to the following:

i. The ATTCPs shall include quality assurance and accountability measures, including but not limited to independent oversight of the certification materials, processes and procedures, visits to building sites where certified technicians are completing acceptance tests, certification process evaluations, and expert review of the training curricula developed for Building Energy Efficiency Standards, Sections 120.5 and 160.3(d). Independent oversight may be demonstrated by accreditation under the ISO/IEC 17024 standard.

ii. The ATTCP shall review a random sample of no less than 1 percent of each ATT's completed compliance forms.

iii. The ATTCP shall perform shadow audits by meeting either of the following:

a. The ATTCP shall randomly select and shadow audit no less than 1 percent of each ATE's overseen projects, following the assigned ATT and observing their performance on the job site.

b. The ATTCP shall shadow audit each ATT at an ATTCP training facility at least once per code cycle where the ATTCP shall observe the performance of the ATT on at least five functional tests for which the ATT is certified. The shadow audit must replicate field conditions for installed equipment and controls in a building. The ATTCP training facility shall be setup to allow auditing of all functional tests for which the ATT is certified. The shadow audits must be in addition to any testing used for ATT recertification.

G. **Certification Identification Number and Verification of ATT and ATE Certification Status.** The ATTCP shall describe in its applications to the Energy Commission procedures for recording, tracking, and communicating certification status, including but not limited to the following:

i. Upon certification of an ATT or ATE, the ATTCP shall issue a unique certification identification number to the ATT or ATE.

ii. The ATTCP shall maintain an accurate public record of the certification status for all ATTs and ATEs that the ATTCP has certified, including any ATTs or ATEs who have been decertified as specified in 10-103.2(c)3E.

iii. The ATTCP shall provide verification of current ATT certification status upon request to authorized document Registration Provider personnel or enforcement agency personnel to determine the ATT's eligibility to sign Certificate of Acceptance documentation according to all

applicable requirements in Sections 10-103.2, 10-102, 10-103(a)4, and Reference Joint Appendix JA7.

H. **Electronic Database System**. The ATTCP shall maintain, or by suitable contractual requirements cause to be maintained, an electronic database system approved by the Energy Commission. The electronic database system shall be capable of all the following:

i. Support all activities for the ATTCP to comply with its quality assurance program as required by Section 10-103.2(c)3F.

ii. For no less than five years, record and preserve all certificates of acceptance offered for certification by the ATTCP and as performed by its own certified ATTs.

iii. Allow the transmission of electronic copies of each completed certificate of acceptance to the ATT that performed the test, the ATE associated with that ATT, or both.

a. Each page of each certificate of acceptance shall bear the logo of the ATTCP or other identifying insignia as approved by the Energy Commission.

b. The electronic copy shall be capable of being printed.

c. The ATTCP may apply to the Energy Commission for approval to use alternative compliance documents that differ from those approved for use by the Energy Commission but must demonstrate that these alternative compliance documents do not differ in format, informational order, or content from approved compliance documents.

iv. Provide a means of verifying any certificate of acceptance to the enforcement agency having jurisdiction as identified on the certificate of acceptance.

v. Provide the Energy Commission with any of the following project data or documents upon request: project address, permit numbers, acceptance test technician and acceptance test employee certification numbers, certificates of acceptance, compliance forms, installation forms, and record of quality assurance review. The Energy Commission may adopt an Application Programming Interface (API) for providing data electronically. Within one year of development of an API, the ATTCP's electronic database system shall have the ability to transfer project data to the Energy Commission through the API upon completion of the project or at established intervals no longer than monthly.

I. **Compliance Document Recording and Repository Reporting Requirement:**

i. The ATTCP shall record all certificates of compliance (Section 10-103(a)1), certificates of installation (Section 10-103(a)3), and certificates of acceptance (Section 10-103(a)4) associated with any acceptance test specified in Part 6, Sections 120.5 and 160.3(d).

ii. Contingent upon Energy Commission approval of the threshold (Section 10-103.2(b)) and upon availability and approval of an electronic document repository by the Executive Director, the ATTCP shall submit monthly data transfer packets to the Energy Commission to an electronic document repository for retention consistent with Energy Commission instructions.

(d) **Requirements for ATTCPs to Provide Regular Reports.** The ATTCP shall provide the following regular reports to the Energy Commission:

~~1. **Annual Report.** The ATTCP shall provide an annual report to the Energy Commission that includes the following:~~

~~A. A summary of the certification services provided over the reporting period, including the total number of Acceptance Test Technicians and Employers certified by the agency during the reporting period and to date.~~

~~B. A summary of all actions taken against any ATT or ATE as a result of the complaint or quality assurance procedures described by the ATTCP as required under Section 10-103.2(c)3D and 10-103.2(c)3F.~~

~~C. A summary of the quality assurance and accountability activities conducted over the reporting period, including the compliance forms reviewed and the on-site audits performed as required under Section 10-103.2(c)3Fii during the reporting period and to date.~~

~~D. A summary of the number and type of acceptance tests performed in each local jurisdiction over the reporting period and to date.~~

~~E. A signed certification to the Energy Commission that the ATTCP continues to meet the requirements of Section 10-103.2.~~

~~2. **Update Report.** The ATTCP shall have no less than six months following the adoption of an update to the Building Energy Efficiency Standards to prepare an Update Report. The ATTCP shall submit an Update Report to the Energy Commission no less than six months prior to the effective date of any newly adopted update to the Building Energy Efficiency Standards, The ATTCP shall report to the Energy Commission what application amendments are proposed to address changes to the Building Energy Efficiency Standards or to ensure training is reflective of the variety of mechanical equipment and systems currently encountered in the field. All required update reports shall contain a signed certification that the ATTCP continues to meet all the requirements of Section 10-103.2(c). Update reports shall be approved through the Amendment Process provided under Section 10-103.2(f).~~

~~All required reports shall contain a signed certification that the ATTCP has met all requirements for this program.~~

~~(e) **Application Review and Determination.** The Energy Commission shall review ATTCP applications according to the criteria and procedures in Section 10-103.2(c) to determine if such providers meet the specified requirements for providing acceptance testing certification services.~~

~~1. Energy Commission staff will review and validate all information received on ATTCP applications, and determine whether the application is complete and contains sufficient information to be evaluated by staff. Complete applications shall be evaluated by staff based on their contents.~~

~~2. The Executive Director may require that the applicant provide additional information as required by staff to fully evaluate the ATTCP application.~~

~~3. The Executive Director shall provide a copy of the staff evaluation to interested persons and provide an opportunity for public comment.~~

4. The Executive Director shall issue a written recommendation that the Energy Commission designate the applicant as an authorized ATTCP or deny the Provider application.

5. The Energy Commission shall make a final decision on the application at a publicly noticed hearing.

(f) **Amendment Process.**

The ATTCP may amend a submitted or approved application, as follows:

1. **Amendment Scope.**

A. **Nonsubstantive Changes.** A nonsubstantive change is a change that does not substantively alter the requirements of the application materials for the ATTCP, ATT, or ATE. For amendments making only nonsubstantive changes, the ATTCP shall submit the following:

i. a letter describing the change to the Energy Commission as an addendum to the application;

ii. A replacement copy of the affected sections of the ATTCP application with the changes incorporated; and

iii. A copy of the affected sections of the ATTCP application showing the changes in underline and strikeout format.

B. **Substantive Changes.** A substantive change is a change that substantively alters the requirements of the application materials for the ATTCP, ATT, or ATE. For amendments making any substantive changes, the ATTCP shall submit the following:

i. A document describing the scope of the change to the application, the reason for the change and the potential impact to the ATTCP, ATT, and ATE as an addendum to the application;

ii. A replacement copy of the affected sections of the ATTCP application with the changes incorporated; and

iii. A copy of the affected sections of the ATTCP application showing the changes in underline and strikeout format.

2. **Amendment Review.** Amendments submitted prior to approval of an ATTCP application shall be included in the application's Application Review and Determination process specified in Section 10-103.2(e).

Amendments submitted after approval of an ATTCP's application that contain only nonsubstantive changes shall be reviewed by the Executive Director for consistency with Section 10-103.2. Amendments determined to be consistent with this Section shall be incorporated into the approval as errata.

Amendments submitted after approval of an ATTCP's application that contain any substantive changes shall be subject to the Application Review and Determination process specified in Section 10-103.2(e). If the Energy Commission finds that the amended application does not meet the requirements of Section 10-103.2, then the ATTCP shall either abide by the terms of their previously approved application or have their approval suspended.

~~(g) **Review by the Energy Commission.**~~

~~If the Energy Commission determines there is a violation of these regulations or that an ATTCP is no longer providing adequate certification services, the Energy Commission may revoke the authorization of the ATTCP pursuant to Section 1230 et. seq. of Title 20 of the California Code of Regulations.~~

NOTE: Authority: Sections 25402, 25402.1, 25213, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8 and 25943, Public Resources Code.

10-103.3 ~~Administrative Procedures for the Energy Code Compliance Program~~ADMINISTRATIVE PROCEDURES FOR THE ENERGY CODE COMPLIANCE PROGRAM

Administrative procedures for the Energy Code Compliance Program are included in Title 24, Part 6, Section 103.3.

~~(a) **Scope.** The requirements in this section apply to ECC-Providers, ECC-Raters, and ECC-Rater Companies performing work relating to residential field verification and diagnostic testing for the Energy Code Compliance (ECC) Program. The ECC Program is intended to verify that the newly constructed residential buildings and additions and alterations to existing residential buildings comply with the requirements of the Building Energy Efficiency Standards in order to protect consumers from poor construction and installations.~~

~~(b) **General Provisions.**~~

~~a. **Conflicts of Interest.**~~

A. ~~**Prohibition of Conflicts of Interest.**~~

~~i. ECC-Providers shall be independent from, and have no financial interest in, ECC-Rater Companies or ECC-Raters.~~

~~ii. ECC-Providers, ECC-Raters, and ECC-Rater Companies shall operate independently and shall not have any financial interest in the builder, designer, or subcontractor serving as the "Responsible Person" signatory as specified in Sections 10-103(a)1 and 10-103(a)3 on a project. However, an exception applies if the ECC-Rater Company submits a Declaration of ECC-Rater Company Separation of Services, as provided in Section 10-103.3(f)2Diii. This applies specifically to projects where the ECC-Rater is involved in, or is reasonably expected to provide, field verification and diagnostic testing services.~~

~~iii. For the purposes of this subdivision, a "financial interest" includes:~~

a. a business entity in which the entity or individual has a direct or indirect investment worth $2,000 or more, or in which the entity or individual is a director, officer, partner, trustee, or employee. However, this prohibition on investments does not include ownership of less than five percent of a publicly traded company.

b. an ownership interest, debt agreement, or employer/employee relationship.

iv. ECC Providers, ECC Raters, and ECC Rater Companies or principals of an ECC Provider or ECC Rater Company shall not perform field verification or diagnostic testing services for builders, designers, or subcontractors owned or operated by close familial relatives. For purposes of this subdivision, "close familial relative" means a spouse, domestic partner, or cohabitation partner or a parent, grandparent (including greats), sibling, child, grandchild (including greats) of the individual or spouse, domestic partner, or cohabitation partner, and any person living in the same household.

v. ECC Raters and ECC Rater Companies shall not perform any construction activity on a project site for which a construction permit is issued and for which they will or are reasonably expected to perform field verification or diagnostic testing services.

vi. ECC Raters or ECC Rater Companies shall provide a report to the building or project owner for field verification or diagnostic testing services performed on the project site. The report may be provided through a contractor or other project representative to the building or project owner but must be a conspicuous and separate document from other documents provided by the contractor or project representative. The report must include all of the following elements:

a. The ECC Rater's or ECC Rater Company's name, logo (if any), contact information, and certification number.

b. The ECC Provider data registry link and registry numbers for all compliance documents registered by the ECC Rater or ECC Rater Company for the project.

c. An itemization of each field verification or diagnostic test, as well as any other services performed for the project, the amount charged, and the results in terms of pass or fail.

vii. The ECC Provider shall develop a Consumer Information Form, and the Commission may request to review and provide recommendations on the content of that form. The Consumer

~~Information Form shall include educational materials regarding the ECC Program, the roles and responsibilities of ECC-Raters, ECC-Providers and ECC-Rater Companies, and the means by which the owner may file a complaint. The Consumer Information Form must also include the owner's valid contact information, comprised of the owner's name, project address, phone number, and email. Prior to the start of any field verification or diagnostic testing at a project site, the ECC-Rater or ECC-Rater Company shall provide a copy of the most recent version of the Consumer Information Form developed by the ECC-Provider to the owner or owner representative and shall submit a completed Consumer Information Form to the ECC-Provider. Failure to register a valid Consumer Information Form will make the ECC-Rater or ECC-Rater Company subject to discipline as described in Sections 10-103.3(d)7 and 10-103.3(d)8. For projects with no current owner in residence, the owner's contact information may be that of the landlord, developer, builder, or any other such person with a real property interest. For the purposes of a Consumer Information Form, register is defined as submitting the information outlined in this paragraph to the ECC-Provider.~~

~~viii. Once an ECC-Rater has registered a failed field verification or diagnostic test, that ECC-Rater or ECC-Rater Company (or Independent Rater) shall become the ECC-Rater of Record (ROR) for the specific field verification or diagnostic test at the project site. If the ROR is an ECC-Rater Company or Independent Rater, then the ROR may be replaced by any ECC-Rater that is a fulltime employee of the ECC-Rater Company or Independent Rater and in good standing with the ECC-Provider. Except as provided in subdivision (a) below, only the ROR may register a subsequent passing field verification or diagnostic test previously registered as a failure.~~

~~a. Under any of the following circumstances, the ECC-Provider may release a project from the ROR but must verify that the retest for the failed field verification or diagnostic test is legitimate either through a site visit, photographic evidence (or other remote verification), or a desk audit (Section 10-103.3(d)5Civ) on the project:~~

~~(i) The ROR agrees to release the project.~~

~~(ii) The ROR is physically unable to continue work on the project due to injury, misfortune, or availability.~~

(iii) The ROR's certification has been suspended (Section 10-103.3(d)7C) or decertified (Section 10-103.3(d)7D).

(iv) The ROR is unwilling to continue work on the project.

b. The ECC-Provider shall lock the project compliance documentation within the data registry by address, permit number, or other reasonable means and shall not allow any further compliance documents to be registered for a failed test at the project site other than from the ROR or allowable substitute under Section 10-103.3(b)1Aviiia.

c. An ECC-Provider shall not knowingly accept compliance documents for registration for a project that has an active failed field verification or diagnostic tests in any other ECC-Provider data registry.

(i) ECC-Providers shall submit a complaint to the Commission (Section 10-103.3(d)6B) upon suspected violation of this requirement.

(ii) Upon investigation, the Commission may take disciplinary action against an ECC-Provider (Section 10-103.3(d)15) if the CEC can demonstrate noncompliance or recommend disciplinary action against an ECC-Rater or ECC-Rater Company (Sections 10-103.3(d)7 and 10-103.3(d)8).

ix. **Use of Registered Certificates.** The use of registered certificates, including Certificates of Compliance, Certificates of Installation, and Certificates of Verification, is limited to the demonstration and documentation of the project compliance with the Building Energy Efficiency Standards. Other uses of registered certificates, such as for federal tax credits, is only permitted for projects that have been completed and are closed within the data registry.

B. **Conflicted Data.** The prohibitions on conflicts of interest specified in Section 10-103.3(b)1A apply to any data collected by an ECC-Rater. Any data collected by an ECC-Rater when they have a conflict of interest, regardless of its accuracy, shall be considered conflicted data. Any data collected through sampling procedures (Building Energy Efficiency Standards, Reference Appendix RA2.6) where the ECC-Provider is refused access to perform an onsite quality assurance audit (Section 10-103.3(d)5Ci) shall be considered conflicted data.

i. ECC-Providers shall not knowingly accept conflicted data on their systems. ECC-Providers may demonstrate that they have fulfilled this requirement by, for example:

a. Requiring ECC-Raters to affirmatively indicate, upon submitting any data to the ECC-Provider, that the data is not conflicted data or that the ECC-Rater had a conflict of interest at the time the data was collected but had express written approval from the Executive Director waiving the conflict of the ECC-Rater.

b. Any other process approved by the CEC.

ii. ECC-Providers shall take all reasonable steps to detect, deter, isolate, and identify conflicted data in their systems, including in compliance documents and Compliance Registration Packages. ECC-Providers may demonstrate that they have taken all reasonable steps, for example:

a. Requiring ECC-Raters to complete training, prior to certification, regarding the requirements of Section 10-103.3(b)1A, including that it applies to data, or by some other reasonable method to deter conflicted data.

b. Instituting a desk audit program that assesses data submitted to the ECC-Provider pursuant to Section 10-103.3(d)5Civ to confirm whether the submitting ECC-Rater had a disqualifying conflict of interest pursuant to Section 10-103.3(b)1A at the time of the data's submission, or by some other reasonable method to detect conflicted data.

c. Investigating and, as necessary, quarantining or marking conflicted data, or otherwise identifying that data as conflicted, including pursuant to Section 10-103.3(b)1Bvi.

d. Any other process approved by the CEC.

iii. ECC-Providers may not use, rely on, sell, or offer for sale, any conflicted data for any purpose other than to detect, deter, isolate, and identify conflicted data from their systems, or to otherwise prevent the generation or transmission of conflicted data.

iv. ECC-Raters and ECC-Rater Companies may not submit any conflicted data without the express written approval of the Executive Director. ECC-Raters and ECC-Rater Companies may fulfill this requirement by, for example:

a. Affirmatively indicating, upon submitting any data to the ECC-Provider, that the data is not conflicted data, or that

~~the ECC-Rater or ECC-Rater Company had a conflict of interest at the time the data was collected but had express written approval from the Executive Director excusing the conflict.~~

~~b. Any other process approved by the CEC.~~

~~v. Any ECC-Rater or ECC-Rater Company may apply to the Executive Director for express written approval excusing a conflict of interest under this section.~~

~~a. Such an application must include the following information: an explanation of the conflict of interest, the beginning and ending date of the conflict of interest (if any), and written justification providing compelling and persuasive evidence that (1) the conflict of interest will not result in inaccurate data and (2) unnecessary hardship will result from the application of the prohibition on conflicted data in this instance.~~

~~b. The Executive Director may grant such written approval only if the Executive Director finds there is compelling and persuasive evidence of the factors identified in Section 10-103.3(b)1Bva.~~

~~c. Unsupported or general assertions of trustworthiness or accuracy are neither compelling nor persuasive evidence of the factors identified in Section 10-103.3(b)1Bva.~~

~~d. The Executive Director may, at their discretion, request additional information, provide express written approval, provide conditional express written approval, or reject the request. If an applicant does not receive a reply within 120 calendar days, their request is denied.~~

~~vi. Upon identifying data that may be conflicted, the ECC-Provider shall perform a desk audit to assess whether the data is in fact conflicted data, such as by contacting the submitting ECC-Rater or ECC-Rater Company and asking them to confirm, in writing, whether the data was conflicted or not. Upon discovery of a violation of the conflict-of-interest restrictions in Section 10-103.3(b)1A, the ECC-Provider shall use this gathered information to initiate disciplinary action against either (or both) the ECC-Rater (Section 10-103.3(d)7) and ECC-Rater Company (Section 10-103.3(d)8) responsible for the registered data in question.~~

~~vii. ECC-Providers shall flag or otherwise mark verified conflicted data (Section 10-103.3(b)1Bvi) in the data registry and inform all of the following of the identification of the data and which field~~

verification and diagnostic tests reliant on the data are invalidated: the homeowner, ECC-Rater, ECC-Rater Company, authority having jurisdiction over the issued construction permit, and the Commission.

b. **Prohibition on False, Inaccurate, or Incomplete Information**

A. ECC-Providers shall not knowingly accept, store, or disseminate untrue, inaccurate, or incomplete information or information received through actions not conducted in compliance with these regulations, including information related to field verification and diagnostic testing information, field verification and diagnostic test results, or results on a certificate of compliance or certificate of installation documents.

B. ECC-Providers shall not accept payment or other consideration in exchange for use of their data registry to report a field verification and diagnostic test result that was knowingly conducted and reported out of compliance with these regulations.

C. Only the ECC-Rater who performs a field verification and diagnostic test shall have signatory authority for all certificates of verification related to the field verification and diagnostic test.

i. ECC-Raters shall not use technicians who are not certified ECC-Raters to perform field verification and diagnostic testing unless said technicians are directly supervised by the ECC-Rater in person on the project site.

ii. No other person shall sign the certificates of verification other than the ECC-Rater who preformed or directly supervised technicians who performed the field verification and diagnostic test.

(c) **ECC-Provider Approval.**

a. **Approval Process**. Approval as an ECC-Provider is limited to a single Triennial Code Cycle. To become an ECC-Provider, an applicant shall submit a Full Application. To continue as an ECC-Provider for a subsequent Triennial Code Cycle, a current ECC-Provider shall submit a Triennial Reapproval Application. Applications will be considered pursuant to the procedures in Section 10-110. A Full Application or a Triennial Reapproval Application may be updated as set forth in Section 10-103.3(c)6. An approved ECC-Provider may make modifications to its application as set forth in Section 10-103.3(c)7. All applications must include a statement of scope that indicates what services the applicant intends to provide to the marketplace. Upon a first-time approval of an ECC-Provider, the Energy Commission shall assign the ECC-Provider a three-digit identification number.

b. **Confidential Information.** An applicant may identify any information in its application the applicant considers confidential and request from the Commission a confidential designation as specified in Title 20, California Code of Regulations, Section 2505. If an applicant requests a designation of confidential information, the applicant shall also submit a non-confidential summary of its application.

c. **Full Application.** The Commission may approve a full application to become an ECC-Provider if the application includes each of the following:

A. **Evidence of Ability to Satisfy ECC-Provider Requirements**. Information sufficient to demonstrate, by a preponderance of the evidence, that the applicant can and will satisfy each regulatory requirement specified as the ECC-Provider Approval Process in Section 10-103.3(c)1 for the duration of their tenure as an ECC-Provider.

i. **Methods of Producing Evidence.** An applicant may evidence its ability to satisfy the ECC-Provider Requirements by providing a written strategy for how it intends to satisfy each requirement, citing examples of how it has been able to satisfy each regulatory requirement, or by any other means of introducing evidence into the record acceptable to the Executive Director or Commission.

ii. **Disputed Evidence.** Any interested party may introduce evidence demonstrating that an applicant either cannot satisfy, or in the past has failed to satisfy, one or more regulatory requirements specified in Section 10-103.3(c)1.

B. The full legal name of the applicant is registered with the California Secretary of State.

C. The full legal name, date of birth, current residential address, and social security number of every individual with an ownership interest in and principal of the ECC-Provider applicant.

D. A complete list of any entities that have business relationships with the applicant such as parent companies, subsidiaries, affiliates, and/or any past names under which the entity has conducted business as an ECC-Provider, if applicable.

E. The Triennial Code Cycle for which the applicant intends to operate as an ECC-Provider.

F. The contact information for one or more Designated Contacts who the Commission can contact as needed.

G. Any other information relating to the applicant's ability to satisfy each regulatory requirement specified in Section 10-103.3(c)1 or specifically requested by the Executive Director or Commission.

d. **Triennial Reapproval Application**. The Commission may approve an existing ECC-Provider's application to continue as an ECC-Provider for a subsequent Triennial Code Cycle if the application includes each of the following:

A. The original Full Application for the previous cycle, any Updated Applications, including Conditions of Approval, and any Post-Approval Amendments that were submitted and/or approved.

B. All previously submitted and approved Triennial Reapproval, if any.

C. Information demonstrating that the applicant can and will satisfy each regulatory requirement not otherwise addressed in any previously approved Application, subject to the same evidentiary constraints and requirements as a Full Application.

D. Alternatively, an existing ECC-Provider may submit a full Application for the Triennial Code Cycle.

e. **Application for Remediation**.

A. An ECC-Provider that has been decertified may submit one Application for Remediation pursuant to Section 10-110 during the Triennial Code Cycle in which it was decertified.

B. An Application for Remediation shall include:

i. The original Full Application, all previously submitted and approved Triennial Reapprovals, any Updated Applications, including Conditions of Certification, and any Post-Approval Amendments that were submitted and/or approved.

ii. All correspondence concerning progressive discipline between the ECC-Provider and the Commission commencing with the notice of potential violation for each violation that led to rescinding approval.

iii. A Remediation Report and Plan explaining why each violation leading to a rescinded approval occurred and the steps that the ECC-Provider has taken to remedy past violations and prevent future violations similar to those that led to its rescinded approval.

iv. A draft Full Application that incorporates all necessary modifications to address the issues described in the Remediation Report and Plan.

C. **Basis for Approval**. The Commission may approve an Application for Remediation if the Commission finds:

i. The decertified ECC-Provider has demonstrated a good faith willingness to take feasible steps toward remediation.

ii. The decertified ECC-Provider has presented a remediation plan that can remedy past violations and prevent future violations similar to those that led to its rescinded approval.

iii. The decertified ECC-Provider has demonstrated the ability to adequately implement the remediation plan.

D. **Upon Approval.** If the decertified ECC-Provider's Application for Remediation is approved by the Commission, the decertified ECC-Provider is eligible to submit a Full Application.

E. **Upon Rejection**. If a decertified ECC-Provider's Application for Remediation is rejected by the Commission, the ECC-Provider may re-submit an Application for Remediation only with the written approval of the Executive Director or Commission.

f. **Updated Application.**

A. **Update with Executive Director's Approval**. With the written permission of the Executive Director, at any point during the Section 10-110 process, an applicant may submit an updated application, which shall be identified as an Updated Application and made available to interested parties for review and comment for at least 30 days prior to consideration by the Commission at a business meeting.

B. **Update at Commission Direction, Conditions of Approval.** The Executive Director or Commission may direct an applicant to update their application in order to address any issues or concerns raised by any interested party with respect to the applicant's ability to completely fulfil the role of ECC-Provider, including by imposing Conditions of Approval.

C. **Applicant Withdrawal and Re-submission**. Applicants who have submitted an application may withdraw their application at any time before approval and may submit a new application pursuant to this section and Section 10-110.

g. **Post-Approval Amendments**. An approved ECC-Provider shall submit a Post-Approval Amendment to the Executive Director when the ECC-Provider wishes to make a modification to their approved application or, as a result of any circumstances other than the transition to a new Triennial Code Cycle or progressive discipline pursuant to Section 10-103.3(c)3, or the application no longer accurately reflects the ECC-Provider's operations.

A. **Process**. The ECC-Provider may submit a Post-Approval Amendment as either substantive or non-substantive. The Executive Director may determine whether a post-approval amendment is substantive or non-substantive.

B. **Substantive**. If the Executive Director determines that a post-approval amendment is substantive, the amendment shall follow the process

~~specified by Section 10-110 and be approved by the Commission. Substantive changes include any changes to training, certification, or oversight (including quality assurance) that would result in any impact to consumers, ECC-Raters, ECC-Rater Companies, or the ability of the ECC-Provider to comply with any requirement of Section 10-103.3(c)1.~~

C. **~~Nonsubstantive~~**. ~~If the Executive Director determines that a post-approval amendment is nonsubstantive, they may approve the amendment by informing the ECC-Provider's Designated Contact and posting the proposed post-approval amendment application. A non-substantive update is any change that is not considered a substantive update, including correcting typographical errors, modifying contact information, renaming positions or programs, and making changes that do not impact consumers, ECC-Raters, ECC-Rater Companies, or alter the ability of the ECC-Provider to comply with any requirement of Section 10-103.3(c)1.~~

~~h.~~ **~~Conditions of Approval~~**. ~~As a prerequisite of approval of any ECC-Provider application, the Commission may impose Conditions of Approval as the Commission deems necessary to ensure that the applicant can meet the requirements of Section 10-103.3(c)1 if approved. If the Commission imposes Conditions of Approval, the Commission may require the applicant to demonstrate that the applicant will satisfy each Condition of Approval prior to approval. Violating a Condition of Approval imposed by the Commission shall constitute a violation of these regulations and may result in disciplinary action, up to and including rescinding of approval.~~

~~i.~~ **~~Executive Director Rejection of Decertified ECC-Provider's Application~~**.

A. ~~The Executive Director may reject any application if the Executive Director determines the applicant is an ECC-Provider that has previously been decertified, or is a successor, subsidiary, or otherwise affiliated or substantially similar organization to an ECC-Provider that has previously been decertified, and that has not completed the Application for Remediation process pursuant to Section 10-103.3(c)5.~~

B. ~~An applicant may appeal the Executive Director's decision to reject its application to the full Commission pursuant to Section 10-103.3(h). The applicant shall establish that it is not a decertified ECC-Provider, successor, subsidiary, or otherwise affiliated or similar organization to a decertified ECC-Provider.~~

C. **~~Minimum Evidentiary Requirements~~**. ~~At a minimum, an appeal from rejection shall demonstrate that the applicant and decertified ECC-Provider have dissimilar and unrelated owners, shareholders (if applicable), executive management, employees, physical assets,~~

~~intangible assets, intellectual property, business practices, registered organization names, branding, marketing materials, and trademarks.~~

D. ~~**Final Agency Action**. If the Commission determines that the applicant has failed to demonstrate it is not a decertified ECC-Provider, or any successor, subsidiary, or otherwise affiliated or substantially similar organization to a decertified ECC-Provider, the Commission may deem the applicant a decertified ECC-Provider ineligible to apply until the applicant has completed remediation or specify when the applicant may re-submit an application. The period of time before re-submittal may not exceed three years from when the appeal was submitted.~~

~~(d) **ECC-Provider Responsibilities.**~~

~~a.~~ ~~**ECC-Rater Training**. For each Triennial Code Cycle, ECC-Providers shall provide training to existing ECC-Raters and new ECC-Rater applicants. The ECC-Provider may also provide this training for prior Triennial Code Cycles. To fulfill the training requirements (Section 10-103.3(d)), an ECC-Provider shall confirm that an ECC-Rater applicant has completed a training curriculum that covers all information necessary to perform all FV&DTs in accordance with the applicable Building Energy Efficiency Standards and passed all associated tests. Alternatively, if offered by the ECC-Provider, an existing ECC-Rater may apply for approval without completing an ECC-Provider's training curriculum by passing a challenge test, which is a comprehensive test of advanced FV&DT technical knowledge that verifies the ECC-Rater applicant has sufficient knowledge necessary to perform FV&DT in accordance with the applicable Building Energy Efficiency Standards. The Commission shall approve all training materials under the full training curriculum and challenge test as part of the ECC-Provider's application (Section 10-103.3(b)).~~

A. ~~**Training and testing curriculum**. An ECC-Provider's training curriculum for ECC-Rater applicants must include the following:~~

i. ~~**Building Energy Efficiency Standards mandatory subject areas**. The training curriculum shall instruct ECC-Raters how to perform FV&DT as set forth in the following Building Energy Efficiency Standards, Reference Appendices:~~

a. ~~RA1: Alternative Residential Field Verification and Diagnostic Test Protocols~~

b. ~~RA2: Residential Verification, Testing, and Documentation Procedures~~

c. ~~RA3: Residential Field Verification and Diagnostic Test Protocols~~

d. ~~RA4: Eligibility Criteria for Energy Efficiency Measures~~

e. NA1: Nonresidential Verification, Testing, and Documentation Procedures

f. NA2: Nonresidential Field Verification and Diagnostic Test Procedures

ii. **Other mandatory subject areas**. The training curriculum shall inform ECC Rater applicants about:

a. The roles and responsibilities of all entities regulated by Section 10-103.3 and in the Building Energy Efficiency Standards, Reference Appendices RA1, RA2, RA3, RA4, NA1, NA2, and JA7.

b. Energy Code nomenclature that designates building types, dwelling units, systems, and compliance methods.

c. Basic building science concepts, including:

(i) Principles of heat transfer.

(ii) Energy conservation features.

(iii) Framing, fenestration, insulation, and other built or installed features.

(iv) Energy consuming appliances.

(v) Types of space conditioning and ventilating systems.

(vi) Types of water heating systems.

(vii) Categories of lighting systems and lighting controls.

(viii) Energy generating and storage systems.

(ix) Energy efficiency effects of building characteristics.

d. Worksite safety.

(i) Personal protective equipment and appropriate dress.

(ii) Communication with site management personnel.

(iii) Awareness of site hazards (including asbestos, fall risks, lifted loads, confined spaces, vehicles, powered equipment and tools, pressurized vessels and pipes, electrical terminals and fixtures, etc.), occupants in the dwelling unit, and escape routes.

(iv) Site security.

(v) Other practices, not limited to those relevant to home energy testing and verification procedures and equipment.

e. Instrumentation.

(i) Diagnostic devices used in the measurement of, but not limited to, duct leakage testing, dwelling unit leakage (blower doors), system air flow and pressure, and refrigerant pressure and temperature.

(ii) Accuracy and tolerance.

(iii) Calibration requirements.

f. Equipment certification.

(i) Overview of manufacturer-certified equipment ratings.

(ii) When and why certification applies for verification.

(iii) Where to find specified certifications and ratings.

g. Compliance document and registration.

(i) Building Energy Efficiency Standards regulations, associated testing protocols, and the corresponding forms for data entry.

(ii) Documentation workflow and data input.

(iii) Form logic and validation.

(iv) Group sampling.

h. Professionalism and conduct when working with various trades, owners, and other site personnel.

i. Resources available on the Commission website related to the Building Energy Efficiency Standards.

j. Progressive discipline of ECC-Raters (Section 10-103.3(d)7) and the appeal process (Section 10-103.3(h)).

k. Quality assurance process (Section 10-103.3(d)5).

l. Conflict of interest requirements (Section 10-103.3(b)1).

m. Prohibition on False, Inaccurate, or Incomplete Information (Section 10-103.3(b)2).

iii. **Classroom Training**. Classroom training shall include an electronic or hardcopy manual for each student and comply with the following requirements:

a. Classroom training may be provided online or in person and may be taught by an in-person instructor, an online instructor or online proctoring software as provided in Section 10-103.3(d)1Aviii.

b. When administered online, the modules must be naturally paced, recorded, and played back no faster than 100 percent speed. Modules must require occasional student interaction not limited to brief quizzes to progress through topics and encourage engagement with the platform.

c. Classroom training may include pre-recorded video instructions but must not solely rely on pre-recorded videos.

d. Classroom training may use mock tests or exams, but mock tests or exams may not be used to comply with the Tests and Exams requirements in Section 10-103.3(d)1Avi.

iv. **Instructional Materials.**

a. The materials shall address all topics listed in Sections 10-103.3(d)1Ai and 10-103.3(d)1Aii.

b. Materials that are presented in a slideshow format must be accompanied by a script or detailed outline that explains the narrative and the purpose of each visual.

c. Slide text and graphics must be legible.

d. Governmental logos must not appear on class materials (including course descriptions, web pages, slides, videos, handouts, and manuals) unless the department, office, or agency has given permission to do so, and then only if usage adheres to respective guidelines. The logo may appear without express permission on official publications whether distributed in whole or in part.

v. **Laboratory Training.** Laboratory training shall cover all FV&DT procedures listed in Building Energy Efficiency Standards Reference Appendices RA1, RA2, RA3, RA4, NA1, and NA2 and comply with the following requirements:

a. All laboratory training facilities shall be designed to provide consistent and repeatable practical training exercises and be approved in advance by the Commission.

b. Laboratory training shall be conducted in a controlled space with appropriate safety measures such as proper ventilation, safe egress, appropriate lighting, and fire response systems. Laboratory training must not be conducted in an occupied residence.

c. All laboratory training shall be in person and be supervised by an instructor with no more than ten students to one

instructor. Laboratory instruction shall include an electronic or hardcopy manual for each student.

d. Any equipment necessary to complete the laboratory training shall be available to students at a ratio of no greater than one test equipment per five students. Each student shall perform the laboratory training independently with full access to the necessary equipment.

vi. **Written test**. An ECC-Rater applicant shall take a written test, offered by an ECC-Provider, to confirm the applicant's understanding of all mandatory training information specified in Sections 10-103.3(d)1Ai and 10-103.3(d)1Aii. Tests shall only be used to verify the knowledge of ECC-Rater applicants and may not be used for training purposes. ECC-Providers shall retain all results for five years from the date of the test. The written test shall comply with all of the following:

a. Be online using proctoring software (Section 10-103.3(d)1Avii) or in person using a live proctor.

b. Consist of between 10 and 100 questions per subject area specified in Sections 10-103.3(d)1Ai and 10-103.3(d)1Aii.

c. Require a passing score of no less than 70 percent.

d. Be approved by the Commission at the time of ECC-Provider application (Section 10-103.3(c)1).

vii. **Practical test**. ECC-Rater applicants shall take a practical test offered by an ECC-Provider to demonstrate competence in all subjects specified in Sections 10-103.3(d)1Ai and 10-103.3(d)1Aii as they apply to the performance of FV&DT procedures. The ECC-Provider shall retain all results for five years from the date of the test. The practical test shall comply with the following:

a. All practical tests shall be performed in any Commission approved facility as required by the Laboratory Training Requirements in Section 10-103.3(d)1Aiv.

b. All practical tests shall be in-person only using a live proctor with no more than five test takers to one proctor.

c. Any equipment required to complete the practical test shall be made available to each test taker. Test takers shall not work in teams to complete any portion of the practical test.

d. All practical tests shall be approved by the Commission by demonstration during the application process (Section 10-103.3(c)1).

viii. **Proctoring Software**. Any proctoring software or learning management system that includes proctoring features used for training and exams shall be approved in advance by the Commission and comply with the following:

a. Proctoring software for training or exams must be time limited.

b. Proctoring software shall monitor the computer desktop, webcam video, and audio of the individual completing the training or exam. The proctoring software, including any interactions with a proctoring service, shall take reasonable steps to detect the use of prohibited outside resources on the exam, and return a failing grade if the use of prohibited outside resources are in fact detected.

B. **Challenge Test**. An ECC-Provider may also offer challenge testing that evaluates competence in all subjects specified in Sections 10-103.3(d)1Ai and 10-103.3(d)1Aii. If a challenge test is used it must comply with the following requirements:

i. Only an ECC-Rater with a current and valid certification shall be eligible to sit for a challenge test. ECC-Raters with a suspended certification are not eligible.

ii. The challenge test shall include a written test to be taken using a live proctor.

iii. The challenge test shall include no less than 100 and no more than 1,000 questions prepared by the ECC-Provider.

iv. The challenge test shall comply with all requirements in Section 10-103.3(d)1Avi.

C. **Training and Testing for Subsequent Triennial Code Cycle Updates**. An ECC-Provider shall provide training to previously certified ECC-Raters on changes made during any Triennial Code Cycle update that would affect the performance of field verification and diagnostic testing, including changes that would trigger testing or in testing procedures. The Triennial Code Cycle Update training and testing shall comply with all Section 10-103.3(d)1A requirements. ECC-Providers may offer a challenge test in compliance with Section 10-103.3(d)1B. Laboratory training (Section 10-103.3(d)1Aiv) and practical testing (Section 10-103.3(d)1Avii) shall only be required if changes made during any Triennial Code Cycle include modifications or new diagnostic test procedures or field verifications.

b. **ECC-Rater Certification.**

A. **Certification Requirements.** Certification as an ECC-Rater is limited to a single Triennial Code Cycle. The ECC-Provider shall record each Triennial

~~Code Cycle for which an individual ECC-Rater has been certified to provide field verification and diagnostic test services. For each Triennial Code Cycle, an ECC-Provider shall certify an eligible ECC-Rater applicant who meets the minimum requirements for an ECC-Rater, as verified by the ECC-Provider, and completes and passes all training requirements. Prior to certification, an ECC-Provider shall advise the ECC-Rater applicant on the required conduct for ECC-Raters in Section 10-103.3(e), the progressive discipline requirements in Section 10-103.3(d)7, and the appeal process in Section 10-103.3(h).~~

B. ~~**Certification Agreement.** Prior to certification, the ECC-Provider shall ensure that the applicant signs the ECC-Rater Agreement with the ECC-Provider, in which the ECC-Rater shall agree, at minimum, to comply with all applicable laws and regulations, including the requirements provided in Section 10-103.3, and shall maintain a copy of the signed agreement.~~

C. ~~**Eligibility.** An ECC-Rater is eligible if they have not been prohibited from practicing by the Executive Director or Commission pursuant to Section 10-103.3(g)1.~~

D. ~~The ECC-Provider shall maintain a list of all certified ECC-Raters with the following information:~~

~~i. First and last name.~~

~~ii. Business contact information.~~

~~a. Phone.~~

~~b. Address.~~

~~c. Email.~~

~~iii. Certification status, limited to Certified-Active, Exemplary-Active, notice of violation, Probation, Suspended, Decertified, Inactive.~~

~~c.~~ ~~**ECC-Rater Company Training**. For each Triennial Code Cycle, the ECC-Provider shall develop and maintain a course of training to summarize the responsibilities of the ECC-Rater Company in the performance of field verifications and diagnostic testing as prescribed in Section 10-103.3(d)3. The ECC-Rater Company training may not exceed 8 hours in duration. All training materials shall be approved by the Commission as part of the ECC-Provider's application (Section 10-103.3(c)1). An ECC-Provider's training curriculum for ECC-Rater Company applicants must, at minimum, include all of the following:~~

A. ~~A summary of the training curriculum for ECC-Rater applicants provided in Section 10-103.3(d)1.~~

B. ~~Information regarding the following:~~

i. The roles and responsibilities of all entities regulated by Section 10-103.3 and in the Building Energy Efficiency Standards, Reference Appendices RA1, RA2, RA3, RA4, NA1, NA2, and JA7.

ii. Discipline procedure for ECC-Raters (Section 10-103.3(d)7) and ECC-Rater Companies (Section 10-103.3(d)8), and the appeal process (Section 10-103.3(h)).

iii. Quality assurance process (Section 10-103.3(d)5).

iv. Conflict of interest requirements (Section 10-103.3(b)1).

v. Prohibition on False, Inaccurate, or Incomplete Information (Section 10-103.3(b)2).

d. **ECC-Rater Company Certification**

A. **Certification Requirements**. An ECC-Provider shall certify an eligible ECC-Rater Company applicant that meets the minimum requirements for an ECC-Rater Company, as verified by the ECC-Provider, and completes and passes all training requirements. Prior to certification, an ECC-Provider shall advise the ECC-Rater Company applicant on the required conduct for ECC-Rater Companies in Section 10-103.3(f)2, the discipline requirements Section 10-103.3(d)8 and the appeal process in Section 10-103.3(h).

B. **Certification Agreement.** The ECC-Rater Company applicant shall sign the ECC-Rater Company agreement with the ECC-Provider in which the ECC-Rater Company shall agree, at minimum, to comply with all applicable laws and regulations, including the requirements provided in this Section 10-103.3.

C. **Public List**. ECC-Providers shall maintain a publicly available list of certified ECC-Rater Companies.

D. **Eligibility**. An ECC-Rater Company is eligible if it meets the minimum qualifications enumerated in Section 10-103.3(f)1B and has not been prohibited from practicing by the Executive Director or Commission pursuant to Section 10-103.3(g)2.

E. After its initial certification, an ECC-Rater Company does not need to complete the training curriculum again or be recertified for each Triennial Code Cycle as long as it maintains its eligibility under Section 10-103.3(f)1B.

F. The ECC-Provider shall maintain a list of all certified ECC-Raters Companies with the following information:

i. First and last name of certified primary.

ii. ECC-Rater Company name.

iii. Business contact information.

a. Phone.

~~b. Address.~~

~~c. Email.~~

~~iv. Certification status, limited to Certified-Active, Exemplary-Active, notice of violation, Probation, Suspended, Decertified, Inactive.~~

G. ~~The ECC-Provider shall maintain any Declarations of ECC-Rater Company Separation of Services (Section 10-103.3(f)2Diii) in the ECC-Provider data registry such that it is accessible for verification by the Energy Commission and local enforcement agencies.~~

e. ~~**Quality Assurance**. An ECC-Provider shall maintain a quality assurance program to ensure appropriate oversight of the ECC-Raters it certifies. This program shall, at a minimum, include the following:~~

A. ~~**Quality Assurance Staff.** ECC-Providers shall maintain the necessary qualified staff to ensure a functioning quality assurance program that includes, at a minimum, performing the types of quality assurance reviews listed in Section 10-103.3(d)5 on ECC-Raters. Any form of audit is subject to the same standards of required conduct as any other field verifications and diagnostic tests and is also subject to Quality Assurance review. Quality Assurance staff may not include active ECC-Raters.~~

B. ~~**Exemplary ECC-Rater.** An ECC-Rater is designated as an "Exemplary ECC-Rater" once the ECC-Rater has been (1) continuously certified as an ECC-Rater for a minimum of 5 years and (2) confirmed for designation by the applicable ECC-Provider after passing all required quality assurance audits within a 12-month period, including at least one annual quality insulation installation (QII) shadow audit and one desk audit.~~

i. ~~The ECC-Provider shall immediately revoke this designation for any audit failure or the failure to be recertified as an ECC-Rater in any subsequent Triennial Code Cycle.~~

ii. ~~This designation, once obtained, may be included in marketing materials. If this designation is revoked, it shall be removed from marketing materials within 10 business days.~~

C. ~~**Types of Quality Assurance Review**. Quality Assurance Review shall take the form of onsite, shadow, and desk audits.~~

i. ~~**Onsite Audits**. The ECC-Provider performs an onsite audit following field verification and diagnostic testing by an ECC-Rater it certified. Onsite audits are performed at the invitation of the homeowner through the complaint process, at the request of the Commission, or at the discretion of the ECC-Provider. Every year, at least one onsite audit shall be performed by the ECC-Provider for each ECC-Rater it has certified, either at random or as directed above. For Exemplary ECC-Raters, the minimum onsite audit~~

~~frequency shall be reduced from once per year to once per Triennial Code Cycle. The audit results shall be included in the annual reporting to the Commission (Section 10-103.3(d)11E) or provided in response to a request by the Commission. Onsite audits shall comply with the following:~~

~~a. Onsite audits must not be performed in the presence of the ECC-Rater and can be performed any time after the ECC-Rater has left the project site.~~

~~b. ECC-Raters must not be informed that their field verification and diagnostic test is receiving an onsite audit until the onsite audit is complete and the results are documented.~~

~~c. At a minimum, onsite audits shall include all of the following:~~

~~(i) A verification of correctly completed certificates of installation (if the ECC-Rater is acting as the Authorized Representative under Section 10-103(a)3A) and verification (Section 10-103(a)4) for the project.~~

~~(ii) Performance of the field verification and diagnostic test that was performed by the ECC-Rater.~~

~~d. A passing result shall include the following at a minimum:~~

~~(i) Correct and completed certificates of installation (if the ECC-Rater is signature authorized under Section 10-103(a)3A) and verification (Section 10-103(a)4) for the project free from false, inaccurate, or incomplete information.~~

~~(ii) All field verification and diagnostic test audit results that include a field test or measurement must pass as required in the Building Energy Efficiency Standards, Reference Appendices RA1, RA2, RA3, RA4, NA1, and NA2.~~

~~e. Onsite audits shall be performed when an ECC-Provider is investigating a complaint from a homeowner about a field verification and diagnostic test.~~

~~f. Onsite audits shall be performed for every 100 dwelling units or single-family residences (or both in combination) in a single development constructed by a single developer that make use of the sample-group provisions (Building Energy Efficiency Standards Reference Appendix RA 2.6)~~

~~beginning with the hundredth dwelling unit or single family residence. Nothing in this provision shall require that any dwelling unit in any sample-group remain open beyond the requirements in Building Energy Efficiency Standards Reference Appendix RA 2.6. These onsite audits shall comply with the following:~~

~~(i) The ECC-Provider shall perform the onsite audit at an untested home and a tested home.~~

~~(ii) If the ECC-Provider is refused access to the development, all sample-groups for the development will be considered conflicted data (Section 10-103.3(b)1B).~~

~~(iii) At the discretion of an ECC-Provider, this onsite audit may also be used to satisfy the requirements for an onsite audit as required by Section 10-103.3(d)5Ci (Onsite Audits) or, if applicable, Section 10-103.3(d)5Cii (Shadow Audits) for an ECC-Rater.~~

~~(iv) A failed onsite audit of the tested dwelling unit shall constitute a failed onsite audit for the ECC-Rater. A failed onsite audit of either the tested or untested dwelling unit shall be recorded in the ECC-Provider's quality assurance database (Section 10-103.3(d)9B). A failed onsite audit of either the tested or untested dwelling unit shall be reported to the developer, ECC-Rater, and ECC-Rater Company as soon as is possible. Failed onsite audits of dwelling units within a sample-group shall not be deemed to fail or impact in any way the compliance status of the sample-group.~~

~~g. If the ECC-Provider is refused access to the development, the ECC-Rater may be subject to investigation and disciplinary action at the discretion of the ECC-Provider. The onsite results shall be documented by the ECC-Provider, provided to the ECC-Rater and ECC-Rater Company, provided to the homeowner, and recorded in the ECC-Provider's quality assurance database (Section 10-103.3(d)9B).~~

~~h. If the onsite audit reveals the ECC-Rater did not accurately perform the field verification and diagnostic test or accurately collect or report data, the ECC-Provider shall initiate disciplinary action (Section 10-103.3(d)7).~~

i. Onsite audits shall include the use of photographic evidence to be recorded in the ECC-Provider data registry as provided in Building Energy Efficiency Standards Reference Appendix JA7.5.6.3.

ii. **Shadow Audits**. A shadow audit requires the ECC-Provider to audit the ECC-Rater as they perform a Quality Insulation Installation field verification (Building Energy Efficiency Standards Reference Appendix RA3.5). The ECC-Provider's auditor shall observe and may not aid the ECC-Rater during the shadow audit. All ECC-Raters shall receive a shadow audit for QII once per year. For Exemplary ECC-Raters, the shadow audit frequency shall be reduced from once per year to once per Triennial Code Cycle. A shadow audit shall also be performed if requested by the Commission or at the discretion of the ECC-Provider. Shadow audits shall comply with the following:

a. The ECC-Rater shall be informed of the shadow audit for scheduling purposes and the ECC-Provider's auditor will explain their presence to the homeowner. The homeowner may grant entry to the auditor. If entry is refused, the ECC-Provider shall reschedule the shadow audit.

b. For newly constructed buildings, the developer or contractor shall not refuse a shadow auditor if sampling is being used on the development. If the auditor is refused entry, the data registry will not accept sample-based compliance documents from the developer, contractor, or ECC-Rater regarding the project.

c. Shadow audits are limited to QII verifications where the ECC-Rater shall make the necessary observations and record results.

d. Reserved.

e. The shadow audit results shall be documented by the ECC-Provider, provided to the ECC-Rater and ECC-Rater Company, and recorded in the ECC-Provider's quality assurance database (Section 10-103.3(d)9B).

f. If the shadow audit reveals the ECC-Rater did not accurately perform the QII test or accurately collect or report data, the ECC-Provider shall initiate disciplinary action (Section 10-103.3(d)7).

iii. **Reserved**

iv. **Desk Audits.** Desk audits consist of an ECC-Provider using registered compliance documents within an ECC-Provider data registry to evaluate an ECC-Rater's Certificates of Compliance (Section 10-103(a)), Certificates of Installation (Section 10-103(b), and Certificates of Verification (Section 10-103(d)) for consistency and accuracy. ECC-Providers shall perform desk audits of all certified ECC-Raters at least once per year and as directed by the Commission or at the discretion of the ECC-Provider. For Exemplary ECC-Raters, the desk audit frequency shall be reduced from once per year to once per Triennial Code Cycle. Desk audits shall comply with the following:

a. ECC-Providers shall develop and document a maximum variance for each data entry point for each field verification and diagnostic test.

b. ECC-Providers shall identify a project to audit where the ECC-Rater provided field verification and diagnostic test services. The ECC-Provider shall collect all compliance documents associated with the project as necessary to audit the field verifications and diagnostic tests performed by the ECC-Rater at the project site and may contact outside authorities, such as the local building authority with jurisdiction over the project.

c. The ECC-Provider shall confirm the measurements, calculations, and other information obtained during field verifications and diagnostic tests at the project are within expected tolerances.

d. The ECC-Provider shall compare the field verification and diagnostic test results from the project site to no less than 20 other field verification and diagnostic test results performed by the same ECC-Rater on other project sites prior to the audited project. If the comparison suggests the subject project results could have been copied from prior project sites, the ECC-Provider shall investigate further to determine if results were falsified or otherwise inaccurate.

e. The desk audit results shall be documented by the ECC-Provider, provided to the ECC-Rater and ECC-Rater Company, and recorded in the ECC-Provider's quality assurance database (Section 10-103.3(d)9B).

f. If the desk audit shows that the ECC-Rater did not accurately perform the field verification and diagnostic test

~~or accurately collect or report data, the ECC-Provider shall initiate disciplinary action (Section 10-103.3(d)7).~~

D. **~~Remedy for Flawed Field Verification and Diagnostic Tests~~**

~~i. A flawed field verification and diagnostic test is any field verification and diagnostic test that is inconsistent with an audit, or that is otherwise determined by the Executive Director, the Commission, or the ECC-Provider to be untrue or inaccurate.~~

~~ii. The ECC-Rater or ECC-Rater Company is responsible for remedying any flawed field verification and diagnostic tests identified by audit or by any other means.~~

~~iii. A flawed field verification and diagnostic test is remedied by providing an additional field verification and diagnostic test to the hiring party that corrects the untrue or inaccurate reporting.~~

E. **~~Payment of Fees; Proportionality.~~** ~~As part of their contractual arrangements with ECC-Raters, ECC-Providers may charge a Quality Assurance fee. The entirety of any Quality Assurance fee may only be used by the ECC-Provider to fund Quality Assurance activities.~~

~~f.~~ **~~Queries and Complaints~~**

A. **~~Public Queries and Complaints~~**. ~~ECC-Providers shall have a system for receiving queries and complaints from consumers, ECC-Raters, ECC-Rater Companies, authorities having jurisdiction, and the general public. The ECC-Provider shall respond to, investigate, and resolve queries and complaints related to field verification and diagnostic testing in a timely manner. ECC-Providers shall ensure the ECC-Raters they certify inform field verifications and diagnostic testing service recipients about the query and complaint system. ECC-Providers shall retain all records of queries and complaints, the corresponding investigation, and the response for a minimum of 5 years from receipt of the query or complaint. ECC-Providers shall annually report to the Commission a summary of all queries, complaints, and actions taken over the last 12 months. The Queries and Complaints Annual Summary shall include all of the following for each query or complaint received:~~

~~i. A tracking number identifying each query or complaint in the ECC-Provider queries and complaints tracking system.~~

~~ii. The name and contact phone or email of the person(s) submitting the query or complaint.~~

~~iii. A summary of the query or complaint.~~

~~iv. A summary of the results of the ECC-Provider investigation and related actions.~~

v. A summary of the resolution of the query or complaint.

B. **Commission-Initiated Queries and Complaints.** The Commission may direct an ECC-Provider to investigate any queries related to the performance of the FV&DT program. An ECC-Provider shall respond within 30 days of receiving a Commission direction to investigate a query.

C. **ECC-Rater and ECC-Rater Company-Initiated Queries and Complaints**. ECC-Providers shall have a system for ECC-Raters and ECC-Rater Companies to report potential violations of these regulations by ECC-Raters, ECC-Rater Companies, and ECC-Providers.

g. **ECC-Rater Discipline**. If an ECC-Rater violates these regulations, including but not limited to the failure to perform accurate and complete field verification and diagnostic tests, the ECC-Provider shall take the following disciplinary steps to address and correct the noncompliance. In the event of a severe violation, however, the ECC-Provider shall proceed immediately to the suspension step for the first severe violation and to the decertification step for a second severe violation. A severe violation of these regulations includes knowingly creating false field verification or diagnostic testing documents, any violation involving criminal activity, coordinating or participating in an organized scheme to violate these regulations, or a demonstrated pattern of violating these regulations. The ECC-Provider and ECC-Rater may extend, by written agreement, the time for response, reply, and final determination for each step below. At any time, the Executive Director may direct an ECC-Provider to investigate an ECC-Rater or discipline an ECC-Rater pursuant to Sections 10-103.3(d)7A through 10-103.3(d)7D.

A. **Step 1: Notice of Violation.** Upon identification of one or more violations of these regulations by an ECC-Rater, the ECC-Provider shall issue a notice of violation to the ECC-Rater and any ECC-Rater Companies for which the ECC-Rater performs FV&DT services. The ECC-Rater Company or Independent Rater shall notify the affected homeowner and show proof of such notice to the ECC-Provider. Within 3 months of issuance of the Notice of Violation, the ECC-Provider will perform a desk audit (Section 10-103.3(d)5Civ) on the ECC-Rater.

i. The ECC-Provider shall require the ECC-Rater take additional training or other corrective action related to the violations within a specified timeframe.

ii. The ECC-Provider shall inform the ECC-Rater of their responsibilities for the following: the ECC-Rater shall be responsible for the costs of quality assurance testing and additional training for the violations, and the ECC-Rater shall be responsible for the costs to the property owner for the original field verification and diagnostic test and any necessary retesting

because of the violations. The ECC-Provider shall not be responsible for any costs related to flawed field verification and diagnostic test as performed by the ECC-Rater.

iii. The notice of violation shall be in writing and include a description of the regulatory requirements and violations, the date and approximate time of the violations, the parties affected by the violations, any corrective action the ECC-Rater shall take, any costs the ECC-Rater shall reimburse, the timeframe for complying with all requirements of the notice of violation.

iv. The ECC-Rater will have 10 days of receipt of the notice of violation to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and within 10 days, request additional information needed from the ECC-Rater. The ECC-Rater shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of the notice of violation or within 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of a violation to the ECC-Rater, any affected homeowners, and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services. The violation shall not be effective until the ECC-Rater has exhausted the right to request reconsideration by the ECC-Provider or until the time to exercise that right has lapsed (Section 10-103.3(d)7Aiv).

B. **Step 2: Probation.** If an ECC-Rater fails to comply with a notice of violation within the specified timeframe or receives a second notice of violation within a three-month period, the ECC-Provider shall issue a notice to the ECC-Rater and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services, placing the ECC-Rater on probation for up to six months.

i. While on probation, the ECC-Rater shall be required to retake the training for both written and laboratory (Section 10-103.3(d)1Ai and Section 10-103.3(d)1Aii) and pass the required testing (Section 10-103.3(d)1Av and Section 10-103.3(d)1Avi) related to the violated regulations.

ii. The notice shall be in writing and include a description of the regulatory requirements and violations, the date and approximate time of the violations, the parties affected by the violations, any corrective action the ECC-Rater must take, any costs the ECC-Rater must reimburse, and the timeframe for complying with all requirements of the notice of violation.

iii. The ECC-Rater will have 10 days of receipt of the notice of probation to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater. The ECC-Rater shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of notice of probation or within 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of probation to the ECC-Rater and any affected ECC-Rater Company. The terms of probation shall last no more than six months and shall not be effective until the ECC-Rater has exhausted the right to request for reconsideration by the ECC-Provider or until the time to exercise that right has lapsed (Section 10-103.3(d)7Biii).

C. **Step 3: Suspension.** If an ECC-Rater fails to fully comply with the terms of probation or receives a new notice of violation while on probation, the ECC-Provider shall issue a notice to the ECC-Rater and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services.

i. The notice of suspension shall be in writing and include the basis for suspension, duration of suspension, and all corrective action the ECC-Rater must complete during suspension.

ii. The ECC-Rater shall have 10 days of receipt of the notice of suspension to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater. The ECC-Rater shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of the notice of suspension or within 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of suspension to the ECC-Rater and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services. The suspension shall not be effective until the ECC-Rater has exhausted their right to appeal pursuant to Section 10-103.3(h) or until the time to exercise their right to appeal has lapsed.

iii. Once the suspension becomes effective, the ECC-Provider shall prohibit the ECC-Rater from submitting any new compliance documents (Section 10-103) or otherwise accessing the ECC-Provider data registry until the suspension has ended.

D. **Step 4: Decertification**. If an ECC-Rater fails to comply with the terms of suspension or receives a new notice of violation while suspended or while a notice of suspension is pending, the ECC-Provider shall issue a notice of decertification to the ECC-Rater and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services.

i. The notice of decertification shall be in writing and include the basis for decertification.

ii. The ECC-Rater will have 10 days of receipt of the notice of decertification to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater. The ECC-Rater shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of the notice of decertification or within 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination on proceeding with decertification to the ECC-Rater and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services. The decertification shall not be effective until the ECC-Rater has exhausted their right to appeal pursuant to Section 10-103.3(h) or until the time to exercise their right to appeal has lapsed.

h. **ECC-Rater Company Discipline**. If an ECC-Rater Company violates these regulations, the ECC-Provider shall take the following disciplinary steps to address and correct the noncompliance. However, in the event of a severe violation, the ECC-Provider shall proceed immediately to the suspension or decertification step. A severe violation of these regulations includes knowingly creating false field verification or diagnostic testing documents, any violation involving criminal activity, coordinating or participating in an organized scheme to violate these regulations, or a demonstrated pattern of violating these regulations. The ECC-Provider and ECC-Rater Company may extend, by written agreement, the time for response, reply, and final determination for each step below. At any time, the Executive Director may direct an ECC-Provider to investigate an ECC-Rater Company or discipline an ECC-Rater Company pursuant to Section 10-103.3(d)8.

A. **Step 1: Notice of Violation**. Upon identification of one or more violations of these regulations by an ECC-Rater Company, the ECC-Provider shall issue a notice of violation to the ECC-Rater Company and any affected homeowners.

i. The ECC-Provider may require the ECC-Rater Company to take additional training or other corrective action related to the violations within a specified timeframe.

ii. The ECC-Provider shall inform the ECC-Rater Company of their responsibilities for the following: the ECC-Rater Company shall be responsible for the costs of quality assurance testing and additional training for the violations, and the ECC-Rater Company shall be responsible for the costs to the property owner for the original field verification and diagnostic test and any necessary retesting because of the violations. The ECC-Provider shall not be responsible for any costs related to flawed field verification and diagnostic test as performed by the ECC-Rater employed by the ECC-Rater Company.

iii. The notice of violation shall be in writing and include a description of the regulatory requirements and violations, the date and approximate time of the violations, the parties affected by the violations, any corrective action the ECC-Rater Company must take, any costs the ECC-Rater Company must reimburse, and the timeframe for complying with all requirements of the notice of violation.

iv. The ECC-Rater Company will have 10 days of receipt of the notice of violation to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater Company. The ECC-Rater Company shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of the notice of violation or within 20 days of receiving a response or additional information from the ECC-Rater Company, whichever is later, the ECC-Provider shall provide a final determination of a violation to the ECC-Rater Company within 30 days. The violation shall not be effective until the ECC-Rater Company has exhausted its right to request reconsideration by the ECC-Provider or until the time to exercise that right has lapsed (Section 10-103.3(d)8Aiv).

B. **Step 2: Probation**. If an ECC-Rater Company fails to complete all corrective actions and reimburse all costs specified for a violation within the required timeframe or receives two violations within a three-month period, the ECC-Provider shall issue a notice of probation to the ECC-Rater Company.

i. The notice of probation shall be in writing and include the basis for probation, the duration of probation, and all corrective action the ECC-Rater Company must complete during probation.

ii. The ECC-Rater Company will have 10 days of receipt of the notice of probation to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response, and, within 10 days, request additional information needed from the ECC-Rater Company. The ECC-Rater Company shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of notice of probation or within 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of probation to the ECC-Rater Company. The terms of probation shall last no more than six months and shall not be effective until the ECC-Rater Company has exhausted its right to request reconsideration by the ECC-Provider or until the time to exercise that right has lapsed (Section 10-103.3(d)8Bii).

C. **Step 3: Suspension**. If an ECC-Rater Company fails to fully comply with the terms of probation or receives a new notice of violation while on probation, the ECC-Provider shall issue a notice of suspension to the ECC-Rater Company.

i. The notice of suspension shall be in writing and include the basis for suspension, the duration of suspension, and all corrective action the ECC-Rater Company must complete during suspension.

ii. During suspension, the ECC-Provider will disable access to its registry for all ECC-Raters of the ECC-Rater Company.

iii. The ECC-Rater Company will have 10 days of receiving the notice of suspension to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater Company. The ECC-Rater Company shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of the notice of suspension or 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of suspension. The suspension shall not be effective until the ECC-Rater Company has exhausted its right to appeal pursuant to Section 10-103(h) or until the time to exercise its right to appeal has lapsed.

D. **Step 4: Decertification**. If an ECC-Rater Company fails to comply with the terms of suspension or receives a new notice of violation while suspended

~~or while a notice of suspension is pending, the ECC-Provider shall issue a notice of decertification to the ECC-Rater Company.~~

~~i. The notice of decertification shall be in writing and include the basis for decertification.~~

~~ii. The ECC-Rater Company will have 10 days of receipt of the notice of decertification to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater Company. The ECC-Rater Company shall have 10 days to provide additional information to the ECC-Provider. No earlier than 30 days of the date of the notice of suspension or 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of decertification. The decertification shall not be effective until the ECC-Rater Company has exhausted its right to appeal pursuant to Section 10-103.3(h) or until the time to exercise its right to appeal has lapsed.~~

~~i.~~ **~~Data Recording~~**

A. **~~Data Recording for Field Verification and Diagnostic Tests~~**~~. Each ECC-Provider shall record all data collected by an ECC-Rater for a field verification and diagnostic test, including the following data:~~

~~i. The registered Certificate(s) of Compliance, Certificate(s) of Installation, Certificate(s) of Verification, and their associated Compliance Registration Packages.~~

~~ii. The energy efficiency improvements verified or tested, if applicable.~~

~~iii. Whether the builder chose to include the home in a sample for FV&DT as specified in the Residential Appendices.~~

~~iv. Whether initial FV&DT as specified in the Residential Appendices was conducted on the home.~~

~~v. Whether the home in a sample was selected and verified or tested as specified in the Residential Appendices.~~

~~vi. Whether the home in a sample was selected for resampling and verified or tested after a sampling failure was found in the sample as specified in the Residential Appendices.~~

~~vii. Whether the home in a sample was verified or tested and corrective action was taken after a resampling failure was found in the sample as specified in the Residential Appendices.~~

viii. Whether the homeowner declined to have verification or testing, and corrective action taken after occupancy as specified in the Residential Appendices.

B. **Data Recording for Quality Assurance Actions.**

i. An ECC-Provider shall record all Quality Assurance and disciplinary actions taken against each ECC-Rater and ECC-Rater Company.

ii. The ECC-Provider shall maintain a database tracking system indicating the certificate status of all certified ECC-Raters and ECC-Rater Companies and all Quality Assurance or disciplinary actions taken against each ECC-Rater and ECC-Rater Company.

iii. Quality Assurance Data regarding ECC-Raters and ECC-Rater Companies shall include all of the following:

a. Name, business address, and contact information for each certified ECC-Rater, ECC-Rater Company, or applicant.

b. Current status of certification, limited to one of the following: Application-in-Review, In-training, Certified, Exemplary, Under Notice of Violation, on Probation, on Suspension, Decertified, Certification Dormant (no data registration activity in one year).

c. Current ECC-Provider pricing assigned to the ECC-Rater or ECC-Rater Company for the costs and services for field verification and diagnostic testing registration including any Quality Assurance fees.

d. **Quality Assurance Actions**. List and indicate pass or fail with an explanation of all of the following audits for each certified ECC-Rater:

(i) Onsite audits (Section 10-103.3(d)5Ci).

(ii) Shadow audits (Section 10-103.3(d)5Cii).

(iii) Desk audits (Section 10-103.3(d)5Civ).

e. **Detailed Quality Assurance Action Records**. The ECC-Provider shall keep all field notes and associated records regarding passed, warnings issued, or failed quality assurance tests for each certified ECC-Rater for no less than 5 years.

j. **Data Retention.**

A. An ECC-Provider shall maintain all information in the original format in which it collects, receives, or records the data for a minimum of 10 years.

B. ECC-Providers shall maintain a system that allows the Commission to readily search and query compliance documents, quality assurance data,

and ECC-Rater and ECC-Rater Company information collected in accordance with ECC-Provider responsibilities (Section 10-103.3(d)). The Commission shall be able to search and query the information stored on the ECC-Provider's system in a way that is not substantially limited compared to the ability of the ECC-Provider.

C. ECC-Providers may not restrict or degrade the Commission's ability to query, access, sort, or filter this information in any way that is substantially different compared to the ability of the ECC-Provider.

D. ECC-Providers shall maintain digital copies of all files that can be indexed and searched at a minimum by calendar year or designated code cycle. It is the responsibility of ECC-Providers to maintain the necessary systems to support these functions, unless the Commission or Executive Director explicitly authorizes the ECC-Provider, in writing, to operate without this functionality or process.

E. Nothing in this subsection shall be construed as requiring an ECC-Provider to process, re-package, or otherwise modify any historical information collected prior to January 1, 2026.

k. **Data Reporting.** ECC-Providers shall comply with the following reporting requirements:

A. ECC-Providers shall maintain a database of the information specified in Section 10-103.3(d)9A and in compliance with Building Energy Efficiency Standards, Reference Appendix JA7, for the greater of: 500 buildings field verified and diagnostically tested by ECC-Raters certified by the respective ECC-Provider each year, or a 10 percent random sample of buildings field verified and diagnostically tested by ECC-Raters certified by the respective ECC-Provider each year. Requests for data shall be limited to information needed to confirm compliance with and/or assess the ECC program.

B. Beginning January 1, 2027, ECC-Providers shall provide this information annually in electronic form to the Commission for evaluating the effectiveness of field verification and diagnostic testing.

C. This information shall be organized according to climate zones as defined in the Building Energy Efficiency Standards, Section 100.1(b).

D. **FV&DT Data Reporting**. Within ninety days of the Executive Director approving a CEC-maintained electronic document repository, an ECC-Provider shall transmit to the Commission electronic document depository Certificate(s) of Certification, Certificate(s) of Installation, Certificate(s) of Verification documents (Section 10-103) and their associated Compliance Registration Packages that are registered and retained by a data registry in accordance with Section 10-103 and Building Energy Efficiency Standards, Appendix JA7. The ECC-Provider shall submit this data no less than once per calendar quarter and in a manner as

directed by the Commission. Once implemented, this requirement shall supersede the requirements of Sections 10-103.3(d)11A, 10-103.3(d)11B and 10-103.3(d)11C.

E. **Quality Assurance Quarterly Report.** The ECC-Provider shall send a report each quarter to the Commission that includes all failed quality assurance audits (Section 10-103.3(d)5). The ECC-Provider shall comply with all of the following:

i. Submit a Quality Assurance Quarterly Report for each project where an audit (Section 10-103.3(d)5) was performed and failed within the calendar quarter. The Quality Assurance Quarterly Report shall be submitted no less than 60 days after the end of the calendar quarter. Each reported project shall list the contractor information, ECC-Rater information, project address, project permit code (if available), other project identification available to help identify the project, and code violations for each failed audit (as prescribed in Section 10-103.3(d)5).

ii. The ECC-Provider shall submit all Quality Assurance Quarterly Reports to the Commission in a docket prepared by the Commission.

F. **Quality Assurance Annual Report.**

i. An ECC-Provider shall submit a Quality Assurance Annual Report to the Commission for each calendar year no later than the end of February of the following year.

ii. The Quality Assurance Annual Report shall include all specified records within the annual timeframe.

iii. The Quality Assurance Annual Report shall summarize all quality assurance actions taken for each ECC-Rater certified by the ECC-Provider during the preceding year.

iv. Detailed Quality Assurance Action Records (Section 10-103.3(d)9Biiid) are not required to be submitted annually to the Commission but shall be subject to Commission requests for information made pursuant to Section 10-103.3(d)12.

G. **Annual Reporting Requirements Regarding ECC-Rater Companies.**

i. By the first of June of each year starting in 2027, an ECC-Provider shall submit an ECC-Rater Company Annual Report to the Commission. The report shall be clearly labeled as confidential and transmitted to the Commission as confidential submission and will be treated as such as permitted by law. The report becomes nonconfidential 5 years following submission but may receive confidential redesignation if the ECC-Provider requests extension

of confidential status using the steps outlined in Title 20 Cal. Code. Regs., Section 2505 et seq.

ii. Reserved

iii. The ECC Provider shall ensure that the ECC Rater Company Annual Report includes the current ECC Provider pricing assigned to each ECC Rater Company and Independent ECC Rater for the costs of all services for field verification and diagnostic testing registration, including any Quality Assurance fees.

H. **Immediate Reporting of Disciplinary Actions.** The ECC Provider shall provide written notification of any ECC Rater or ECC Rater Company decertification to the Commission within 24 hours of decertification. The Commission shall notify all ECC Providers of the decertification and instruct all ECC Providers to immediately suspend the ECC Rater's or ECC Rater Company's access credentials to their respective data registries.

l. **Responses to Commission Requests for Data.**

A. At any time, the Executive Director may request access to or a digital copy of one or more registered compliance documents, associated with Compliance Registration Packages, and quality assurance records that an ECC Provider is required to maintain pursuant to Section 10-103.3(d)9 and the Building Energy Efficiency Standards, Reference Joint Appendix JA7. Requests for data shall be limited to information needed to confirm compliance with, assess the Section 10-103.3 ECC Program, or both.

B. The provider shall comply with the request in the timeframe specified by the Executive Director.

C. ECC Providers have the sole responsibility to ensure that their systems can comply with the data request provisions of this subsection, including providing the Commission with reasonable access to any and all compliance documents, including Compliance Registration Packages, submitted within the past 10 years.

m. **Data Registry Requirements.** ECC Providers must comply with all data registry requirements provided by the Building Energy Efficiency Standards Reference Joint Appendix JA7, and Section 10-109.

n. **No Approved ECC Providers.** If there are no certified ECC Providers, the CEC may perform the ECC Provider Responsibilities provided in Section 10-103.3(d) or suspend all or a portion of the FV&DT program, including (but not limited to) relevant provisions of the Building Energy Efficiency Standards found in the Residential Appendices RA1, RA2, RA3 and RA4; Nonresidential Appendices NA1 and NA2; Reference Joint Appendix JA7; and Section 10-109.

o. **ECC Provider Discipline.** If the Executive Director becomes aware of an ECC Provider's violation of these regulations, including any Conditions of Approval,

~~the Executive Director shall take the disciplinary steps necessary to address and correct the violation. Violations that trigger the disciplinary process include failure to comply with quality assurance requirements (Section 10-103.3(d)5), failure to investigate or discipline ECC-Raters and ECC-Rater Companies (Section 10-103.3(d)7 and Section 10-103.3(d)8), failure to allow the Commission full access to the ECC-Provider data registry (Section 10-103.3(d)12), refusal to comply with Commission data requests (Section 10-103.3(d)12), failure to cooperate in a Commission complaint investigation (Section 10-103.3(d)12), and failure to otherwise comply with any applicable law or regulation. In the event of a severe violation, the Executive Director may proceed immediately to issue a notice of suspension for the first severe violation and to issue a notice of decertification for a second severe violation. A severe violation of these regulations includes knowingly creating false field verification or diagnostic testing documents, any violation involving criminal activity, coordinating or participating in an organized scheme to violate these regulations, or a demonstrated pattern of violating these regulations.~~

A. ~~**Step 1: Notice of Violation.** Upon identification of one or more violations of these regulations by an ECC-Provider, the Executive Director shall issue a notice of violation to the ECC-Provider's designated contact and publicly post the notice. The Executive Director shall require the ECC-Provider to take corrective action related to the violations within a specified timeframe. The notice of violation shall be in writing and include a description of the legal requirements and violations, any corrective action the ECC-Provider must take, and the timeframe for complying with all the notice of violation requirements. The ECC-Provider will have 10 days of receipt of the notice of violation to respond in writing. If the Executive Director receives a response, the Executive Director shall acknowledge the response and, within 5 days, request additional information needed from the ECC-Provider. The ECC-Provider will have 5 days to provide additional information to the Executive Director. Within 30 days of the date of the notice of violation or within 20 days of receiving additional information from the ECC-Provider, whichever is later, the Executive Director shall provide a final determination of a violation to the ECC-Provider.~~

B. ~~**Step 2: Probation**. If an ECC-Provider fails to complete all corrective action prescribed by the Executive Director within the specified timeframe or receives a second notice of violation within a three-month period, the Executive Director shall issue a notice of probation to the ECC-Provider's designated contact. The Executive Director shall also publicly post the notice of probation. The notice shall be in writing, include a description of the regulatory requirements and violations, and specify the probation duration. The ECC-Provider will have 10 days of receipt of the~~

notice of probation to respond in writing. If the Executive Director receives a response, the Executive Director shall acknowledge the response and, within 5 days, request additional information needed from the ECC-Provider. The ECC-Provider will have 5 days to provide additional information to the Executive Director. Within 30 days of the date of the notice of probation or within 20 days of receiving additional information from the ECC-Provider, whichever is later, the Executive Director shall provide a final determination of probation to the ECC-Provider.

C. **Step 3: Suspension.** If an ECC-Provider fails to complete all corrective action or receives a new notice of violation while on probation, the Executive Director shall issue a notice of suspension to the ECC-Provider's designated contact. The Executive Director shall also publicly post the notice of suspension. The notice shall be in writing and include a description of the regulatory requirements, violations, and proposed terms of suspension. The terms of suspension shall not be effective until the ECC-Provider has exhausted its right to appeal pursuant to Section 10-103.3(h) or until the time to exercise its right to appeal has lapsed, at which time the terms of suspension shall be deemed to have been imposed by the Commission.

i. The ECC-Provider shall have 10 days of receipt of the notice of suspension to respond in writing. If the Executive Director receives a response, the Executive Director shall acknowledge the response and, within 5 days, request additional information needed from the ECC-Provider. The ECC-Provider will have 5 days to provide additional information to the Executive Director. Within 30 days of the date of the notice of suspension or within 20 days of receiving additional information from the ECC-Provider, whichever is later, the Executive Director shall provide a final determination of a suspension to the ECC-Provider.

ii. **Terms of Suspension**. Suspension may include conditionally or unconditionally restricting access to the Report Generator by the ECC-Provider. The duration of suspension shall be included in the terms of suspension.

iii. **Amendment to Terms of Suspension**. The Executive Director may amend any term of the suspension by issuing a notice of amendment to terms of suspension to the ECC-Provider's Designated Contact that includes the new terms of suspension and proposed effective date. Within 30 days of the date of the notice, the ECC-Provider may appeal the new terms pursuant to Section 10-103.3(h) or accept the new terms. If the ECC-Provider does not respond to the notice, the new terms shall go into effect on the 31st day after the date of the notice.

iv. **180-day Report.** After 180 days of suspension, the Executive Director has 30 days to send to the ECC-Provider's Designated Contact and publicly post a 180-day report that includes each outstanding violation, a timeline of when notices of potential violation and notices of violation were given for each outstanding violation, the date the probation began, the date suspension began and all terms of suspension, any amendments during the suspension, all steps the Executive Director is aware that the ECC-Provider has taken to remedy each violation, and any other information the Executive Director deems relevant, including the Executive Director's intentions moving forward with respect to the ECC-Provider.

D. **Step 4: Rescinding Approval.** If an ECC-Provider fails to comply with the terms of suspension or receives a new notice of violation while suspended or while a notice of suspension is pending, the Executive Director shall issue a notice of rescinding approval to the ECC-Provider's designated contact. The rescinded approval shall not be effective until the ECC-Provider has exhausted its right to appeal pursuant to Section 10-103.3(h) or until the time to exercise its right to appeal has lapsed, at which time the rescinded approval shall be deemed to have been imposed by the Commission.

i. The ECC-Provider shall have 10 days of receipt of the notice of rescinded approval to respond in writing. If the Executive Director receives a response, the Executive Director shall acknowledge the response and, within 5 days, request additional information needed from the ECC-Provider. The ECC-Provider will have 5 days to provide additional information to the Executive Director. Within 30 days of the date of the notice of rescinded approval or within 20 days of receiving additional information from the ECC-Provider, whichever is later, the Executive Director shall provide a final determination of a rescinded approval to the ECC-Provider.

E. **Remediation** required to restore eligibility to apply to be an ECC-Provider. Once an ECC-Provider has been decertified, neither that entity nor any successor, subsidiary, or otherwise affiliated or substantially similar organization, is eligible to apply to operate as or apply to become a certified ECC-Provider until it has completed the following remediation process:

i. A decertified ECC-Provider may regain their eligibility to apply to become an ECC-Provider by submitting an Application for Remediation pursuant to Section 10-103.3(c)9 and receiving the Commission's approval.

ii. Once a decertified ECC-Provider has completed the remediation process by receiving the Commission's approval, the decertified ECC-Provider becomes a remediated ECC-Provider eligible to submit an ECC-Provider Application pursuant to Section 10-103.3(c)3 according to the process set out in Section 10-110. A remediated ECC-Provider is only eligible for a full application pursuant to Section 10-103.3(c)3.

(e) **ECC-Rater Certification and Responsibilities.**

a. **Certification.**

A. **Certification Process**. ECC-Rater applicants shall apply to a Commission approved ECC-Provider for certification pursuant to the application process established by the ECC-Provider.

B. **Minimum Qualifications**. ECC-Rater applicants shall have completed all training set forth in Section 10-103.3(d)1.

C. **ECC-Rater Agreement**. Prior to being certified, an ECC-Rater applicant shall sign the ECC-Rater agreement with the ECC-Provider, in which the ECC-Rater shall agree, at minimum, to comply with all applicable laws and regulations, including the requirements provided in this Section 10-103.3.

D. **Clean Certification Record**. ECC-Providers shall not issue a new ECC-Rater certification to any ECC-Rater applicant if that applicant has an ongoing disciplinary proceeding requiring resolution by another ECC-Provider.

i. At a minimum, the issuing ECC-Provider shall require an ECC-Rater applicant to attest that the ECC-Rater applicant is in good standing with all other ECC-Providers.

ii. Any ECC-Provider may submit a complaint to the Commission if it suspects that an ECC-Rater with an outstanding disciplinary status requiring resolution has been issued a new ECC-Rater certification by another ECC-Provider.

b. **Required Conduct.**

A. ECC-Raters shall provide field verification services in compliance with these regulations, including any regulations contained in the California Building Energy Efficiency Standards and related Reference Appendices RA1, RA2, RA3, RA4, JA7, NA1, and NA2.

B. ECC-Raters shall not create, record, submit, or certify untrue, inaccurate, or incomplete field verification and diagnostic test information or report field verification and diagnostic test results that did not comply with these regulations.

C. ~~ECC-Raters shall not accept payment or other consideration in exchange for reporting a field verification and diagnostic test result not conducted and reported in compliance with these regulations.~~

D. ~~ECC-Raters shall comply with the conflict-of-interest prohibitions set forth in Section 10-103.3(b)1.~~

E. ~~ECC-Raters shall be present and personally participate in any field verification and diagnostic test or field verification activity. If an ECC-Rater relies on employees, designees, trainees, or any other individual to assist them in performing field verification and diagnostic test activity, the ECC-Rater shall be able to directly monitor and verify that any tests or measurements were performed properly in accordance with regulations.~~

F. ~~ECC-Raters shall not provide information based on assumptions, averages, or otherwise generated in any way other than by field verification and diagnostic testing performed in accordance with these regulations. Any such information is presumed to be untrue, inaccurate, and/or incomplete unless the ECC-Rater has the written permission of the Executive Director that explains how that information is collected and why such data is not untrue, inaccurate, and/or incomplete.~~

G. ~~ECC-Raters not employed by an ECC-Rater Company are considered independent. Independent ECC-Raters shall submit an Annual Activity Report no later than the end of March of each year starting in 2027 to the Commission that includes the information listed in Sections 10-103.3(f)2Fiii and 10-103.3(f)2Fiv.~~

~~c. **Failure to Adhere to Required Conduct.** ECC-Raters are subject to the disciplinary action set forth in Section 10-103.3(d)7 for the failure to adhere to the required conduct and these regulations.~~

~~d. **Appeal and Reconsideration of Discipline**.~~

A. ~~ECC-Raters may seek reconsideration and review of a disciplinary action as set forth in Section 10-103.3(d)7.~~

B. ~~ECC-Raters may appeal a disciplinary action imposed on them as set forth in Section 10-103(h).~~

~~(f) **ECC-Rater Company Certification and Responsibilities.**~~

~~a. **Certification**.~~

A. ~~**Certification Process.** ECC-Rater Company applicants shall apply to a Commission-approved ECC-Provider pursuant to the application process established by the ECC-Provider.~~

B. ~~**Minimum Qualifications**. At least one principal of the ECC-Rater Company applicant shall hold an active ECC-Rater certification issued by a Commission-approved ECC-Provider or be actively pursuing certification~~

as evidenced by enrollment in training courses. A principal of an ECC-Rater Company is defined as a senior management-level employee and is not limited to an owner or shareholder of the ECC-Rater Company.

C. **Training.** Prior to being certified, the ECC-Rater Company applicant shall complete all required training provided by the ECC-Provider.

D. **ECC-Rater Company Agreement.** Prior to being certified, the ECC-Rater Company applicant shall sign an agreement with the ECC-Provider, in which the ECC-Rater Company shall agree, at minimum, to comply with all applicable laws and regulations, including but not limited to the requirements provided in Section 10-103.3.

b. **Required Conduct.**

A. Reserved

B. ECC-Rater Companies shall have view-only access to the compliance documents registered by its ECC-Rater.

C. ECC-Rater Companies shall not change data entered into the ECC-Provider data registry for any Certificates of Verification.

D. ECC-Rater Companies may be the "Document Author" for Certificates of Compliance and Certificates of Installation registered in the ECC-Provider data registry but may not sign as the "Responsible Person" or "Installing Technician" (Sections 10-103(a)1 and 10-103(a)3).

i. An ECC-Rater or ECC-Rater Company may sign the Certificate of Installation as the "Authorized Representative" if they have a Delegation of Signature Authority (Section 10-103(a)3A) agreement with the Responsible Person and in place with ECC-Provider.

ii. The ECC-Rater Company may not provide additional project services beyond field verification and diagnostic testing or as provided in Sections 10-103.3(f)2D and 10-103.3(f)2Di, including design, construction management, permitting, or "Responsible Person" signatories (Sections 10-103(a)1 and 10-103(a)3) unless the ECC-Rater Company submits a Declaration of ECC-Rater Company Separation of Services as provided in Section 10-103.3(f)2Diii.

iii. **Declaration of ECC-Rater Company Separation of Services.** The Declaration of ECC-Rater Company Separation of Services provides proof to the ECC-Provider showing that the ECC-Rater(s) employed or contracted by the ECC-Rater Company to provide field verification and diagnostic services is in compliance with the requirements in Section 10-103.3(b)1 and is independent and acting as a third party as defined by Section 10-103(a)5 from the

person(s) employed or contracted by the ECC-Rater Company to provide services beyond the field verifications and diagnostic testing services including design, construction management, permitting, or "Responsible Person" signatories (Section 10-103(a)1 and Section 10-103(a)3) on the same project.

a. The ECC-Rater Company must show proof that the person(s) providing these additional services do not have management, hiring or firing, payment or any other authority over the ECC-Rater or direct the ECC-Rater activities in any regard on the same project(s).

b. The ECC-Rater Company must show proof that the person(s) providing these additional services is qualified to do so under Division 3 of the Business and Professions Code.

c. The ECC-Rater Company must show proof that the person(s) providing signatory services under Section 10-103(a)1 and Section 10-103(a)3 will be legally responsible for design, construction, or installation in the applicable classification for the scope of work and will sign as the Responsible Person.

d. The Declaration of ECC-Rater Company Separation of Services must be retained by the ECC-Provider to which all project compliance documentations are submitted.

E. ECC-Rater Companies shall use the approved data registry user interface of a data registry or an approved external digital data service for data input into the ECC-Provider data registry.

F. By the end of March of each year starting in 2027, each ECC-Rater Company shall submit an Annual Activity Report to the Commission. The report must be clearly labeled as confidential and must be treated as such as permitted by law. The report becomes nonconfidential 5 years following submission but may receive confidential redesignation if the ECC-Provider requests extension of confidential status using the steps outlined in Title 20 Cal. Code. Regs., Section 2505 et seq. The report shall contain all of the following:

i. ECC-Rater Company Contact details, principals, and required certificates.

ii. A list of all ECC-Raters working for the ECC-Rater Company.

iii. The total number of field verifications and diagnostic tests performed by ECC-Raters working for the ECC-Rater Company during the prior calendar year, organized by enforcement agency.

iv. The total and average cost of services charged for each type of field verification and diagnostic test performed by ECC-Raters working for the ECC-Rater Company during the prior calendar year.

G. The ECC-Rater Company is responsible for assuring all of its ECC-Raters comply with these regulations and all other applicable laws and regulations when providing field verification and diagnostic services.

H. The ECC-Rater Company shall support the ECC-Rater progressive discipline requirements (Section 10-103.3(d)7) as follows:

i. **Notice of Violation**. The ECC-Rater Company shall ensure the ECC-Rater complies with any corrective action and reimbursement of costs prescribed in the notice of violation within the timeframe provided in the notice of violation. The ECC-Rater Company shall facilitate any refund to a homeowner.

ii. **Probation**. The ECC-Rater Company shall ensure the ECC-Rater complies with any training and tests and reimbursement of costs prescribed in the notice of probation within the time provided in the notice of probation. The ECC-Rater Company shall not assign any new work to the ECC-Rater until probation is lifted.

iii. **Suspension.** The ECC-Rater Company shall ensure the ECC-Rater complies with the terms of suspension prescribed in the notice of suspension.

iv. **Decertification**. The ECC-Rater Company shall ensure the decertified ECC-Rater does not perform any FV&DT services.

I. ECC-Rater Companies shall not provide untrue, inaccurate, or incomplete field verification and diagnostic test information or report field verification and diagnostic test results that did not comply with these regulations.

J. ECC-Rater Companies shall not accept payment or other consideration in exchange for reporting a field verification and diagnostic test result not conducted and reported in compliance with these regulations.

K. **Prohibition of Conflicts of Interest**. ECC-Rater Companies shall comply with the conflict-of-interest prohibitions set forth in Section 10-103.3(b)1.

c. **Failure to Adhere to Required Conduct.** ECC-Rater Companies are subject to the disciplinary action set forth in Section 10-103.3(d)8 for the failure to adhere to the required conduct and these regulations.

d. **Reconsideration of Discipline.** ECC-Rater Companies may request reconsideration and review of a disciplinary action as set forth in Section 10-103.3(d)8.

(g) **Prohibition from Practice and Re-Entry.** Any ECC-Rater, ECC-Rater Company, or ECC-Provider that is currently suspended, or that has been decertified by the Executive Director or Commission pursuant to these regulations, is prohibited from operating pursuant to its certification under these regulations.

a. **ECC-Raters.**

A. While prohibited from practice, an ECC-Rater shall not submit field verification and diagnostic test information, including any compliance documents or Compliance Registration Packages, to an ECC-Provider, data registry, or the Commission.

B. Any such information submitted by an ECC-Rater who is prohibited from practicing is invalid and may not be relied on for purposes of permit compliance under the Energy Code.

b. **ECC-Rater Companies.** ECC-Rater Companies shall not act in any manner that leads to, encourages, or aids a violation of the prohibition to practice.

c. **ECC-Providers.**

A. No ECC-Provider shall accept or maintain field verification and diagnostic test information, including any compliance documents or Compliance Registration Packages, from an entity that is prohibited from practice at the time that information was either gathered or submitted.

B. Nothing in this subsection shall be interpreted as prohibiting an ECC-Provider from storing or relying on information submitted by an ECC-Rater while they were in good standing.

d. **Re-Entry**. The Executive Director or Commission may, for good cause, reinstate an entity's ability to practice pursuant to Section 10-103.3(c).

(h) **Appeal to Commission.** Within 30 days of any decision or determination made by the Executive Director (Section 10-103.3(d)15) or an ECC-Provider (Sections 10-103.3(d)7 and 10-103.3(d)8), an ECC-Provider, ECC-Rater, or ECC-Rater Company subject to the decision or determination ("appellant") may appeal the decision or determination to the Commission. The following procedures apply to the appeal:

a. The appeal shall be in writing and signed by the appellant and served on the party whose decision is the subject of appeal ("respondent") and the Commission. The appeal shall consist of a written argument, stating the grounds for modifying or reversing the decision, identifying the statutes and regulations relevant to the appeal, and stating whether an oral hearing is requested, and a copy of all relevant notices, responses, correspondence, documents, and decisions.

b. Within 30 days after the date the appeal was filed, the respondent shall serve on the appellant and the Commission a written argument stating the grounds for affirming, modifying, or reversing the decision; identifying the statutes and regulations relevant to the appeal; and stating whether an oral hearing is

~~requested. The respondent's written argument shall also be accompanied by any relevant notices, responses, correspondences, documents, and decisions not previously provided by the appellant.~~

~~c.~~ **~~Commission Consideration of Appeal~~**

A. ~~The proceedings on appeal shall be conducted in a manner consistent with Chapter 4.5 of the Government Code (Section 11400 et seq.) and Title 20 CCR sections 1200-1216.~~

B. ~~The Commission shall review the decision or determination made pursuant to this section for substantial evidence.~~

10-104 – EXCEPTIONAL DESIGNS

NOTE: See Section 10-109 for approval of calculation methods and Alternative Component Packages.

(a) **Requirements.** If a building permit applicant proposes to use a performance compliance approach, and the building designs cannot be adequately modeled by an approved calculation method, an applicant ~~shall be granted a building permit~~may determine that the building complies with Part 6 if the Energy Commission finds:

1. That the design cannot be adequately modeled with an approved calculation method; and
2. Using an alternative evaluation technique, that the design complies with Part 6.~~; and~~
3. ~~That the enforcement agency has determined that the design complies with all other legal requirements.~~

(b) **Applications.** The applicant shall submit four copies of a signed application, or an electronic copy of a signed application, with the following materials to the Executive Director:

1. A copy of the plans and documentation required by Title 24, Part 6, Section 100.5.1.1.1 *[Section 10-103(a)2]*; and
2. A statement explaining why meeting the energy budget cannot be demonstrated using an approved calculation method; and

~~3. Documentation from the enforcement agency stating that:~~

~~A. Meeting the energy budget requirements cannot be demonstrated using an approved calculation method; and~~

~~B. The design complies with all other legal requirements; and~~

~~4~~3. A detailed evaluation of the energy consumption of the proposed building and the building's materials, components, and manufactured devices proposed to be installed to meet the requirements of Part 6 using an alternative evaluation technique. The evaluation shall include a copy of the technique, instructions for its use, a list of all input data, and all other information required to replicate the results.

NOTE: Authority: Sections 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8 and 25943, Public Resources Code.

10-105 – ENFORCEMENT BY THE ENERGY COMMISSION

(a) **Where there is No Local Enforcement Agency.** Before new construction may begin in an area where there is no local enforcement agency, the Executive Director shall determine in writing that the building design conforms to the requirements of Part 6. The person proposing to construct the building shall submit the information described in Title 24, Part 6, Sections 100.5.1.1 and 100.5.1.1.1 *[Sections 10-103(a)1 and 10-103(a)2]* to the Executive Director when such a determination is sought.

(b) **Where building construction is under the jurisdiction of a State agency.** Pursuant to Public Resources Code Section 25402.1(g)(5), no construction of any State building shall commence until the Department of General Services or the State agency that otherwise has jurisdiction over the property determines that the construction is designed to comply with the requirements of Part 6, and confirms that the documentation requirements of Title 24, Part 6, Sections 100.5.1.1 and 100.5.1.1.1 *[Sections 10-103(a)1 and 10-103(a)2]* have been met and that the plans indicate the features and performance specifications needed to comply with Part 6. The responsible state agency shall notify the Energy Commission's Executive Director of its determination.

(c) **Where the Enforcement Agency Fails to Enforce.** If an enforcement agency fails to enforce the requirements of this article or of Part 6 the Energy Commission, after furnishing 10 days written notice, may condition building permit issuance on submission of the information described in Title 24, Part 6, Sections 100.5.1.1 and 100.5.1.1.1 *[Sections 10-103(a)1 and 10-103(a)2]* to the Executive Director and on his or her written determination that proposed construction conforms to the requirements of Part 6.

NOTE: Authority: Code Section 25402.1, Public Resources Code. Reference: Section 25402.1, Public Resources Code.

10-106 – LOCALLY ADOPTED ENERGY STANDARDS

(a) **Requirements.** Local governmental agencies may adopt and enforce energy standards for newly constructed buildings, additions, alterations, and repairs to existing buildings provided the following two requirements are met prior to any enforcement of the standards:

1. A determination that the standards are cost effective is adopted by the local agency at a public meeting and subsequently filed with the Energy Commission; and
2. The Energy Commission finds that the standards will require buildings to be designed to consume less energy than permitted by Title 24, Part 6.

(b) **Documentation Application.** Local governmental agencies wishing to enforce energy standards subject to Section10-106(a) shall submit an application with the following materials to the Executive Director:

1. The proposed energy standards;
2. The local governmental agency's findings and supporting analyses on the energy savings and cost effectiveness of the proposed energy standards;
3. A statement or finding by the local governmental agency that the proposed energy standards will require buildings to be designed to consume less energy than permitted by Part 6; and
4. Any findings, determinations, declarations or reports, including any negative declaration or environmental impact report, required pursuant to the California Environmental Quality Act, Pub. Resources Code Section 21000 et seq.

NOTE: Authority: Section 25402.1, Public Resources Code. Reference: Sections 25402.1, 21080.4, 21153, Public Resources Code.

10-107 – INTERPRETATIONS

(a) The Energy Commission may make a written determination as to the applicability or interpretation of any provision of this article or of Part 6 upon written application, if a dispute concerning a provision arises between an applicant for a building permit and the enforcement agency, and the dispute has been heard by the local board of permit appeals or other highest local review body. Notice of any such appeal, including a summary of the dispute and the section of the regulations involved, shall if possible be sent to the Energy Commission by the enforcing agency 15 days before the appeal is heard, and the result of the appeal shall be sent to the Energy Commission within 15 days after the decision is made. Either party to the dispute may apply for a determination but shall concurrently deliver a copy of the application to the other party. The determinations are binding on the parties.

(b) The Executive Director may, upon request, give written advice concerning the meaning of any provision of this article or of Part 6. Such advice is not binding on any person.

NOTE: Authority: Section 25402.1, Public Resources Code. Reference: Section 25218.5 and 25402.1, Public Resources Code.

10-108 – EXEMPTION

(a) **Requirements.** The Energy Commission may exempt any building from any provision of Part 6 if it finds that:

1. Substantial funds had been expended in good faith on planning, designing, architecture, or engineering of the building before the adoption date of the provision; and
2. Compliance with the requirements of the provision would be impossible without both substantial delays and substantial increases in costs of construction above the reasonable costs of the measures required to comply with the provision.

(b) **Application.** The applicant shall submit four copies of a signed application with the following materials to the Executive Director:

1. A summary of the claimant's contracts for the project;
2. A summary of internal financial reports on the project;
3. Dated schedules of design activities; and
4. A progress report on project completion.

NOTE: Authority: Section 25402.1, Public Resources Code. Reference: Section 25402.1, Public Resources Code.

10-109 – COMPLIANCE SOFTWARE, ALTERNATIVE COMPONENT PACKAGES, EXCEPTIONAL METHODS, DATA REGISTRIES AND RELATED EXTERNAL DIGITAL DATA SOURCES, ALTERNATIVE RESIDENTIAL FIELD VERIFICATION PROTOCOLS, ELECTRONIC DOCUMENT REPOSITORIES, PHOTOVOLTAIC, AND BATTERY ENERGY STORAGE SYSTEM REQUIREMENT DETERMINATIONS

(a) **Compliance software, alternative component packages, exceptional methods, data registries and related data input software, alternative residential field verification protocols or electronic document repositories** must be approved by the Energy Commission in order to be used to demonstrate compliance with Part 6.

(b) **Application.** Applications for approval of compliance software, alternative component packages, exceptional methods, data registries and related data input software, and alternative field verification protocols must be made as follows:

1. An applicant shall submit four copies of a signed application form specified by the Executive Director.
2. The application shall include the following materials:
   A. A description of the functional or analytical capabilities of the compliance software, alternative component package, calculation method, exceptional method, data registry or related data input software, and alternative field verification protocol; and
   B. A demonstration that the criteria in Section 10-109 are met; and
   C. An initial fee of one thousand dollars ($1,000). The total fee shall cover the Energy Commission's cost of reviewing and analyzing the application. Within 75 days of receipt of an application, the Energy Commission will provide an estimate of the total maximum cost to review and analyze the application and make a determination as to the completeness of the application. Consideration of the application will be delayed until the applicant submits requested additional information. After the Energy Commission determines the total cost, if the cost exceeds the initial fee, the Energy Commission shall assess an additional fee to cover the total cost. If the actual cost is less than the initial, or any estimated maximum, fee the Energy Commission shall refund the difference to the applicant.

(c) **Compliance Software.**

1. **Compliance Manager.** The compliance manager is the public domain computer program, including simulation and compliance rule implementation software, developed by the Energy Commission pursuant to Public Resources Code Section 25402.1. The compliance

manager software simulates the energy use of a proposed buildings with *residential* or *nonresidential* ~~building~~ use designations and compares it to a standard design energy budget to determine if the building complies with the Energy Code~~Building Energy Efficiency Standards~~. The compliance manager shall be able to do the following:

A. Standard design – The standard design building is a building simulated to establish the baseline energy budget for space heating, space cooling, indoor air quality ventilation, and water heating for a proposed building.

   For newly constructed buildings, the standard design building shall be modeled as in the same location and having the same characteristics, including but not limited to floor area, volume, and configuration, as the proposed building, except that wall and fenestration areas shall be distributed equally between the four main compass points. For additions and alterations, the standard design shall be modeled as in the same location and having the same characteristics and shall have the same wall and fenestration areas and orientations as the existing building.

   Where the Energy Commission specifies that the standard design building includes a covered product subject to 42 USC 6295 or an appliance regulated by the Appliance Efficiency Regulations, the standard design building shall be modeled to meet but not exceed the efficiency level required by 42 USC 6295 for that covered product or applicable standards required by the Appliance Efficiency Regulations for that regulated appliance, respectively.

   The standard design building shall be modeled to include the mandatory requirements of the Energy Code ~~Building Energy Efficiency Standards~~ and to meet but not exceed the prescriptive requirements that would apply to the proposed building.

   The process of generating the standard design shall be performed automatically. This modeling shall be based on the inputs that describe the proposed building, substituting the assumptions for wall and fenestration area distribution, required efficiency for the covered product subject to 42 USC 6295 that the Energy Commission specifies in the standard design, the applicable standards for the appliance regulated by the Appliance Efficiency Regulation that the Energy Commission specifies in the standard design, and mandatory and prescriptive options applicable to the proposed building, thereby creating a standard design building against which the energy use of the proposed building can be evaluated.

B. The modeled energy budgets of the standard design building and the energy consumption of the proposed building are described in Title 24 Part 6, Section~~s~~ 120.5.2 [140.1(a), 150.1(b)1, and 170.1(a)]. These requirements ensure that all modeled building features are specified on a one-for-one equivalent energy use or equivalent energy cost basis. Compliance credit for covered products subject to 42

USC 6295 having efficiencies exceeding the efficiency levels required by 42 USC 6295 shall be calculated in terms of Llong-term Ssystem Ccost and Ssource Eenergy, thereby ensuring that the compliance credit is on a one-for-one equivalent energy or equivalent cost basis.

Long-term Ssystem Ccost (LSC) – All electricity, gas or propane used within the modeled buildings shall be converted to LSC.

Source Eenergy – The energy used within the modeled buildings shall be represented as long-run marginal, hourly source energy.

C. **Climate zone.** The Energy Commission has established typical weather data, prescriptive packages, and energy budgets for 16 geographic areas of California, called climate zones, as specified in the Energy Efficiency Standards and Joint Appendix 2.

Climate zone dependent information based on the climate zone or zip code specified for the proposed building shall be used.

Where climate elements are incorporated into modeling calculations for the standard and proposed buildings, the effects of weather, temperature, and other climate elements shall be calculated based on the climate zone specified for the proposed buildings. The same adjustment shall be applied to both buildings.

The standard design shall be modeled as incorporating prescriptive options appropriate to climate zone specified for the proposed building.

For covered products subject to 42 USC 6295 and for appliances regulated by the Appliance Efficiency Regulations, the estimated energy use of those covered products or appliances used to calculate the total energy use of the standard design and proposed buildings shall be determined using the test procedures prescribed by 42 USC 6293, or the Appliance Efficiency Regulations, respectively. This estimated energy use shall be adjusted to reflect the conditions where Part 6 is being applied, as a part of calculating the total Llong-term Ssystem Ccost and Ssource Eenergy of each building consistent with this section and document in the Alternative Calculation Method Reference Manual.

D. **Alternative Calculation Method Reference Manual.** The Energy Commission shall publish a reference manual, Alternative Calculation Method Reference Manual, that specifies the standard design, documents the calculations and methods used by the compliance software to model building performance, calculates LSC and Source Energy, and determines building compliance with the Energy Code~~Building Energy Efficiency Standards~~.

E. **Compliance Documentation.** If required, the necessary files needed to register the compliance documentation with a ECC-provider shall be generated.

2. **Public Domain Computer Programs.** In addition to the compliance manager, public domain computer programs that are approved pursuant to Public Resources Code Section 25402.1, the Energy Commission may, upon written application or its own motion, approve additional public domain computer programs that may be used to demonstrate that proposed building designs meet energy budgets.

   A. The Energy Commission shall ensure that users' manuals or guides for each approved program are available.

   B. The Energy Commission shall approve a program only if it predicts energy consumption substantially equivalent to that predicted by the above-referenced public domain computer program, when it models building designs or features.

3. **Alternative Calculation Methods (All Occupancies)**. The Energy Commission may approve non-public domain computer programs as an alternative calculation method that building permit applicants may then use to demonstrate compliance with the performance standards (energy budgets) in Part 6. In addition to the application requirements of Section 10-116, an application for approval of compliance software must include documentation demonstrating that the compliance software meets the requirements, specifications, and criteria specified in 10-109(c)1A, 10-109(c)1B, 10-109(c)1C, 10-109(c)1D and 10-109(c)1E, as appropriate.

(d) **Alternative Component Packages.** In addition to the application requirements of subdivision (b) above, an application for approval of an alternative component package must include documentation that demonstrates that the package:

1. Will meet the applicable energy budgets; and

2. Is likely to apply to a significant percentage of newly constructed buildings or to a significant segment of the building construction and design community.

(e) **Exceptional Methods.** The Energy Commission may approve an exceptional method that analyzes a design, material, or device that cannot be adequately modeled using the public domain computer programs. Applications for approval of exceptional methods shall include all information needed to verify the method's accuracy.

(f) **Energy Commission Action.** The Energy Commission may take the following actions on an application submitted pursuant to this section:

1. Approve the application unconditionally;

2. Restrict approval to specified occupancies, designs, materials, or devices; or

3. Reject the application.

(g) **Resubmittal.** An applicant may resubmit a rejected application or may request modification of a restricted approval. Such application shall include the information required pursuant to this section, and, if applicable, shall indicate how the proposed compliance software,

alternative component package, exceptional method, data registry or related data input software has been changed to enhance its accuracy or capabilities.

1. Modification. Whenever an approved compliance software, alternative component package, exceptional method, data registry or related data input software is changed in any way, it must be resubmitted under this section for approval.
2. The Energy Commission may modify or withdraw approval of compliance software, an alternative component package, an exceptional method, or a data registry or related data input software based on its approval of other programs, methods, registries or data input software that are more suitable.

(h) **Alternative Procedures or Protocols.** In addition to the procedures and protocols identified in Sections 10-109(c), 10-116 and the Reference Appendices, the Energy Commission may authorize alternative procedures or protocols that demonstrate compliance with Part 6.

(i) **Data Registries and Related External Digital Data Sources, and Electronic Document Repositories.**

1. **Data Registries and Related External Digital Data Sources.**

   Data registries and related external digital data sources shall conform to the requirements specified in Reference Joint Appendix JA7.

   A. The Energy Commission may approve residential data registries that provide for compliance document and their associated Compliance Registration Packages registration and retention, when required by Part 6 of all residential compliance documentation and the nonresidential Certificates of Verification.

   B. **Nonresidential Data Registry Approval Thresholds.**

      i. The Energy Commission may approve nonresidential data registries that provide for compliance document and their associated Compliance Registration Packages registration, when required by Part 6 of all nonresidential compliance documentation, excluding all Certificates of Acceptance recorded by an acceptance test technician certification provider (Title 24, Part 6, Sections 103.1 and 103.2) *[~~(~~10-103.1 and 10-103.2~~)~~]*. However, nonresidential data registries may not provide for registration of nonresidential Certificates of Verification.

      ii. As a prerequisite to reviewing and/or approving nonresidential data registries for use, on or after January 1, 2023, the Energy Commission shall first make all of the following findings:

         a. The Energy Commission has approved data schema capable of utilization in the development of any nonresidential data registry.

b. The Energy Commission will not lose access to information necessary to support the enforcement and development of current and future building code cycles.

iii. The procedures for consideration and approval of applications enumerated in 10-110 shall not apply to applications for nonresidential data registries until the Energy Commission makes the findings specified in 10-109(i)1Bii.

iv. Nothing in this or any other section, including 10-110, shall be construed as requiring the Energy Commission to make the findings specified in 10-109(i)1Biia by any set date, regardless of pending applications.

v. The Registration Provider shall only use data schema approved by the Energy Commission in a nonresidential data registry.

C. The Energy Commission may approve external digital data sources used for data input to various data registries for registering, when required by Part 6 residential or nonresidential compliance documentation.

2. **Electronic Document Repositories.**

A. The Energy Commission may approve electronic document repositories that retain for the Energy Commission electronic compliance documentation and their associated Compliance Registration Packages generated by residential and nonresidential data registries when registration is required by Part 6.

(j) **Alternative Residential Field Verification Protocols.**

Alternative residential field verification protocols shall comply with the application requirements of Section 10-109(b) and any applicable requirements of Reference Residential Appendices RA1.

(k) **Photovoltaic System and Battery Energy Storage System (BESS) Requirement Determinations.**

The Energy Commission may, upon written application or its own motion, determine that the photovoltaic or BESS requirements in Section 702.3.1 [150.1(a)3, Section 140.0(c), Section 170.0(a)3] shall not apply, if the Energy Commission finds that the implementation of public agency rules regarding utility system costs and revenue requirements, compensation for customer-owned generation, interconnection fees, or other factors, causes the Energy Commission's cost effectiveness conclusions, made pursuant to Public Resources Code 25402(b)(3), to not hold for particular buildings.

Applications shall include full information regarding the differences between public agency rules and Energy Commission cost effectiveness determinations, including all information requested by the Energy Commission to enable full review of the application. Applications shall also include specific recommended limitations to the scope of the determination that is requested, and specific eligibility criteria to determine what buildings would qualify for the

determination. Applications from public agencies shall be submitted to the Energy Commission only after public review within the jurisdiction of the public entity or service area of the utility.

(i) For ~~In cases where conditions have changed that potentially would alter~~ Energy Commission determinations that previously have been made:

a. ~~, t~~The Energy Commission may, on its own motion, ~~reconsider~~ update the information provided for the most recent determination, and determine if the photovoltaic or BESS requirements in Section 702.3.1 [150.1(a)3, Section 140.0(c), Section 170.0(a)3] shall not apply based on the latest information. ~~those determinations on its own motion.~~ Prior applicants shall assist the Energy Commission in obtaining information regarding current public agency rules upon request.

b. These determinations may be approved by the Executive Director.

NOTE: Authority: Sections 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8,25605, 25910, and 25943, Public Resources Code.

10-110 – PROCEDURES FOR CONSIDERATION OF APPLICATIONS UNDER SECTIONS ~~*10-103.3,*~~ 10-104, 10-106, 10-108, 10-109, 10-116 AND TITLE 24, PART 6 SECTION 103.3 *[10-103.3]*

(a) Within 75 days of receipt of an application, the Executive Director shall determine if the application is complete with all the supporting information required pursuant to Sections ~~10-103.3,~~ 10-104, 10-106, 10-108, 10-109, ~~or~~ 10-116 or Title 24, Part 6, Section 103.3 *[10-103.3]* (the complete application package).

(b) Once the application is determined to be complete, the Executive Director shall make the complete application package available to interested parties for review and comment. Comments from interested parties must be submitted within a time period set by the Executive Director, which shall be no less than 15 and no greater than 60 days after the complete application package is made available.

(c) Within 75 days of the date the application is determined to be complete, the Executive Director may request any additional information needed to evaluate the application. Consideration of the application will be delayed until the applicant submits the requested additional information.

(d) Within 75 days of the date the application is determined to be complete, the Executive Director may convene a workshop to gather additional information from the applicant and other interested parties. Interested parties will have 15 days after the workshop to submit additional comments or information regarding the application.

(e) Within 90 days of the date the application is determined to be complete, or within 30 days after receipt of complete additional information requested under Section 10-110(c), or within 60 days after the receipt of additional information submitted by interested parties under Section 10-110(d), whichever is later, the Executive Director shall submit to the Energy Commission a written recommendation on the application.

(f) The complete application package, any additional information considered by the Executive Director, and the Executive Director's recommendation shall be placed on the consent calendar and considered at the next business meeting after submission of the recommendation The matter may be removed from the consent calendar at the request of any person.

(g) The Executive Director may charge a fee to recover the costs of processing and reviewing applications, with the exception of Section 10-106 applications.

(h) All applicants have the burden of proof to establish that their applications should be granted.

NOTE: Authority: Section 25402.1, Public Resources Code. Reference: Section 25402.1, Public Resources Code.

10-111 – CERTIFICATION AND LABELING OF FENESTRATION PRODUCT AND EXTERIOR DOOR U-FACTORS, SOLAR HEAT GAIN COEFFICIENTS, VISIBLE TRANSMITTANCE AND AIR LEAKAGE

~~This section~~Title 24, Part 6, Section 300.1.1.5 and Section 300.1.1.6 establish~~es~~ rules for implementing labeling and certification requirements relating to U-factors, solar heat gain coefficients (SHGCs), visible transmittance (VT) and air leakage for fenestration products and exterior doors under Section 300.1.1 *[110.6(a)]* of Part 6. ~~This~~Those section~~s~~ also provide~~s~~ for designation of the National Fenestration Rating Council (NFRC) as the supervisory entity responsible for administering the state's certification program for fenestration products and exterior doors, provided NFRC meets specified criteria.

~~(a) **Labeling Requirements.**~~

~~1. **Temporary labels.**~~

~~A. Every manufactured fenestration product and exterior door shall have attached to it a clearly visible temporary label that lists the U-factor, the solar heat gain coefficient (SHGC) and Visible Transmittance (VT) and that certifies compliance with the air leakage requirements of Section 110.6(a)1. Temporary labels for manufactured fenestration products and exterior doors are to incorporate the values determined by Section 10-111(a)1B and shall comply with the labeling requirements of NFRC 700. No other values for U-factor, SHGC, VT and Air Leakage are allowed on the temporary label attached to the manufactured fenestration product or exterior door. Component Modeling Approach (CMA) and site-built fenestration products shall have an NFRC label certificate that lists the U-factor, the Solar Heat Gain Coefficient (SHGC), and the Visible Transmittance (VT) and shall comply with the labeling requirements of NFRC 705 for the Component Modeling Approach or NFRC 700 for site-built fenestration products.~~

~~B. U-factor, SHGC, VT and Air Leakage shall be determined by either:~~

~~i. Fenestration products and exterior doors rated and certified using NFRC 100, NFRC 200, NFRC 202 NFRC 203 or NFRC 400 Rating Procedures. The manufacturer shall stipulate that the ratings were determined in accordance with applicable NFRC procedures. For manufactured fenestration products and exterior doors, a temporary label certificate approved by the supervisory entity (NFRC) meets the requirements of this section. For component modeling and site-built fenestration products, a label certificate approved by the supervisory entity (NFRC) meets the requirements of this section.~~

~~ii. For manufactured or site-built fenestration products and exterior doors not rated by NFRC, a temporary label with the words "CEC Default U-factor," followed by the appropriate default U-factor specified in Section 110.6(a)2 and with the words "CEC Default SHGC," followed by the appropriate default SHGC specified in~~

Section 110.6(a)3 and with the words "CEC Default VT," followed by the appropriate VT as specified in Section 110.6(a)4, meets the requirements of this Subsection B.

C. Temporary labels shall also certify that the manufactured fenestration product or exterior door complies with the air leakage requirements of Section 110.6(a)1 of the Standards.

2. **Permanent labels.** Rated products shall have a permanent label consistent with their rating and certification that is either a stand-alone label, an extension or tab of an existing permanent certification label being used by the manufacturer/responsible party, or a series of marks or etchings on the product. The permanent label coupled with observable product characteristics, shall be usable to trace the product to certification information on file with the supervisory entity or to a directory of certified products, published by the supervisory entity. For CMA and site-built fenestration products, a label certificate approved by the supervisory entity meets the requirements of this section.

EXCEPTION to Section 10-111(a): Field-fabricated fenestration products.

(b) **Certification Requirements.**

1. **Certification to default ratings.** The manufacturer shall certify on the Default Label that the product's U-factor, SHGC and VT meets the default criteria in Sections 110.6(a)2, 110.6(a)3 and 110.6(a)4; and

A. A temporary label, affixed to the product, that meets the requirements of Section 10-111(a)1B meets this requirement.

B. If the product claims the default U-factor for a thermal break product, the manufacturer shall also certify on the label that the product meets the thermal break product criteria, specified on the default table, on which the default value is based. Placing the terms “Meets Thermal Break Default Criteria” on the default temporary label or default label certificate meets this requirement.

2. **Certification to NFRC rating procedure.** If a product's U-factor, SHGC or VT is based on the NFRC Rating Procedure, the U-factor, SHGC or VT shall be certified by the manufacturer according to the procedures of an independent certifying organization approved by the Commission.

A. A temporary label, affixed to the product or label certificate for CMA and site-built fenestration, meeting the requirements of Section 10-111(a) certified by the independent certifying organization complies with this requirement.

B. An “independent certifying organization approved by the Commission” means any organization authorized by the supervisory entity to certify U-factor ratings, Solar Heat Gain Coefficient and Visible Transmittance ratings in accordance with the NFRC Rating Procedure. If the Commission designates the NFRC as the supervisory entity, any independent certification and inspection agency (IA) licensed by NFRC shall be

deemed to be an "independent certifying organization approved by the Commission."

C. The "supervisory entity" means the NFRC, except as provided in Section 10-111(c)1.

EXCEPTION to Section 10-111(b): Field-fabricated fenestration products.

(c) **Designation of Supervisory Entity.** The NFRC shall be the supervisory entity to administer the certification program relating to U-factors, SHGC, and VT ratings for fenestration products and exterior doors, provided the Commission determines that the NFRC meets the criteria in Section 10-111(d).

1. The Commission may consider designating a supervisory entity other than NFRC only if the Commission determines that the NFRC cannot meet the criteria in Section 10-111(d). Such other supervisory entity shall meet the criteria in Section 10-111(d) prior to being designated.

2. The Commission shall periodically review, at least annually, the structure and operations of the supervisory entity to ensure continuing compliance with the criteria in Section 10-111(d).

(d) **Criteria for Supervisory Entity.**

1. Membership in the entity shall be open on a nondiscriminatory basis to any person or organization that has an interest in uniform thermal performance ratings for fenestration products and exterior doors, including, but not limited to, members of the fenestration industry, glazing infill industry, building industry, design professionals, specifiers, utilities, government agencies, and public interest organizations. The membership shall be composed of a broad cross section of those interested in uniform thermal performance ratings for fenestration products.

2. The governing body of the entity shall reflect a reasonable cross section of the interests represented by the membership.

3. The entity shall maintain a program of oversight of product manufacturers, laboratories, and independent certifying organizations that ensures uniform application of the NFRC Rating Procedures, labeling and certification, and such other rating procedures for other factors affecting energy performance as the NFRC and the Commission may adopt.

4. The entity shall require manufacturers and independent certifying organizations within its program to use laboratories accredited by the supervisory entity to perform simulations and tests under the NFRC Rating Procedure or by an NFRC Approved Calculation Entity (ACE) under the Component Modeling Approach (CMA) Product Certification Program (PCP).

5. The entity shall maintain appropriate guidelines for testing and simulation laboratories, manufacturers, and certifying agencies, including requirements for adequate:

A. Possession and calibration of equipment;

B. Education, competence, and training of personnel;

C. Quality control;

D. Record keeping and reporting;

E. Periodic review (including, but not limited to, blind testing by laboratories; inspections of products; and inspections of laboratories, manufacturing facilities, and certifying agencies);

F. Challenges to certified ratings; and

G. Guidelines to maintain the integrity of the program, including, but not limited to, provisions to avoid conflicts of interest within the rating and certification process.

6. The entity shall be a nonprofit organization and shall maintain reasonable, nondiscriminatory fee schedules for the services it provides and shall make its fee schedules, the financial information on which fees are based, and financial statements available to its members for inspection.

7. The entity shall provide hearing processes that give laboratories, manufacturers, and certifying agencies a fair review of decisions that adversely affect them.

8. The entity shall maintain a certification policy committee whose procedures are designed to avoid conflicts of interest in deciding appeals, resolving disputes, and setting policy for the certifying organizations within its program.

9. The entity shall publish at least annually a directory of products certified and decertified within its program.

10. The entity itself shall be free from conflict-of-interest ties or to undue influence from any particular manufacturing interest(s), testing or simulation lab(s), or independent certifying organization(s).

11. The entity shall provide or authorize the use of labels and label certificates for Component Modeling Approach and site-built fenestration products that can be used to meet the requirements of Sections 110.6(a)2, 110.6(a)3 and 110.6(a)4, and this section.

12. The entity's certification program shall allow for multiple participants in each aspect of the program to provide for competition between manufacturers, testing labs, simulation labs, and independent certifying organizations.

(e) **Certification for Other Factors.** Nothing in this section shall preclude any entity, whether associated with a U-factor, SHGC or VT certification program or not, from providing certification services relating to factors other than U-factors, SHGCs and VTs for fenestration products and exterior doors.

NOTE: Authority: Section 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.8, and 25943, Public Resources Code.

10-112 – CRITERIA FOR DEFAULT TABLES

(a) The Energy Commission shall maintain tables of default U-factors and SHGCs for use as an alternative to U-factors and SHGCs derived based on the NFRC Rating Procedure. The default values shall meet the ~~following~~ criteria in Title 24, Part 6, Section 300.1.1.~~:1. The values shall be derived from simulations of products using the same computer simulation program(s) used in the NFRC Rating Procedure.~~

~~2. The default values shall be set so that they do not provide to any significant number of products a lower U-factor or SHGC than those products would obtain if they were rated using the full NFRC Rating Procedure.~~

~~(b) The Commission shall periodically review and revise the default tables as necessary to ensure that the criteria are met.~~

NOTE: Authority: Sections 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.8, 25910 and 25943, Public Resources Code.

10-113 – RATING AND LABELING OF ROOFING PRODUCT REFLECTANCE AND EMITTANCE

~~This section~~Title 24, Part 6, Section 300.4.1.1 establishes rules for implementing labeling and rating requirements relating to reflectance and emittance for roofing products for showing compliance with Sections 102.5.2, 102.4, 301.3.1, 301.5.2.2.3, 302.3.7, 302.5.2.2.3, and 302.5.2.3 *[140.1, 140.2, 140.3(a)1, 141.0(b)2B, 150.1(c)11, 150.2(b)1H, and 150.2(b)2]* of Title 24, California Code of Regulations, Part 6. This section also provides for designation of the Cool Roof Rating Council (CRRC) as the supervisory entity responsible for administering the state's rating program for roofing products, provided CRRC meets specified criteria.

~~(a) **Labeling Requirements.**~~

~~Every roofing product installed in construction to take compliance credit or meet the prescriptive requirements for reflectance and emittance under Sections 140.1, 140.2, 140.3(a)1, 141.0(b)2B, 150.1(c)11, 150.2(b)1I or 150.2(b)2 shall have a clearly visible packaging label that lists the emittance and the initial and aged solar reflectance, or a CRRC Rapid Rating for solar reflectance, tested in accordance with CRRC-1.~~

~~Packaging for liquid-applied roof coatings shall state the product meets the requirements specified in Section 110.8(i)4.~~

~~(b) **Certification Requirements.**~~

~~Every roofing product installed in construction to take compliance credit or meet the prescriptive requirements for reflectance and emittance under Sections 140.1, 140.2, 140.3(a)1, 141.0(b)2B, 150.1(c)11, 150.2(b)1I or 150.2(b)2 shall be rated by CRRC or another supervisory entity approved by the Commission pursuant to Section 10-113(c).~~

~~(c) **Designation of Supervisory Entity.** The CRRC shall be the supervisory entity to administer the rating program relating to reflectance and emittance ratings for roofing products, provided the Commission determines that the CRRC meets the criteria in Section 10-113(d).~~

~~1. The Commission may consider designating a supervisory entity other than CRRC if the Commission determines that the CRRC is not meeting the criteria in Section 10-113(d). Such other supervisory entity shall meet the criteria in Section 10-113(d) prior to being designated.~~

~~2. The Commission shall periodically review, at least annually, the structure and operations of the supervisory entity to ensure continuing compliance with the criteria in Section 10-113(d). The supervisory entity shall provide an annual report to the Commission explaining all of the measures it has taken to comply with the criteria in Section 10-113(d).~~

~~(d) **Criteria for Supervisory Entity.**~~

~~1. Membership in the entity shall be open on a nondiscriminatory basis to any person or organization that has an interest in uniform performance ratings for roofing products,~~

~~including, but not limited to, members of the roofing industry, building industry, design professionals, specifiers, utilities, government agencies, and public interest organizations. The membership shall be composed of a broad cross section of those interested in uniform thermal performance ratings for roofing products.~~

2. ~~The governing body of the entity shall reflect a reasonable cross-section of the interests represented by the membership.~~
3. ~~The entity shall maintain a program of oversight of product manufacturers, laboratories, and independent certifying organizations that ensures uniform application of the CRRC testing and rating procedures, labeling and rating, and such other rating procedures for other factors that improves the accuracy of properties of roofing products affecting energy performance as the CRRC and the Commission may adopt.~~
4. ~~The entity shall require manufacturers and independent certifying organizations within its program to use only laboratories accredited by the supervisory entity to perform tests in accordance with CRRC-1.~~
5. ~~The entity shall maintain appropriate guidelines for testing laboratories and manufacturers, including requirements for adequate:~~
   - ~~A. Possession and calibration of equipment;~~
   - ~~B. Education, competence, and training of personnel;~~
   - ~~C. Quality control;~~
   - ~~D. Record keeping and reporting;~~
   - ~~E. Periodic review including but not limited to, blind testing by laboratories; inspections of products; and inspections of laboratories and manufacturing facilities;~~
   - ~~F. Challenges to ratings; and~~
   - ~~G. Guidelines to maintain the integrity of the program, including, but not limited to, provisions to avoid conflicts of interest within the rating process.~~
6. ~~The entity shall be a nonprofit organization and shall maintain reasonable, nondiscriminatory fee schedules for the services it provides, and shall make its fee schedules, the financial information on which fees are based, and financial statements available to its members for inspection.~~
7. ~~The entity shall provide hearing processes that give laboratories, manufacturers and certifying agencies a fair review of decisions that adversely affect them.~~
8. ~~The entity shall maintain a policy committee or similar body whose procedures are designed to avoid conflicts of interest in deciding appeals, resolving disputes, and setting policy for the certifying organizations in its program.~~
9. ~~The entity shall publish at least annually a directory of rated products and products that are no longer rated by the CRRC.~~

~~10. The entity itself shall be free from conflict-of-interest ties or to undue influence from any particular roofing product manufacturing interest(s), testing or independent certifying organization(s).~~

~~11. The entity shall provide or authorize the use of labels that can be used to meet the requirements for showing compliance with the requirements of Sections 140.1, 140.2, 140.3(a)1, 141.0(b)2B, 150.1(c)11, 150.2(b)1I and 150.2(b)2, and this section.~~

~~12. The entity's rating program shall allow for multiple participants in each aspect of the program to provide for competition between manufacturers and between testing labs.~~

NOTE: Authority: Sections 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.8, 25910 and 25943, Public Resources Code.

10-114 – DETERMINATION OF OUTDOOR LIGHTING ZONES AND ADMINISTRATIVE RULES FOR USE

~~This section~~Title 24, Part 6, Section 601.3.2.3.5 establishes rules for implementing outdoor lighting zones to show compliance with Section 601.3.2 [140.7] of Title 24, California Code of Regulations, Part 6.

~~(a) **Lighting Zones.** Exterior lighting allowances in California vary by Lighting Zones (LZ).~~

~~(b) **Lighting Zone Characteristics.** TABLE 10-114-A specifies the relative ambient illumination level and the statewide default location for each lighting zone.~~

~~(c) **Amending the Lighting Zone Designation.** A local jurisdiction may officially adopt changes to the lighting zone designation of an area by following a public process that allows for formal public notification, review, and comment about the proposed change. The local jurisdiction may determine areas where Lighting Zone 4 is applicable and may increase or decrease the lighting zones for areas that are in State Default Lighting Zones 1, 2 and 3, as specified in TABLE 10-114-A.~~

~~*TABLE 10-114-A LIGHTING ZONE CHARACTERISTICS AND RULES FOR AMENDMENTS BY LOCAL JURISDICTIONS*~~

~~Zone~~	~~Ambient Illumination~~	~~Statewide Default Location~~	~~Moving Up to Higher Zones~~	~~Moving Down to Lower Zones~~
~~LZ0~~	~~Very Low~~	~~Undeveloped areas of government designated parks, recreation areas, and wildlife preserves.~~	~~Undeveloped areas of government designated parks, recreation areas, and wildlife preserves can be designated as LZ1 or LZ2 if they are contained within such a zone.~~	~~Not applicable~~
~~LZ1~~	~~Low~~	~~Rural areas, as defined by the 2020 U.S. Census. These areas include: single or dual family residential areas, parks, and agricultural zone districts, developed portion of government designated parks, recreation areas, and wildlife preserves. Those that are wholly contained within a higher lighting zone may be considered by the local government as part of that lighting zone.~~	~~Developed portion of a government designated park, recreation area, or wildlife preserve, can be designated as LZ2 or LZ3 if they are contained within such a zone.~~ ~~Retail stores, located in a residential neighborhood, and rural town centers can be designated as LZ2 if the business operates during hours of darkness.~~	~~Not applicable.~~
~~LZ2~~	~~Moderate~~	~~Urban areas, as defined by the 2020 U.S. Census.~~ ~~The following building types may occur here: multifamily housing, mixed use residential neighborhoods, religious facilities, schools, and light commercial business districts or industrial zoning districts.~~	~~Special districts within a default LZ2 zone may be designated as LZ3 or LZ4 by a local jurisdiction.~~ ~~Examples include special commercial districts or areas with special security considerations located within a mixed-use residential area or city center.~~	~~Special districts may be designated as LZ1 by the local jurisdiction, without any size limits.~~
~~LZ3~~	~~Moderately High~~	~~Urban areas, as defined by the 2020 U.S. Census.~~ ~~The following building types may occur here: high intensity commercial corridors, entertainment centers, and heavy industrial or manufacturing zone districts.~~	~~Special districts within a default LZ3 may be designated as a LZ4 by local jurisdiction for high intensity nighttime use, such as entertainment or commercial districts or areas with special security considerations requiring very high light levels.~~	~~Special districts may be designated as LZ1 or LZ2 by the local jurisdiction, without any size limits.~~
~~LZ4~~	~~High~~	~~None.~~	~~Not applicable.~~	~~Not applicable.~~

NOTE: Authority: Sections 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, and 25943, Public Resources Code.

10-115 – COMMUNITY SHARED SOLAR ELECTRIC GENERATION SYSTEM OR COMMUNITY SHARED BATTERY ENERGY STORAGE SYSTEM COMPLIANCE OPTION FOR ON-SITE SOLAR ELECTRIC GENERATION OR BATTERY ENERGY STORAGE REQUIREMENTS

(a) **Community shared solar ~~E~~electric generation system or battery energy storage system (BESS) offset**. If approved by the Energy C~~c~~ommission, a community shared solar system, other community shared renewable system, community shared BESS, or combination of the aforementioned systems (hereinafter referred to as a community shared solar or BESS) may be used as a compliance option to partially or totally meet the on-site solar electric generation system and/or BESS that is otherwise required by Section 701.3 [140.0(c)], 702.3.1 [150.1(a)3], or 703.3 [170.0(a)3] of Title 24, California Code of Regulations, Part 6. To be approved, the community shared solar electric generation or community shared BESS must demonstrate, to the Energy Commission's satisfaction, that all the following requirements will be met:

1. **Enforcement agency.** The community shared solar electric generation system and/or community shared BESS shall be installed and available for enforcement agency site inspection no later than the point in time the enforcement agency must physically verify compliance of the building which would otherwise be required to have an on-site solar electric generation and/or BESS, and shall not cause delay in the process of enforcement agency review and approval of that building. The enforcement agency shall have jurisdiction and facilitated access to make site inspections. All documentation for the community solar electric generation system and/or community solar BESS that is required to demonstrate compliance for the building shall be completed prior to building permit application.
2. **Energy performance.** The community shared solar electric generation system and/or community shared BESS shall be demonstrated to provide the same or better energy performance equal to the partial or total compliance with the energy performance of the on-site solar electric generation and/or BESS that would otherwise have been required for the building, computed by compliance software certified for use by the Energy Commission.
3. **Participating building energy savings benefits.** The community shared solar electric generation system and/or community shared BESS shall provide energy saving benefits directly to the building. The energy savings benefits allocated to the building shall be in the form of:
   A. actual reductions in the energy consumption of the participating building;
   B. energy reduction credits that will result in virtual reductions in the building's energy consumption that is subject to energy bill payments; or
   C. payments to the building that will have an equivalent effect as energy bill reductions.

The reduction in the building's energy bill resulting from A, B, or C above shall be greater than the added cost to the building resulting from the building's share in the community shared solar and/or BESS.

4. **Durability, participation, and building opt-out.**

   A**. Durability**. The community shared solar electric generation system and/or community shared BESS shall be designed and installed to provide the energy savings benefits to the participating building(s) specified in Section 10-115(a)3 for a period of no less than 20 years.

   B. **Participation.** The Administrator(s) approved by the Energy Commission pursuant to Section 10-115(b)1 shall ensure that all participating buildings, which use the community shared solar and/or community shared BESS to comply with Section 701.3 [140.0(c)], 702.3.1 [150.1(a)3], or 703.3 [170.0(a)3], remain participating buildings for no less than a 20-year period ("Participation Period"), regardless of who owns or occupies the participating building, unless the building owner discontinues participation after causing the on-site solar electric generation system to be installed and interconnected pursuant to the Opt-Out Requirements. For purposes of this Section, "Opt-Out Requirements" shall mean installation and interconnection of an on-site solar electric generation system that meets or exceeds. the requirements of Section 701.3 [140.0(c)], 702.3.1 [150.1(a)3], or 703.3 [170.0(a)3] in effect at the time the builder applied for the original building permit for the participating building. To demonstrate compliance, the Administrator shall require either:

      i. **Equitable servitude.** As a condition for a building to participate, participating builders shall impose an equitable servitude through a properly recorded declaration of covenants, conditions and restrictions ("CC&Rs") or other properly recorded covenant, deed restriction or other legally binding method referenced in each deed transferring title for each participating building. This equitable servitude shall run with the land and obligate the original owner(s)/tenant(s) and all subsequent owner(s)/tenant(s) of the participating building to maintain the building's participation in the community shared solar and/or community shared BESS for the Participation Period, or ensure installation and interconnection of an on-site solar electric generation system that satisfies the Opt-Out Requirements. The equitable servitude shall specify that in order to discontinue participation in the community shared solar and/or BESS, the building owner must satisfy the Opt-Out Requirements. The builder shall ensure that the equitable servitude provides the Administrator approved by the Energy Commission the right to enforce the above provisions. The equitable servitude shall remain in force for a period of 20 years from the date of first participation of the building in the community shared solar and/or BESS. The equitable servitude shall not be revocable. The equitable servitude shall be delivered to all responsible parties through transfer disclosure statements.

ii. **Other system**. The Energy Commission may approve another program, structure, or system by which an Administrator (or other entity approved by the Energy Commission) ensures the requirements of this Section 10-115(a)4B will be satisfied for a Participation Period of no less than 20 years.

C. **Compliance documentation.** The Administrator shall maintain record(s) of the compliance documentation that determined the requirements for the on-site solar electric generation system and/or BESS to comply with the standards in effect at the time the builder applied for the original building permit, and which establishes participants' obligations to meet the Opt-Out Requirements. The Administrator shall provide a copy of this compliance documentation upon a participating building owner's request, to every new owner of a participating building when the Administrator is notified that title has transferred, and to any participating building owner who requests to Opt-Out.

D. **Building opt-out.** At any time during the Participation Period, a participating building owner shall have the option to discontinue the participation of the building in the community shared solar and/or BESS ("Opt-Out") if the building satisfies the Opt-Out Requirement.

i. Prior to Opt-Out, the building owner shall demonstrate that they have installed such an on-site solar electric generation system and met the Opt-Out Requirements by providing documentation from the installer of the on-site solar system or an attestation of the building owner with supporting documentation. The building owner shall be responsible for all costs associated with documenting that the on-site solar generation system satisfies the Opt-Out Requirements.

ii. Upon receiving documentation regarding Opt-Out from a building owner, the Administrator shall compare the documentation to the compliance documentation specified in Section 10-115(a)4C and confirm whether, based on the documentation, the installed solar system meets or exceeds the Opt-Out Requirements. Within 30 days of a building owner providing documentation, the Administrator shall provide written confirmation to the building owner whether, based on the Administrator's review of that documentation, the on-site solar generation system satisfies the Opt-Out Requirements. The Administrator may, at its discretion, verify the documentation through a physical inspection. The Administrator shall maintain record of the documentation that demonstrates and confirms the on-site solar generation system met the Opt-Out requirements for the remainder of the Participation Period.

iii. Upon a building owner's exercise of the Opt-Out, all costs and benefits associated with participation in the community shared solar and/or BESS shall cease. If any balance of costs or benefits is owed to either party at the time of Opt-Out, such balance shall be paid to that party.

iv. The Administrator (or other entity approved by the Energy Commission pursuant to Section 10-115(a)4Bii) shall not impose any penalty related to a participating

building's Opt-Out, or charge participants for recuperation of unrealized revenue that would have been expected to accrue beyond the end of participation. If the Administrator (or other entity approved by the Energy Commission) plans to charge any other fees at the time of building Opt-Out, the Application for Energy Commission Approval shall explain the purpose of those fees.

5. **Additionality.** The community shared solar electric generation system and/or community shared BESS shall provide the energy savings benefits specified in Section 10-115(a)3 exclusively to the participating building(s). Those energy savings benefits shall in no way be attributed to other purposes or transferred to other buildings or property.
   A. The participating building(s) shall be served primarily by renewable resources developed specifically for the community solar electric generation system.
   B. Other renewable resources may be used when participating buildings are permitted before the renewable resources developed for the program start operating or after they cease operating. During these times, other renewable resources may be used to meet the requirements of Section 10-115(a)4 for each participating building.
   C. The renewable resources, including those developed primarily to serve participating buildings and those utilized to serve participating buildings during the time periods described in Section 10-115(a)5B for the purpose of meeting the requirements of Section 10-115(a)4, shall meet the following requirement:
      i. For each renewable resource used to serve participating buildings, bundled Renewable Energy Credits (RECs), which satisfy the criteria of Portfolio Content Category 1, shall be retired and tracked in the Western Renewable Energy Generation Information System (WREGIS) on the behalf of program participants, to ensure that they will not be allocated to or used for any other purpose, including Renewable Performance Standard (RPS) compliance, resale of RECs or renewable generation to any other person or entity, or any other mandatory or voluntary renewable electricity program requirement or claim.
   D. Renewable resources developed to serve participating buildings may also be used to serve other loads when there is excess generation beyond what is needed to serve participating buildings. Any excess generation used for such other loads shall be isolated from the generation serving participating buildings and shall not result in violation of Section 10-115(a)5C.
6. **Location.** The community shared solar electric generation system and/or community shared BESS shall be located on a distribution system of the load serving entity providing service to the participating buildings. The distribution system shall have an electrical voltage less than 100kV.
7. **Size.** The community shared solar electric generation system and/or community shared BESS shall not be served by any individual source larger than 20 MW.

8. **Accountability and recordkeeping.** Applicants for Energy Commission approval of community shared solar electric generation systems and/or community shared BESSs shall be accountable to all parties who relied on these systems for partial or total compliance with the on-site solar electric generation and/or BESS that would otherwise be required, including but not limited to builders of the buildings, owners of the buildings, enforcement agencies, and the Energy Commission.

   A. Each year beginning twelve months after initial approval, the Administrator shall provide to the Energy Commission a report demonstrating the previous year's compliance with each requirement of Section 10-115.

   B. Recordkeeping regarding compliance with the requirements in Sections 10-115(a) shall be maintained over the period of time specified in Section 10-115(a)4 for each building for which the community shared solar electric generation or BESS is used to demonstrate partial or total compliance. Access to these records shall be provided to any entity approved by the Energy Commission for auditing compliance with these requirements.

(b) **Application for Energy Ccommission approval.** Any entity may apply to the Energy Commission for approval to administer a community shared solar electric generation or community shared BESS to provide partial or total compliance with the on-site solar electric generation system and/or BESS required by Section 702.3.1 [150.1] of Title 24, California Code of Regulations, Part 6. Once approved, the entity shall be the Administrator of the community shared solar electric generation or community shared BESS.

1. The application shall demonstrate to the Energy Commission's satisfaction that each of the requirements specified in Section 10-115(a) will be met and shall include detailed explanation of the actions that will be taken by the applicant to ensure that each requirement is met over the period of time specified in Section 10-115(a)4 for each building for which a partial or total offset is used to demonstrate compliance.

2. All applicants have the burden of proof to establish that their application should be granted.

3. Applications from public agencies shall be submitted to the Energy Commission only after public review through at least one public meeting within the jurisdiction of the public entity or service area of the load-serving entity and adoption by the public agency. The Energy Commission shall have the authority to not approve any application that the Energy Commission determines to be inconsistent with the requirements of Section 10-115.

(c) **Executive director approval of revised applications.** The Administrator of an approved community shared solar electric generation system and/or community shared BESS shall submit a revised application demonstrating compliance with the Section 10-115 requirements to the Executive Director for approval, when:

1. A new renewable resource is proposed to be added to a community shared solar electric generation system and/or community shared BESS, and/or

2. The Energy Commission modifies the requirements of Section 10-115 in a building standards rulemaking. Such modified requirements would not apply retroactively to the buildings for which building permit applications are submitted prior to the effective date of the modified standards or to the continued use of previously approved renewable resources developed to serve a community shared solar electric generation system and/or community shared BESS.

Within 60 days of receiving a revised application, the Executive Director may either: approve the revised application by letter if the Executive Director concludes that the requirements of Section 10-115 will be met, request the Administrator to resubmit their revised application with changes, or disapprove the application. If the Executive Director disapproves the application, the applicant may request that the Energy Commission review the Executive Director's determination. The petition must be filed in writing in accordance with Title 20, California Code of Regulations, Section 1208 within 15 days of the date of the filing of the Executive Director's determination and must state the basis for requesting review of the Executive Director's determination. Within 45 days of receiving a request for review, the Energy Commission shall issue a written decision affirming or modifying the Executive Director's determination. If the Energy Commission does not issue a written decision within 45 days, the request for review shall be deemed denied. The Administrator shall have the burden of proof to establish that its revised application should be approved.

NOTE: Authority: Sections 25213, 25218, 25218.5, 25402, 25402.1, and 25605, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.8, 25605, and 25943, Public Resources Code.

10-116 – THIRD PARTY ALTERNATIVE CALCULATION METHOD COMPLIANCE SOFTWARE

(a) **Scope.** The requirements of this section apply to Alternative Calculation Method (ACM) compliance software used to demonstrate compliance with Part 6 that are developed by third party software developers as specified by Section 10-109(c)3.

(b) **Application.** Applications for approval of ACM candidate compliance software must include the following materials:

1. Compliance software vendor certification statement that ACM candidate compliance software meets requirements and successfully pass tests specified in the Alternative Calculation Method Reference Manual.
2. Computer runs and summary sheets including, but not limited to, input and output files, files necessary for transferring information to an ECC-provider (if required), and a summary of the compliance results from required computer runs.

   Candidate compliance software runs shall be modeled as specified in the Alternative Calculation Method Reference Manual. Vendor of the ACM compliance software may propose alternate tests from those specified in the Alternative Calculation Method Reference Manual when the vendor of the ACM compliance software believes that one or more of the standard tests are not appropriate for the ACM candidate compliance software. Alternative tests will be evaluated by the Energy Commission on a case-by-case basis and will be applied if the proposed tests compare features of the ACM candidate compliance software to the Energy Commission public domain computer program.
3. User manual and changelog describing the functional and analytical capabilities of the ACM candidate compliance software or a complete list of changes to the ACM compliance software. Vendor of the ACM Compliance software shall make a copy of their user manual available to all building departments in California.

   The user manual shall provide thorough explanation of the following:

   A. Software capabilities. A section that discusses the program capabilities. Reference may be made to other sections of the user manual for more complete descriptions if appropriate.

   B. Preparing basic input. Description of the basic use of the compliance software for compliance. This section shall include a complete summary of all inputs and commands necessary for compliance.

   C. Checklist for compliance submittal. A checklist of all items that must be included in a compliance submittal to the enforcement agency using the compliance software.

   D. Sample compliance documentation. Complete set of compliance documentation for a sample building. The example shall include all documentation and standard reports that would normally be submitted to an enforcement agency. This example shall be

usable as a model for compliance software users and enforcement agencies to demonstrate a proper compliance submittal.

E. Compliance statement. The following statement shall appear within the first three pages of the user manual, "[Compliance software name] may be used to show compliance with California ~~2025~~2028 Energy Code~~Building Energy Efficiency Standards~~."

F. Related publications. References to the Energy Code~~Building Energy Efficiency Standards~~, Residential Compliance Manual, and Nonresidential Compliance Manual and where to find these publications.

4. Executable ACM candidate compliance software.

5. Alternative nonresidential energy simulation engine which meets all of the requirements of ASHRAE 140 (2023) including annex A3 and produces results that are accurate to the simulation results of the Energy Commission public domain computer program.

6. Application fee deposit of $1,000 for ACM candidate compliance software that has not been previously approved by the Energy Commission, or for the first approval following an update to the Energy Code, Title 24, Part 6~~ Building Energy Efficiency Standards~~.

(c) **Approval process.** For approval of an application, the following procedures apply:

1. Submit application**.** Four copies of an application, or an electronic copy of a signed application, must be submitted to the Energy Commission.

2. Correspondence with the Energy Commission. Provide additional information or address specific change requests made by the Energy Commission.

The Energy Commission may take the following actions on an application submitted pursuant to this section:

A. Approve the application unconditionally;

B. Restrict approval to specified occupancies, designs, materials, or devices; or

C. Reject the application.

3. Application fee deposit review. Address additional review costs including additional fees to cover the total costs if greater than the application fee deposit, or refund if the cost of reviewing the application is less than the application fee deposit.

4. Business meeting approval or approval by the Executive Director.

Once approved, the ACM compliance software may be used by users and building officials to demonstrate compliance.

(d) **ACM compliance software updates.** When revisions are made to ACM compliance software the following procedures apply:

1. Revisions that result in major changes to ACM compliance software, changes that would affect compliance values, or that match rules established for modeling compliance software documented in the Energy Conservation and Alternative Calculation Method (ACM) Reference Manuals.

A. Updated ACM compliance software shall comply with the approval process in 10-116(c) and 10-110. The Energy Commission schedule will be based on extent of change to the Energy Commission public domain software and is no shorter than 90 days.

B. Incorporate changes from the Energy Commission public domain program by directly incorporating the new version of the Energy Commission public domain program or updating alternative nonresidential energy simulation engines to produce results that are accurate to the new version of the Energy Commission public domain program.

C. Upon approval of updated ACM compliance software, previous versions of the ACM compliance software will expire 90 days after approval of the new version.

2. Revisions that result in minor changes to the ACM compliance software, user interface, or software updates that do not change compliance values.

A. If the Energy Commission determines that the minor change must be incorporated on a specific schedule, updated ACM compliance software must go through the approval process based on the Energy Commission schedule. The Energy Commission schedule will be based on extent of change to the Energy Commission public domain software and is no shorter than 45 days.

B. Incorporate changes from the Energy Commission public domain program by directly incorporating the new version of the Energy Commission public domain program or updating alternative nonresidential energy simulation engines to produce results that are accurate to the new version of the Energy Commission public domain program.

C. Upon approval of updated ACM compliance software, previous versions of the ACM compliance software will expire 60 days after approval of the new version.

Rules established in the Alternative Calculation Method Reference Manual will be updated no more than twice annually in January and July. If ACM compliance software relies on rules that are updated in the Alternative Calculation Method Reference Manual, then the ACM compliance software must be updated. ACM compliance software that is not updated will be decertified.

(e) **Expiration.** Approval of an ACM compliance software expires and is replaced by approval of a newer version as part of the typical cycle of updating ACM compliance software to account for bug fixes and changes to the Energy Commission public domain program.

(f) **Decertification.** Decertification is the formal process of withdrawing approval of ACM compliance software as a result of the following:

1. ~~Building Energy Efficiency Standards~~The Energy Code undergoes substantial changes such that the software would fail to confirm compliance with the Energy Code~~Building Energy Efficiency Standards.~~

2. A letter from the vendor of the ACM compliance software requesting that a particular version(s) of ACM compliance software be decertified and describing the reasons why decertification is appropriate.
3. An "initiating party" commences a procedure to decertify an ACM compliance software version(s) according to the following process:
    A. Submit review request. Written communication to the Energy Commission's Executive Director with copies to the Building Standards Office including name the of the ACM compliance software and version, nature of error, explanation for why the error requires decertification and appropriate data or other information relevant to evaluate the error.
    B. Correspondence with interested parties. The Executive Director shall notify and make a copy of the initial written communication available to the vendor of the ACM compliance software and any known interested parties within 30 days of receipt. Interested parties shall have 45 days from the date of the notification provided by the Executive Director to submit comments to the Energy Commission relating to the request.
    C. Correspondence with initiating parties. The Executive Director may request additional information needed to evaluate the identified error within 75 days of receipt of the written communication. The initiating party must respond withing 30 days of the request for additional information.
    D. Workshop. The Executive Director may convene a workshop within 75 days of receipt of the written communication to gather additional information from the initiating party, the vendor of the ACM compliance software, and interested parties. All parties shall have 15 days after a workshop to submit additional information regarding the error.
    E. Determination. Within 90 days of receipt of the written communication, or within 30 days of receipt of complete additional information requested of the initiating party, whichever is later, the Executive Director shall either determine that the ACM compliance need not be decertified or submit to the Energy Commission a written recommendation that the ACM compliance software be decertified.
    F. Decertification. If it is determined that the ACM compliance software be decertified, it shall take effect 60 days later. Within the first 30 days of the 60-day period, the Executive Director shall send out a notice to building officials and interested parties announcing the decertification.

All initiating parties have the burden of proof to establish that the review of ACM compliance software errors should be performed. The decertification process may be terminated at any time by mutual consent of the initiating party and the Executive Director.

The vendor of the ACM compliance software may use the period outline here to update the compliance software, obtain approval by the Energy Commission, and release a revised version that corrects the error initially brough to the attention of the Energy Commission.

CALIFORNIA
ENERGY COMMISSION

2028 ENERGY CODE

CALIFORNIA CODE OF REGULATIONS
TITLE 24, PART 6

DISCLAIMER #1

Staff members of the California *Energy Commission* prepared this draft regulatory text. As such, it does not necessarily represent the views of the *Energy Commission*, its employees, or the State of California. The *Energy Commission*, the State of California, its employees, contractors and subcontractors make no warrant, express or implied, and assume no legal liability for the information in this report; nor does any party represent that the uses of this information will not infringe upon privately owned rights. This draft regulatory text has not been approved or disapproved by the *Energy Commission* nor has the *Energy Commission* passed upon the accuracy or adequacy of the information in this draft regulatory text.

DISCLAIMER #2

General provisions were compiled from multiple subchapters of the adopted 2028 Energy Code and duplicative language was removed. Minor edits have been made to compile the general provisions that do not impact or change requirements.

ARRANGEMENT AND FORMAT OF THE 2028 CALIFORNIA ENERGY CODE

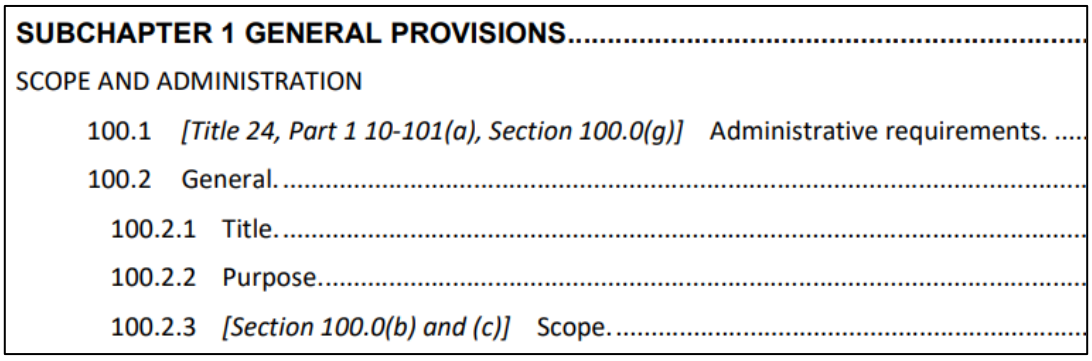
The format of the California Energy Code (Title 24, Part 6) allows each chapter to be devoted to a particular subject or building system. The following table shows how the Energy Code is divided. The convention used for section and subsection numbering indicates whether the requirements are mandatory, can be used to comply via the prescriptive or performance paths, and to which occupancies the requirements apply.

TOPICS AND BUILDING SYSTEMS BY CHAPTER

CHAPTERS	SUBJECTS
1	General Provisions
2	Definitions
3	Envelope
4	Heating, Ventilation, and Air-Conditioning (HVAC)
5	Plumbing
6	Electrical and Lighting
7	Photovoltaic (PV) and Battery Energy Storage Systems (BESS)
8	Pool and Spa
9	Process Systems and Equipment
10	Commissioning
Joint Appendices	Appendices that apply to all use designations
Residential Appendices	Appendices that apply to residential use designations
Nonresidential Appendices	Appendices that apply to nonresidential use designations

SECTION AND SUBSECTION NUMBERING

Each section and subsection within a chapter starts with the chapter number and uses a decimal system to indicate a tiered relationship as demonstrated by the table of contents excerpt below from Chapter 1.



SUBCHAPTER 1 GENERAL PROVISIONS

SCOPE AND ADMINISTRATION

100.1 *[Title 24, Part 1 10-101(a), Section 100.0(g)]* Administrative requirements.

100.2 General.

100.2.1 Title.

100.2.2 Purpose.

100.2.3 *[Section 100.0(b) and (c)]* Scope.

For chapters that address building systems, chapters 3 – 8 and 10, the section and subsection numbers follow a consistent numbering convention. Section -00 always includes mandatory requirements for all occupancies, -01 includes requirements for nonresidential and hotel/motel occupancies, -02 includes requirements for single-family occupancies, and -03 includes requirements for multifamily occupancies. Even within the sections, each subsection also follows a consistent pattern. The diagram below shows the structure for chapter 3, but this structure is consistent with chapters 4 – 8, and 10 as well.

Section 300 Mandatory Requirements for all occupancies

Subsection 300.1 Fenestration products and exterior doors

Subsection 300.2 Requirements to limit air leakage

Subsection 300.3 Insulation

Subsection 300.4 Roofing products

Subsection 300.5 Radiant barrier

Section 301 Nonresidential and Hotel/Motel occupancies

Subsection 301.1 General

Subsection 301.2 Mandatory requirements

Subsection 301.3 Prescriptive requirements

Subsection 301.4 Performance requirements

Subsection 301.5 Additions and alterations to existing buildings

Section 302 Single-family occupancies

Subsection 302.1 General

Subsection 302.2 Mandatory requirements

Subsection 302.3 Prescriptive requirements

Subsection 302.4 Performance requirements

Subsection 302.5 Additions and alterations to existing buildings

Section 303 Multifamily occupancies

Subsection 303.1 General

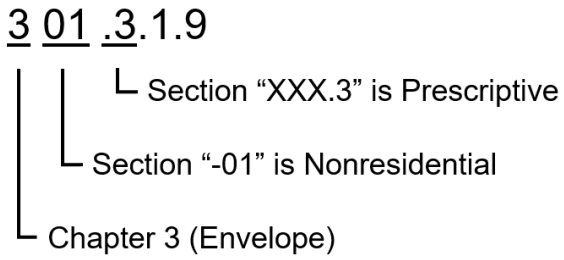
Subsection 303.2 Mandatory requirements

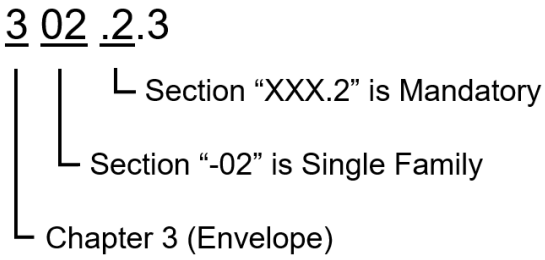
Subsection 303.3 Prescriptive requirements

Subsection 303.4 Performance requirements

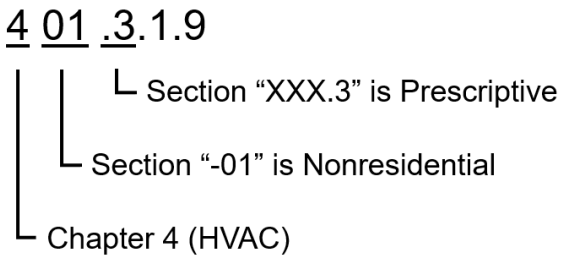
Subsection 303.5 Additions and alterations to existing buildings

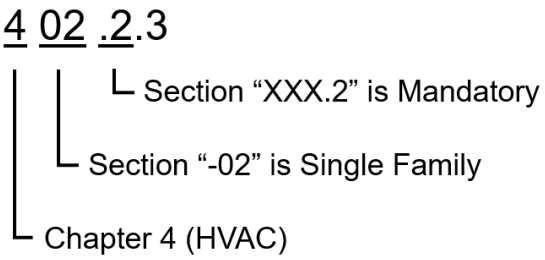
The numbering convention being consistent in chapters 3 – 8 and 10 allows the reader to infer the building system, building occupancy, and type of requirement (mandatory, prescriptive, performance, addition/alteration). The diagram below shows how the chapter number indicates the building system, the next two numbers of the section indicate the building occupancy, and the number following the first decimal indicates the type of requirement.





This exact same numbering convention can be applied to chapter 4, HVAC, and also to chapters 5 – 8, and 10.





Chapter 9, which includes requirements for covered process systems, is organized similarly but does not exactly follow the numbering convention because the chapter is arranged by covered process system instead of by building occupancy.

Section 901 Refrigerated warehouses

Subsection 901.1 Mandatory requirements

Subsection 901.2 Prescriptive requirements

Subsection 901.3 Performance requirements

Subsection 901.4 Additions and alterations to existing buildings

Section 902 Commercial refrigeration

Subsection 902.1 Mandatory requirements

Subsection 902.2 Prescriptive requirements

Subsection 902.3 Performance requirements

Subsection 902.4 Additions and alterations to existing buildings

TABLE OF CONTENTS

SUBCHAPTER 1 GENERAL PROVISIONS....1

SCOPE AND ADMINISTRATION 1

100.1 *[Title 24, Part 1 10-101(a), Section 100.0(g)]* Administrative requirements. 1

100.2 General. 1

100.2.1 Title. 1

100.2.2 Purpose. 1

100.2.3 *[Section 100.0(b) and (c)]* Scope. 1

100.3 *[Section 100.0(a)]* Applicability. 2

100.4 *[Section 100.0(e)]* Sections applicable. 2

100.4.1 Single occupancy. 2

100.4.2 *[Section 100.0(f)]* Mixed occupancy. 3

100.4.3 *[Section 100.0(e)2]* Newly constructed buildings, covered processes, outdoor lighting, and indoor and outdoor signs. 3

100.4.4 *[Section 100.0(e)3]* New construction to existing buildings, covered processes, outdoor lighting, and indoor and outdoor signs (additions, alterations and repairs). 3

100.4.4.1 *[Section 141.0(c), 180.3]* Repairs.....3

TABLE 100.4-A [Table 100.0-A] APPLICATION OF STANDARDS NONRESIDENTIAL AND HOTEL/MOTEL[1] 4

TABLE 100.4-B [Table 100.0-A] APPLICATION OF STANDARDS COVERED PROCESSES[1] 7

TABLE 100.4-C [Table 100.0-A] APPLICATION OF STANDARDS SINGLE-FAMILY.....9

TABLE 100.4-D [Table 100.0-A] APPLICATION OF STANDARDS MULTIFAMILY.....10

SYSTEMS AND EQUIPMENT 27

101.1 *[Section 100.0(h)]* Certification requirements for manufactured equipment, products, and devices. 27

101.2 *[Section 110.0]* General. 27

101.2.1 *[Section 110.0(a)]* General requirements. 27

101.2.2 *[Section 110.0(b)]* Certification requirements for manufactured systems, equipment, appliances and building components. 28

101.2.2.1 *[Section 110.0(b)3]* Certification status. 28
101.3 *[Section 110.1]* Mandatory requirements for appliances. 28
101.3.1 *[Section 110.1(a)]* Appliance efficiency regulations. 28
101.3.2 *[Section 110.1(b)]* Efficiency level verification. 28
101.3.3 *[Section 110.1(c)]* Efficiency level demonstration. 29
101.4 *[Section 110.5]* Natural gas central furnaces, cooking equipment, pool and spa heaters, and fireplaces: pilot lights prohibited. 29
COMPLIANCE APPROACHES 31
102.1 General. 31
102.1.1 *[Section 100.0(e)2Bii]* Buildings, covered processes, outdoor lighting, and indoor and outdoor signs. 31
102.2 California climate zones. 31
102.3 Mandatory requirements. 33
102.4 *[Section 150.1(c)]* Prescriptive approach 33
102.5 *[Section 100.2]* Performance approach. 33
102.5.1 *[Section 100.2]* Calculation of energy budgets. 33
102.5.1.1 Long-term System Cost (LSC) 33
102.5.1.2 Source Energy. 33
102.5.2 *[Section 140.1(a), 150.1(b)1, 170.1(a)]* Newly constructed buildings. 34
102.5.3 *[Section 141.0(a)2, 150.2(a)2, 180.1(b)]* Additions in existing buildings. 34
102.5.4 *[Section 141.0(b)3, 150.2(b)2, 180.2(c)]* Alterations in existing buildings. 36
TABLE 102.5-A [Table 141.0-E-2] – NONRESIDENTIAL AND HOTEL/MOTEL BUILDING STANDARD DESIGN FOR AN ALTERED COMPONENT 37
TABLE 102.5-B [TABLE 150.2-G] SINGLE-FAMILY BUILDING STANDARD DESIGN FOR AN ALTERED COMPONENT 38
102.5.5 *[Section 150.1(b)2, 170.1(b)]* Compliance demonstration requirements for performance standards. 39
TABLE 102.5-C [Table 170.2-K] MECHANICAL COMPONENT PACKAGE – MULTIFAMILY STANDARD BUILDING DESIGN 42

SUBCHAPTER 1
GENERAL PROVISIONS

SECTION 100

SCOPE AND ADMINISTRATION

100.1 *[Title 24, Part 1 10-101(a), Section 100.0(g)]* **Administrative requirements.**

Title 24, *Part 1*, Chapter 10, Sections 10-101 through 10-115 contain administrative regulations relating to the energy *building* regulations in Title 24, *Part 6*.

Administrative requirements relating to permit requirements, enforcement by the *Energy C~~c~~ommission*, locally adopted energy standards, interpretations, claims of exemption, *approved calculation methods*, rights of appeal, and certification and labeling requirements of *fenestration products* and *roofing products* are specified in California Code of Regulations, Title 24, *Part 1*, Sections 10-101 to 10-115.

100.2 General.

100.2.1 Title.

These regulations shall be known as the California Energy Code, or Energy Code,~~Building Energy Efficiency Standards,~~ and may be cited as such.~~ and will be referred to herein as "this code." It is intended that it shall also be known as the Energy Code.~~ The California ~~Building Energy Efficiency Standards~~Energy Code is *Part 6* of twelve~~hirteen~~ parts of the official compilation and publication of the adoption, amendment and repeal of *building* regulations to the California Code of Regulations, Title 24, also referred to as the California Building Standards Code.

100.2.2 Purpose.

The purpose of this code is to establish the minimum requirements to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, stability, access to persons with disabilities, sanitation, adequate *lighting* and ventilation and energy conservation; safety to life and property from fire and other hazards attributed to the built environment; and to provide safety to fire fighters and emergency responders during emergency operations.

100.2.3 *[Section 100.0(b) and (c)]* **Scope.**

The provisions of *Part 6* apply to the *building envelope*, *space-conditioning systems*, water-heating systems, *pool* and *spas*, solar ready *buildings*, indoor *lighting* systems of *buildings*, *outdoor lighting* systems, *electrical power distribution systems*, and *signs* located either indoors or outdoors, in *buildings* that are:

1. Covered by Section 100.3 *[Section 100.0(a)]*; and
2. Set forth in Table 100.4-(1), Table 100.4-(2), Table 100.4-(3), and Table 100.4-(4) *[Table 100.0-A]*.

100.3 *[Section 100.0(a)]* **Applicability.**

The provisions of *Part 6* apply to all *buildings*:

1. That are of ~~*Occupancy* *Group*~~ A, B, E, F, H, I, L, M, R, S, or U *occupancies*; and
2. For which an application for a *building* permit or renewal of an existing permit is filed (or is required by law to be filed) on or after the effective date of the provisions, or which are constructed by a *governmental agency*; and
3. That are unconditioned, or indirectly or directly conditioned, or *process spaces*.

Exception 1 to Section 100.3: Qualified historic *buildings*, as regulated by the California Historic *Building* Code (Title 24, Part 8). *Lighting* in qualified historic *buildings* shall comply with the applicable requirements in Section 601.3.1.1.3 *[Section 140.6(a)3Q]*.

Exception 2 to Section 100.3: *Building* departments, at their discretion, may not require compliance for temporary *buildings*, temporary *outdoor lighting* or *temporary lighting* in an unconditioned *building*, or structures erected in response to a natural disaster. Temporary *buildings* or structures shall be completely removed upon the expiration of the time limit stated in the permit.

Exception 3 to Section 100.3: ~~*Buildings* in *Occupancy* *Group*~~ I-3 and I-4 *occupancies*.

100.4 *[Section 100.0(e)]* **Sections applicable.**

Table 100.4-(1), Table 100.4-(3), and Table 100.4-(4) *[Table 100.0-A]* list the provisions of *Part 6* that are applicable to different types of ~~*buildings*~~ *use designations* and their different *occupancies* covered by Section 100.3 *[Section 100.0(a)]*.

Covered processes associated with *nonresidential*, *hotel/motel*, or *multifamily occupancies* shall comply with the applicable requirements of Table 100.4-(2).

Exception to Section 100.4: Spaces or requirements not listed in Table 100.4-~~A~~(1), Table 100.4-~~B~~(2), Table 100.4-~~C~~(3), and Table 100.4-~~D~~(4) *[Table 100.0-A]*.

100.4.1 Single occupancy building.

When a *building* is designed and constructed for one type of ~~*occupancy*~~ *use designation* ~~(nonresidential, hotel/motel, covered process, single-family or multifamily residential)~~, the

entire building of ~~area for~~ that *use designation* ~~*occupancy*~~ shall meet the provisions of *Part 6* applicable to that *use designation*~~*occupancy*~~.

100.4.2 *[Section 100.0(f)]* **Mixed occupancy building.**

When a *building* is designed and constructed for more than one type of *use designation*~~*occupancy* (nonresidential, hotel/motel, covered process, single family or multifamily residential)~~, the area for each *use designation*~~*occupancy*~~ shall meet the provisions of *Part 6* applicable to that *use designation*~~*occupancy*~~.

Exception 1 to Section 100.4.2: If one *use designation*~~*occupancy*~~ constitutes at least 80 percent of the *conditioned floor area* of the *building*, the *entire building envelope*, *HVAC system*, and *water heating* may be designed to comply with the provisions of *Part 6* applicable to that *use designation*~~*occupancy*~~, provided that the applicable *lighting* requirements in Sections 601.3 *[Sections 140.6 through 140.8]*, 602.2.1 *[Section 150.0(k)]*, or Sections 603.2.1 through 603.2.2 *[Section 160.5]* and 603.3 *[Section 170.2(e)],* are met for each *use designation*~~*occupancy*~~ and space type, and mandatory measures in Sections listed in Table 100.4-~~A~~(1), Table 100.4-~~B~~(2), Table 100.4-~~C~~(3) and Table 100.4-~~D~~(4) are met for each *use designation*~~*occupancy*~~ and space type.

Exception 2 to Section 100.4.2: If one *use designation*~~*occupancy*~~ constitutes at least 90 percent of the combined conditioned plus *unconditioned floor area* of the *building*, the *entire building* indoor *lighting* may be designed to comply with only the *lighting* provisions of *Part 6* applicable to that *use designation*~~*occupancy*~~.

100.4.3 *[Section 100.0(e)2]* **Newly constructed buildings, covered processes, outdoor lighting, and indoor and outdoor signs.**

Tables 100.4-~~A~~(1) through 100.4-~~D~~(4) specify sections that apply to *newly constructed buildings*, *covered processes*, *outdoor lighting*, and indoor and outdoor signs.

100.4.4 *[Section 100.0(e)3]* **New construction to existing buildings, covered processes, outdoor lighting, and indoor and outdoor signs (additions, alterations and repairs).**

New construction to existing *buildings*, *covered processes*, *outdoor lighting*, and indoor and outdoor signs includes *additions*, *alterations* and *repairs*. Tables 100.4-~~A~~(1) through 100.4-~~D~~(4) specify sections that uniquely apply to *additions* and *alterations* to existing *buildings.*

For *alterations* that change the *occupancy* classification of the *building*, the requirements specified apply to the *occupancy* after the *alterations*.

Relocation or moving of a *relocatable public school building* is not, by itself, considered an *alteration* for the purposes of Title 24, *Part 6*.

Exception 1 to Section 100.4.4 *[Section 141.0]*: *Alterations* to *healthcare facilities* are not required to comply with Title 24, *Part 6*.

100.4.4.1 *[Section 141.0(c), 180.3]* **Repairs.**

Repairs shall not increase the preexisting energy consumption of the repaired component, system, or *equipment*.

TABLE 100.4-(1) [TABLE 100.0-A] APPLICATION OF STANDARDS NONRESIDENTIAL AND HOTEL/MOTEL[1]

APPLICATION	MANDATORY (NEWLY CONSTRUCTED)	PRESCRIPTIVE (NEWLY CONSTRUCTED)	PERFORMANCE (NEWLY CONSTRUCTED)	*ADDITIONS/ ALTERATIONS*
General	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)
Definitions	200 (Definitions)	200 (Definitions)	200 (Definitions)	200 (Definitions)
Envelope (conditioned)	300 (Mandatory for all) 301.1 (General) 301.2 (Mandatory)	301.3	301.4	301.5
Envelope (unconditioned, including *process spaces*)	N.A.	301.3.10 (Daylighting for Large *Enclosed Spaces*)	N.A.	301.5
HVAC (conditioned)	400 (Mandatory for all) 401.1 (General) 401.2 (Mandatory)	401.3	401.4	401.5
Plumbing	500 (Mandatory for all) 501.1 (General) 501.2 (Mandatory)	501.3	501.4	501.5
Indoor *Lighting* (conditioned, including *process spaces*)	600 (Mandatory for all) 601.1 (General) 601.2.1 (*Lighting* Equipment) 601.2.2 (Mandatory Indoor) 601.2.5 (In-the-field Forms)	601.3.1	601.4	601.5
Indoor *Lighting* (unconditioned, and parking garages)	600 (Mandatory for all) 601.1 (General) 601.2.1 (*Lighting* Equipment) 601.2.2 (Mandatory Indoor) 601.2.5 (In-the-field Forms)	601.3.1	N.A.	601.5
Outdoor Lighting	600 (Mandatory for all) 601.1 (General) 601.2.1 (*Lighting* Equipment) 601.2.3 (Mandatory Outdoor) 601.2.5 (In-the-field Forms)	601.3.2	N.A.	601.5

(CONTINUED): TABLE 100.4-(1) [TABLE 100.0-A] APPLICATION OF STANDARDS NONRESIDENTIAL AND HOTEL/~~MOTEL~~[1]MOTEL[a]

APPLICATION	MANDATORY (NEWLY CONSTRUCTED)	PRESCRIPTIVE (NEWLY CONSTRUCTED)	PERFORMANCE (NEWLY CONSTRUCTED)	***ADDITIONS/ ALTERATIONS***
Signs (Indoor and Outdoor)	600 (Mandatory for all) 601.1 (General) 601.2.1 (*Lighting* Equipment) 601.2.4 (Mandatory Signs)	601.3.3	N.A.	601.5
Electrical Power Distribution (EPD)	600 (Mandatory for all) 601.1 (General) 600.4.4.1 (In-the-field Forms) 601.2.6 (Mandatory EPD)	N.A.	N.A.	601.5
Solar Ready *Buildings*	700.1 (Mandatory for all) Nonresidential: 701.1 (General) 701.2.1 (Solar Ready) Hotel/Motel: 703.1 (General) 703.2.1 (Solar Ready)	N.A.	N.A.	Nonresidential: *Additions*: 701.5 (Solar Ready) *Alterations*: N.A. Nonresidential: *Additions*: 703.5 (Solar Ready) *Alterations*: N.A.
Solar and *Battery Energy Storage Systems*	700.1 (Mandatory for all) Nonresidential: 701.1 (General) Hotel/Motel: 703.1 (General)	Nonresidential: 701.3 Hotel/Motel: 703.3	Nonresidential: 701.4 Hotel/Motel: 703.4	N.A.
Pool and *Spa* Systems	800 (Mandatory for all)	N.A.	N.A.	800 (Mandatory for all)
Covered Processes	See Table 100.4-(2)	See Table 100.4-(2)	See Table 100.4-(2)	See Table 100.4-(2)
Design Review and Commissioning	1001 (Mandatory)	N.A.	N.A.	N.A.

Footnotes for Table 100.4(1) *[Table 100.0-A]*:

a. ~~*Nonresidential* and *hotel/motel b*~~*Buildings* that contain *covered processes* may conform to the applicable requirements of the applicable *use designations* ~~both *occupancy types*~~ listed in Tables 100.4(1) and 100.4(2) *[Table 100.0-A]*.

~~Footnotes for Table 100.4-A *[Table 100.0-A]*:~~

~~*Nonresidential* and *hotel/motel buildings* that contain *covered processes* may conform to the applicable requirements of both *occupancy types* listed in Tables 100.4-A and 100.4-B *[Table 100.0-A]*.~~

TABLE 100.4-B(2) [TABLE 100.0-A] APPLICATION OF STANDARDS COVERED ~~PROCESSES~~[1] PROCESSES[a]

APPLICATION	MANDATORY (NEWLY CONSTRUCTED)	PRESCRIPTIVE (NEWLY CONSTRUCTED)	PERFORMANCE (NEWLY CONSTRUCTED)	***ADDITIONS/ ALTERATIONS***
General	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)
Definitions	200 (Definitions)	200 (Definitions)	200 (Definitions)	200 (Definitions)
Refrigerated Warehouse	900 (General) 901.1 (*Refrigerated Warehouse*) 913 (*Process* Piping)	N.A.	N.A.	901.4 (*Refrigerated Warehouse*) 913 (*Process* Piping)
Commercial Refrigeration	900 (General) 902.1 (Commercial Refrigeration) 913 (*Process* Piping)	N.A.	N.A.	902.4 (Commercial Refrigeration) 913 (*Process* Piping)
Enclosed Parking Garages	900 (General) 903.1 (Enclosed Parking Garages)	N.A.	N.A.	903.4 (Enclosed Parking Garages)
Process Boilers	900 (General) 904.1 (*Process Boilers*) 913 (*Process* Piping)	N.A.	N.A.	904.4 (*Process Boilers*) 913 (*Process* Piping)
Compressed Air	900 (General) 905.1 (Compressed Air)	N.A.	N.A.	905.4 (Compressed Air)
Elevator Ventilation and *Lighting*	900 (General) 906.1 (Elevators)	N.A.	N.A.	906.4 (Elevators)
Escalators and Moving Walkways	907.1 (Escalator and Moving Walkway)	N.A.	N.A.	907.4 (Escalator and Moving Walkway)
Controlled Environment Horticulture (CEH)	900 (General) 908.1 (CEH)	N.A.	N.A.	908.4 (CEH)
Steam Traps	900 (General) 909.1 (Steam Traps) 913 (*Process* Piping)	N.A.	N.A.	909.4 (Steam Traps) 913 (*Process* Piping)
Computer Rooms	900 (General) 910.1 (*Computer Rooms*)	910.2	910.3	910.4 (*Computer Rooms*)
Commercial *Kitchens*	900 (General) 911.1 (Commercial *Kitchen*)	911.2	911.3	911.4 (Commercial *Kitchen*)
Laboratory/ *Factory* Exhaust Systems	900 (General)	912.2	912.3	912.4 (*Laboratory* and *Factory*)
Process Piping	913.1 (*Process* Piping)	N.A.	N.A.	913.4 (*Process* Piping)

Footnotes for Table 100.4(2) *[Table 100.0-A]*:

a. *Nonresidential* and *hotel/motel buildings* that contain *covered processes* may conform to the applicable requirements of both *occupancy types* listed in Tables 100.4(1) and 100.4(2) *[Table 100.0-A]*.

~~Footnotes for Table 100.4-B *[Table 100.0-A]*:~~

~~a. *Nonresidential* and *hotel/motel buildings* that contain *covered processes* may conform to the applicable requirements of both *occupancy types* listed in Tables 100.4-A and 100.4-B *[Table 100.0-A]*.~~

TABLE 100.4-C(3) [TABLE 100.0-A] APPLICATION OF STANDARDS SINGLE-FAMILY

APPLICATION	MANDATORY (NEWLY CONSTRUCTED)	PRESCRIPTIVE (NEWLY CONSTRUCTED)	PERFORMANCE (NEWLY CONSTRUCTED)	*ADDITIONS/ ALTERATIONS*
General	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)
Definitions	200 (Definitions)	200 (Definitions)	200 (Definitions)	200 (Definitions)
Envelope (conditioned)	300 (Mandatory for all) 302.1 (General) 302.2 (Mandatory)	302.3	302.4	302.5
HVAC (conditioned)	400 (Mandatory for all) 402.1 (General) 402.2 (Mandatory)	402.3	402.4	402.5
Indoor Air Quality	400 (Mandatory for all) 402.1 (General), 402.2.7 (Mandatory)	N.A.	N.A.	402.5
Plumbing	500 (Mandatory for all) 502.1 (General) 502.2 (Mandatory)	502.3	502.4	502.5
Indoor *Lighting* (conditioned, unconditioned, and parking garages)	600 (Mandatory for all) 602.1 (General) 602.2.1 (Mandatory Indoor)	N.A.	N.A.	602.5
Outdoor Lighting	600 (Mandatory for all) 602.1 (General) 602.2.1 (Mandatory Outdoor)	N.A.	N.A.	602.5
Electric Ready	602.2.2 (Mandatory)	N.A.	N.A.	*Additions*: 602.5.1 (Mandatory) *Alterations*: N.A.
Solar Ready *Buildings*	700.1 (Mandatory for all) 702.1 (General) 702.2.1 (Solar Ready)	N.A.	N.A.	N.A.
Solar and *Battery Energy Storage Systems*	700.1 (Mandatory for all) 702.1 (General) 702.2.2 (*BESS* Ready) 702.2.3 (SWH Systems)	702.3	702.4	N.A.
Pool and *Spa* Systems	800 (Mandatory for all) 802.1 (General) 802.2 (Mandatory)	N.A.	N.A.	802.5

TABLE 100.4-D(4) [TABLE 100.0-A] APPLICATION OF STANDARDS MULTIFAMILY

APPLICATION	MANDATORY (NEWLY CONSTRUCTED)	PRESCRIPTIVE (NEWLY CONSTRUCTED)	PERFORMANCE (NEWLY CONSTRUCTED)	*ADDITIONS/ ALTERATIONS*
General	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)	100 (Scope) 101 (Systems and Equipment) 102 (Compliance Approaches)
Definitions	200 (Definitions)	200 (Definitions)	200 (Definitions)	200 (Definitions)
Envelope (conditioned)	300 (Mandatory for all) 303.1 (General) 303.2 (Mandatory)	303.3	303.4	303.5
HVAC (conditioned)	400 (Mandatory for all) 403.1 (General) 403.2 (Mandatory)	403.3	403.4	403.5
Indoor Air Quality and Ventilation	400 (Mandatory for all) 403.1 (General) 403.2.2 (Mandatory)	N.A.	N.A.	403.5
Plumbing	500 (Mandatory for all) 503.1 (General) 503.2 (Mandatory)	503.3	503.4	503.5
Indoor *Lighting* (conditioned, including *process spaces*)	600 (Mandatory for all) 603.1 (General) 603.2.1 (*Dwelling Units*) 603.2.2 (*Common Use Areas*) 603.2.2.5 (In-the-field Forms)	603.3.1 (*Dwelling Units*) 603.3.2 (*Common Use Areas*)	603.4	603.5
Indoor *Lighting* (unconditioned, and parking garages)	600 (Mandatory for all) 603.1 (General) 603.2.1 (*Dwelling Units*) 603.2.2 (*Common Use Areas*) 603.2.2.5 (In-the-field Forms)	603.3.1 (*Dwelling Units*) 603.3.2 (*Common Use Areas*)	N.A.	603.5

(CONTINUED): TABLE 100.4-D(4) [TABLE 100.0-A] APPLICATION OF STANDARDS MULTIFAMILY

APPLICATION	MANDATORY (NEWLY CONSTRUCTED)	PRESCRIPTIVE (NEWLY CONSTRUCTED)	PERFORMANCE (NEWLY CONSTRUCTED)	*ADDITIONS/ ALTERATIONS*
Outdoor Lighting	600 (Mandatory for all) 603.1 (General) 603.2.1 (*Dwelling Units*) 603.2.2 (*Common Use Areas*) 603.2.2.5 (In-the-field Forms)	603.3.2.4	N.A.	603.5
Electrical Power Distribution (EPD)	600 (Mandatory for all) 603.1 (General) 603.2.3 (EPD Equipment)	N.A.	N.A.	603.5
Electric Ready	603.2.4 (Mandatory)	N.A.	N.A.	*Additions*: 603.5.1 (*Dwelling*) *Alterations*: N.A.
Solar Ready *Buildings*	700.1 (General) 703.1 (General) 703.2.1 (Solar Ready)	N.A.	N.A.	*Additions*: 703.5 *Alterations*: N.A.
Solar and *Battery Energy Storage Systems*	700.1 (General) 703.1 (General) 703.2.2 (SWH Systems)	703.3	703.4	N.A.
Pool and *Spa* Systems	800 (Mandatory for all) 803.1 (General) 803.2 (Mandatory)	N.A.	N.A.	803.5

100.5 *[Part 1, 10-103]* **Permit, certificate, informational, and enforcement requirements for designers, installers, builders, manufacturers, and suppliers.**

100.5.1 *[Part 1, 10-103(a)]* **Documentation.**

For all *buildings* other than *healthcare facilities*, the following documentation is required to demonstrate compliance with *Part 6*. This documentation shall meet the requirements of Section 100.5.1 *[Section 10-103(a)]* or alternatives approved by the *Executive Director*. *Healthcare facilities* shall instead comply with the applicable provisions of Title 24, *Part 1*, Chapter 7.

Exception to Section 100.5.1 *[Section 10-103(a)]***:** Enforcing agencies may not require *nonresidential buildings* that have no more than 1,000 square feet of *conditioned floor area* in the *entire building* and an occupant load of 49 persons or less to comply with the documentation requirements of Section 100.5.1 *[Section 10-103(a)]*, provided a statement of compliance with *Part 6* is submitted and signed by a licensed engineer or the licensed architect with chief responsibility for the design.

100.5.1.1 *[Part 1, 10-103(a)1]* **Certificate of Compliance.**

~~1.~~ For all *buildings*, the Certificate of Compliance described in Section 100.5 *[Section 10-103]* shall be signed by the person who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the *building* design (*responsible person*); and submitted in accordance with Sections 100.5.1.1 and 100.5.1.1.1 *[Sections 10-103(a)1 and 10-103(a)2]* to certify conformance with *Part 6*. If more than one person has responsibility for the *building* design, each person shall sign the Certificate of Compliance document(s) applicable to that portion of the design for which the person is responsible. Alternatively, the person with chief responsibility for the *building* design shall prepare and sign the Certificate of Compliance document(s) for the *entire building* design. Subject to the requirements of Sections 100.5.1.1 and 100.5.1.1.1 *[Sections 10-103(a)1 and 10-103(a)2]*, persons who prepare Certificate of Compliance documents (*documentation authors*) shall sign a declaration statement on the documents they prepare to certify the information provided on the documentation is accurate and complete. In accordance with applicable requirements of Section 100.5.1.1 *[10-103(a)1]*, the signatures provided by *responsible persons* and *documentation authors* shall be original signatures on paper documents or electronic signatures on electronic documents conforming to the electronic signature specifications in Reference Joint Appendix JA7. ~~For all Nonresidential buildings, the Design Review Kickoff Certificate(s) of Compliance and the Construction Document Design Review Checklist Certificate(s) of Compliance shall be reviewed and signed by a licensed professional engineer or licensed architect, or a licensed contractor representing services performed by or under the direct supervision of a licensed engineer or architect, as specified in the provisions of Division 3 of the Business and Professions Code. For buildings less than 10,000 square feet, this signer may be the engineer or architect of record. For buildings greater than 10,000 square feet but less than 50,000 square feet, this signer shall be a qualified in-~~

~~house engineer or architect with no other project involvement or a third-party engineer, architect, or contractor. For buildings greater than 50,000 square feet and all buildings with complex mechanical systems serving more than 10,000 square feet, this signer shall be a third-party engineer, architect, or contractor.~~

1. ~~A.~~ All Certificate of Compliance documentation shall conform to a format and informational order and content approved by the *Energy Commission*.

   These documents shall:

   1.1. Identify the energy features, performance specifications, materials, components, and *manufactured devices* required for compliance with *Part 6*.

   1.2. Identify the *building* project name and location. The *building* project name and location identification on the Certificate of Compliance shall be consistent with the *building* project name and location identification given on the other applicable *building* design plans and specifications submitted to the *enforcement agency* for approval with the *building* permit application.

   1.3. Display the unique registration number assigned by the data registry if Section 100.5.1.1 *[Section 10-103(a)1]* requires the document to be registered.

   1.4. Include a declaration statement to the effect that the *building* energy features, performance specifications, materials, components, and *manufactured devices* for the *building* design identified on the Certificate of Compliance indicate the *building* is in compliance with the requirements of Title 24, Parts 1 and 6, and the *building* design features identified on the Certificate of Compliance are consistent with the *building* design features identified on the other applicable compliance documents, worksheets, calculations, plans, and specifications submitted to the *enforcement agency* for approval with the *building* permit application.

   1.5. Be signed by the *documentation author* to certify the documentation is accurate and complete. When document registration is required by Section 100.5.1.1 *[Section 10-103(a)1]*, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

   1.6. Be signed by the *responsible person* eligible under Division 3 of the Business and Professions Code to accept responsibility for the design to certify conformance with *Part 6*. When document registration is required by Section 100.5.1.1 *[Section 10-103(a)1]*, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

2. ~~B.~~ For all ~~low-rise residential *buildings*~~ *single-family, multifamily 3 or less stories use designations* for which compliance requires field verification, the person(s) responsible for the Certificate(s) of Compliance shall submit the Certificate(s) and their associated Compliance Registration Packages for registration and retention to an ECC-provider data registry in compliance with Section 103.3 *[Section 10-103.3]*.

The submittals to the ECC-provider data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.

Contingent upon availability and approval of an electronic document repository by the *Executive Director*, Certificate of Compliance documents and their associated Compliance Registration Packages that are registered and retained by an ECC-provider data registry shall also be automatically transmitted by the data registry Section 103.3 *[Section 10-103.3]*, to an electronic document repository for retention in accordance with the specifications in Reference Joint Appendix JA7.

3. ~~C.~~ For *alterations* to existing *single-family, multifamily 3 stories or less use designations* ~~residential buildings~~ for which field verification is not required, including but not limited to water heater and *window* replacements, and for *additions* to existing *residential buildings* that are less than 300 square feet for which field verification is not required, the *enforcement agencies* may at their discretion not require any Certificate of Compliance documentation, or may develop simplified Certificate of Compliance documentation for demonstrating compliance with the Standards.

   Allowances by *enforcement agencies* to not require compliance documentation shall not be deemed to grant authorization for any work to be done in any manner in violation of this code or other provisions of law.

4. ~~D.~~ Contingent upon approval of data registry(s) by the *Energy Commission*, all nonresidential, ~~*buildings*~~ *multifamily more than 3 stories,* ~~*, high-rise residential buildings, and hotel/s and motels*~~ *use designations*, when designated to allow use of an *occupancy group* or type regulated by *Part 6* the person(s) responsible for the Certificate(s) of Compliance shall submit the Certificate(s) and their associated Compliance Registration Packages for registration and retention to a data registry approved by the *Energy Commission*. The submittals to the approved data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.

   Contingent upon availability and approval of an electronic document repository by the *Executive Director*, Certificate of Compliance documents and their associated Compliance Registration Packages that are registered and retained by an approved data registry shall also be automatically transmitted by the data registry to an electronic document repository for retention in accordance with the specifications in Reference Joint Appendix JA7.

100.5.1.1.1 *[Part 1, 10-103(a)2]* **Application for a building permit.**

~~2.~~ Each application for a *building* permit subject to *Part 6* shall contain at least one copy of the documents specified in Section 100.5.1.1.1 *[Sections 10-103(a)2A, 10-103(a)2B, and 10-103(a)2C]*.

1. ~~A.~~ For all *newly constructed buildings*, *additions*, *alterations*, or *repairs* regulated by *Part 6* the applicant shall submit the applicable Certificate(s) of Compliance to the *enforcement agency* for approval. The certificate(s) shall conform to the requirements of Section 100.5.1.1 *[Section 10-103(a)1]*, and shall

be approved by the local *enforcement agency*, in accordance with all applicable requirements of Section 100.5.4 *[Section 10-103(d)]*, by stamp or authorized signature prior to issuance of a *building* permit. A copy of the Certificate(s) of Compliance shall be included with the documentation the builder provides to the *building* owner at occupancy as specified in Section 100.5.2 *[Section 10-103(b)]*.

For *alterations* to existing residential ~~buildings~~ *use designations* for which field verification is required, and when the *enforcement agency* does not require *building* design plans to be submitted with the application for a *building* permit, the applicable Certificate of Compliance documentation specified in Section 100.5.1.1 *[Section 10-103(a)1]* is not required to be approved by the *enforcement agency* prior to issuance of a *building* permit, but shall be approved by the *enforcement agency* prior to final inspection of the *dwelling unit*, and shall be made available to the *enforcement agency* for all applicable inspections, or made available for viewing on an approved data registry.

When the *enforcement agency* requires *building* design plans to be submitted with the application for a *building* permit, the applicable Certificate of Compliance documents shall be incorporated into the *building* design plans. When Section 100.5.1.1 *[Section 10-103(a)1]* requires document registration, the certificate(s) that are incorporated into the *building* design plans shall be copies of the registered Certificate of Compliance documents from an ECC-provider data registry, or a data registry approved by the *Energy Commission*.

2. ~~B.~~ When the *enforcement agency* requires *building* design plans and specifications to be submitted with the application for a *building* permit, the plans shall conform to the specifications for the features, materials, components, and *manufactured devices* identified on the Certificate(s) of Compliance, and shall conform to all other applicable requirements of *Part 6*. Plans and specifications shall be submitted to the *enforcement agency* for any other feature, material, component, or *manufactured device* that *Part 6* requires be indicated on the *building* design plans and specifications. Plans and specifications submitted with each application for a *building* permit for ~~Nonresidential~~ nonresidential, multifamily more than 3 stories and hotel/*motel use* designations ~~buildings, High-rise Residential buildings and Hotels and Motels~~ shall provide *acceptance requirements for code compliance* of each feature, material, component or *manufactured device* when acceptance requirements are required under *Part 6*. Plans and specifications for ~~Nonresidential~~ nonresidential, multifamily more than 3 stories and hotel/*motel use* designations ~~buildings, High-rise Residential buildings and Hotels and Motels~~ shall require, and indicate with a prominent note on the plans, that within 90 days after the *Enforcement Agency* issues a permanent final occupancy permit, record drawings be provided to the *building* owner.

   For all *buildings*, if the specification for a *building* design feature, material, component, or *manufactured device* is changed before final construction or installation, such that the *building* may no longer comply with *Part 6* the *building*

must be brought back into compliance, and so indicated on amended plans, specifications, and Certificate(s) of Compliance that shall be submitted to the *enforcement agency* for approval. Such characteristics shall include the efficiency (or other characteristic regulated by *Part 6*) of each *building* design feature, material, component, or device.

3. ~~C.~~ The *enforcement agency* shall have the authority to require submittal of any supportive documentation that was used to generate the Certificate(s) of Compliance, including but not limited to the electronic input file for the *compliance software* tool that was used to generate performance method Certificate(s) of Compliance; or any other supportive documentation that is necessary to demonstrate that the *building* design conforms to the requirements of *Part 6*.

100.5.1.2 *[Part 1, 10-103(a)3]* **Certificate of Installation.**

~~3.~~ For all *buildings*, the person in charge of the construction or installation, who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the construction or installation of features, materials, components, or *manufactured devices* regulated by *Part 6* or the *Appliance Efficiency Regulations* (*responsible person*) shall sign and submit Certificate of Installation documentation as specified in Section 100.5.1.2 *[Section 10-103(a)3]* to certify conformance with *Part 6*. If more than one person has responsibility for the construction or installation, each person shall sign and submit the Certificate of Installation documentation applicable to the portion of the construction or installation for which they are responsible; alternatively, the person with chief responsibility for the construction or installation shall sign and submit the Certificate of Installation documentation for the entire construction or installation scope of work for the project. Subject to the requirements of Section 100.5.1.2 *[Section 10-103(a)3]*, persons who prepare Certificate of Installation documentation (*documentation authors*) shall sign a declaration statement on the documents they prepare to certify the information provided on the documentation is accurate and complete. In accordance with applicable requirements of Section 100.5.1.2 *[Section 10-103(a)3]*, the signatures provided by *responsible persons* and *documentation authors* shall be original signatures on paper documents or electronic signatures on electronic documents conforming to the electronic signature specifications in Reference Joint Appendix JA7.

1. ~~A.~~ **Delegation of Signature Authority.** Except where prohibited by law, including but not limited to any requirements under Division 3 of the Business and Professions Code, the Responsible Person may delegate signature authority to third parties (Authorized Representatives) provided that there is a written agreement:

   1.1. Between the Responsible Person and the person to be designated as the Authorized Representative.

   1.2. Specifying that the Authorized Representative may sign Certificates of Installation on behalf of the Responsible Person.

1.3. Specifying that the legal responsibility for construction or installation in the applicable classification for the scope of work specified on the Certificate of Installation document(s) remains with the Responsible Person.

1.4. That is signed by both the Responsible Person and the Authorized Representative.

1.5. That is retained by the ECC-provider to which all compliance documents are submitted for the *building* to which the Certificate of Installation documentation pertains.

1.6. That is maintained in the ECC-provider data registry such that it is accessible for verification by, including but not limited to, the *Energy Commission* and *enforcement agencies*.

2. ~~**B.**~~ **Format.** All Certificate of Installation documentation shall conform to a format and informational order and content approved by the *Energy Commission*.

These documents shall:

2.1. Identify the features, materials, components, *manufactured devices*, and system performance diagnostic results required to demonstrate compliance with *Part 6* and the *Appliance Efficiency Regulations*.

2.2. State the number of the *building* permit under which the construction or installation was performed.

2.3. Display the unique registration number assigned by the data registry if Section 100.5.1.2 *[Section 10-103(a)3]* requires the document to be registered.

2.4. Include a declaration statement indicating that the constructed or installed features, materials, components or *manufactured devices* (the installation) identified on the Certificate of Installation conforms to all applicable codes and regulations, and the installation conforms to the requirements given on the plans and specifications approved by the *enforcement agency*.

2.5. Be signed by the documentation author to certify the documentation is accurate and complete. When document registration is required by Section 100.5.1.2 *[Section 10-103(a)3]*, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

2.6. Be signed by the Responsible Person eligible under Division 3 of the Business and Professions Code to accept responsibility for construction or installation in the applicable classification for the scope of work specified on the Certificate of Installation document(s), or shall be signed by their Authorized Representative. When document registration is required by Section 100.5.1.2 *[Section 10-103(a)3]*, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

3. ~~C.~~ For all single-family, *multifamily 3 stories or less use designations* ~~low-rise residential buildings~~, the person(s) responsible for the Certificate(s) of Installation, or their Authorized Representative(s), shall submit the following Certificate of Installation documentation and their associated Compliance Registration Packages that are applicable to the *building* to an ECC-provider data registry for registration and retention in accordance with Section 103.3 *[Section 10-103.3]* and procedures specified in Reference Residential Appendix RA2:

   3.1. All Certificates of Installation for which compliance requires field verification.

   3.2. All other Certificates of Installation, except those not required by the *Energy Commission*.

   The submittals to the ECC-provider data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.

   Contingent upon availability and approval of an electronic document repository by the *Executive Director*, Certificate of Installation documents and their associated Compliance Registration Packages that are registered and retained by an ECC-provider data registry in compliance with Section 103.3 *[Section 10-103.3]* shall also be automatically transmitted by the data registry to an electronic document repository for retention in accordance with the specifications in Reference Joint Appendix JA7.

4. ~~D.~~ For *alterations* to existing single-family, multifamily 3 or less *use designations* ~~residential buildings~~ for which field verification is not required, including but not limited to water heater and *window* replacements, and for *additions* to existing *residential buildings* that are less than 300 square feet for which field verification is not required, the *enforcement agencies* may, at their discretion, not require any Certificate of Installation documentation, or may develop simplified Certificate of Installation documentation for demonstrating compliance with the Standards.

   Allowances by *enforcement agencies* to not require compliance documentation shall not be deemed to grant authorization for any work to be done in any manner in violation of this code or other provisions of law.

5. ~~E.~~ Contingent upon approval of data registry(s) by the *Energy Commission*, all nonresidential ~~buildings,~~, multifamily more than 3 stories and hotel/*motel use* designations ~~high-rise residential buildings, and hotels and motels~~, when designated to allow use of an *occupancy group* or type regulated by *Part 6* the person(s) responsible for the Certificate(s) of Installation, except those documents not required by the *Energy Commission*, shall submit the Certificate(s) and their associated Compliance Registration Packages for registration and retention to a data registry approved by the *Energy Commission*. The submittals to the approved data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.

   Contingent upon availability and approval of an electronic document repository by the *Executive Director*, Certificate of Installation documents and their associated Compliance Registration Packages that are registered and retained by an approved

data registry shall also be automatically transmitted by the data registry to an electronic document repository for retention in accordance with the specifications in Reference Joint Appendix JA7.

6. ~~F.~~ **Availability.** For all *buildings*, a copy of the Certificate(s) of Installation shall be posted, or made available with the *building* permit(s) issued for the *building*, or made available for viewing on an approved data registry, and shall be made available to the *enforcement agency* for all applicable inspections. When document registration is required by Section 100.5.1.2 *[Section 10-103(a)3]*, registered copies of the Certificate(s) of Installation from an ECC-provider data registry or a data registry approved by the *Energy Commission* shall be posted or made available with the *building* permit(s) issued for the *building*, and shall be made available to the *enforcement agency* for all applicable inspections. If construction on any portion of the *building* subject to *Part 6* will be impossible to inspect because of subsequent construction, the *enforcement agency* may require the Certificate(s) of Installation to be posted upon completion of that portion. A copy of the Certificate(s) of Installation shall be included with the documentation the builder provides to the *building* owner at occupancy as specified in Section 100.5.2 *[Section 10-103(b)]*.

100.5.1.3 *[Part 1, 10-103(a)4]* **Certificate of Acceptance.**

~~4.~~ For all *nonresidential, multifamily more than 3 stories and hotel/motel use designations* ~~*buildings, high-rise residential buildings, and hotels and motels*~~, when designated to allow use of an *occupancy group* or type regulated by *Part 6* the person in charge of the acceptance testing, who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the applicable scope of system design, or construction, or installation of features, materials, components, or *manufactured devices* regulated by *Part 6* or the *Appliance Efficiency Regulations* (*responsible person*), shall sign and submit all applicable Certificate of Acceptance documentation in accordance with Section 100.5.1.3 *[Section 10-103(a)4]* and Reference Nonresidential Appendix NA7 to certify conformance with *Part 6*. If more than one person has responsibility for the acceptance testing, each person shall sign and submit the Certificate of Acceptance documentation applicable to the portion of the construction or installation, for which they are responsible; alternatively, the person with chief responsibility for the system design, construction, or installation, shall sign and submit the Certificate of Acceptance documentation for the entire construction or installation scope of work for the project. Subject to the requirements of Section 100.5.1.3 *[Section 10-103(a)4]*, persons who prepare Certificate of Acceptance documentation (*documentation authors*) shall sign a declaration statement on the documents they prepare to certify the information provided on the documentation is accurate and complete. Persons who perform acceptance test procedures in accordance with the specifications in Reference Nonresidential Appendix NA7, and report the results of the acceptance tests on the Certificate of Acceptance (*field technicians*) shall sign a declaration statement on the documents they submit to certify the information provided on the documentation is true and correct. In accordance with applicable requirements of Section 100.5.1.3 *[Section 10-103(a)4]*, the signatures provided by *responsible persons*, *field technicians*, and *documentation authors* shall be original signatures on paper

documents or electronic signatures on electronic documents conforming to the electronic signature specifications in Reference Joint Appendix JA7.

1. ~~A.~~ All Certificate of Acceptance documentation shall conform to a format and informational order and content approved by the *Energy Commission*.

   These documents shall:

   1.1. Identify the features, materials, components, *manufactured devices*, and system performance diagnostic results required to demonstrate compliance with the acceptance requirements to which the applicant must conform as indicated in the plans and specifications submitted under Section 100.5.1.1.1 *[Section 10-103(a)2]*, and as specified in Reference Nonresidential Appendix NA7.

   1.2. State the number of the *building* permit under which the construction or installation was performed.

   1.3. Display the unique registration number assigned by the data registry if Section 100.5.1.3 *[Section 10-103(a)4]* requires the document to be registered.

   1.4. Include a declaration statement indicating that the features, materials, components or *manufactured devices* identified on the Certificate of Acceptance conform to the applicable acceptance requirements as indicated in the plans and specifications submitted under Section 100.5.1 *[Section 10-103(a)]*, and with applicable acceptance requirements and procedures specified in the Reference Nonresidential Appendix NA7, and confirms that Certificate(s) of Installation described in Section 100.5.1.2 *[Section 10-103(a)3]* has been completed and is posted or made available with the *building* permit(s) issued for the *building*, or made available for viewing on an approved data registry.

   1.5. Be signed by the documentation author to certify the documentation is accurate and complete. When document registration is required by Section 100.5.1.3 *[Section 10-103(a)4]*, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

   1.6. Be signed by the field technician who performed the acceptance test procedures and reported the results on the Certificate of Acceptance. When document registration is required by Section 100.5.1.3 *[Section 10-103(a)4]*, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

   1.7. Be signed by the responsible person in charge of the acceptance testing who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the system design, construction or installation in the applicable classification for the scope of work identified on the Certificate of Acceptance, or shall be signed by their authorized representative. When document registration is required by Section 100.5.1.3 *[Section 10-103(a)4]*, the signature shall be an electronic signature on an electronic document in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

2. ~~B.~~ Contingent upon approval of data registry(s) by the Energy Commission, for all *nonresidential buildings*, *high-rise residential buildings*, and hotels and motels, when designated to allow use of an *occupancy group* or type regulated by *Part 6* the person(s) responsible for the Certificate(s) of Acceptance shall submit the Certificate(s) and their associated Compliance Registration Packages for registration and retention to a data registry approved by the Energy Commission, excluding all Certificates of Acceptance recorded by an acceptance test technician certification provider (Sections 103.1 and 103.2) *[(10-103.1 and 10-103.2)]*. The submittals to the approved data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.

   Contingent upon availability and approval of an electronic document repository by the *Executive Director*, Certificate of Acceptance documents and their associated Compliance Registration Packages that are registered and retained by an approved data registry shall also be automatically transmitted by the data registry, to an electronic document repository for retention in accordance with the specifications in Reference Joint Appendix JA7.

3. ~~C.~~ A copy of the Certificate(s) of Acceptance shall be posted, or made available with the *building* permit(s) issued for the *building*, and shall be made available to the *enforcement agency* for all applicable inspections. If construction on any portion of the *building* subject to *Part 6* will be impossible to inspect because of subsequent construction, the *enforcement agency* may require the Certificate(s) of Acceptance to be posted upon completion of that portion. A copy of the Certificate(s) of Acceptance shall be included with the documentation the builder provides to the *building* owner at occupancy as specified in Section 100.5.2 *[Section 10-103(b)]*.

100.5.1.4 *[Part 1, 10-103(a)5]* **Certificate of Field Verification and Diagnostic Testing (Certificate of Verification).**

~~5.~~ For all *buildings* for which compliance requires field verification, a certified ECC-Rater shall conduct all required field verification and diagnostic testing in accordance with applicable procedures specified in *Reference Appendices* RA2, RA3, NA1, and NA2. All applicable Certificate of Verification documentation shall be completed, signed, and submitted by the certified ECC-Rater who performed the field verification and diagnostic testing services (*responsible person*) in accordance with the requirements of Section 100.5.1.4 *[Section 10-103(a)5]*, and *Reference Appendices* RA2, and NA1, to certify conformance with *Part 6*. If more than one rater has responsibility for the verification for the *building*, each rater shall sign and submit the Certificate of Verification documentation applicable to the portion of the *building* for which they are responsible. Subject to the requirements of Section 100.5.1.4 *[Section 10-103(a)5]*, persons who prepare Certificate of Verification documentation (*documentation authors*) shall sign a declaration statement on the documents they prepare to certify the information provided on the documentation is accurate and complete. The signatures provided by *responsible persons* and *documentation authors* shall be electronic signatures on electronic documents.

1. ~~A.~~ **Format.** All Certificate of Verification documentation shall conform to a format and informational order and content approved by the *Energy Commission*.

   These documents shall:

   1.1. Identify the installed features, materials, components, *manufactured devices*, or system performance diagnostic results that require verification for compliance with *Part 6* as specified on the Certificate(s) of Compliance for the *building*.

   1.2. State the number of the *building* permit under which the construction or installation was performed,

   1.3. Display the unique registration number assigned by the ECC-provider data registry, and provide any additional information required by *Reference Appendices* RA2, RA3, NA1, and NA2.

   1.4. Include a declaration statement indicating that the installed features, materials, components or *manufactured devices* requiring verification conform to the applicable requirements in *Reference Appendices* RA2, RA3, NA1, NA2, and the requirements specified on the Certificate(s) of Compliance approved by the local *enforcement agency*, and confirms the same features, materials, components or *manufactured devices* are identified on the applicable Certificate(s) of Installation signed and submitted by the person(s) responsible for the construction or installation as described in Section 100.5.1.2 *[Section 10-103(a)3]*.

   1.5. Be signed by the *documentation author* to certify the documentation is accurate and complete. The signatures shall be electronic signatures on electronic documents in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

   1.6. Be signed by the ECC-Rater who performed the field verification and diagnostic testing services (*responsible person)*. The signatures shall be electronic signatures on electronic documents in accordance with the electronic signature specifications in Reference Joint Appendix JA7.

2. ~~B.~~ For all *buildings* for which compliance requires field verification, the certified ECC-Rater responsible for the Certificate(s) of Verification shall submit the Certificates and their associated Compliance Registration Packages for registration and retention to a ECC-provider data registry in accordance with the applicable procedures in *Reference Appendices* RA2 and NA1, and in compliance with Section 103.3 *[Section 10-103.3]*.

   The submittals to the ECC-provider data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.

   Contingent upon availability and approval of an electronic document repository by the *Executive Director*, Certificate of Verification documents and their associated Compliance Registration Packages that are registered and retained by an ECC-provider data registry in accordance with Section 103.3 *[Section 10-103.3]* shall also be automatically transmitted by the data registry, to an electronic document

repository for retention in accordance with the specifications in Reference Joint Appendix JA7.

3. ~~C.~~ **Availability.** For all *buildings*, a copy of the registered Certificate(s) of Verification shall be posted, or made available with the *building* permit(s) issued for the *building*, or made available for viewing on an approved data registry, and shall be made available to the *enforcement agency* for all applicable inspections. If construction on any portion of the *building* subject to *Part 6* will be impossible to inspect because of subsequent construction, the *enforcement agency* may require the Certificate(s) of Verification to be posted upon completion of that portion. A copy of the registered Certificate(s) of Verification shall be included with the documentation the builder provides to the *building* owner at occupancy as specified in Section 100.5.2 *[Section 10-103(b)]*.

100.5.2 *[Part 1, 10-103(b)]* **Compliance, Operating, Maintenance, and Ventilation Information to be provided by Builder.**

1. **Compliance information.**

   1.1. For *single-family, multifamily 3 stories or less use designations*~~low-rise residential buildings~~, at final inspection, the *enforcement agency* shall require the builder to leave in the *building*, copies of the completed, signed, and submitted compliance documents for the *building* owner at occupancy. For *single-family, multifamily 3 stories or less use designations*~~low-rise residential buildings~~, such information shall, at a minimum, include copies of all Certificate of Compliance, Certificate of Installation, and Certificate of Verification documentation submitted. These documents shall be in paper or electronic format and shall conform to the applicable requirements of Section 100.5.1 *[Section 10-103(a)]*.

   1.2. For *nonresidential, multifamily more than 3 stories and hotel/motel use designations*~~buildings~~, *high-rise residential buildings* and hotels and motels, at final inspection, the *enforcement agency* shall require the builder to leave in the *building*, copies of the completed, signed, and submitted compliance documents for the *building* owner at occupancy. For *nonresidential, multifamily more than 3 stories and hotel/motel use designations*~~buildings~~, *high-rise residential buildings* and hotels and motels, such information shall include copies of all Certificate of Compliance, Certificate of Installation, Certificate of Acceptance and Certificate of Verification documentation submitted. These documents shall be in paper or electronic format and shall conform to the applicable requirements of Section 100.5.1 *[Section 10-103(a)]*.

2. **Operating information.** At final inspection, the *enforcement agency* shall require the builder to leave in the *building*, for the *building* owner at occupancy, operating information for all applicable features, materials, components, and mechanical devices installed in the *building*. Operating information shall include instructions on how to operate the features, materials, components, and mechanical devices correctly and efficiently. The instructions shall be consistent with specifications set forth by the *Executive Director*. For *low-rise residential buildings*, such information shall be contained

in a folder or manual which provides all information specified in Section 100.5.2 *[Section 10-103(b)]*. This operating information shall be in paper or electronic format.

For *dwelling units*, *buildings* or *tenant spaces* that are not individually owned and operated, or are centrally operated, such information shall be provided to the person(s) responsible for operating the feature, material, component or mechanical device installed in the *building*. This operating information shall be in paper or electronic format.

3. **Maintenance information.** At final inspection, the *enforcement agency* shall require the builder to leave in the *building*, for the *building* owner at occupancy, maintenance information for all features, materials, components, and *manufactured devices* that require routine maintenance for efficient operation. Required routine maintenance actions shall be clearly stated and incorporated on a *readily accessible* label. The label may be limited to identifying, by title and/or publication number, the operation and maintenance manual for that particular model and type of feature, material, component or *manufactured device*. For *single-family, multifamily 3 stories or less use designations*~~low-rise residential buildings~~, this information shall include a schedule of all interior *luminaires* and *lamps* installed to comply with Section 602.2.1 *[Section 150.0(k)]*.

   For *dwelling units*, *buildings* or *tenant spaces* that are not individually owned and operated, or are centrally operated, such information shall be provided to the person(s) responsible for maintaining the feature, material, component or mechanical device installed in the *building*. This information shall be in paper or electronic format.

4. **Ventilation information.**

   4.1. For ~~*low-rise and high-rise residential buildings*~~*multifamily use designations*, the *enforcement agency* shall require the builder to leave the following information in the *building*, for the *building* owner at occupancy:

      4.1.1. A description of the quantities of *outdoor air* that the whole-dwelling unit ventilation system(s) are designed to provide to the *building*'s *conditioned space*, and instructions for proper operation and maintenance of the ventilation system.

      4.1.2. Instructions for proper operation and maintenance of local exhaust systems, including instructions for conditions for which any occupant-controlled systems such as *kitchen* range hoods and *bathroom* exhaust fans should be used.

      4.1.3. For systems in *buildings* or *tenant spaces* that are not individually owned and operated by the *dwelling unit* occupants, the *building*'s owner or their representative shall provide a copy of the ventilation system information to *dwelling* occupants at the beginning of their *occupancy*. For systems in *buildings* or *tenant spaces* that are centrally operated, all applicable ventilation system information shall be provided to the person(s) responsible for operating and maintaining the feature, material,

component, or mechanical ventilation device installed in the *building*. This information shall be in paper or electronic format.

4.2. For *nonresidential*, *multifamily more than 3 stories and hotel/motel use designations*~~buildings, hotels, and motels~~, the *enforcement agency* shall require the builder to provide the *building* owner at occupancy a description of the quantities of outdoor and recirculated air that the ventilation systems are designed to provide to each area. For *buildings* or *tenant spaces* that are not individually owned and operated, or are centrally operated, such information shall be provided to the person(s) responsible for operating and maintaining the feature, material, component or mechanical device installed in the *building*. This information shall be in paper or electronic format.

100.5.3 *[Part 1, 10-103(c)]* **Equipment Information to be Provided by Manufacturer or Supplier.**

The manufacturer or supplier of any *manufactured device* shall, upon request, provide to *building* designers and installers information about the device. The information shall include the efficiency (and other characteristics regulated by *Part 6*). This information shall be in paper or electronic format.

100.5.4 *[Part 1, 10-103(d)]* **Enforcement Agency Requirements.**

1. **Permits.** An *enforcement agency* shall not issue a *building* permit for any construction unless the *enforcement agency* determines in writing that the construction is designed to comply with the requirements of *Part 6* that are in effect on the date the *building* permit was applied for. The *enforcement agency* determination shall confirm that the documentation requirements of Section 100.5.1 *[Sections 10-103(a)1 and 10-103(a)2]* have been met.

   If a *building* permit has been previously issued, there has been no construction under the permit, and the permit has expired, the *enforcement agency* shall not issue a new permit unless the *enforcement agency* determines in writing that the construction is designed to comply with the requirements of *Part 6* in effect on the date the new permit is applied for. The *enforcement agency* determination shall confirm that the documentation requirements of Section 100.5.1 *[Sections 10-103(a)1 and 10-103(a)2]* have been met.

   "Determines in writing" includes, but is not limited to, approval of a *building* permit with a stamp normally used by the *enforcement agency*.

2. **Inspection.** The *enforcement agency* shall inspect *newly constructed buildings* and *additions*, and *alterations* to existing *buildings* to determine whether the construction or installation is consistent with the agency's approved plans and specifications, and complies with *Part 6*. Final certificate of occupancy shall not be issued until such consistency and compliance is verified. For *Occupancy Group* R-3, final inspection shall not be complete until such consistency and compliance is verified.

   Such verification shall include determination that:

2.1. All installed features, materials, components, or *manufactured devices*, regulated by the *Appliance Efficiency Regulations* or *Part 6* are indicated, when applicable, on the Certificate(s) of Installation, Certificate(s) of Acceptance and Certificate(s) of Verification, and are consistent with such features, materials, components, or *manufactured devices* given in the plans and specifications and the Certificate(s) of Compliance approved by the local *enforcement agency*.

2.2. All required Certificates of Installation are posted, or made available with the *building* permit(s) issued for the *building*, or made available for viewing on an approved data registry, and are made available to the *enforcement agency* for all applicable inspections, and that all required Certificates of Installation conform to the specifications of Section 100.5.1.2 *[Section 10-103(a)3]*.

2.3. All required Certificates of Acceptance are posted, or made available with the *building* permit(s) issued for the *building*, and are made available to the *enforcement agency* for all applicable inspections, and that all required Certificates of Acceptance conform to the specifications of Section 100.5.1.3 *[Section 10-103(a)4]*.

2.4. All required Certificates of Verification are posted, or made available with the *building* permit(s) issued for the *building*, or made available for viewing on an approved data registry, and are made available to the *enforcement agency* for all applicable inspections, and that all required Certificates of Verification conform to the specifications of Section 100.5.1.4 *[Section 10-103(a)5]*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 101

SYSTEMS AND EQUIPMENT

101.1 *[Section 100.0(h)]* **Certification requirements for manufactured equipment, products, and devices.**

Part 6 limits the installation of *manufactured equipment*, *products, and devices* to those that have been certified as specified by Sections 101.2 *[Section 110.0]* and 101.3 *[Section 110.1]*. Requirements for *manufactured equipment*, *products, and devices*, when not specified in Title 24 *Part 6*, are specified in California Code of Regulations, Title 20, Sections 1601-1609.

101.2 *[Section 110.0]* **General.**

The following sections specify requirements for manufacturing, construction and installation of certain systems, *equipment*, appliances and *building* components that are installed in *buildings* within the scope of Section 100.3 *[Section 100.0(a)]*.

101.3, 101.4 *[Section 110.1, 110.5]* Systems and Equipment

300.1 *[Section 110.6]* Mandatory Requirements for *Fenestration Products* and Exterior *Doors*

300.2 *[Section 110.7]* Mandatory Requirements to Limit Air Leakage

300.3 *[Section 110.8]* Mandatory Requirements for Insulation, *Roofing Products* and *Radiant Barriers*

400.5 *[Section 110.2]* Mandatory Requirements for Space-conditioning Equipment

400.6, 500.4, 600.4 *[Section 110.12]* Mandatory Requirements for Demand Management

500.3 *[Section 110.3]* Mandatory Requirements for Service Water-heating Systems and Equipment

600.2 *[Section 110.9]* Mandatory Requirements for *Lighting* Controls ~~d~~Devices and ~~s~~Systems

600.3 *[Section 110.11]* Mandatory Requirements for Electrical Power Distribution System

701.2, 702.2, 703.2 *[Section 110.10]* Mandatory Requirements for Solar Readiness

800 *[Section 110.4]* Mandatory Requirements for *Pool* and *Spa* Systems and Equipment

101.2.1 *[Section 110.0(a)]* **General requirements.**

Systems, *equipment*, appliances and *building* components shall only be installed in a *building* within the scope of Section 100.3 *[Section 100.0(a)]* regulated by *Part 6* only if:

1. The manufacturer has certified that the system, *equipment*, appliances or *building* component complies with the applicable manufacturing provisions of the Sections listed in Section 101.2; and

2. The system, *equipment*, appliance or *building* component complies with all applicable installation provisions of the Sections listed in Section 101.2.

101.2.2 *[Section 110.0(b)]* **Certification requirements for manufactured systems, equipment, appliances and building components.**

Appliances that are within the scope of Section 1601 of the *Appliance Efficiency Regulations* shall only be installed if they have been *certified to the Energy Commission* by the manufacturer, pursuant to the provisions of Title 20 California Code of Regulations, Section 1606; or

Systems, equipment, appliances and *building* components that are required by *Part 6* or the *Reference Appendices* to be *certified to the Energy Commission*, which are not appliances that are within the scope of Section 1601 of the *Appliance Efficiency Regulations*, shall only be installed if they are certified by the manufacturer in a declaration, executed under penalty of perjury under the laws of the State of California, that:

1. All the information provided pursuant to the certification is true, complete, accurate and in compliance with all applicable requirements of *Part 6*; and
2. The *equipment*, product, or device was tested using the test procedure specified in *Part 6* if applicable

101.2.2.1 *[Section 110.0(b)3]* **Certification status.**

The certification status of any system, *equipment*, appliance or *building* component shall be confirmed only by reference to:

1. A directory published or approved by the *Energy C~~c~~ommission*; or
2. A copy of the application for certification from the manufacturer and the letter of acceptance from the *Commission* staff; or
3. Written confirmation from the publisher of an *Energy C~~c~~ommission*-approved directory that a device has been certified; or
4. An *Energy C~~c~~ommission*-approved label on the device.

NOTE: *Part 6* does not require a builder, designer, owner, operator, or enforcing agency to test any certified device to determine its compliance with minimum specifications or efficiencies adopted by the *Energy C~~c~~ommission*.

101.3 *[Section 110.1]* **Mandatory requirements for appliances.**

101.3.1 *[Section 110.1(a)]* **Appliance efficiency regulations.**

Any appliance regulated by the *Appliance Efficiency Regulations*, Title 20 California Code of Regulations, Section 1601 et seq., may be installed only if the appliance fully complies with Section 1608(a) of those regulations.

101.3.2 *[Section 110.1(b)]* **Efficiency level verification.**

Except for those circumstances described in Section 101.3.3 *[Section 110.1(c)]*, conformance with efficiency levels required to comply with *Part 6* mandatory, prescriptive and performance standards shall be verified utilizing data from either:

1. The *Energy Commission*'s database of certified appliances maintained pursuant to Title 20 California Code of Regulations Section 1606, and which is available at: www.energy.ca.gov/appliances/database/; or
2. An equivalent directory published by a federal agency; or
3. An approved trade association directory as defined in Title 20 California Code of Regulations Section 1606(h).

101.3.3 *[Section 110.1(c)]* **Efficiency level demonstration.**

Conformance with efficiency levels required to comply with *Part 6* mandatory, prescriptive and performance standards shall be demonstrated either by default to the mandatory efficiency levels specified in *Part 6* or by following procedures approved by the *Energy C~~c~~ommission* pursuant to Section 10-109 of Title 24, *Part 1*, when:

1. Data to verify conformance with efficiency levels required to comply with *Part 6* mandatory, prescriptive and performance standards is not available pursuant to subdivision (b); or
2. Field verification and diagnostic testing is required for compliance with *Part 6* and the *Energy Commission* has not approved a field verification and diagnostic test protocol that is applicable to the appliance; or
3. The appliance meets the requirements of Section 101.3.1 *[Section 110.1(a)]* but has been site-modified in a way that affects its performance; or
4. The U.S. Department of Energy has approved a waiver from federal test procedures, pursuant to 10 *CFR* Section 430.27 or Section 431.401 and that waiver fails to specify how the efficiency of the system shall be determined.

101.4 *[Section 110.5]* **Natural gas central furnaces, cooking equipment, pool and spa heaters, and fireplaces: pilot lights prohibited.**

Any natural gas system or *equipment* listed below may be installed only if it does not have a continuously burning pilot light:

101.4.1- Fan-type central furnaces.

101.4.2- Household cooking appliances.

Exception to Section 101.4.2: Household cooking appliances without an electrical supply voltage connection and in which each pilot consumes less than 150 Btu/hr.

101.4.3- *Pool* heaters.

101.4.4- *Spa* heaters.

101.4.5- Indoor and outdoor *fireplaces*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 102

COMPLIANCE APPROACHES

102.1 General.

102.1.1 *[Section 100.0(e)2Bii]* **Buildings, covered processes, outdoor lighting, and indoor and outdoor signs.**

In order to comply with *Part 6*, *buildings*, *covered processes*, *outdoor lighting*, and indoor and outdoor signs, regulated by Section 100.2.3 *[Section 100.0(b) and (c)]* shall meet the following requirements for the *climate zone* in which the *building* is located:

1. **Mandatory requirements.** Section 102.3; and either:
2. **Prescriptive approach.** Section 102.4; or
3. **Performance approach.** Section 102.5.

Exception to Section 102.1.1 *[Section 100.0(e)2Diib]***:** Seasonally occupied agricultural single-family housing limited by state or federal agency contract to *occupancy* not more than 180 days in any calendar year does not need to comply with performance or prescriptive standards in items two and three.

102.2 California climate zones.

Climate zones are the 16 geographic areas of California for which the *Energy Commission* has established typical weather data, prescriptive packages, and *energy budgets*. *Climate zones* are defined by ZIP code and listed in Reference Joint Appendix JA2. Figure 102.2-A *[FIGURE 100.1-A]* is an approximate map of the 16 *climate zones*.

The *Energy C~~c~~ommission* periodically updates, publishes, and makes available to interested persons and local *enforcement agencies* precise descriptions of the *climate zones*, which is available by zip code boundaries depicted in the Reference Joint Appendices along with a list of the communities in each zone.

Exception to Section 102.2: If a single contiguous subdivision or tract falls in more than one *climate zone*, all *buildings* in the subdivision or tract may be designed to meet the performance or prescriptive standards for the *climate zones* that contains 50 percent or more of the *dwelling units*.

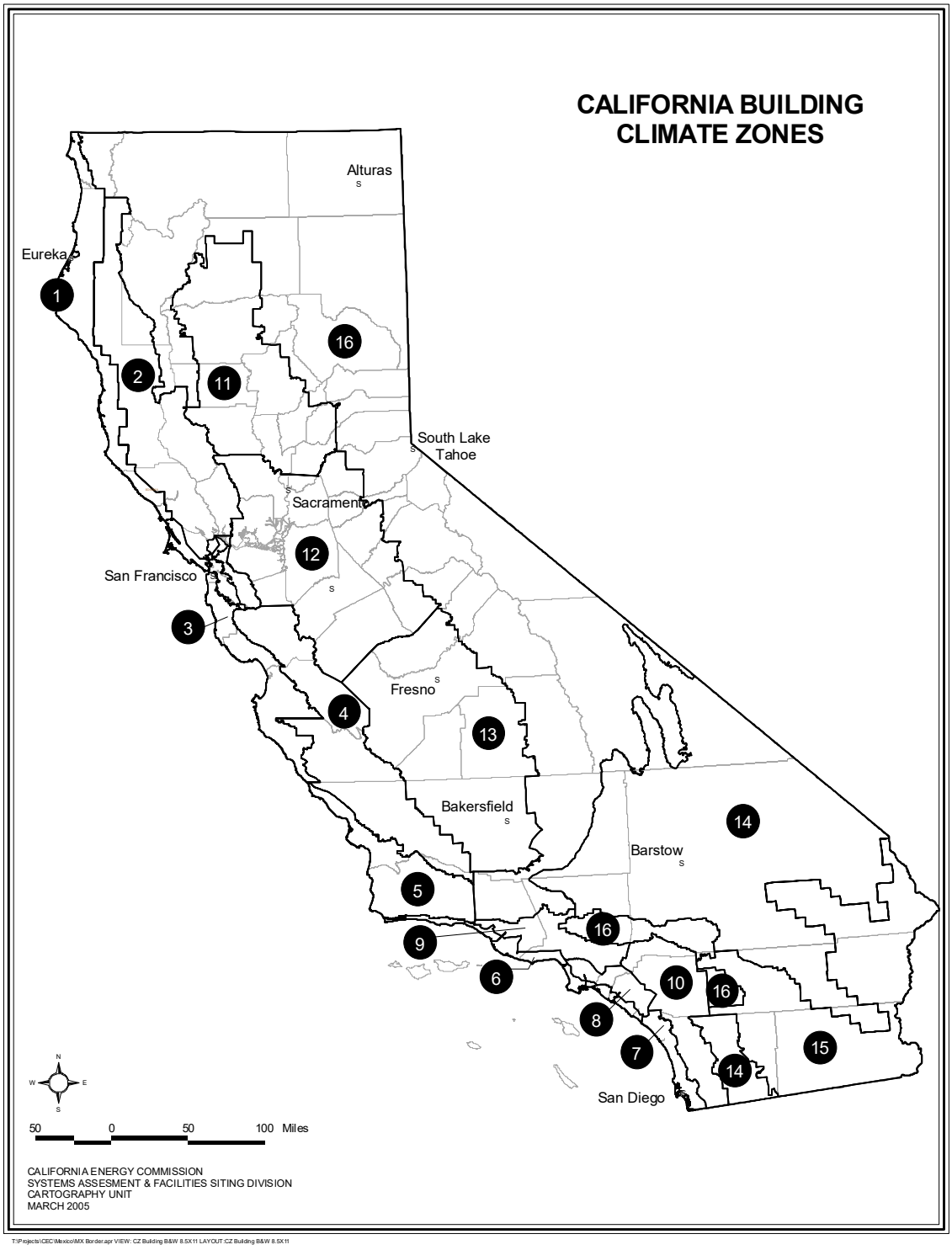


FIGURE 102.2-A [FIGURE 100.1-A]—CALIFORNIA CLIMATE ZONES

102.3 Mandatory requirements.

Buildings, *covered processes*, *outdoor lighting*, and indoor and outdoor *signs*, that comply with the mandatory requirements shall be designed, constructed and equipped to meet all of the requirements for the appropriate *climate zone* shown in the applicable sections listed in Tables 100.4-(1) through 100.4-(4) per Section 100.4 *[Section 100.0(e)]*.

102.4 *[Section 150.1(c)]* **Prescriptive approach.**

Buildings, *covered processes*, *outdoor lighting*, and indoor and outdoor *signs*, that comply with the prescriptive standards shall be designed, constructed and equipped to meet all of the requirements for the appropriate *climate zone* shown in the applicable sections listed in Tables 100.4-(1) through 100.4-(4) per Section 100.4 *[Section 100.0(e)]*.

102.5 *[Section 100.2]* **Performance approach.**

A *building* complies with the performance standards compliance approach if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual. *Energy budgets* are adopted by the *Energy C~~c~~ommission* to establish the maximum energy consumption that a proposed *building*, or portion of a *building*, can be designed to consume.

102.5.1 *[Section 100.2]* **Calculation of energy budgets.**

The *energy budget* for newly constructed *single-family, multifamily*, and *nonresidential buildings* are expressed in terms of *Long-Term System Cost (LSC)* and *Source Energy*. The *Energy Budget* for *additions* and *alterations* for all *building* types are expressed in terms of *LSC*.

102.5.1.1 Long-term System Cost (LSC).

Long-term System Cost (LSC) is calculated by multiplying for each hour of the year the site energy use (electricity kWh, natural gas therms, or fuel oil or *LPG* gallons) for each energy type by the applicable CEC-published *LSC* hourly factors. *LSC* hourly factors vary for each hour of the year and by energy type (electricity, natural gas, or propane), by *Climate Zone* and by *building* type (residential, nonresidential). *LSC* hourly factors are summarized in Reference Joint Appendix JA3. *LSC* hourly factors for propane are used for all *energy obtained from depletable sources* other than electricity and natural gas.

102.5.1.2 Source Energy.

Source Energy is calculated by multiplying for each hour of the year the site energy use (electricity kWh, natural gas therms, or fuel oil or *LPG* gallons) by Btu factors for fossil fuel consumed either directly at the *building* site or caused to be consumed to meet the electrical demand of the *building* considering the long-term marginal hourly resources of Energy Commission-projected electric system resource procurement.

102.5.2 *[Section 140.1(a), 150.1(b)1, 170.1(a)]* **Newly constructed buildings.**

The *energy budget* is expressed in terms of *Llong-term Ssystem Ccost (LSC)* and *Ssource Eenergy*.

Long-term system cost (LSC). The *LSC energy budget* is determined by applying the mandatory and prescriptive requirements of the standard design to the *proposed design building* and has two components, the Efficiency *LSC* and the Total *LSC*.

1. **Efficiency *LSC*.** The Efficiency *LSC* energy is the sum of the *LSC* energy for space-conditioning, water heating, mechanical ventilation, and *lighting*.
2. **Total *LSC*.** The Total *LSC* energy is the sum of the Efficiency *LSC* energy and *LSC* energy from the *photovoltaic system*, *battery energy storage systems* (*BESS*) and demand flexibility.

Source Energy. The *Ssource Eenergy budget* is determined by applying the mandatory and prescriptive requirements of the *standard design building* to the *proposed design building.* For multifamily only, a consumer gas or propane water heater is used to determine the *source energy* budget. The *Source Energy* is the total annual *source energy*.

Exception to Section 102.5.2: A community shared *solar electric generation system*, or other renewable electric generation system, and/or community shared *BESS*, which provides dedicated power, utility energy reduction credits, or payments for energy bill reductions, to the permitted *building* and is approved by the *Energy Commission* as specified in Title 24, *Part 1*, Section 10-115, may offset part or all of the *LSC* energy from *solar electric generation systems, BESS* (not including single-family), or demand flexibility (not including nonresidential, hotel/motel, multifamily) required to comply with the Standards, as calculated according to methods established by the *Energy CCommission* in the applicable *ACM* Reference Manual.

102.5.3 *[Section 141.0(a)2, 150.2(a)2, 180.1(b)]* **Additions in existing buildings.**

The *Energy Budget* for *additions* is expressed in terms of Efficiency *Long-term System Cost (LSC)*. Performance calculations shall comply pursuant to the applicable options in Section 102.5.3.1 through 102.5.3.3, and requirements in Sections 102.5.3.4 and 102.5.3.5.

102.5.3.1- For *additions* alone. The *addition* complies if the *addition* alone meets the *energy budgets* expressed in terms of *Long-Term System Cost (LSC)* energy.

102.5.3.2- Existing plus *addition* plus *alteration*. The standard design for existing plus *addition*, plus *alteration* energy use is the combination of:

1. the existing *building*'s unaltered *components* to remain,
2. existing *building altered components* that are the more efficient, in *LSC energy*, of either the existing conditions or the applicable mandatory and prescriptive requirements for *alterations*,
3. plus the proposed *addition's* energy use meeting the applicable mandatory and prescriptive requirements for *additions*.

The proposed design energy use is the combination of the existing *building's* unaltered *components* to remain and the *altered component's* energy features, plus the proposed energy features of the *addition*.

Exception to Section 102.5.3.2: Existing single-family and multifamily structures with a minimum R-11 insulation in framed walls showing compliance with Section 102.5.3 *[Section 150.2(a)2, 180.1(b)]* are not required to comply with the mandatory wall insulation requirements of Section 302.2.3 *[Section 150.0(c)]* and Section 303.2.2 *[Section 160.1(b)]*.

102.5.3.3- Whole *building*.

Any *addition*, *alteration*, or *repair* may comply with the requirements of Title 24, *Part 6* by meeting the applicable requirements for the *entire building*.

102.5.3.4- Mechanical ventilation for indoor air quality – single-family and multifamily *dwelling units*. *Additions* to existing *buildings* shall comply with Sections 402.2.7 and 402.2.8 *[Section 150.0(o)]* or Section 403.2.2 *[Section 160.2]* subject to the requirements specified below.

When field verification and diagnostic testing are required below, single-family *buildings* and multifamily *buildings* with three *habitable stories* or less, shall use the applicable procedures in the Residential Appendices. Multifamily *buildings* with four or more *habitable stories* shall use the applicable procedures in Nonresidential Appendices NA1 and NA2.

1. **Whole-dwelling unit mechanical ventilation.** *Dwelling units* that meet the conditions in items 1.1 or 1.2 shall not be required to comply with the whole-dwelling unit ventilation airflow requirements specified below for single-family or multifamily *dwelling units*.

   1.1. *Additions* to an existing *dwelling unit* that increase the *conditioned floor area* of the existing *dwelling unit* by less than or equal to 1,000 square feet.

   1.2. *Junior Accessory Dwelling Units* (*JADU*) that are *additions* to an existing *building*.

   Single-family. *Additions* to an existing *dwelling unit* that increase the *conditioned floor area* of the existing *dwelling unit* by more than 1,000 square feet shall have mechanical ventilation airflow in accordance with Section 402.2.7.3 *[Section 150.0(o)1C, 150.0(o)1E, or 150.0(o)1F]*, as applicable. The mechanical ventilation airflow rate shall be based on the *conditioned floor area* of the entire *dwelling unit* comprised of the existing *dwelling unit conditioned floor area* plus the *addition conditioned floor area*.

   New *dwelling units* that are *additions* to an existing *building* shall have mechanical ventilation airflow provided in accordance with Section 402.2.7.3 *[Section 150.0(o)1C, 150.0(o)1E, or 150.0(o)1F]*, as applicable. The mechanical ventilation airflow rate shall be based on the *conditioned floor area* of the new *dwelling unit*.

   Multifamily. *Additions* to an existing *dwelling unit* that increase the *conditioned floor area* of the existing *dwelling unit* by more than 1,000 square feet shall have

mechanical ventilation airflow in accordance with Section 403.2.2.3.4 *[Section 160.2(b)2Aiv]* or Section 403.2.2.3.5 *[Section 160.2(b)2Av]*, as applicable. The mechanical ventilation airflow rate shall be based on the *conditioned floor area* of the entire *dwelling unit* comprised of the existing *dwelling unit conditioned floor area* plus the *addition conditioned floor area*.

New *dwelling units* that are *additions* to an existing *building* shall have mechanical ventilation airflow provided in accordance with Section 403.2.2.3.4 *[Section 160.2(b)2Aiv]* or Section 403.2.2.3.5 *[Section 160.2(b)2Av]*, as applicable. The mechanical ventilation airflow rate shall be based on the *conditioned floor area* of the new *dwelling unit*.

2. **Local Mechanical Exhaust.** *Additions* to existing *buildings* shall comply with all applicable requirements specified in Sections 402.2.7.5 *[Section 150.0(o)1G]* and 402.2.8 *[Section 150.0(o)2]* for single-family *buildings*, or Section 403.2.2.3.6 *[Section 160.2(b)2Avi]* and Section 403.2.2.3.12 *[Section 160.2(b)2B]* for multifamily *buildings*.

102.5.3.5- Space-Conditioning Load Calculations and System Capacity – single-family *buildings*. *Additions* to existing *buildings* shall comply with all applicable requirements specified in Section 402.5.1.2.2 *[Section 150.2(a)1E]*.

102.5.4 *[Section 141.0(b)3, 150.2(b)2, 180.2(c)]* **Alterations in existing buildings.**

The *Energy Budget* for *alterations* is expressed in terms of Efficiency *Long-term System Cost (LSC)*, and the *altered component*(s) and any newly installed *equipment* serving the *alteration* shall meet the applicable requirements below.

If an existing component is replaced with a new component, that component is considered an *altered component* for the purpose of determining the *energy budget* and shall meet the requirements of this section.

Any *alteration*, or *repair* may comply with the requirements of Title 24, *Part 6* by meeting the applicable requirements for the *entire building*.

Exception to Section 102.5.4: The economizer *fault detection and diagnostics* requirements of Section 401.2.2.9 *[Section 120.2(i)]* shall not apply to *alterations* of *space-conditioning systems* or *components*.

102.5.4.1- Standard design *alterations*. The standard design for an *altered component* shall be the higher efficiency of existing conditions or the applicable mandatory and prescriptive requirements for *alterations*. For components not being altered, the standard design shall be based on the unaltered existing conditions such that the standard and proposed designs for these components are identical.

102.5.4.2- Proposed design *alterations*. The proposed design shall be based on the actual values of the *altered components*.

102.5.4.3- Third party verification. When the third party verification option is specified, all components proposed for *alteration*, for which the additional credit is taken, must be third party verified per 10-103(a)5. The standard design for the *altered component* shall be based on Table 102.5-(1) *[Table 141.0-E-2]* or Table 102.5-(2) *[Table 150.2-G]*.

TABLE 102.5-(1) [TABLE 141.0-E-2] – NONRESIDENTIAL AND HOTEL/MOTEL BUILDING STANDARD DESIGN FOR AN ALTERED COMPONENT

ALTERED COMPONENT	STANDARD DESIGN WITHOUT THIRD PARTY VERIFICATION OF EXISTING CONDITIONS SHALL BE BASED ON	STANDARD DESIGN WITH THIRD PARTY VERIFICATION OF EXISTING CONDITIONS SHALL BE BASED ON
Roof/Ceiling Insulation, Wall Insulation, and Floor/Soffit Insulation	The requirements of Section 301.5.2.1, 401.5.2.1 *[Section 141.0(b)1]* and Section 301.5.2.2.3 *[Section 141.0(b)2Bii]*.	The requirements of 301.5.2.1, 401.5.2.1 *[Section 141.0(b)1]* and Section 301.5.2.2.3 *[Section 141.0(b)2Bii]*.
Fenestration The allowed glass area shall be the smaller of the a. or b. below: a. The proposed glass area or b. The larger of: 1.The existing glass area that remains; or 2.The area allowed in Section 301.3.4.1 *[Section 140.3(a)5A]*.	The *U-factor* and *RSHGC* requirements of Table 301.5-(1) *[TABLE 141.0-A]*.	The existing *U-factor* and *RSHGC* levels.
Space-Conditioning System Equipment and Ducts	The requirements of Sections 401.5.2.2.1 *[Section 141.0(b)2C]*, 401.5.2.2.3 *[Section 141.0(b)2Di]* or 401.5.2.2.4 *[Section 141.0(b)2Dii]*, and 401.5.2.2.2 *[Section 141.0(b)2E]*.	The requirements of Sections 401.5.2.2.1 *[Section 141.0(b)2C]*, 401.5.2.2.3 *[Section 141.0(b)2Di]* or 401.5.2.2.4 *[Section 141.0(b)2Dii]*, and 401.5.2.2.2 *[Section 141.0(b)2E]*.
Window ~~Film[1]~~Film[a]	The *U-factor* of 0.40 and *SHGC* value of 0.35.	The existing *fenestration* in the *alteration* shall be based on Table 300.1-(1) *[TABLE 110.6-A]* and Table 300.1-(2) *[Table 110.6-B]*.
Plumbing Systems	The requirements of Section 501.3 *[Section 140.5]* without solar water heating requirements.	The requirements of Section 501.3 *[Section 140.5]* without solar water heating requirements.
Roofing Products	The requirements of Sections 301.5.2.2.2, 301.5.2.2.3 *[Section 141.0(b)2B]*.	The requirements of Sections 301.5.2.2.2, 301.5.2.2.3 *[Section 141.0(b)2B]*.
Lighting System	The requirements of Sections 601.5.2.2.1 through 601.5.2.2.4 *[Section 141.0(b)2F through 141.0(b)2K]*.	The requirements of Sections 601.5.2.2.1 through 601.5.2.2.4 *[Section 141.0(b)2F through 141.0(b)2K]*.
All Other Measures	The proposed efficiency levels.	The proposed efficiency levels.

Footnote to Table 102.5(1) *[Table 141.0-E-2]*:

a. Applied *window films* installed as part of an *alteration* complies with the *U-factor*, *RSHGC* and *VT* requirements of Table 102.5(1) *[TABLE 141.0-E-2]*.

~~Footnote to Table 102.5-A(1) *[Table 141.0-E-2]*:~~

~~1. Applied *window films* installed as part of an *alteration* complies with the *U-factor*, *RSHGC* and *VT* requirements of Table 102.5-A(1) *[TABLE 141.0-E-2]*.~~

TABLE 102.5-B(2) [TABLE 150.2-G] SINGLE-FAMILY BUILDING STANDARD DESIGN FOR AN ALTERED COMPONENT

ALTERED COMPONENT	STANDARD DESIGN WITHOUT THIRD PARTY VERIFICATION OF EXISTING CONDITIONS SHALL BE BASED ON	STANDARD DESIGN WITH THIRD PARTY VERIFICATION OF EXISTING CONDITIONS SHALL BE BASED ON
Ceiling Insulation, Wall Insulation, and Raised-floor Insulation	The requirements of Section 302.2.1 *[Section 150.0(a)]*, Section 302.2.3 *[Section 150.0(c)]*, and Section 302.2.4 *[Section 150.0(d)]*	The existing insulation *R-value*
Fenestration	The requirements of Section 302.3.3.1 *[Section 150.1(c)3A]*.	The existing *fenestration U-factor* and *SHGC* values as verified.
Window Film	The requirements of Section 302.3.3.1 *[Section 150.1(c)3A]*.	The existing *fenestration* in the *alteration* shall be based on Table 300.1-A(1) *[Table 110.6-A]* and Table 300.1-B(2) *[Table 110.6-B]*.
Doors	The *U-factor* of 0.20. The *door area* shall be the *door area* of the existing *building*.	If the proposed *U-factor* is < 0.20, the standard design shall be based on the existing *U-factor* value as verified. Otherwise, the standard design shall be based on the *U-factor* of 0.20. The *door area* shall be the *door area* of the existing *building*.
Space-Heating and Space-Cooling Equipment	Table 402.3-A(1) *[TABLE 150.1-A]* for equipment efficiency requirements; Section 402.5.2.2.1 *[Section 150.2(b)1C]* for entirely new or complete replacement systems; Section 402.5.2.2.2 *[Section 150.2(b)1F]* for refrigerant charge verification requirements.	The existing efficiency levels.
Air Distribution System – *Duct Sealing*	The requirements of Section 402.5.2.2.5 *[Section 150.2(b)1D]* and Section 402.5.2.2.4 *[Section 150.2(b)1E]*	The requirements of Section 402.5.2.2.5 *[Section 150.2(b)1D]* and Section 402.5.2.2.4 *[Section 150.2(b)1E]*
Air Distribution System – Duct Insulation	The proposed efficiency levels.	The existing efficiency levels.
Water Heating Systems	The requirements of Section 502.5.2.2.2 *[Section 150.2(b)1Hii]*	The existing efficiency level.
Roofing Products	The requirements of Section 302.5.2.2.3 *[Section 150.2(b)1I]*.	The requirements of Section 302.5.2.2.3 *[Section 150.2(b)1I].*
All Other Measures	The proposed efficiency levels.	The existing efficiency levels.

102.5.4.4- Mechanical Ventilation for Indoor Air Quality – single-family and multifamily *dwelling units*. The *altered components* shall meet the applicable mandatory and prescriptive requirements for *alterations*.

Single-family. Entirely new or complete replacement mechanical ventilation systems as these terms are used in Section 402.5.2.2.6 *[Section 150.2(b)1L]* for single-family *dwelling units*, shall comply with the requirements in Section 402.5.2.2.6 *[Section 150.2(b)1L]*.

Altered mechanical ventilation systems shall comply with the requirements of Section 402.5.2.2.7 *[Section 150.2(b)1M]* for single-family *dwelling units*.

Multifamily. Entirely new or complete replacement mechanical ventilation systems as these terms are used in Section 403.5.2.2.6 *[Section 180.2(b)5A]* for multifamily *dwelling units*, shall comply with the requirements in Section 403.5.2.2.6 *[Section 180.2(b)5A]*.

Altered mechanical ventilation systems shall comply with the requirements of Section 403.5.2.2.7 *[Section 180.2(b)5B]* for multifamily *dwelling units*.

102.5.4.5- Mechanical Systems – single-family and multifamily *dwelling units*.

Single-family. Entirely new or complete replacement *space-conditioning systems*, and entirely new or complete replacement *duct systems*, as these terms are used in Section 402.5.2.2.1 *[Section 150.2(b)1C]* and Section 402.5.2.2.5 *[Section 150.2(b)1Diia]* for single-family *dwelling units*, shall comply with the requirements of Section 402.2.6.12 *[Section 150.0(m)12]* and Section 402.2.6.13 *[Section 150.0(m)13]*.

Multifamily. Entirely new or complete replacement *space-conditioning systems*, and entirely new or complete replacement *duct systems*, as these terms are used in Section 403.5.2.2.1 *[Section 180.2(b)2Ai]* and Section 403.5.2.2.5.3 *[Section 180.2(b)2Aiia]* for multifamily *dwelling units*, shall comply with the requirements of Section 402.2.6.13 *[Section 150.0(m)13]*.

102.5.5 *[Section 150.1(b)2, 170.1(b)]* **Compliance demonstration requirements for performance standards.**

102.5.5.1- Certificate of compliance and application for a *building* permit. The application for a *building* permit shall include documentation pursuant to Section 100.5.1 *[Sections 10-103(a)1 and 10-103(a)2]* which demonstrates, using an *approved calculation method*, that the *building* has been designed so that its energy consumption does not exceed the *standard design energy budgets* for the applicable *climate zone*.

Exception to Section 102.5.5.1: A permit applicant may demonstrate compliance for any orientation of the same single-family *building* model if the documentation demonstrates that the *building* model with its proposed designs and features would comply in each of the four *cardinal orientations*.

102.5.5.2- Single-family field verification. When performance of installed features, materials, components, *manufactured devices* or systems listed below is above the minimum mandatory or prescriptive requirements, field verification shall be performed in accordance with the applicable requirements below, and the results of the verification(s) shall be documented on applicable certificates of installation pursuant to Section 100.5.1.2 *[Section 10-103(a)3]* and applicable certificates of verification pursuant to Section 100.5.1.4 *[Section 10-103(a)5]*.

1. ***EER2/SEER2/CEER/HSPF2* Rating.** When performance compliance requires installation of a *space conditioning system* with a rating that is greater than the minimum rating required by Table 402.3~~-A~~(1) *[Table 150.1-A]* or specified for the standard design, the installed system shall be field verified in accordance with the procedures specified in the applicable sections of Reference Residential Appendix RA3.4.

2. ***Variable capacity heat pump* (*VCHP*) compliance option.** When performance compliance requires installation of a *heat pump* system that meets all the requirements of the *VCHP* compliance option specified in the *ACM* Reference Manual, the system shall be field verified in accordance with the procedures in Reference Residential Appendix RA3.4.4.3.

3. **Low leakage *air handler*.** When performance compliance requires installation of a low leakage *air-handling unit*, the installed *air-handling unit* shall be field verified in accordance with the procedures specified in Reference Residential Appendix RA3.1.4.3.9.

4. ***Heat pump* - rated heating capacity.** When performance compliance requires installation of a *heat pump* system, the heating capacity values at 47° F and 17° F shall be field verified in accordance with the procedures specified in Reference Residential Appendix RA3.4.

5. **Whole-house fan.** When performance compliance requires installation of a whole-house fan, the whole-house fan ventilation airflow rate and fan efficacy shall be field verified in accordance with the procedures in Reference Residential Appendix RA3.9.

6. ***Central fan ventilation cooling system*.** When performance compliance requires installation of a *central fan ventilation cooling system*, the installed system shall be field verified in accordance with the procedures in Reference Residential Appendix RA3.3.4.

7. ***Building* enclosure air leakage.** When performance compliance requires a *building* enclosure leakage rate that is lower than the standard design, the *building* enclosure shall be field verified in accordance with the procedures specified in Reference Residential Appendix RA3.8.

8. **Quality Insulation Installation (QII).** When performance compliance requires field verification of QII, the *building* insulation system shall be field verified in accordance with the procedures in Reference Residential Appendix RA3.5.

102.5.5.3- Multifamily *dwelling unit* field verification. When performance of installed features, materials, components, *manufactured devices* or systems listed below is above the minimum mandatory or prescriptive requirements, field verification shall be performed in accordance with the applicable requirements below, and the results of the verification(s) shall be documented on applicable Certificates of Installation pursuant to Section 100.5.1.2 *[Section 10-103(a)3]* and applicable Certificates of Verification pursuant to Section 100.5.1.4 *[Section 10-103(a)5]*.

1. ***EER2/SEER2/CEER/HSPF2* Rating.** When performance compliance requires installation of a *space-conditioning system* with a rating that is greater than the minimum rating required by Table 102.5~~-C~~(3) *[Table 170.2-K]* or specified for the standard design, the installed system shall be field verified in accordance with the procedures specified in the applicable sections of Reference Residential Appendix RA3.

2. ***Variable capacity heat pump* (*VCHP*) compliance option.** When performance compliance requires installation of a *heat pump* system that meets all the requirements of the *VCHP* compliance option specified in the *ACM* Reference Manual, the system shall be field verified in accordance with the procedures in Reference Residential Appendix RA3.4.4.3.
3. **Low leakage *air handler*.** When performance compliance requires installation of a low leakage *air-handling unit*, the installed air handling unit shall be field verified in accordance with the procedures specified in Reference Residential Appendix RA3.1.4.3.9.
4. **Thermal balancing valve.** When performance compliance requires installation of thermal balancing valves with variable speed circulation pump(s), the installation shall meet the procedures specified in Reference Residential Appendix RA4.4.3.
5. ***Heat pump*—rated heating capacity.** When performance compliance requires installation of a *heat pump* system, the heating capacity values at 47°F and 17°F shall be field verified in accordance with the procedures specified in Reference Residential Appendix RA3.4.4.2.
6. ***Dwelling unit* enclosure air leakage.** When performance compliance requires a *building* enclosure leakage rate that is lower than the standard design, the *building* enclosure shall be field verified in accordance with the procedures specified in Reference Residential Appendix RA3.8.
7. **Quality insulation installation (QII).** When performance compliance requires field verification of QII, the *building* insulation system shall be field verified in accordance with the procedures in Reference Residential Appendix RA3.5.

TABLE 102.5 ~~C~~(3) [TABLE 170.2-K] MECHANICAL COMPONENT PACKAGE – MULTIFAMILY STANDARD BUILDING DESIGN

COMPONENT	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
~~Unitary[4]~~ Unitary[d] – Balanced Ventilation ~~System[1]~~ System[a] *HRV*/*ERV* Sensible Recovery Efficiency	0.67	0.67	NR	0.67	NR	NR	NR	NR	NR	NR	0.67	0.67	0.67	0.67	NR	0.67
~~Unitary[4]~~ Unitary[d] – Balanced Ventilation ~~System[1]~~ System[a] *HRV*/*ERV* Fan Efficacy (W/cfm)	0.6	0.6	1.0	0.6	1.0	1.0	1.0	1.0	1.0	1.0	0.6	0.6	0.6	0.6	1.0	0.6
~~Unitary[4]~~ Unitary[d] – Balanced Ventilation ~~System[1]~~ System[a] Non-HRV/*ERV* Fan Efficacy (W/cfm)	NR	NR	NR	NR	0.4	0.4	0.4	0.4	0.4	0.4	NR	NR	NR	NR	0.4	NR
~~Unitary[4]~~ Unitary[d] – Heat ~~Pump[3]~~ Pump[c], ~~HSPF2[2]~~ HSPF2[b]	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
~~Unitary[4]~~ Unitary[d] – Dual-Fuel Heat ~~Pump[3]~~ Pump[c], *AFUE*	MIN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	MIN
~~Unitary[4]~~ Unitary[d] – Refrigerant Charge Verification or *Fault* Indicator Display	NR	REQ	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
~~Unitary[4]~~ Unitary[d] – *SEER2*	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
~~Central[5]~~ Central[e] - Balanced Ventilation ~~Systems[1]~~ Systems[a] Sensible Recovery Efficiency/ Effectiveness	0.67	0.67	NR	0.67	NR	NR	NR	NR	NR	NR	0.67	0.67	0.67	0.67	NR	0.67
~~Central[5]~~ Central[e] - Balanced Ventilation ~~Systems[1]~~ Systems[a] Bypass Function	REQ	REQ	NR	REQ	NR	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	NR	REQ
~~Central[5]~~ Central[e] – *Central Fan Integrated Ventilation System* Fan Efficacy	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
Duct Insulation in *Unconditioned Space*	R 8	R 8	R 6	R 8	R 6	R 6	R 6	R 8	R 8	R 8	R 8	R 8	R 8	R 8	R 8	R 8

Footnotes to TABLE 102.5(3) *[Table 170.2-K]*:

a. Requirements only apply when using Balanced Ventilation to meet Section 403.2.2.3.4 *[Section 160.2(b)2Aivb].*

b. *HSPF2* means "*heating seasonal performance factor*."

c. A supplemental heating unit may be installed in a space served directly or indirectly by a primary heating system, provided that the unit thermal capacity does not exceed 2 kilowatts or 7,000 Btu/hr and is controlled by a time-limiting device not exceeding 30 minutes.

d. Unitary system serving one *dwelling unit*

e. Central system serving multiple *dwelling units*

~~Footnotes to TABLE 102.5-C *[Table 170.2-K]*:~~

~~1. Requirements only apply when using Balanced Ventilation to meet Section 403.2.2.3.4 *[Section 160.2(b)2Aivb].*~~

~~2. *HSPF2* means "*heating seasonal performance factor*."~~

~~3. A supplemental heating unit may be installed in a space served directly or indirectly by a primary heating system, provided that the unit thermal capacity does not exceed 2 kilowatts or 7,000 Btu/hr and is controlled by a time-limiting device not exceeding 30 minutes.~~

~~4. Unitary system serving one *dwelling unit*~~

~~5. Central system serving multiple *dwelling units*~~

102.5.6 *[Part 1, 10-104]* **Exceptional designs.**

Requirements. If a *building* permit applicant proposes to use a performance compliance approach, and the *building* designs cannot be adequately modeled by an approved calculation method, an applicant may determine that the *building* complies with *Part 6*~~shall be granted a building permit~~ if the *Energy Commission* finds:

1. That the design cannot be adequately modeled with an approved calculation method; and
2. Using an alternative evaluation technique, that the design complies with *Part 6*~~; and~~
3. ~~That the enforcement agency has determined that the design complies with all other legal requirements~~.

Applications. The applicant shall follow the procedures outlined in Title 24, *Part 1* Section 10-104.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code.*

SECTION 103

FIELD VERIFICATION AND DIAGNOSTIC TESTING

103.1 Nonresidential lighting controls Acceptance Test training and certification.

~~(a)~~ 103.1.1 *[Part 1, 10-103.1(a)]* Scope.

The requirements of this section apply to Acceptance Test Technicians (ATTs), Acceptance Test Employers (ATEs), and Acceptance Test Technician Certification Providers (ATTCPs) that perform work relating to the acceptance testing of nonresidential *lighting* systems and controls.

~~(b)~~ 103.1.2 *[Part 1, 10-103.1(b)]* Industry Certification Threshold.

ATT and ATE certification requirements shall take effect when the *Energy Commission* finds that each of the following conditions are met. Until such time that Items 1 and 2 below *[Sections 10-103.1(b)1 and 10-103.1(b)2]* are met, or if, subsequent to being met, they cease to be maintained, Field Technicians may complete acceptance testing as specified in *Part 6*, Sections 601.2.5 and 603.2.2.5 *[Sections 130.4 and 160.5(e)]* without meeting the certification requirements specified in Section 103.1 *[Part 1, Section 10-103.1]*.

1. **Number of Certified ATTs.** There shall be no less than 300 ATTs certified to perform the *lighting* acceptance tests in- the Energy Code~~Building Energy Efficiency Standards~~, Sections 601.2.5 and 603.2.2.5 *[Sections 130.4 and 160.5(e)]*. The number of certified ATTs shall be submitted to the *Energy Commission* in the annual reports prepared by ATTCPs, as specified in Section 103.1.4 Item 1 *[Section 10-103.1(d)1]*.
2. **Industry Coverage by ATTCPs.** ATTCPs approved by the *Energy Commission*, in their entirety, shall provide reasonable access to certification to the following industry groups: electrical contractors, certified general electricians, licensed architects, professional engineers, controls installation and startup contractors and certified commissioning professionals who have verifiable training, experience and expertise in *lighting* controls and electrical systems. The *Energy Commission* will determine whether reasonable access to certification is provided by considering factors such as certification costs commensurate with the complexity of the training being provided, certification marketing materials, prequalification criteria, class location and availability, and curriculum.

103.1.3 *[Part 1, 10-103.1(c)]* ~~(c)~~ Qualifications and ~~Approval~~ approval of ATTCPs.

ATTCPs shall submit a written application to the *Energy Commission* with a summary and the related background documents to explain how the following criteria and procedures have been met:

1. ~~1.~~ **Organizational Structure.** ATTCPs shall provide written explanations of the organization type, by-laws, and ownership structure. ATTCPs shall explain in writing how their certification program meets the qualification requirements of Section 103.1.3 *[Title 24, Part 1, Section 10-*

103.1(c)]. ATTCPs shall explain in their application to the *Energy Commission* their organizational structure and their procedures for independent oversight, quality assurance, supervision and support of the acceptance test training and certification processes.

2. ~~2.~~ **Certification of ATEs.** The ATTCPs shall provide written explanations of their certification and oversight of ATEs. This explanation shall document how the ATTCP ensures that ATEs are providing quality control and appropriate supervision and support for their ATTs.

   2.1. ~~A.~~ **Recertification.** The ATTCP shall recertify all ATEs prior to the implementation of each adopted update to the Energy Code ~~Building Energy Efficiency Standards~~ as these updates affect the acceptance test requirements. Recertification requirements and procedures shall only apply to those specific elements that are new or modified in future updates to the Energy Code~~Building Energy Efficiency Standards~~.

3. ~~3.~~ **Training and Certification Procedures.** ATTCPs shall include with their application a complete copy of all training and testing procedures, manuals, handbooks, and materials. ATTCPs shall explain in writing how their training and certification procedures include, but are not limited to, the following:

   3.1. ~~A.~~ **Training Scope.** The scope of the training shall include both hands-on experience and theoretical training to certify competency in the technologies and skills necessary to perform the acceptance tests.

   3.2. ~~B.~~ **ATT Training.**

      3.2.1. ~~i.~~ **Curricula.** ATTCP training curricula for ATTs shall include, but not be limited to, the analysis, theory, and practical application of the following:

         3.2.1.1. ~~a.~~ *Lamp* and ballast systems;

         3.2.1.2. ~~b.~~ Line voltage switching controls;

         3.2.1.3. ~~c.~~ *Low voltage* switching controls;

         3.2.1.4. ~~d.~~ Dimming controls;

         3.2.1.5. ~~e.~~ Occupancy sensors;

         3.2.1.6. ~~f.~~ Photosensors;

         3.2.1.7. ~~g.~~ Demand responsive signal inputs to *lighting control systems*;

         3.2.1.8. ~~h.~~ Energy Code~~Building Energy Efficiency Standards~~ required *lighting control systems*;

         3.2.1.9. ~~i.~~ Energy Code~~Building Energy Efficiency Standards~~ required *lighting* control system-specific analytical/problem solving skills;

         3.2.1.10. ~~j.~~ Integration of mechanical and electrical systems for Energy Code ~~Building Energy Efficiency Standards~~ required *lighting* control installation and commissioning;

         3.2.1.11. ~~k.~~ Safety procedures for low-voltage retrofits (<50 volts) to control line voltage systems (120 to 480 volts);

3.2.1.12. ~~l.~~ Accurate and effective tuning, calibration, and programming of Energy Code ~~Building Energy Efficiency Standards~~ required *lighting control systems*;

3.2.1.13. ~~m.~~ Measurement of *illuminance* according to the Illuminating Engineering Society's measurement procedures as provided in the *IES Lighting Library*;

3.2.1.14. ~~n.~~ Energy Code~~Building Energy Efficiency Standards~~ *lighting* controls acceptance testing procedures; and

3.2.1.15. ~~o.~~ Energy Code~~Building Energy Efficiency Standards~~ acceptance testing compliance documentation for *lighting* controls.

3.2.2. ~~ii.~~ **Hands-on training.** The ATTCP shall describe in its application the design and technical specifications of the laboratory boards, equipment and other elements that will be used to meet the hands-on requirements of the training and certification.

3.2.3. ~~iii.~~ **Prequalification.** Participation in the certification program shall be limited to persons who have at least three years of professional experience and expertise in *lighting* controls and electrical systems as determined by the *Lighting* Controls ATTCPs.

NOTE: ATTCPs may specify additional qualifications for participation in their programs, such as limiting participation to persons that are not currently listed as "decertified" by another ATTCP.

3.2.4. ~~iv.~~ **Instructor to Trainee Ratio.** The ATTCP shall document in its application to the *Energy Commission* why its instructor to trainee ratio is sufficient to ensure the integrity and efficacy of the curriculum and program based on industry standards and other relevant information.

3.2.5. ~~v.~~ **Tests.** The ATTCP shall describe the written and practical tests used to demonstrate each certification applicant's competence in all specified subjects. The ATTCPs shall retain all results of these tests for five years from the date of the test.

3.2.6. ~~vi.~~ **Recertification.** The ATTCP shall recertify all ATTs prior to the implementation of each adopted update to the Energy Code ~~Building Energy Efficiency Standards~~ when these updates affect the acceptance test requirements. Recertification requirements and procedures shall only apply to those specific elements that are new or modified in future updates to the Energy Code~~Building Energy Efficiency Standards~~. The ATTCP shall develop recertification training curricula for ATTs consistent with training requirements in Section 103.1.3 Items 3.1 and 3.2 *[Sections 10-103.1(c)3A and 10-103.1(c)3B]*, and shall submit the proposed recertification training curricula to the *Energy Commission* for review and approval in the update report required under Section 103.1.4 Item 2 *[Section 10-103.1(d)2]*.

3.3. ~~C.~~ **ATE Training.** Training for ATEs shall consist of a single class or webinar consisting of at least four hours of instruction that covers the scope and process of the acceptance tests in the Energy Code~~Building Energy Efficiency Standards~~, Sections 601.2.5 and 603.2.2.5 *[Sections 130.4 and 160.5(e)]*.

3.4. ~~D.~~ **Complaint Procedures.** The ATTCP shall describe in its applications to the *Energy Commission* procedures for accepting and addressing complaints regarding the performance of any ATT or ATE certified by the ATTCP, and explain how *building* departments and the public will be notified of these proceedings.

3.5. ~~E.~~ **Decertification Procedures.** The ATTCP shall describe in its applications to the *Energy Commission* procedures for revoking their certification of ATTs and ATEs based upon poor quality or ineffective work, failure to perform acceptance tests, falsification of documents, failure to comply with the documentation requirements of these regulations or other specified actions that justify decertification. The ATTCP shall also describe its general procedures for decertified ATTs or ATEs seeking to regain their certification status, including eligibility requirements for recertification (if any).

3.6. ~~F.~~ **Quality Assurance and Accountability.** The ATTCP shall describe in its application to the *Energy Commission* its procedures for conducting quality assurance and accountability activities, including but not limited to the following:

3.6.1. ~~i.~~ Program Audit: The ATTCP shall include quality assurance and accountability measures, including but not limited to independent oversight of the certification materials, processes and procedures, visits to *building* sites where certified technicians are completing acceptance tests, certification process evaluations, and expert review of the training curricula developed for ~~Building Energy Efficiency Standards~~the Energy Code, Sections 601.2.5 and 603.2.2.5 *[Sections 130.4 and 160.5(e)]*. Independent oversight may be demonstrated by accreditation under the ISO/IEC 17024 standard.

3.6.2. ~~ii.~~Desk Audit: The ATTCP shall review a random sample of no less than 1 percent of each ATT's ~~completed compliance forms~~projects, counted per *building* permit.

3.6.3. ~~iii.~~ Field Audit: The ATTCP shall perform audits by meeting either of the following:

3.6.3.1. Site Audit: The ATTCP shall perform randomly selected on-site audits of no less than 1 percent of each ATT's ~~completed acceptance tests~~projects, counted per *building* permit.

3.6.3.2. Training Facility Audit: The ATTCP shall shadow audit each ATT at an ATTCP training facility at least once per code cycle where the ATTCP shall observe the performance of the ATT on at least five functional tests for which the ATT is certified. The shadow audit must replicate field conditions for installed equipment and controls in a *building*. The ATTCP training facility shall be setup to allow auditing of all functional tests for which the ATT is certified. The shadow audits must be in addition to any testing used for ATT recertification.

3.7. ~~G.~~ **Certification Identification Number and Verification of ATT and ATE Certification Status.** The ATTCP shall describe in its application to the *Energy Commission* its procedures for recording, tracking, and communicating certification status, including but not limited to the following:

3.7.1. ~~i.~~ Upon certification of an ATT or ATE, the ATTCP shall issue a unique certification identification number to the ATT or ATE.

3.7.2. ~~ii.~~ The ATTCP shall maintain an accurate public record of the certification status and service territory for all ATTs and ATEs that the ATTCP has certified, including any ATTs or ATEs who have been decertified as specified in Section 103.1.3 Item 3.5 *[Section 10-103.1(c)3E]*. Service territory denotes the geographic area in which an ATT or ATE provides acceptance testing services. If no service territory is specified, it is automatically assumed to be the territory associated with the technician's listed contact address.

3.7.3. ~~iii.~~ The ATTCP shall provide verification of current ATT certification status upon request to authorized document Registration Provider personnel or *enforcement agency* personnel to determine the ATT's eligibility to sign Certificate of Acceptance documentation according to all applicable requirements in Section 103.1, Chapter 2, Section 100.5.1.3 *[Sections 10-103.1, 10-102, 10-103(a)4]*, and the Reference Joint Appendix JA7.

3.8. ~~H.~~ **Electronic Database System**. The ATTCP shall maintain, or by suitable contractual requirements cause to be maintained, an electronic database system approved by the *Energy Commission*. The electronic database system shall be capable of all the following:

3.8.1. ~~i.~~ Support all activities for the ATTCP to comply with its quality assurance program as required by Section 103.1.3 Item 3.6 *[Section 10-103.1(c)3F]*.

3.8.2. ~~ii.~~ For no less than five years, record and preserve all certificates of acceptance offered for certification by the ATTCP and as performed by its own certified ATTs.

3.8.3. ~~iii.~~ Allow the transmission of electronic copies of each completed certificate of acceptance to the ATT that performed the test, the ATE associated with that ATT, or both.

3.8.3.1. ~~a.~~ Each page of each certificate of acceptance shall bear the logo of the ATTCP or other identifying insignia as approved by the *Energy Commission*.

3.8.3.2. ~~b.~~ The electronic copy shall be capable of being printed.

3.8.3.3. ~~c.~~ The ATTCP may apply to the *Energy Commission* for approval to use alternative compliance documents that differ from those approved for use by the *Energy Commission* but must demonstrate that these alternative compliance documents do not differ in format, informational order, or content from approved compliance documents.

3.8.4. ~~iv.~~ Provide a means of verifying any certificate of acceptance to the *enforcement agency* having jurisdiction as identified on the certificate of acceptance.

3.8.5. ~~v.~~ Provide the *Energy Commission* with any of the following project data or documents upon request: project address, permit numbers, acceptance test technician and acceptance test employee certification numbers, certificates of acceptance, compliance forms, installation forms, and record of quality assurance review. Contingent upon availability and approval of a standardized electronic data transfer mechanism by the *Executive Director*, within one year of its approval the ATTCP's electronic database system shall be capable of sending project information through this mechanism at project completion or at intervals not exceeding one month.~~The Energy Commission may adopt an Application Programming Interface (API) for providing data electronically. Within one year of development of an API, the ATTCP's electronic database system shall have the ability to transfer project data to the Energy Commission through the API upon completion of the project or at established intervals no longer than monthly.~~

3.8.6. ~~vi.~~ The ATTCP shall prepare an Acceptance Test Summary Report (ATSR) that provides a comprehensive summary of the status of all certificates of acceptance required for a project. The ATTCP shall provide a means of verifying any ATSR to the *enforcement agency* as identified on the certificate of acceptance. The report shall include all the following:

3.8.6.1. ~~a.~~The ATTCP's official logo or another identifying insignia authorized by the *Energy Commission*.

3.8.6.2. ~~b.~~ A digital label that can be scanned to verify that the certificates of acceptance were recorded through the ATTCP database.

3.8.6.3. ~~c.~~ Project name.

3.8.6.4. ~~d.~~ Project address.

3.8.6.5. ~~e.~~ Project permit number.

3.8.6.6. ~~f.~~ A list of all required acceptance tests for each project and completion status.

3.9. ~~i.~~ Compliance Document Recording and Repository Reporting Requirement:

3.9.1. ~~i.~~ The ATTCP shall record all certificates of compliance (Section 100.5.1.1) *[(Section 10-103(a)1)]*, certificates of installation Section 100.5.1.2) *[(Section 10-103(a)3)]*, and certificates of acceptance (Section 100.5.1.3) *[(Section 10-103(a)4)]* associated with any acceptance test specified in *Part 6*, Sections 601.2.5 and 603.2.2.5 *[Sections 130.4 and 160.5(e)]*.

3.9.2. ~~ii.~~ Contingent upon *Energy Commission* approval of the threshold (Section 103.1.2) *[(Section 10-103.1(b))]* and upon availability and approval of an electronic document repository by the *Executive Director*, the ATTCP shall submit monthly data transfer packets to the *Energy Commission* to an electronic document repository for retention consistent with *Energy Commission* instructions.

103.1.4 *[Part 1, 10-103.1(d)]* ~~**(d)**~~ **Requirements for ATTCPs to provide regular reports.**

The ATTCP shall provide the following regular reports to the *Energy Commission*:

1. **Annual Report.** The ATTCP shall provide an annual report to the *Energy Commission* that includes the following:

~~A. A summary of the certification services provided over the reporting period, including the total number of Acceptance Test Technicians and Employers certified by the ATTCP during the reporting period and to date.~~

1.1. Certification Services. A summary of the certification services provided during the reporting period, including:

1.1.1. The number of Acceptance Test Technicians (ATTs) and Acceptance Test Employers (ATEs) newly certified.

1.1.2. The Certification IDs renewed, inactive, suspended, or decertified;

1.1.3. Total certifications held to date and latest code cycle certified.

~~B. A summary of all actions taken against any ATT or ATE as a result of the complaint or quality assurance procedures described by the ATTCP as required under Section 10-103.1(c)3D and 10-103.1(c)3F.~~

1.2. Disciplinary Actions. A summary of all actions taken against any ATT or ATE as a result of complaints or quality assurance procedures conducted pursuant to Section 103.1.3 Item 3.4 *[Sections 10-103.1(c)3D]* and Section 103.1.3 Item 3.6 *[10-103.1(c)3F]*. The summary shall include:

1.2.1. Description of the ATTCP's approved complaint and quality assurance procedures, as applicable to the actions taken and sufficient to understand the type of action;

1.2.2. The general nature and source of each complaint or quality assurance finding;

1.2.3. The ATT or ATE involved; and

1.2.4. The status or resolution of each action.

~~C. A summary of the quality assurance and accountability activities conducted over the reporting period, including the compliance forms reviewed and the on-site audits performed as required under Section 10-103.1(c)3Fii during the reporting period and to date.~~

1.3. Quality Assurance and Accountability. A summary of the quality assurance and accountability activities conducted during the reporting period and to date, as required under Section 103.1.3 Item 3.6 *[Section 10-103.2(c)3F]*, including for each ATT:

1.3.1. The number of each type of acceptance test completed;

1.3.2. The number of desk audits, on-site audits, and failed audits; and

1.3.3. Aggregate totals of quality assurance and accountability activities conducted during reporting period to date.

~~D. A summary of the number and type of acceptance tests performed in each local jurisdiction over the reporting period and to date.~~

1.4. Acceptance Testing Data. A summary, per project, of the number and types of acceptance tests performed in each local jurisdiction during the reporting period and to date. The summary shall, at minimum, identify:

1.4.1. The jurisdiction, project address, permit number;

1.4.2. The acceptance test type; and

1.4.3. The number of tests completed.

~~E. A signed certification to the Energy Commission that the ATTCP continues to meet the requirements of Section 10-103.1.~~

1.5. Certification Statement.

1.5.1. A signed statement by an authorized representative of the ATTCP certifying that the ATTCP continues to meet all requirements of Section 103.2 *[Section 10-103.2]*.

1.6. Form and Manner of Submittal.

1.6.1. The annual report shall be submitted to the *Energy Commission* by March 31 of the calendar year immediately following the reporting period.

1.6.2. The *Energy Commission* may make available recommended formats, templates, or electronic reporting tools to support consistent, accurate, and efficient reporting.

2. **Update Report**. The ATTCP shall have no less than six months following the adoption of an update to the ~~Building Energy Efficiency Standards~~Energy Code to prepare an Update Report. The ATTCP shall submit an Update Report to the *Energy Commission* no less than six months prior to the effective date of any newly adopted update to the Energy Code~~Building Energy Efficiency Standards~~. The ATTCP shall report to the *Energy Commission* what application amendments are proposed, to address changes to the ~~Building Energy Efficiency Standards~~ Energy Code or to ensure training is reflective of the variety of *lighting* controls that are currently encountered in the field. All required update reports shall contain a signed certification that the ATTCP continues to meet the requirements of Section 103.1 *[Section 10-103.1]*. Update reports shall be approved through the Amendment Process provided under Section 103.1.6 *[Section 10-103.1(f)]*.

   All required reports shall contain a signed certification that the ATTCP has met all requirements for this program.

103.1.5 *[Part 1, 10-103.1(e)]* ~~**(e)**~~ **Application Review and Determination.**

The *Energy Commission* shall review ATTCP applications according to the criteria and procedures in Section 103.1.3 *[Section 10-103.1(c)]* to determine if such providers meet the specified requirements for providing acceptance testing certification services.

1. *Energy Commission* staff will review and validate all information received on ATTCP applications, and determine whether the application is complete and contains sufficient information to be evaluated by staff. Complete applications shall be evaluated by staff based on their contents.
2. The *Executive Director* may require that the applicant provide additional information as required by staff to fully evaluate the ATTCP application.

3. The *Executive Director* shall provide a copy of the staff evaluation to interested persons and provide a reasonable opportunity for public comment.
4. The *Executive Director* shall issue a written recommendation that the *Energy Commission* designate the applicant as an authorized ATTCP or deny the application.
5. The *Energy Commission* shall make a final decision on the application at a publicly noticed hearing.

103.1.6 *[Part 1, 10-103.1(f)]* ~~**(f)**~~ **Amendment Process.**

The ATTCP may amend a submitted or approved application, as follows:

1. **Amendment Scope.**
   1.1. **Nonsubstantive Changes.** A nonsubstantive change is a change that does not substantively alter the requirements of the application materials for the ATTCP, ATT, or ATE. A nonsubstantive change includes, but is not limited to, correcting typographical errors, modifying contact information, renaming positions or programs, and making changes that do not impact consumers, ATTs, ATEs, or alter the ability of the ATTCP to comply with any requirement of Section 103.1.3 *[Section 10-103.1(c)]*. For amendments making only nonsubstantive changes, the ATTCP shall submit the following:
      1.1.1. A letter describing the change to the *Energy Commission* as an addendum to the application;
      1.1.2. A replacement copy of the affected sections of the ATTCP application with the changes incorporated; and
      1.1.3. A copy of the affected sections of the ATTCP application showing the changes in underline and strikeout format.
   1.2. **Substantive Changes.** A substantive change is a change that substantively alters the requirements of the application materials for the ATTCP, ATT, or ATE. Substantive changes include, but are not limited to, any changes to training, database provider, certification, or oversight (including quality assurance) that would result in any impact to consumers, ATTs, ATEs, or the ability of the ATTCP to comply with any requirement of Section 103.1.3 *[Section 10-103.1(c)]*. For amendments making any substantive changes, the ATTCP shall submit the following:
      1.2.1. A document describing the scope of the change to the application, the reason for the change and the potential impact to the ATTCP, ATT, and ATE as an addendum to the application;
      1.2.2. A replacement copy of the affected sections of the ATTCP application with the changes incorporated; and
      1.2.3. A copy of the affected sections of the ATTCP application showing the changes in underline and strikeout format.
2. **Amendment Review.** Amendments submitted prior to approval of an ATTCP application shall be included in the application's Application Review and Determination process specified in Section 103.1.5 *[Section 10-103.1(e)]*.

Amendments submitted after approval of an ATTCP's application that contain only nonsubstantive changes shall be reviewed by the *Executive Director* for consistency with Section 103.1 *[Section 10-103.1]*. Amendments determined to be consistent with this Section shall be incorporated into the approval as errata.

Amendments submitted after approval of an ATTCP's application that contain any substantive changes shall be subject to the Application Review and Determination process specified in Section 103.1.5 *[Section 10-103.1(e)]*. If the *Energy Commission* finds that the amended application does not meet the requirements of Section 103.1 *[Section 10-103.1]*, then the ATTCP shall either abide by the terms of their previously approved application or have their approval suspended.

103.1.7 *[Part 1, 10-103.1(g)]* ~~(g)~~ Review by the Energy Commission.

If the *Energy Commission* determines there is a violation of these regulations or that an ATTCP is no longer providing adequate certification services, the *Energy Commission* may revoke the authorization of the ATTCP pursuant to Section 1230 et seq. of Title 20 of the California Code of Regulations.

103.2 Nonresidential mechanical Acceptance Test training and certification.

103.2.1 *[Part 1, 10-103.2(a)]* ~~(a)~~ Scope.

The requirements of this section apply to Acceptance Test Technicians (ATTs), Acceptance Test Employers (ATEs), and Acceptance Test Technician Certification Providers (ATTCPs) that perform work relating to the acceptance testing of nonresidential mechanical systems and controls.

103.2.2 *[Part 1, 10-103.2(b)]* ~~(b)~~ Industry Certification Threshold.

ATT and ATE certification requirements shall take effect when the *Energy Commission* finds that each of the following conditions are met. Until such time that Section 103.2.2 *[Sections 10-103.2(b)1 and 10-103.2(b)2]* ~~are~~ is met, or if, subsequent to being met, they cease to be maintained, Field Technicians may complete acceptance testing as specified in Sections 401.2.7 and 403.2.3.5 *[Sections 120.5 and 160.3(d)]* without completing certification requirements specified in Section 103.2 *[Part 1, Section 10-103.2]*.

1. **Number of Certified ATTs.**

   1.1. ~~A.~~ There shall be no less than 300 ATTs certified to perform the complete set of mechanical acceptance tests in the Energy Code, ~~Building Energy Efficiency Standards,~~ Sections 401.2.7 and 403.2.3.5 *[Sections 120.5 and 160.3(d)]*, except as provided in Section 103.2.2 Item 1.2 *[Subsection 10-103.2(b)1B]*. The number of certified ATTs shall be submitted to the *Energy Commission* in the annual reports prepared by ATTCPs, as specified in Section 103.2.4 Item 1 *[Section 10-103.2(d)1]*.

   1.2. ~~B.~~ If there are less than 300 ATTs certified to perform all of the acceptance tests in the Energy Code, ~~Building Energy Efficiency Standards,~~ Sections 401.2.7 and 403.2.3.5 *[Sections 120.5 and 160.3(d)]*, then there shall be at least 300 ATTs certified to complete the following tests:

1.2.1. ~~i.~~ NA7.5.1 *Outdoor Air* Ventilation Systems

1.2.2. ~~ii.~~ NA7.5.2 Constant Volume, Single Zone Unitary *Air Conditioners* and *Heat Pumps*

1.2.3. ~~iii.~~ NA7.5.4 *Air Economizer* Controls

1.2.4. ~~iv.~~ NA7.5.5 *Demand Control Ventilation* Systems

1.2.5. ~~v.~~ NA 7.5.6 Supply Fan Variable Flow Controls

1.2.6. ~~vi.~~ NA7.5.7, NA7.5.9 Hydronic System Variable Flow Controls

1.2.7. ~~vii.~~ NA7.5.10 *Automatic* Demand Shed Controls

2. **Industry Coverage by ATTCPs.** ATTCPs approved by the *Energy Commission*, in their entirety, provide reasonable access to certification to the following industry groups: Professional engineers, licensed architects, HVAC installers, mechanical contractors, Testing and Balancing (TAB) certified technicians, controls installation and startup contractors and certified commissioning professionals who have verifiable training, experience and expertise in *HVAC systems*. The *Energy Commission* will determine reasonable access by considering factors such as certification costs commensurate with the complexity of the training being provided, certification marketing materials, prequalification criteria, class availability and curriculum.

103.2.3 *[Part 1, 10-103.2(c)]* ~~**(c)**~~ **Qualifications and Approval of ATTCPs.**

ATTCPs shall submit a written application to the *Energy Commission* with a summary and the necessary background documents to explain how the following criteria and procedures have been met:

1. **Organizational Structure.** ATTCPs shall provide written explanations of the organization type, by-laws, and ownership structure. ATTCPs shall explain in writing how their certification program meets the qualifications of- the Energy Code~~Building Energy Efficiency Standards~~, Section 103.2.3 *[Section 10-103.2(c)]*. ATTCPs shall explain in their application to the *Energy Commission* their organizational structure and their procedures for independent oversight, quality assurance, supervision and support of the acceptance test training and certification processes.
2. **Certification of ATEs.** The ATTCPs shall provide written explanations of their certification and oversight of ATEs. This explanation shall document how the ATTCP ensures that ATEs are providing quality control and appropriate supervision and support for their ATTs.

   2.1. **Recertification.** The ATTCP shall recertify all ATEs prior to the implementation of each adopted update to the Energy Code ~~Building Energy Efficiency Standards~~ as these updates affect the acceptance test requirements. Recertification requirements and procedures shall only apply to those specific elements that are new or modified in future updates to- the Energy Code~~Building Energy Efficiency Standards~~.
3. **Requirements for Applicant ATTCPs to Document Training and Certification Procedures.** ATTCPs shall include with their application a complete copy of all training and testing procedures, manuals, handbooks, and materials. ATTCPs shall explain in writing how their training and certification procedures include, but are not limited to, the following:

3.1. **Training Scope.** The scope of the training shall include both hands-on experience and theoretical training to certify competency in the technologies and skills necessary to perform the acceptance tests.

3.2. **ATT Training.**

3.2.1. **Curricula**. ATTCP training curricula for ATTs shall include, but not be limited to, the analysis, theory, and practical application of the following:

3.2.1.1. Constant volume system controls;

3.2.1.2. Variable volume system controls;

3.2.1.3. Air-side economizers;

3.2.1.4. Air distribution system leakage;

3.2.1.5. Demand controlled ventilation with CO_2 sensors;

3.2.1.6. Demand controlled ventilation with occupancy sensors;

3.2.1.7. *Automatic* demand shed controls;

3.2.1.8. Hydronic valve leakage;

3.2.1.9. Hydronic system variable flow controls;

3.2.1.10. *Supply air* temperature reset controls;

3.2.1.11. *Condenser* water temperature reset controls;

3.2.1.12. *Outdoor air* ventilation systems;

3.2.1.13. Supply fan variable flow controls;

3.2.1.14. Boiler and chiller isolation controls;

3.2.1.15. *Fault detection and diagnostics* for packaged direct-expansion units;

3.2.1.16. *Automatic fault detection and diagnostics* for air handling units and zone terminal units;

3.2.1.17. Distributed energy storage direct-expansion air conditioning systems;

3.2.1.18. Thermal energy storage systems;

3.2.1.19. Conductivity controls and overflow alarms for open and *closed-circuit cooling towers*;

3.2.1.20. Energy Code ~~Building Energy Efficiency Standards~~ mechanical acceptance testing procedures per Section 401.2.7 *[Section 120.5]*, Section 403.2.3.5 *[Section 160.3(d)]* and field verification and diagnostic testing allowed per *Reference Appendices* Section NA1.9; and

3.2.1.21. ~~t~~Energy Code~~Building Energy Efficiency Standards~~ acceptance testing compliance documentation for mechanical systems.

3.2.2. **Hands-on training.** The ATTCP shall describe in its application the design and technical specifications of the laboratory boards, equipment and other elements that will be used to meet the hands-on requirements of the training and certification.

3.2.3. **Prequalification.** Participation in the certification program shall be limited to persons who have at least three years of professional experience and expertise in mechanical controls and systems as determined by the Mechanical ATTCPs.

NOTE: ATTCPs may specify additional qualifications for participation in their programs, such as limiting participation to persons that are not currently listed as "decertified" by another ATTCP.

3.2.4. **Instructor to Trainee Ratio.** The ATTCP shall document in its application to the *Energy Commission* why its instructor to trainee ratio is sufficient to ensure the integrity and efficacy of the curriculum and program based on industry standards and other relevant information.

3.2.5. **Tests.** The ATTCP shall describe the written and practical tests used to demonstrate each certification applicant's competence in all specified subjects. The ATTCPs shall retain all results of these tests for five years from the date of the test.

3.2.6. **Recertification.** The ATTCP shall recertify all ATTs prior to the implementation of each adopted update to the ~~Building Energy Efficiency Standards~~Energy Code as these updates affect the acceptance test requirements. Recertification requirements and procedures shall only apply to those specific elements that are new or modified in future updates to- the Energy Code~~Building Energy Efficiency Standards~~.

3.3. **ATE Training.** Training for ATEs shall consist of a single class or webinar consisting of at least four hours of instruction that covers the scope and process of the acceptance tests in- the Energy Code~~Building Energy Efficiency Standards~~, Sections 401.2.7 and 403.2.3.5 *[Sections 120.5 and 160.3(d)]*.

3.4. **Complaint Procedures.** Procedures described in writing for notifying *building* departments and the public that the ATTCP will accept complaints regarding the performance of any certified ATT or ATE, and procedures for how the ATTCP will address these complaints.

3.5. **Decertification Procedures.** The ATTCP shall describe in its application to the *Energy Commission* procedures for revoking their certification of ATTs and ATEs based upon poor quality or ineffective work, failure to perform acceptance tests, falsification of documents, failure to comply with the documentation requirements of these regulations or other specified actions that justify decertification. The ATTCP shall also describe its general procedures for decertified ATTs or ATEs seeking to regain their certification status, including eligibility requirements for recertification (if any).

3.6. **Quality Assurance and Accountability.** The ATTCP shall describe in its applications to the *Energy Commission* procedures for conducting quality assurance and accountability activities, including but not limited to the following:

3.6.1. Program Audit: The ATTCPs shall include quality assurance and accountability measures, including but not limited to independent oversight of the certification materials, processes and procedures, visits to *building* sites where certified technicians are

completing acceptance tests, certification process evaluations, and expert review of the training curricula developed for the Energy Code~~Building Energy Efficiency Standards~~, Sections 401.2.7 and 403.2.3.5 *[Sections 120.5 and 160.3(d)]*. Independent oversight may be demonstrated by accreditation under the ISO/IEC 17024 standard.

3.6.2. Desk Audit: The ATTCP shall review a random sample of no less than 1 ~~percent~~project of each ATE's~~ATT's~~ completed project compliance forms within one code cycle. The ATE must have performed a minimum of 5 projects to meet the Desk Audit requirements. The ATTCP may engage in additional checks at its discretion.

3.6.3. Shadow Audit: The ATTCP shall perform shadow audits by meeting either of the following~~:~~ options: The ATTCP may use either site or training facility audits for shadow auditing ATT at its discretion or may restrict the shadow audit to either site or training facility audit for all ATTs under its certification.

3.6.3.1. Site Audit: The ATTCP shall randomly select and shadow audit no less than 1 project~~percent~~ of each ATE's overseen projects within one code cycle.~~,~~ The ATTCP shall follow~~ing~~ the ~~assigned~~ ATT assigned to that project and observe~~ing~~ their performance on the job site.

3.6.3.2. Training Facility Audit: The ATTCP shall randomly select and shadow audit one ATT from~~each ATT~~ a minimum of five percent, rounded up to the nearest whole number, of all active ATEs at an ATTCP training facility at least once per code cycle. ~~where the~~ The ATTCP shall observe the performance of the ATT on at least five functional tests for which the ATT is certified. To the extent possible, the~~The~~ shadow audit must replicate field conditions for installed equipment and controls in a *building*. ~~The ATTCP training facility shall be setup to allow auditing of all functional tests for which the ATT is certified. The shadow audits must be in addition to any testing used for ATT recertification.~~

3.7. **Certification Identification Number and Verification of ATT and ATE Certification Status.** The ATTCP shall describe in its applications to the *Energy Commission* procedures for recording, tracking, and communicating certification status, including but not limited to the following:

3.7.1. Upon certification of an ATT or ATE, the ATTCP shall issue a unique certification identification number to the ATT or ATE.

3.7.2. The ATTCP shall maintain an accurate public record of the certification status and service territory for all ATTs and ATEs that the ATTCP has certified, including any ATTs or ATEs who have been decertified as specified in Section 103.2.3 *Ite*, 3.5 *[Section 10-103.2(c)3E]*. Service territory denotes the geographic area in which an ATT or ATE provides acceptance testing services. If no service territory is specified, it is automatically assumed to be the territory associated with the technician's listed contact address.

3.7.3. The ATTCP shall provide verification of current ATT certification status upon request to authorized document Registration Provider personnel or *enforcement agency* personnel to determine the ATT's eligibility to sign Certificate of Acceptance documentation according to all applicable requirements in Section 103.2, Chapter 2, Section 100.5.1.3 *[Sections 10-103.2, 10-102, 10-103(a)4]*, and Reference Joint Appendix JA7.

3.8. **Electronic Database System**. The ATTCP shall maintain, or by suitable contractual requirements cause to be maintained, an electronic database system approved by the *Energy Commission*. The electronic database system shall be capable of all the following:

3.8.1. Support all activities for the ATTCP to comply with its quality assurance program as required by Section 103.2.3 Item 3.6 *[Section 10-103.2(c)3F]*.

3.8.2. For no less than five years, record and preserve all certificates of acceptance offered for certification by the ATTCP and as performed by its own certified ATTs.

3.8.3. Allow the transmission of electronic copies of each completed certificate of acceptance to the ATT that performed the test, the ATE associated with that ATT, or both.

3.8.3.1. Each page of each certificate of acceptance shall bear the logo of the ATTCP or other identifying insignia as approved by the *Energy Commission*.

3.8.3.2. The electronic copy shall be capable of being printed.

3.8.3.3. The ATTCP may apply to the *Energy Commission* for approval to use alternative compliance documents that differ from those approved for use by the *Energy Commission* but must demonstrate that these alternative compliance documents do not differ in format, informational order, or content from approved compliance documents.

3.8.4. Provide a means of verifying any certificate of acceptance to the *enforcement agency* having jurisdiction as identified on the certificate of acceptance.

3.8.5. Provide the *Energy Commission* with any of the following project data or documents upon request: project address, permit numbers, acceptance test technician and acceptance test employee certification numbers, certificates of acceptance, compliance forms, installation forms, and record of quality assurance review. Contingent upon availability and approval of a standardized electronic data transfer mechanism by the *Executive Director*, within one year of its approval the ATTCP's electronic database system shall be capable of sending project information through this mechanism at project completion or at intervals not exceeding one month.~~The Energy Commission may adopt an Application Programming Interface (API) for providing data electronically. Within one year of development of an API, the ATTCP's electronic database system shall have the ability to transfer project data to the Energy Commission through the API upon completion of the project or at established intervals no longer than monthly.~~

3.8.6. The ATTCP shall prepare an Acceptance Test Summary Report (ATSR) that provides a comprehensive summary of the status of all certificates of acceptance required for a project. The ATTCP shall provide a means of verifying any ATSR to the *enforcement agency* as identified on the certificate of acceptance. The report shall include all the following:

3.8.6.1. The ATTCP's official logo or another identifying insignia authorized by the *Energy Commission*.

3.8.6.2. A digital label that can be scanned to verify that the certificates of acceptance were recorded through the ATTCP database.

3.8.6.3. Project name.

3.8.6.4. Project address.

3.8.6.5. Project permit number.

3.8.6.6. A list of all required acceptance tests for each project and completion status.

3.9. **Compliance Document Recording and Repository Reporting Requirement:**

3.9.1. The ATTCP shall record all certificates of compliance (Section 100.5.1.1) *[(Section 10-103(a)1)]*, certificates of installation (Section 100.5.1.2) *[(Section 10-103(a)3)]*, and certificates of acceptance (Section 100.5.1.3) *[(Section 10-103(a)4)]* associated with any acceptance test specified in *Part 6*, Sections 401.2.7 and 403.2.3.5 *[Sections 120.5 and 160.3(d)]*.

3.9.2. Contingent upon *Energy Commission* approval of the threshold (Section 103.2.2) *[(Section 10-103.2(b))]* and upon availability and approval of an electronic document repository by the *Executive Director*, the ATTCP shall submit monthly data transfer packets to the *Energy Commission* to an electronic document repository for retention consistent with *Energy Commission* instructions.

103.2.4 *[Part 1, 10-103.2(d)]* ~~**(d)**~~ **Requirements for ATTCPs to ~~Provide~~ provide ~~Regular~~ regular ~~Reports~~reports.**

The ATTCP shall provide the following regular reports to the *Energy Commission*:

1. ~~1.~~ **Annual Report.** The ATTCP shall provide an annual report to the *Energy Commission* that includes the following:

~~A. A summary of the certification services provided over the reporting period, including the total number of Acceptance Test Technicians and Employers certified by the agency during the reporting period and to date.~~

1.1. Certification Services. A summary of the certification services provided during the reporting period, including:

1.1.1. The number of Acceptance Test Technicians (ATTs) and Acceptance Test Employers (ATEs) newly certified.

1.1.2. The Certification IDs renewed, inactive, suspended, or decertified;

1.1.3. Total certifications held to date and latest code cycle certified; and.

~~B. A summary of all actions taken against any ATT or ATE as a result of the complaint or quality assurance procedures described by the ATTCP as required under Section 10-103.2(c)3D and 10-103.2(c)3F.~~

1.2. Disciplinary Actions. A summary of all actions taken against any ATT or ATE as a result of complaints or quality assurance procedures conducted pursuant to Section 103.2.3 Item 3.4 *[Section 10-103.2(c)3D]* and Section 103.2.3 Item 3.6 *[Section 10-103.2(c)3F]*. The summary shall include, but not be limited to:

1.2.1. Description of the ATTCP's approved complaint and quality assurance procedures, as applicable to the actions taken and sufficient to understand the type of action;

1.2.2. The general nature and source of each complaint or quality assurance finding;

1.2.3. The ATT or ATE involved; and

1.2.4. The status or resolution of each action.

~~C. A summary of the quality assurance and accountability activities conducted over the reporting period, including the compliance forms reviewed and the on-site audits performed as required under Section 10-103.2(c)3Fii during the reporting period and to date.~~

1.3. Quality Assurance and Accountability. A summary of the quality assurance and accountability activities conducted during the reporting period and to date, as required under Section 103.2.3 Item 3.6 *[Section 10-103.2(c)3F]*, including for each ATT:

1.3.1. The number of each type of acceptance test completed ;

1.3.2. The number of desk audits, on-site audits, and failed audits; and

1.3.3. Aggregate totals.

~~D. A summary of the number and type of acceptance tests performed in each local jurisdiction over the reporting period and to date.~~

1.4. Acceptance Testing Data. A summary, per project, of the number and types of acceptance tests performed in each local jurisdiction during the reporting period and to date. The summary shall, at minimum, identify:

1.4.1. The jurisdiction, project address, permit number;

1.4.2. The acceptance test type; and

1.4.3. The number of tests completed.

~~E. A signed certification to the Energy Commission that the ATTCP continues to meet the requirements of Section 10-103.2.~~

1.5. Certification Statement.

1.5.1. A signed certification to the *Energy Commission* that the ATTCP continues to meet the requirements of Section 103.2 *[Section 10-103.2]*.

1.6. Form and Manner of Submittal.

1.6.1. The annual report shall be submitted to the *Energy Commission* by March 31 of the calendar year immediately following the reporting period.

1.6.2. The *Energy Commission* may make available recommended formats, templates, or electronic reporting tools to support consistent, accurate, and efficient reporting.

2. **Update Report.** The ATTCP shall have no less than six months following the adoption of an update to the Energy Code ~~Building Energy Efficiency Standards~~ to prepare an Update Report. The ATTCP shall submit an Update Report to the *Energy Commission* no less than six months prior to the effective date of any newly adopted update to the- Energy Code~~Building Energy Efficiency Standards~~, The ATTCP shall report to the *Energy Commission* what application

amendments are proposed to address changes to the Energy Code ~~Building Energy Efficiency Standards~~ or to ensure training is reflective of the variety of mechanical equipment and systems currently encountered in the field. All required update reports shall contain a signed certification that the ATTCP continues to meet all the requirements of Section 103.2.3 *[Section 10-103.2(c)]*. Update reports shall be approved through the Amendment Process provided under Section 103.2.6 *[Section 10-103.2(f)]*.

All required reports shall contain a signed certification that the ATTCP has met all requirements for this program.

103.2.5 *[Part 1, 10-103.2(e)]* **~~(e)~~ Application ~~Review~~ review and ~~Determination~~determination.**

The *Energy Commission* shall review ATTCP applications according to the criteria and procedures in Section 103.2.3 *[Section 10-103.2(c)]* to determine if such providers meet the specified requirements for providing acceptance testing certification services.

1. *Energy Commission* staff will review and validate all information received on ATTCP applications, and determine whether the application is complete and contains sufficient information to be evaluated by staff. Complete applications shall be evaluated by staff based on their contents.
2. The *Executive Director* may require that the applicant provide additional information as required by staff to fully evaluate the ATTCP application.
3. The *Executive Director* shall provide a copy of the staff evaluation to interested persons and provide an opportunity for public comment.
4. The *Executive Director* shall issue a written recommendation that the *Energy Commission* designate the applicant as an authorized ATTCP or deny the Provider application.
5. The *Energy Commission* shall make a final decision on the application at a publicly noticed hearing.

103.2.6 *[Part 1, 10-103.2(f)]* **~~(f)~~ Amendment ~~Process~~process.**

The ATTCP may amend a submitted or approved application, as follows:

1. **Amendment Scope.**

1.1. **Nonsubstantive Changes.** A nonsubstantive change is a change that does not substantively alter the requirements of the application materials for the ATTCP, ATT, or ATE. A nonsubstantive change includes, but is not limited to, correcting typographical errors, modifying contact information, renaming positions or programs, and making changes that do not impact consumers, ATTs, ATEs, or alter the ability of the ATTCP to comply with any requirement ofSection 103.2.3 *[Section 10-103.2(c)].* For amendments making only nonsubstantive changes, the ATTCP shall submit the following:

1.1.1. ~~a~~A letter describing the change to the *Energy Commission* as an addendum to the application;

1.1.2. A replacement copy of the affected sections of the ATTCP application with the changes incorporated; and

1.1.3. A copy of the affected sections of the ATTCP application showing the changes in underline and strikeout format.

1.2. **Substantive Changes.** A substantive change is a change that substantively alters the requirements of the application materials for the ATTCP, ATT, or ATE. A substantive change includes, but is not limited to, any changes to training, database provider, certification, or oversight (including quality assurance) that would result in any impact to consumers, ATTs, ATEs, or the ability of the ATTCP to comply with any requirement of Section 103.2.3 *[Section 10-103.2(c)]*. For amendments making any substantive changes, the ATTCP shall submit the following:

1.2.1. A document describing the scope of the change to the application, the reason for the change and the potential impact to the ATTCP, ATT, and ATE as an addendum to the application;

1.2.2. A replacement copy of the affected sections of the ATTCP application with the changes incorporated; and

1.2.3. A copy of the affected sections of the ATTCP application showing the changes in underline and strikeout format.

2. **Amendment Review.** Amendments submitted prior to approval of an ATTCP application shall be included in the application's Application Review and Determination process specified in Section 103.2.5 *[Section 10-103.2(e)]*.

Amendments submitted after approval of an ATTCP's application that contain only nonsubstantive changes shall be reviewed by the *Executive Director* for consistency with Section 103.2 *[Section 10-103.2]*. Amendments determined to be consistent with this Section shall be incorporated into the approval as errata.

Amendments submitted after approval of an ATTCP's application that contain any substantive changes shall be subject to the Application Review and Determination process specified in Section 103.2.5 *[Section 10-103.2(e)]*. If the *Energy Commission* finds that the amended application does not meet the requirements of Section 103.2 *[Section 10-103.2]*, then the ATTCP shall either abide by the terms of their previously approved application or have their approval suspended.

103.2.7 *[Part 1, 10-103.2(g)]* ~~**(g)**~~ **Review by the Energy Commission.**

If the *Energy Commission* determines there is a violation of these regulations or that an ATTCP is no longer providing adequate certification services, the *Energy Commission* may revoke the authorization of the ATTCP pursuant to Section 1230 et. seq. of Title 20 of the California Code of Regulations.

103.3 *[Part 1, 10-103.3]* Administrative procedures for the Energy Code Compliance Program.

103.3.1 *[Part 1, 10-103.3(a)]* Scope.

The requirements in this section apply to ECC-Providers, ECC-Raters, and ECC-Rater Companies performing work relating to *single-family, multifamily use designations* ~~residential~~ field verification and diagnostic testing for the Energy Code Compliance (ECC) Program. The ECC Program is

intended to verify that the newly constructed *single-family, multifamily use designations* ~~residential buildings~~ and *additions* and *alterations* to existing *single-family, multifamily use designations* ~~residential buildings~~ comply with the requirements of the Energy Code ~~Building Energy Efficiency Standards~~ in order to protect consumers from poor construction and installations.

103.3.2 *[Part 1, 10-103.3(b)]* **General Provisions.**

1. **Conflicts of Interest**.

1.1. **Prohibition of Conflicts of Interest**.

1.1.1. ECC-Providers shall be independent from, and have no financial interest in, ECC-Rater Companies or ECC-Raters.

1.1.2. ECC-Providers, ECC-Raters, and ECC-Rater Companies shall operate independently and shall not have any financial interest in the builder, designer, or subcontractor serving as the "Responsible Person" signatory as specified in Section 100.5.1.1 and 100.5.1.2 *[Sections 10-103(a)1 and 10-103(a)3]* on a project. However, an exception applies if the ECC-Rater Company submits a Declaration of ECC-Rater Company Separation of Services, as provided in Section 103.3.6 Item 2.3.3 *[Section 10-103.3(f)2Diii]*. This applies specifically to projects where the ECC-Rater is involved in, or is reasonably expected to provide, field verification and diagnostic testing services.

1.1.3. For the purposes of this subdivision, a "financial interest" includes:

1.1.3.1. a business entity in which the entity or individual has a direct or indirect investment worth $2,000 or more, or in which the entity or individual is a director, officer, partner, trustee, or employee. However, this prohibition on investments does not include ownership of less than five percent of a publicly traded company.

1.1.3.2. an ownership interest, debt agreement, or employer/employee relationship.

1.1.4. ECC-Providers, ECC-Raters, and ECC-Rater Companies or principals of an ECC-Provider or ECC-Rater Company shall not perform field verification or diagnostic testing services for builders, designers, or subcontractors owned or operated by close familial relatives. For purposes of this subdivision, "close familial relative" means a spouse, domestic partner, or cohabitation partner or a parent, grandparent (including greats), sibling, child, grandchild (including greats) of the individual or spouse, domestic partner, or cohabitation partner, and any person living in the same household.

1.1.5. ECC-Raters and ECC-Rater Companies shall not perform any construction activity on a project site for which a construction permit is issued and for which they will or are reasonably expected to perform field verification or diagnostic testing services.

1.1.6. ECC-Raters or ECC-Rater Companies shall provide a report to the *building* or project owner for field verification or diagnostic testing services performed on the

project site. The report may be provided through a contractor or other project representative to the *building* or project owner but must be a conspicuous and separate document from other documents provided by the contractor or project representative. The report must include all of the following elements:

1.1.6.1. The ECC-Rater's or ECC-Rater Company's name, logo (if any), contact information, and certification number.

1.1.6.2. The ECC-Provider data registry link and registry numbers for all compliance documents registered by the ECC-Rater or ECC-Rater Company for the project.

1.1.6.3. An itemization of each field verification or diagnostic test, as well as any other services performed for the project, the amount charged, and the results in terms of pass or fail.

1.1.7. The ECC-Provider shall develop a Consumer Information Form, and the *Energy Commission* may request to review and provide recommendations on the content of that form. The Consumer Information Form shall include educational materials regarding the ECC Program, the roles and responsibilities of ECC-Raters, ECC-Providers and ECC-Rater Companies, and the means by which the owner may file a complaint. The Consumer Information Form must also include the owner's valid contact information, comprised of the owner's name, project address, phone number, and email. Prior to the start of any field verification or diagnostic testing at a project site, the ECC-Rater or ECC-Rater Company shall provide a copy of the most recent version of the Consumer Information Form developed by the ECC-Provider to the owner or owner representative and shall submit a completed Consumer Information Form to the ECC-Provider. Failure to register a valid Consumer Information Form will make the ECC-Rater or ECC-Rater Company subject to discipline as described in Section 103.3.4 Items 7 and 8 *[Sections 10-103.3(d)7 and 10-103.3(d)8]*. For projects with no current owner in residence, the owner's contact information may be that of the landlord, developer, builder, or any other such person with a real property interest. For the purposes of a Consumer Information Form, register is defined as submitting the information outlined in this paragraph to the ECC-Provider.

1.1.8. Once an ECC-Rater has registered a failed field verification or diagnostic test, that ECC-Rater or ECC-Rater Company (or Independent Rater) shall become the ECC-Rater of Record (ROR) for the specific field verification or diagnostic test at the project site. If the ROR is an ECC-Rater Company or Independent Rater, then the ROR may be replaced by any ECC-Rater that is a fulltime employee of the ECC-Rater Company or Independent Rater and in good standing with the ECC-Provider. Except as provided in subdivision (a) below, only the ROR may register a subsequent passing field verification or diagnostic test previously registered as a failure.

1.1.8.1 Under any of the following circumstances, the ECC-Provider may release a project from the ROR but must verify that the retest for the failed field verification or diagnostic test is legitimate either through a site visit,

photographic evidence (or other remote verification), or a desk audit (Section 103.3.4 Item 5.3.3) *[(Section 10-103.3(d)5Civ)]* on the project:

1.1.8.1.1 The ROR agrees to release the project.

1.1.8.1.2 The ROR is physically unable to continue work on the project due to injury, misfortune, or availability.

1.1.8.1.3 The ROR's certification has been suspended (Section 103.3.4 Item 7.3) *[(Section 10-103.3(d)7C)]* or decertified (Section 103.3.4 Item 7.4) *[(Section 10-103.3(d)7D)]*.

1.1.8.1.4 The ROR is unwilling to continue work on the project.

1.1.8.2 The ECC-Provider shall lock the project compliance documentation within the data registry by address, permit number, or other reasonable means and shall not allow any further compliance documents to be registered for a failed test at the project site other than from the ROR or allowable substitute under Section 103.3.2 Item 1.1.8.1 *[Section 10-103.3(b)1Aviiia]*.

1.1.8.3 An ECC-Provider shall not knowingly accept compliance documents for registration for a project that has an active failed field verification or diagnostic tests in any other ECC-Provider data registry.

1.1.8.3.1 ECC-Providers shall submit a complaint to the *Energy Commission* Section 103.3.4 Item 6.2 *[(Section 10-103.3(d)6B)]* upon suspected violation of this requirement.

1.1.8.3.2 Upon investigation, the *Energy Commission* may take disciplinary action against an ECC-Provider (Section 103.3.4 Item 15 *[(Section 10-103.3(d)15)]* if the CEC can demonstrate noncompliance or recommend disciplinary action against an ECC-Rater or ECC-Rater Company (Section 103.3.4 Items 7 and 8 *[(Sections 10-103.3(d)7 and 10-103.3(d)8)]*.

1.1.8.3.3 The ECC Rater shall capture one photograph while physically present at the project site. The photograph must be registered with the failed field verification or diagnostic test. The photograph shall conform to all of the following:

1.1.8.3.3.1 The ECC Rater must be clearly identifiable.

1.1.8.3.3.2 The photograph must be taken at or adjacent to the project site.

1.1.8.3.3.3 The photograph must include at least one background element recognizable at the project site.

1.1.8.3.3.4 The photograph must be geotagged and timestamped.

1.1.9 **Use of Registered Certificates**. The use of registered certificates, including Certificates of Compliance, Certificates of Installation, and Certificates of Verification, is limited to the demonstration and documentation of the project compliance with the ~~Building Energy Efficiency Standards~~Energy Code. Other uses of registered certificates, such as for federal tax credits, is only permitted for projects that have been completed and are closed within the data registry.

1.2 **Conflicted Data**. The prohibitions on conflicts of interest specified in Section 103.3.2 Item 1.1 *[Section 10-103.3(b)1A]* apply to any data collected by an ECC-Rater. Any data collected by an ECC-Rater when they have a conflict of interest, regardless of its accuracy, shall be considered conflicted data. Any data collected through sampling procedures (~~Building Energy Efficiency Standards~~Energy Code, Reference Appendix RA2.6) where the ECC-Provider is refused access to perform an onsite quality assurance audit (Section 103.3.4 Item 5.3.1) *[(Section 10-103.3(d)5Ci)]* shall be considered conflicted data.

1.2.8 ECC-Providers shall not knowingly accept conflicted data on their systems. ECC-Providers may demonstrate that they have fulfilled this requirement by, for example:

1.2.8.1 Requiring ECC-Raters to affirmatively indicate, upon submitting any data to the ECC-Provider, that the data is not conflicted data or that the ECC-Rater had a conflict of interest at the time the data was collected but had express written approval from the *Executive Director* waiving the conflict of the ECC-Rater.

1.2.8.2 Any other process approved by the CEC.

1.2.9 ECC-Providers shall take all reasonable steps to detect, deter, isolate, and identify conflicted data in their systems, including in compliance documents and Compliance Registration Packages. ECC-Providers may demonstrate that they have taken all reasonable steps, for example:

1.2.9.1 Requiring ECC-Raters to complete training, prior to certification, regarding the requirements of Section 103.3.2 Item 1.1 *[Section 10-103.3(b)1A]*, including that it applies to data, or by some other reasonable method to deter conflicted data.

1.2.9.2 Instituting a desk audit program that assesses data submitted to the ECC-Provider pursuant to Section 103.3.4 Item 5.3.4 *[Section 10-103.3(d)5Civ]* to confirm whether the submitting ECC-Rater had a disqualifying conflict of interest pursuant to Section 103.3.2 Item 1.1 *[Section 10-103.3(b)1A]* at the time of the data's submission, or by some other reasonable method to detect conflicted data.

1.2.9.3 Investigating and, as necessary, quarantining or marking conflicted data, or otherwise identifying that data as conflicted, including pursuant to Section 103.3.2 Item 1.2.6 *[Section 10-103.3(b)1Bvi]*.

1.2.9.4 Any other process approved by the CEC.

1.2.10 ECC-Providers may not use, rely on, sell, or offer for sale, any conflicted data for any purpose other than to detect, deter, isolate, and identify conflicted data from their systems, or to otherwise prevent the generation or transmission of conflicted data.

1.2.11 ECC-Raters and ECC-Rater Companies may not submit any conflicted data without the express written approval of the *Executive Director*. ECC-Raters and ECC-Rater Companies may fulfill this requirement by, for example:

1.2.11.1 Affirmatively indicating, upon submitting any data to the ECC-Provider, that the data is not conflicted data, or that the ECC-Rater or ECC-Rater Company had a conflict of interest at the time the data was collected but had express written approval from the *Executive Director* excusing the conflict.

1.2.11.2 Any other process approved by the CEC.

1.2.12 Any ECC-Rater or ECC-Rater Company may apply to the *Executive Director* for express written approval excusing a conflict of interest under this section.

1.2.12.1 Such an application must include the following information: an explanation of the conflict of interest, the beginning and ending date of the conflict of interest (if any), and written justification providing compelling and persuasive evidence that (1) the conflict of interest will not result in inaccurate data and (2) unnecessary hardship will result from the application of the prohibition on conflicted data in this instance.

1.2.12.2 The *Executive Director* may grant such written approval only if the *Executive Director* finds there is compelling and persuasive evidence of the factors identified in Section 103.3.2 Item 1.2.5.1 *[Section 10-103.3(b)1Bva]*.

1.2.12.3 Unsupported or general assertions of trustworthiness or accuracy are neither compelling nor persuasive evidence of the factors identified in Section 103.3.2 Item 1.2.5.1 *[Section 10-103.3(b)1Bva]*.

1.2.12.4 The *Executive Director* may, at their discretion, request additional information, provide express written approval, provide conditional express written approval, or reject the request. If an applicant does not receive a reply within 120 calendar days, their request is denied.

1.2.13 Upon identifying data that may be conflicted, the ECC-Provider shall perform a desk audit to assess whether the data is in fact conflicted data, such as by contacting the submitting ECC-Rater or ECC-Rater Company and asking them to confirm, in writing, whether the data was conflicted or not. Upon discovery of a violation of the conflict-of-interest restrictions in Section 103.3.2 Item 1.1 *[Section 10-103.3(b)1A],* the ECC-Provider shall use this gathered information to initiate disciplinary action against either (or both) the ECC-Rater (Section 103.3.4 Item 7)

[(Section 10-103.3(d)7)] and ECC-Rater Company (Section 103.3.4 Item 8) *[(Section 10-103.3(d)8)]* responsible for the registered data in question.

1.2.14 ECC-Providers shall flag or otherwise mark verified conflicted data (Section 103.3.2 Item 1.2.6) *[(Section 10-103.3(b)1Bvi)]* in the data registry and inform all of the following of the identification of the data and which field verification and diagnostic tests reliant on the data are invalidated: the homeowner, ECC-Rater, ECC-Rater Company, authority having jurisdiction over the issued construction permit, and the *Energy Commission*.

2. **Prohibition on False, Inaccurate, or Incomplete Information**

2.1 ECC-Providers shall not knowingly accept, store, or disseminate untrue, inaccurate, or incomplete information or information received through actions not conducted in compliance with these regulations, including information related to field verification and diagnostic testing information, field verification and diagnostic test results, or results on a certificate of compliance or certificate of installation documents.

2.2 ECC-Providers shall not accept payment or other consideration in exchange for use of their data registry to report a field verification and diagnostic test result that was knowingly conducted and reported out of compliance with these regulations.

2.3 Only the ECC-Rater who performs a field verification and diagnostic test shall have signatory authority for all certificates of verification related to the field verification and diagnostic test.

2.3.8 ECC-Raters shall not use technicians who are not certified ECC-Raters to perform field verification and diagnostic testing unless said technicians are directly supervised by the ECC-Rater in person on the project site.

2.3.9 No other person shall sign the certificates of verification other than the ECC-Rater who preformed or directly supervised technicians who performed the field verification and diagnostic test.

103.3.3 *[Part 1, 10-103.3(c)]* **ECC-Provider ~~Approval~~approval.**

1. **Approval Process**. Approval as an ECC-Provider is limited to a single Triennial Code Cycle. To become an ECC-Provider, an applicant shall submit a Full Application. To continue as an ECC-Provider for a subsequent Triennial Code Cycle, a current ECC-Provider shall submit a Triennial Reapproval Application. Applications will be considered pursuant to the procedures in Title 24, *Part 1,* Section 10-110. A Full Application or a Triennial Reapproval Application may be updated as set forth in Section 103.3.3 Item 6 *[Section 10-103.3(c)6]*. An approved ECC-Provider may make modifications to its application as set forth in Section 103.3.3 Item 7 *[Section 10-103.3(c)7]*. All applications must include a statement of scope that indicates what services the applicant intends to provide to the marketplace. Upon a first-time approval of an ECC-Provider, the *Energy Commission* shall assign the ECC-Provider a three-digit identification number.

2. **Confidential Information.** An applicant may identify any information in its application the applicant considers confidential and request from the *Energy Commission* a confidential designation as specified in Title 20, California Code of Regulations, Section 2505. If an applicant

requests a designation of confidential information, the applicant shall also submit a non-confidential summary of its application.

3. **Full Application.** The *Energy Commission* may approve a full application to become an ECC-Provider if the application includes each of the following:

   3.1. **Evidence of Ability to Satisfy ECC-Provider Requirements**. Information sufficient to demonstrate, by a preponderance of the evidence, that the applicant can and will satisfy each regulatory requirement specified as the ECC-Provider Approval Process in Section 103.3.3 Item 1 *[Section 10-103.3(c)1]* for the duration of their tenure as an ECC-Provider.

      3.1.1. **Methods of Producing Evidence**. An applicant may evidence its ability to satisfy the ECC-Provider Requirements by providing a written strategy for how it intends to satisfy each requirement, citing examples of how it has been able to satisfy each regulatory requirement, or by any other means of introducing evidence into the record acceptable to the *Executive Director* or *Energy Commission*.

      3.1.2. **Disputed Evidence.** Any interested party may introduce evidence demonstrating that an applicant either cannot satisfy, or in the past has failed to satisfy, one or more regulatory requirements specified in Section 103.3.3 Item 1 *[Section 10-103.3(c)1]*.

   3.2. The full legal name of the applicant is registered with the California Secretary of State.

   3.3. The full legal name, date of birth, current residential address, and social security number of every individual with an ownership interest in and principal of the ECC-Provider applicant.

   3.4. A complete list of any entities that have business relationships with the applicant such as parent companies, subsidiaries, affiliates, and/or any past names under which the entity has conducted business as an ECC-Provider, if applicable.

   3.5. The Triennial Code Cycle for which the applicant intends to operate as an ECC-Provider.

   3.6. The contact information for one or more Designated Contacts who the *Energy Commission* can contact as needed.

   3.7. Any other information relating to the applicant's ability to satisfy each regulatory requirement specified in Section 103.3.3 Item 1 *[Section 10-103.3(c)1]* or specifically requested by the *Executive Director* or *Energy Commission*.

4. **Triennial Reapproval Application**. The *Energy Commission* may approve an existing ECC-Provider's application to continue as an ECC-Provider for a subsequent Triennial Code Cycle if the application includes each of the following:

   4.1. The original Full Application for the previous cycle, any Updated Applications, including Conditions of Approval, and any Post-Approval Amendments that were submitted and/or approved.

   4.2. All previously submitted and approved Triennial Reapproval, if any.

4.3. Information demonstrating that the applicant can and will satisfy each regulatory requirement not otherwise addressed in any previously approved Application, subject to the same evidentiary constraints and requirements as a Full Application.

4.4. Alternatively, an existing ECC-Provider may submit a full Application for the Triennial Code Cycle.

5. **Application for Remediation**.

5.1. An ECC-Provider that has been decertified may submit one Application for Remediation pursuant to Title 24, *Part 1*, Section 10-110 during the Triennial Code Cycle in which it was decertified.

5.2. An Application for Remediation shall include:

5.2.1. The original Full Application, all previously submitted and approved Triennial Reapprovals, any Updated Applications, including Conditions of Certification, and any Post-Approval Amendments that were submitted and/or approved.

5.2.2. All correspondence concerning progressive discipline between the ECC-Provider and the *Energy Commission* commencing with the notice of potential violation for each violation that led to rescinding approval.

5.2.3. A Remediation Report and Plan explaining why each violation leading to a rescinded approval occurred and the steps that the ECC-Provider has taken to remedy past violations and prevent future violations similar to those that led to its rescinded approval.

5.2.4. A draft Full Application that incorporates all necessary modifications to address the issues described in the Remediation Report and Plan.

5.3. **Basis for Approval**. The *Energy Commission* may approve an Application for Remediation if the *Energy Commission* finds:

5.3.1. The decertified ECC-Provider has demonstrated a good faith willingness to take feasible steps toward remediation.

5.3.2. The decertified ECC-Provider has presented a remediation plan that can remedy past violations and prevent future violations similar to those that led to its rescinded approval.

5.3.3. The decertified ECC-Provider has demonstrated the ability to adequately implement the remediation plan.

5.4. **Upon Approval.** If the decertified ECC-Provider's Application for Remediation is approved by the *Energy Commission*, the decertified ECC-Provider is eligible to submit a Full Application.

5.5. **Upon Rejection**. If a decertified ECC-Provider's Application for Remediation is rejected by the *Energy Commission*, the ECC-Provider may re-submit an Application for Remediation only with the written approval of the *Executive Director* or *Energy Commission*.

6. **Updated Application**.

6.1. **Update with *Executive Director*'s Approval**. With the written permission of the *Executive Director*, at any point during the Title 24, *Part 1*, Section 10-110 process, an applicant may submit an updated application, which shall be identified as an Updated Application and made available to interested parties for review and comment for at least 30 days prior to consideration by the *Energy Commission* at a business meeting.

6.2. **Update at *Energy Commission* Direction, Conditions of Approval.** The *Executive Director* or *Energy Commission* may direct an applicant to update their application in order to address any issues or concerns raised by any interested party with respect to the applicant's ability to completely fulfil the role of ECC-Provider, including by imposing Conditions of Approval.

6.3. **Applicant Withdrawal and Re-submission**. Applicants who have submitted an application may withdraw their application at any time before approval and may submit a new application pursuant to this section and Title 24, *Part 1*, Section 10-110.

7. **Post-Approval Amendments**. An approved ECC-Provider shall submit a Post-Approval Amendment to the *Executive Director* when the ECC-Provider wishes to make a modification to their approved application or, as a result of any circumstances other than the transition to a new Triennial Code Cycle or progressive discipline pursuant to Section 103.3.3 Item 3 *[Section 10-103.3(c)3]*, or the application no longer accurately reflects the ECC-Provider's operations.

7.1. ***Process***. The ECC-Provider may submit a Post-Approval Amendment as either substantive or non-substantive. The *Executive Director* may determine whether a post-approval amendment is substantive or non-substantive.

7.2. **Substantive**. If the *Executive Director* determines that a post-approval amendment is substantive, the amendment shall follow the process specified by Title 24, *Part 1*, Section 10-110 and be approved by the *Energy Commission*. Substantive changes include any changes to training, certification, or oversight (including quality assurance) that would result in any impact to consumers, ECC-Raters, ECC-Rater Companies, or the ability of the ECC-Provider to comply with any requirement of Section 103.3.3 Item 1 *[Section 10-103.3(c)1]*.

7.3. **Nonsubstantive**. If the *Executive Director* determines that a post-approval amendment is nonsubstantive, they may approve the amendment by informing the ECC-Provider's Designated Contact and posting the proposed post-approval amendment application. A non-substantive update is any change that is not considered a substantive update, including correcting typographical errors, modifying contact information, renaming positions or programs, and making changes that do not impact consumers, ECC-Raters, ECC-Rater Companies, or alter the ability of the ECC-Provider to comply with any requirement of Section 103.3.3 Item 1 *[Section 10-103.3(c)1]*.

8. **Conditions of Approval**. As a prerequisite of approval of any ECC-Provider application, the *Energy Commission* may impose Conditions of Approval as the *Energy Commission* deems necessary to ensure that the applicant can meet the requirements of Section 103.3.3 Item 1 *[Section 10-103.3(c)1]* if approved. If the *Energy Commission* imposes Conditions of Approval, the *Energy Commission* may require the applicant to demonstrate that the applicant will satisfy each Condition of Approval prior to approval. Violating a Condition of Approval imposed by the

Energy Commission shall constitute a violation of these regulations and may result in disciplinary action, up to and including rescinding of approval.

9. ***Executive Director*** **Rejection of Decertified ECC-Provider's Application**.

   9.1. The *Executive Director* may reject any application if the *Executive Director* determines the applicant is an ECC-Provider that has previously been decertified, or is a successor, subsidiary, or otherwise affiliated or substantially similar organization to an ECC-Provider that has previously been decertified, and that has not completed the Application for Remediation process pursuant to Section 103.3.3 Item 5 *[Section 10-103.3(c)5]*.

   9.2. An applicant may appeal the *Executive Director*'s decision to reject its application to the full *Energy Commission* pursuant to Section 103.3.8 *[Section 10-103.3(h)]*. The applicant shall establish that it is not a decertified ECC-Provider, successor, subsidiary, or otherwise affiliated or similar organization to a decertified ECC-Provider.

   9.3. **Minimum Evidentiary Requirements**. At a minimum, an appeal from rejection shall demonstrate that the applicant and decertified ECC-Provider have dissimilar and unrelated owners, shareholders (if applicable), executive management, employees, physical assets, intangible assets, intellectual property, business practices, registered organization names, branding, marketing materials, and trademarks.

   9.4. **Final Agency Action**. If the *Energy Commission* determines that the applicant has failed to demonstrate it is not a decertified ECC-Provider, or any successor, subsidiary, or otherwise affiliated or substantially similar organization to a decertified ECC-Provider, the *Energy Commission* may deem the applicant a decertified ECC-Provider ineligible to apply until the applicant has completed remediation or specify when the applicant may re-submit an application. The period of time before re-submittal may not exceed three years from when the appeal was submitted.

103.3.4 *[Part 1, 10-103.3(d)]* **ECC-Provider ~~Responsibilities~~responsibilities.**

1. **ECC-Rater Training**. For each Triennial Code Cycle, ECC-Providers shall provide training to existing ECC-Raters and new ECC-Rater applicants. The ECC-Provider may also provide this training for prior Triennial Code Cycles. To fulfill the training requirements (Section 103.3.4) *[(Section 10-103.3(d))]*, an ECC-Provider shall confirm that an ECC-Rater applicant has completed a training curriculum that covers all information necessary to perform all FV&DTs in accordance with the applicable ~~Building Energy Efficiency Standards~~Energy Code and passed all associated tests. Alternatively, if offered by the ECC-Provider, an existing ECC-Rater may apply for approval without completing an ECC-Provider's training curriculum by passing a challenge test, which is a comprehensive test of advanced FV&DT technical knowledge that verifies the ECC-Rater applicant has sufficient knowledge necessary to perform FV&DT in accordance with the applicable ~~Building Energy Efficiency Standards~~parts of the Energy Code. The *Energy Commission* shall approve all training materials under the full training curriculum and challenge test as part of the ECC-Provider's application (Section 103.3.2) *[(Section 10-103.3(b))]*.

   1.1. **Training and testing curriculum**. An ECC-Provider's training curriculum for ECC-Rater applicants must include the following:

1.1.1. **Energy Code ~~Building Energy Efficiency Standards~~ mandatory subject areas**. The training curriculum shall instruct ECC-Raters how to perform FV&DT as set forth in the following ~~Building Energy Efficiency Standards~~the Energy Code, *Reference Appendices*:

1.1.1.1. RA1: Alternative Residential Field Verification and Diagnostic Test Protocols

1.1.1.2. RA2: Residential Verification, Testing, and Documentation Procedures

1.1.1.3. RA3: Residential Field Verification and Diagnostic Test Protocols

1.1.1.4. RA4: Eligibility Criteria for Energy Efficiency Measures

1.1.1.5. NA1: Nonresidential Verification, Testing, and Documentation Procedures

1.1.1.6. NA2: Nonresidential Field Verification and Diagnostic Test Procedures

1.1.2. **Other mandatory subject areas**. The training curriculum shall inform ECC-Rater applicants about:

1.1.2.1. The roles and responsibilities of all entities regulated by Section 103.3 *[Section 10-103.3]* and in the ~~Building Energy Efficiency Standards,~~Energy Code, *Reference Appendices* RA1, RA2, RA3, RA4, NA1, NA2, and JA7.

1.1.2.2. Energy Code nomenclature that designates *building* types, *dwelling units*, systems, and compliance methods.

1.1.2.3. Basic *building* science concepts, including:

1.1.2.3.1. Principles of heat transfer.

1.1.2.3.2. Energy conservation features.

1.1.2.3.3. Framing, *fenestration*, insulation, and other built or installed features.

1.1.2.3.4. Energy consuming appliances.

1.1.2.3.5. Types of space conditioning and ventilating systems.

1.1.2.3.6. Types of water heating systems.

1.1.2.3.7. Categories of *lighting* systems and *lighting* controls.

1.1.2.3.8. Energy generating and storage systems.

1.1.2.3.9. Energy efficiency effects of *building* characteristics.

1.1.2.4. Worksite safety.

1.1.2.4.1. Personal protective equipment and appropriate dress.

1.1.2.4.2. Communication with site management personnel.

1.1.2.4.3. Awareness of site hazards (including asbestos, fall risks, lifted loads, confined spaces, vehicles, powered

equipment and tools, pressurized vessels and pipes, electrical terminals and fixtures, etc.), occupants in the *dwelling unit*, and escape routes.

1.1.2.4.4. Site security.

1.1.2.4.5. Other practices, not limited to those relevant to home energy testing and verification procedures and equipment.

1.1.2.5. Instrumentation.

1.1.2.5.1. Diagnostic devices used in the measurement of, but not limited to, duct leakage testing, *dwelling unit* leakage (blower doors), system air flow and pressure, and refrigerant pressure and temperature.

1.1.2.5.2. Accuracy and tolerance.

1.1.2.5.3. Calibration requirements.

1.1.2.6. Equipment certification.

1.1.2.6.1. Overview of manufacturer-certified equipment ratings.

1.1.2.6.2. When and why certification applies for verification.

1.1.2.6.3. Where to find specified certifications and ratings.

1.1.2.7. Compliance document and registration.

1.1.2.7.1. ~~Building Energy Efficiency Standards~~Energy Code regulations, associated testing protocols, and the corresponding forms for data entry.

1.1.2.7.2. Documentation workflow and data input.

1.1.2.7.3. Form logic and validation.

1.1.2.7.4. Group sampling.

1.1.2.8. Professionalism and conduct when working with various trades, owners, and other site personnel.

1.1.2.9. Resources available on the *Energy Commission* website related to the Energy Code ~~Building Energy Efficiency Standards~~.

1.1.2.10. Progressive discipline of ECC-Raters (Section 103.3.4 Item 7) *[(Section 10-103.3(d)7)]* and the appeal process (Section 103.3.8 *[(Section 10-103.3(h))]*.

1.1.2.11. Quality assurance process Section 103.3.4 Item 5 *[(Section 10-103.3(d)5)]*.

1.1.2.12. Conflict of interest requirements Section 103.3.2 Item 1) *[(Section 10-103.3(b)1)]*.

1.1.2.13. Prohibition on False, Inaccurate, or Incomplete Information (Section 103.3.2 Item 2 *[(Section 10-103.3(b)2)]*.

1.1.3. **Classroom Training**. Classroom training shall include an electronic or hardcopy manual for each student and comply with the following requirements:

1.1.3.1. Classroom training may be provided online or in person and may be taught by an in-person instructor, an online instructor or online proctoring software as provided in Section 103.3.4 Item 1.1.8 *[Section 10-103.3(d)1Aviii]*.

1.1.3.2. When administered online, the modules must be naturally paced, recorded, and played back no faster than 100 percent speed. Modules must require occasional student interaction not limited to brief quizzes to progress through topics and encourage engagement with the platform.

1.1.3.3. Classroom training may include pre-recorded video instructions but must not solely rely on pre-recorded videos.

1.1.3.4. Classroom training may use mock tests or exams, but mock tests or exams may not be used to comply with the Tests and Exams requirements in Section 103.3.4 Item 1.1.6 *[Section 10-103.3(d)1Avi]*.

1.1.4. **Instructional Materials.**

1.1.4.1. The materials shall address all topics listed in Section 103.3.4 Items 1.1.1 and 1.1.2 *[Sections 10-103.3(d)1Ai and 10-103.3(d)1Aii]*.

1.1.4.2. Materials that are presented in a slideshow format must be accompanied by a script or detailed outline that explains the narrative and the purpose of each visual.

1.1.4.3. Slide text and graphics must be legible.

1.1.4.4. Governmental logos must not appear on class materials (including course descriptions, web pages, slides, videos, handouts, and manuals) unless the department, office, or agency has given permission to do so, and then only if usage adheres to respective guidelines. The logo may appear without express permission on official publications whether distributed in whole or in part.

1.1.5. **Laboratory Training**. Laboratory training shall cover all FV&DT procedures listed in ~~Building Energy Efficiency Standards Reference~~Energy Code, Appendices RA1, RA2, RA3, RA4, NA1, and NA2 and comply with the following requirements:

1.1.5.1. All laboratory training facilities shall be designed to provide consistent and repeatable practical training exercises and be approved in advance by the *Energy Commission*.

1.1.5.2. Laboratory training shall be conducted in a controlled space with appropriate safety measures such as proper ventilation, safe egress,

appropriate *lighting*, and fire response systems. Laboratory training must not be conducted in an occupied residence.

1.1.5.3. All laboratory training shall be in person and be supervised by an instructor with no more than ten students to one instructor. Laboratory instruction shall include an electronic or hardcopy manual for each student.

1.1.5.4. Any equipment necessary to complete the laboratory training shall be available to students at a ratio of no greater than one test equipment per five students. Each student shall perform the laboratory training independently with full access to the necessary equipment.

1.1.6. **Written test**. An ECC-Rater applicant shall take a written test, offered by an ECC-Provider, to confirm the applicant's understanding of all mandatory training information specified in Section 103.3.4 Items 1.1.1 and 1.1.2 *[Sections 10-103.3(d)1Ai and 10-103.3(d)1Aii]*. Tests shall only be used to verify the knowledge of ECC-Rater applicants and may not be used for training purposes. ECC-Providers shall retain all results for five years from the date of the test. The written test shall comply with all of the following:

1.1.6.1. Be online using proctoring software Section 103.3.4 Item 1.1.7 *[(Section 10-103.3(d)1Avii)]* or in person using a live proctor.

1.1.6.2. Consist of between 10 and 100 questions per subject area specified in Section 103.3.4 Items 1.1.1 and 1.1.2 *[Sections 10-103.3(d)1Ai and 10-103.3(d)1Aii]*.

1.1.6.3. Require a passing score of no less than 70 percent.

1.1.6.4. Be approved by the *Energy Commission* at the time of ECC-Provider application (Section 103.3.3 Item 1) *[(Section 10-103.3(c)1)]*.

1.1.7. **Practical test**. ECC-Rater applicants shall take a practical test offered by an ECC-Provider to demonstrate competence in all subjects specified in Section 103.3.4 Items 1.1.1 and 1.1.2 *[Sections 10-103.3(d)1Ai and 10-103.3(d)1Aii]* as they apply to the performance of FV&DT procedures. The ECC-Provider shall retain all results for five years from the date of the test. The practical test shall comply with the following:

1.1.7.1. All practical tests shall be performed in any *Energy Commission* approved facility as required by the Laboratory Training Requirements in Section 103.3.4 Item 1.1.4 *[Section 10-103.3(d)1Aiv]*.

1.1.7.2. All practical tests shall be in-person only using a live proctor with no more than five test takers to one proctor.

1.1.7.3. Any equipment required to complete the practical test shall be made available to each test taker. Test takers shall not work in teams to complete any portion of the practical test.

1.1.7.4. All practical tests shall be approved by the *Energy Commission* by demonstration during the application process (Section 103.3.3 Item 1) *[(Section 10-103.3(c)1)]*.

1.1.8. **Proctoring Software**. Any proctoring software or learning management system that includes proctoring features used for training and exams shall be approved in advance by the *Energy Commission* and comply with the following:

1.1.8.1. Proctoring software for training or exams must be time limited.

1.1.8.2. Proctoring software shall monitor the computer desktop, webcam video, and audio of the individual completing the training or exam. The proctoring software, including any interactions with a proctoring service, shall take reasonable steps to detect the use of prohibited outside resources on the exam, and return a failing grade if the use of prohibited outside resources are in fact detected.

1.2. **Challenge Test**. An ECC-Provider may also offer challenge testing that evaluates competence in all subjects specified in Section 103.3.4 Items 1.1.1 and 1.1.2 *[Sections 10-103.3(d)1Ai and 10-103.3(d)1Aii]*. If a challenge test is used it must comply with the following requirements:

1.2.1. Only an ECC-Rater with a current and valid certification shall be eligible to sit for a challenge test. ECC-Raters with a suspended certification are not eligible.

1.2.2. The challenge test shall include a written test to be taken using a live proctor.

1.2.3. The challenge test shall include no less than 100 and no more than 1,000 questions prepared by the ECC-Provider.

1.2.4. The challenge test shall comply with all requirements in Section 103.3.4 Item 1.1.6 *[Section 10-103.3(d)1Avi]*.

1.3. **Training and Testing for Subsequent Triennial Code Cycle Updates**. An ECC-Provider shall provide training to previously certified ECC-Raters on changes made during any Triennial Code Cycle update that would affect the performance of field verification and diagnostic testing, including changes that would trigger testing or in testing procedures. The Triennial Code Cycle Update training and testing shall comply with all Section 103.3.4 Item 1.1 *[Section 10-103.3(d)1A]* requirements. ECC-Providers may offer a challenge test in compliance with Section 103.3.4 Item 1.2 *[Section 10-103.3(d)1B]*. Laboratory training Section 103.3.4 Item 1.1.4 *[(Section 10-103.3(d)1Aiv)]* and practical testing Section 103.3.4 Item 1.1.7 *[(Section 10-103.3(d)1Avii)]* shall only be required if changes made during any Triennial Code Cycle include modifications or new diagnostic test procedures or field verifications.

2. **ECC-Rater Certification.**

2.1. **Certification Requirements.** Certification as an ECC-Rater is limited to a single Triennial Code Cycle. The ECC-Provider shall record each Triennial Code Cycle for which an individual ECC-Rater has been certified to provide field verification and diagnostic test services. For each Triennial Code Cycle, an ECC-Provider shall certify an eligible ECC-Rater

applicant who meets the minimum requirements for an ECC-Rater, as verified by the ECC-Provider, and completes and passes all training requirements. Prior to certification, an ECC-Provider shall advise the ECC-Rater applicant on the required conduct for ECC-Raters in Section 103.3.5 *[Section 10-103.3(e)]*, the progressive discipline requirements in Section 103.3.4 Item 7 *[Section 10-103.3(d)7]*, and the appeal process in Section 103.3.8 *[Section 10-103.3(h)]*.

2.2. **Certification Agreement**. Prior to certification, the ECC-Provider shall ensure that the applicant signs the ECC-Rater Agreement with the ECC-Provider, in which the ECC-Rater shall agree, at minimum, to comply with all applicable laws and regulations, including the requirements provided in Section 103.3 *[Section 10-103.3]*, and shall maintain a copy of the signed agreement.

2.3. **Eligibility.** An ECC-Rater is eligible if they have not been prohibited from practicing by the *Executive Director* or *Energy Commission* pursuant to Section 103.3.7 Item 1 *[Section 10-103.3(g)1]*.

2.4. The ECC-Provider shall maintain a list of all certified ECC-Raters with the following information:

2.4.1. First and last name.

2.4.2. Business contact information.

2.4.2.1. Phone.

2.4.2.2. Address.

2.4.2.3. Email.

2.4.3. Certification status, limited to Certified-Active, Exemplary-Active, notice of violation, Probation, Suspended, Decertified, Inactive.

2.4.4. Photograph of the ECC-Rater.

3. **ECC-Rater Company Training**. For each Triennial Code Cycle, the ECC-Provider shall develop and maintain a course of training to summarize the responsibilities of the ECC-Rater Company in the performance of field verifications and diagnostic testing as prescribed in Section 103.3.4 Item 3 *[Section 10-103.3(d)3]*. The ECC-Rater Company training may not exceed 8 hours in duration. All training materials shall be approved by the *Energy Commission* as part of the ECC-Provider's application (Section 103.3.3 Item 1) *[(Section 10-103.3(c)1)]*. An ECC-Provider's training curriculum for ECC-Rater Company applicants must, at minimum, include all of the following:

3.1. A summary of the training curriculum for ECC-Rater applicants provided in Section 103.3.4 Item 1 *[Section 10-103.3(d)1]*.

3.2. Information regarding the following:

3.2.1. The roles and responsibilities of all entities regulated by Section 103.3 *[Section 10-103.3]* and in the ~~Building Energy Efficiency Standards,~~Energy Code, *Reference Appendices* RA1, RA2, RA3, RA4, NA1, NA2, and JA7.

3.2.2. Discipline procedure for ECC-Raters (Section 103.3.4 Item 7) *[(Section 10-103.3(d)7)]* and ECC-Rater Companies (Section 103.3.4 Item 8) *[*(*Section 10-103.3(d)8)]*, and the appeal process (Section 103.3.8) *[(Section 10-103.3(h))]*.

3.2.3. Quality assurance process (Section 103.3.4 Item 5) *[(Section 10-103.3(d)5)]*.

3.2.4. Conflict of interest requirements (Section 103.3.2 Item 1) [(Section 10-103.3(b)1)].

3.2.5. Prohibition on False, Inaccurate, or Incomplete Information (Section 103.3.2 Item 2) [(Section 10-103.3(b)2)].

4. **ECC-Rater Company Certification**

4.1. **Certification Requirements**. An ECC-Provider shall certify an eligible ECC-Rater Company applicant that meets the minimum requirements for an ECC-Rater Company, as verified by the ECC-Provider, and completes and passes all training requirements. Prior to certification, an ECC-Provider shall advise the ECC-Rater Company applicant on the required conduct for ECC-Rater Companies in Section 103.3.6 Item 2 *[Section 10-103.3(f)2]*, the discipline requirements Section 103.3.4 Item 8 *[Section 10-103.3(d)8]* and the appeal process in Section 103.3.8 *[Section 10-103.3(h)]*.

4.2. **Certification Agreement.** The ECC-Rater Company applicant shall sign the ECC-Rater Company agreement with the ECC-Provider in which the ECC-Rater Company shall agree, at minimum, to comply with all applicable laws and regulations, including the requirements provided in this Section 103.3 *[Section 10-103.3]*.

4.3. **Public List**. ECC-Providers shall maintain a publicly available list of certified ECC-Rater Companies.

4.4. **Eligibility**. An ECC-Rater Company is eligible if it meets the minimum qualifications enumerated in Section 103.3.6 Item 1.2 *[Section 10-103.3(f)1B]* and has not been prohibited from practicing by the *Executive Director* or *Energy Commission* pursuant to Section 103.3.7 Item 2 *[Section 10-103.3(g)2]*.

4.5. After its initial certification, an ECC-Rater Company does not need to complete the training curriculum again or be recertified for each Triennial Code Cycle as long as it maintains its eligibility under Section 103.3.6 Item 1.2 *[Section 10-103.3(f)1B]*.

4.6. The ECC-Provider shall maintain a list of all certified ECC-Raters Companies with the following information:

4.6.1. First and last name of certified primary.

4.6.2. ECC-Rater Company name.

4.6.3. Business contact information.

4.6.3.1. Phone.

4.6.3.2. Address.

4.6.3.3. Email.

4.6.4. Certification status, limited to Certified-Active, Exemplary-Active, notice of violation, Probation, Suspended, Decertified, Inactive.

4.7. The ECC-Provider shall maintain any Declarations of ECC-Rater Company Separation of Services (Section 103.3.6 Item 2.4.3) *[(Section 10-103.3(f)2Diii)]* in the ECC-Provider data registry such that it is accessible for verification by the *Energy Commission* and local *enforcement agencies*.

5. **Quality Assurance**. An ECC-Provider shall maintain a quality assurance program to ensure appropriate oversight of the ECC-Raters it certifies. This program shall, at a minimum, include the following:

5.1. **Quality Assurance Staff.** ECC-Providers shall maintain the necessary qualified staff to ensure a functioning quality assurance program that includes, at a minimum, performing the types of quality assurance reviews listed in Section 103.3.4 Item 5 *[Section 10-103.3(d)5]* on ECC-Raters. Any form of audit is subject to the same standards of required conduct as any other field verifications and diagnostic tests and is also subject to Quality Assurance review. Quality Assurance staff may not include active ECC-Raters.

5.2. **Exemplary ECC-Rater.** An ECC-Rater is designated as an "Exemplary ECC-Rater" once the ECC-Rater has been (1) continuously certified as an ECC-Rater for a minimum of 5 years and (2) confirmed for designation by the applicable ECC-Provider after passing all required quality assurance audits within a 12-month period, including at least one annual quality insulation installation (QII) shadow audit and one desk audit.

5.2.1. The ECC-Provider shall immediately revoke this designation for any audit failure or the failure to be recertified as an ECC-Rater in any subsequent Triennial Code Cycle.

5.2.2. This designation, once obtained, may be included in marketing materials. If this designation is revoked, it shall be removed from marketing materials within 10 business days.

5.3. **Types of Quality Assurance Review**. Quality Assurance Review shall take the form of onsite, shadow, and desk audits.

5.3.1. **Onsite Audits**. The ECC-Provider performs an onsite audit following field verification and diagnostic testing by an ECC-Rater it certified. Onsite audits are performed at the invitation of the homeowner through the complaint process, at the request of the *Energy Commission*, or at the discretion of the ECC-Provider. Every year, at least one onsite audit shall be performed by the ECC-Provider for each ECC-Rater it has certified, either at random or as directed above. For Exemplary ECC-Raters, the minimum onsite audit frequency shall be reduced from once per year to once per Triennial Code Cycle. The audit results shall be included in the annual reporting to the *Energy Commission* (Section 103.3.4 Item 11.5) *[(Section 10-103.3(d)11E)]* or provided in response to a request by the *Energy Commission*. Onsite audits shall comply with the following:

5.3.1.1. Onsite audits must not be performed in the presence of the ECC-Rater and can be performed any time after the ECC-Rater has left the project site.

5.3.1.2. ECC-Raters must not be informed that their field verification and diagnostic test is receiving an onsite audit until the onsite audit is complete and the results are documented.

5.3.1.3. At a minimum, onsite audits shall include all of the following:

5.3.1.3.1. A verification of correctly completed certificates of installation (if the ECC-Rater is acting as the Authorized Representative under Section 100.5.1.2 Item 1 *[Section 10-103(a)3A)]* and verification Section 100.5.1.3 *[(Section 10-103(a)4)]* for the project.

5.3.1.3.2. Performance of the field verification and diagnostic test that was performed by the ECC-Rater.

5.3.1.4. A passing result shall include the following at a minimum:

5.3.1.4.1. Correct and completed certificates of installation (if the ECC-Rater is signature authorized under Section 100.5.1.2 Item 1 *[Section 10-103(a)3A]* and verification Section 100.5.1.3 *[(Section 10-103(a)4)]* for the project free from false, inaccurate, or incomplete information.

5.3.1.4.2. All field verification and diagnostic test audit results that include a field test or measurement must pass as required in the ~~Building Energy Efficiency Standards~~Energy Code, *Reference Appendices* RA1, RA2, RA3, RA4, NA1, and NA2.

5.3.1.5. Onsite audits shall be performed when an ECC-Provider is investigating a complaint from a homeowner about a field verification and diagnostic test.

5.3.1.6. Onsite audits shall be performed for every 100 *dwelling units* or single-family residences (or both in combination) in a single development constructed by a single developer that make use of the sample-group provisions (~~Building Energy Efficiency Standards~~Energy Code, Reference Appendix RA 2.6) beginning with the hundredth *dwelling unit* or single family residence. Nothing in this provision shall require that any *dwelling unit* in any sample-group remain open beyond the requirements in Energy Code,~~Building Energy Efficiency Standards~~ Reference Appendix RA 2.6. These onsite audits shall comply with the following:

5.3.1.6.1. The ECC-Provider shall perform the onsite audit at an untested home and a tested home.

5.3.1.6.2. If the ECC-Provider is refused access to the development, all sample-groups for the development will be considered conflicted data Section 103.3.2 Item 1.2 *[(Section 10-103.3(b)1B)]*.

5.3.1.6.3. At the discretion of an ECC-Provider, this onsite audit may also be used to satisfy the requirements for an onsite audit as required by Section 103.3.4 Item 5.3.1 *[Section 10-103.3(d)5Ci]* (Onsite Audits) or, if applicable, Section 103.3.4 Item 5.3.2 *[Section 10-103.3(d)5Cii]* (Shadow Audits) for an ECC-Rater.

5.3.1.6.4. A failed onsite audit of the tested *dwelling unit* shall constitute a failed onsite audit for the ECC-Rater. A failed onsite audit of either the tested or untested *dwelling unit* shall be recorded in the ECC-Provider's quality assurance database Section 103.3.4 Item 9.2 *[(Section 10-103.3(d)9B)]*. A failed onsite audit of either the tested or untested *dwelling unit* shall be reported to the developer, ECC-Rater, and ECC-Rater Company as soon as is possible. Failed onsite audits of *dwelling units* within a sample-group shall not be deemed to fail or impact in any way the compliance status of the sample-group.

5.3.1.7. If the ECC-Provider is refused access to the development, the ECC-Rater may be subject to investigation and disciplinary action at the discretion of the ECC-Provider. The onsite results shall be documented by the ECC-Provider, provided to the ECC-Rater and ECC-Rater Company, provided to the homeowner, and recorded in the ECC-Provider's quality assurance database (Section 103.3.4 Item 9.2) *[(Section 10-103.3(d)9B)]*.

5.3.1.8. If the onsite audit reveals the ECC-Rater did not accurately perform the field verification and diagnostic test or accurately collect or report data, the ECC-Provider shall initiate disciplinary action (Section 103.3.4 Item 7) *[(Section 10-103.3(d)7)]*.

5.3.1.9. Onsite audits shall include the use of photographic evidence to be recorded in the ECC-Provider data registry as provided in the Energy Code,~~Building Energy Efficiency Standards~~ Reference Appendix JA7.5.6.3.

5.3.2. **Shadow Audits**. A shadow audit requires the ECC-Provider to audit the ECC-Rater as they perform a Quality Insulation Installation field verification (~~Building Energy Efficiency Standards~~Energy Code, Reference Appendix RA3.5). The ECC-Provider's auditor shall observe and may not aid the ECC-Rater during the shadow audit. All ECC-Raters shall receive a shadow audit for QII once per year. For Exemplary ECC-Raters, the shadow audit frequency shall be reduced from once per year to once per Triennial Code Cycle. A shadow audit shall also be

performed if requested by the *Energy Commission* or at the discretion of the ECC-Provider. Shadow audits shall comply with the following:

5.3.2.1. The ECC-Rater shall be informed of the shadow audit for scheduling purposes and the ECC-Provider's auditor will explain their presence to the homeowner. The homeowner may grant entry to the auditor. If entry is refused, the ECC-Provider shall reschedule the shadow audit.

5.3.2.2. For *newly constructed buildings*, the developer or contractor shall not refuse a shadow auditor if sampling is being used on the development. If the auditor is refused entry, the data registry will not accept sample-based compliance documents from the developer, contractor, or ECC-Rater regarding the project.

5.3.2.3. Shadow audits are limited to QII verifications where the ECC-Rater shall make the necessary observations and record results.

~~6. Reserved.~~

6.1.1.1. The shadow audit results shall be documented by the ECC-Provider, provided to the ECC-Rater and ECC-Rater Company, and recorded in the ECC-Provider's quality assurance database (Section 103.3.4 Item 9.2) *[(Section 10-103.3(d)9B)]*.

6.1.1.2. If the shadow audit reveals the ECC-Rater did not accurately perform the QII test or accurately collect or report data, the ECC-Provider shall initiate disciplinary action (Section 103.3.4 Item 7) *[(Section 10-103.3(d)7)]*.

~~iii. **Reserved**~~

6.1.2. **Desk Audits.** Desk audits consist of an ECC-Provider using registered compliance documents within an ECC-Provider data registry to evaluate an ECC-Rater's Certificates of Compliance (Section 100.5.1) *[(Section 10-103(a))]*, Certificates of Installation (Section 100.5.1.2) *[(Section 10-103(b)]*, and Certificates of Verification (Section 100.5.1.4) *[(Section 10-103(d))]* for consistency and accuracy. ECC-Providers shall perform desk audits of all certified ECC-Raters at least once per year and as directed by the *Energy Commission* or at the discretion of the ECC-Provider. For Exemplary ECC-Raters, the desk audit frequency shall be reduced from once per year to once per Triennial Code Cycle. Desk audits shall comply with the following:

6.1.2.1. ECC-Providers shall develop and document a maximum variance for each data entry point for each field verification and diagnostic test.

6.1.2.2. ECC-Providers shall identify a project to audit where the ECC-Rater provided field verification and diagnostic test services. The ECC-Provider shall collect all compliance documents associated with the project as necessary to audit the field verifications and diagnostic tests performed by the ECC-Rater at the project site and may contact

outside authorities, such as the local *building* authority with jurisdiction over the project.

6.1.2.3. The ECC-Provider shall confirm the measurements, calculations, and other information obtained during field verifications and diagnostic tests at the project are within expected tolerances.

6.1.2.4. The ECC-Provider shall compare the field verification and diagnostic test results from the project site to no less than 20 other field verification and diagnostic test results performed by the same ECC-Rater on other project sites prior to the audited project. If the comparison suggests the subject project results could have been copied from prior project sites, the ECC-Provider shall investigate further to determine if results were falsified or otherwise inaccurate.

6.1.2.5. The desk audit results shall be documented by the ECC-Provider, provided to the ECC-Rater and ECC-Rater Company, and recorded in the ECC-Provider's quality assurance database (Section 103.3.4 Item 9.2) *[(Section 10-103.3(d)9B)]*.

6.1.2.6. If the desk audit shows that the ECC-Rater did not accurately perform the field verification and diagnostic test or accurately collect or report data, the ECC-Provider shall initiate disciplinary action (Section 103.3.4 Item 7) *[(Section 10-103.3(d)7)]*.

6.2. **Remedy for Flawed Field Verification and Diagnostic Tests**

6.2.1. A flawed field verification and diagnostic test is any field verification and diagnostic test that is inconsistent with an audit, or that is otherwise determined by the *Executive Director*, the *Energy Commission*, or the ECC-Provider to be untrue or inaccurate.

6.2.2. The ECC-Rater or ECC-Rater Company is responsible for remedying any flawed field verification and diagnostic tests identified by audit or by any other means.

6.2.3. A flawed field verification and diagnostic test is remedied by providing an additional field verification and diagnostic test to the hiring party that corrects the untrue or inaccurate reporting.

6.3. **Payment of Fees; Proportionality.** As part of their contractual arrangements with ECC-Raters, ECC-Providers may charge a Quality Assurance fee. The entirety of any Quality Assurance fee may only be used by the ECC-Provider to fund Quality Assurance activities.

7. **Queries and Complaints**

7.1. **Public Queries and Complaints**. ECC-Providers shall have a system for receiving queries and complaints from consumers, ECC-Raters, ECC-Rater Companies, authorities having jurisdiction, and the general public. The ECC-Provider shall respond to, investigate, and resolve queries and complaints related to field verification and diagnostic testing in a timely manner. ECC-Providers shall ensure the ECC-Raters they certify inform field verifications and diagnostic testing service recipients about the query and complaint

system. ECC-Providers shall retain all records of queries and complaints, the corresponding investigation, and the response for a minimum of 5 years from receipt of the query or complaint. ECC-Providers shall annually report to the *Energy Commission* a summary of all queries, complaints, and actions taken over the last 12 months. The Queries and Complaints Annual Summary shall include all of the following for each query or complaint received:

7.1.1. A tracking number identifying each query or complaint in the ECC-Provider queries and complaints tracking system.

7.1.2. The name and contact phone or email of the person(s) submitting the query or complaint.

7.1.3. A summary of the query or complaint.

7.1.4. A summary of the results of the ECC-Provider investigation and related actions.

7.1.5. A summary of the resolution of the query or complaint.

7.2. **Energy Commission-Initiated Queries and Complaints.** The *Energy Commission* may direct an ECC-Provider to investigate any queries related to the performance of the FV&DT program. An ECC-Provider shall respond within 30 days of receiving an *Energy Commission* direction to investigate a query.

7.3. **ECC-Rater and ECC-Rater Company-Initiated Queries and Complaints**. ECC-Providers shall have a system for ECC-Raters and ECC-Rater Companies to report potential violations of these regulations by ECC-Raters, ECC-Rater Companies, and ECC-Providers.

8. **ECC-Rater Discipline**. If an ECC-Rater violates these regulations, including but not limited to the failure to perform accurate and complete field verification and diagnostic tests, the ECC-Provider shall take the following disciplinary steps to address and correct the noncompliance. In the event of a severe violation, however, the ECC-Provider shall proceed immediately to the suspension step for the first severe violation and to the decertification step for a second severe violation. A severe violation of these regulations includes knowingly creating false field verification or diagnostic testing documents, any violation involving criminal activity, coordinating or participating in an organized scheme to violate these regulations, or a demonstrated pattern of violating these regulations. The ECC-Provider and ECC-Rater may extend, by written agreement, the time for response, reply, and final determination for each step below. At any time, the *Executive Director* may direct an ECC-Provider to investigate an ECC-Rater or discipline an ECC-Rater pursuant to Section 103.3.4 Items 7.1 through 7.4 *[Sections 10-103.3(d)7A through 10-103.3(d)7D]*.

8.1. **Step 1: Notice of Violation**. Upon identification of one or more violations of these regulations by an ECC-Rater, the ECC-Provider shall issue a notice of violation to the ECC-Rater and any ECC-Rater Companies for which the ECC-Rater performs FV&DT services. The ECC-Rater Company or Independent Rater shall notify the affected homeowner and show proof of such notice to the ECC-Provider. Within 3 months of issuance of the Notice of Violation, the ECC-Provider will perform a desk audit (Section 103.3.4 Item 5.3.4) *[(Section 10-103.3(d)5Civ)]* on the ECC-Rater.

8.1.1. The ECC-Provider shall require the ECC-Rater take additional training or other corrective action related to the violations within a specified timeframe.

8.1.2. The ECC-Provider shall inform the ECC-Rater of their responsibilities for the following: the ECC-Rater shall be responsible for the costs of quality assurance testing and additional training for the violations, and the ECC-Rater shall be responsible for the costs to the property owner for the original field verification and diagnostic test and any necessary retesting because of the violations. The ECC-Provider shall not be responsible for any costs related to flawed field verification and diagnostic test as performed by the ECC-Rater.

8.1.3. The notice of violation shall be in writing and include a description of the regulatory requirements and violations, the date and approximate time of the violations, the parties affected by the violations, any corrective action the ECC-Rater shall take, any costs the ECC-Rater shall reimburse, the timeframe for complying with all requirements of the notice of violation.

8.1.4. The ECC-Rater will have 10 days of receipt of the notice of violation to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and within 10 days, request additional information needed from the ECC-Rater. The ECC-Rater shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of the notice of violation or within 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of a violation to the ECC-Rater, any affected homeowners, and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services. The violation shall not be effective until the ECC-Rater has exhausted the right to request reconsideration by the ECC-Provider or until the time to exercise that right has lapsed (Section 103.3.4 Item 7.1.4) *[(Section 10-103.3(d)7Aiv)]*.

8.2. **Step 2: Probation**. If an ECC-Rater fails to comply with a notice of violation within the specified timeframe or receives a second notice of violation within a three-month period, the ECC-Provider shall issue a notice to the ECC-Rater and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services, placing the ECC-Rater on probation for up to six months.

8.2.1. While on probation, the ECC-Rater shall be required to retake the training for both written and laboratory (Section 103.3.4 Items 1.1.1 and 1.1.2) *[(Section 10-103.3(d)1Ai and Section 10-103.3(d)1Aii)]* and pass the required testing (Section 103.3.4 Items 1.1.5 and 1.1.6) *[(Section 10-103.3(d)1Av and Section 10-103.3(d)1Avi)]* related to the violated regulations.

8.2.2. The notice shall be in writing and include a description of the regulatory requirements and violations, the date and approximate time of the violations, the parties affected by the violations, any corrective action the ECC-Rater must take, any costs the ECC-Rater must reimburse, and the timeframe for complying with all requirements of the notice of violation.

8.2.3. The ECC-Rater will have 10 days of receipt of the notice of probation to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater. The ECC-Rater shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of notice of probation or within 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of probation to the ECC-Rater and any affected ECC-Rater Company. The terms of probation shall last no more than six months and shall not be effective until the ECC-Rater has exhausted the right to request for reconsideration by the ECC-Provider or until the time to exercise that right has lapsed (Section 103.3.4 Item 7.2.3) *[(Section 10-103.3(d)7Biii)]*.

8.3. **Step 3: Suspension**. If an ECC-Rater fails to fully comply with the terms of probation or receives a new notice of violation while on probation, the ECC-Provider shall issue a notice to the ECC-Rater and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services.

8.3.1. The notice of suspension shall be in writing and include the basis for suspension, duration of suspension, and all corrective action the ECC-Rater must complete during suspension.

8.3.2. The ECC-Rater shall have 10 days of receipt of the notice of suspension to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater. The ECC-Rater shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of the notice of suspension or within 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of suspension to the ECC-Rater and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services. The suspension shall not be effective until the ECC-Rater has exhausted their right to appeal pursuant to Section 103.3.8 *[Section 10-103.3(h)]* or until the time to exercise their right to appeal has lapsed.

8.3.3. Once the suspension becomes effective, the ECC-Provider shall prohibit the ECC-Rater from submitting any new compliance documents (Section 100.5) *[(Section 10-103)]* or otherwise accessing the ECC-Provider data registry until the suspension has ended.

8.4. **Step 4: Decertification**. If an ECC-Rater fails to comply with the terms of suspension or receives a new notice of violation while suspended or while a notice of suspension is pending, the ECC-Provider shall issue a notice of decertification to the ECC-Rater and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services.

8.4.1. The notice of decertification shall be in writing and include the basis for decertification.

8.4.2. The ECC-Rater will have 10 days of receipt of the notice of decertification to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater. The ECC-Rater shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of the notice of decertification or within 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination on proceeding with decertification to the ECC-Rater and any ECC-Rater Company for which the ECC-Rater performs field verification and diagnostic testing services. The decertification shall not be effective until the ECC-Rater has exhausted their right to appeal pursuant to Section 103.3.8 *[Section 10-103.3(h)]* or until the time to exercise their right to appeal has lapsed.

9. **ECC-Rater Company Discipline**. If an ECC-Rater Company violates these regulations, the ECC-Provider shall take the following disciplinary steps to address and correct the noncompliance. However, in the event of a severe violation, the ECC-Provider shall proceed immediately to the suspension or decertification step. A severe violation of these regulations includes knowingly creating false field verification or diagnostic testing documents, any violation involving criminal activity, coordinating or participating in an organized scheme to violate these regulations, or a demonstrated pattern of violating these regulations. The ECC-Provider and ECC-Rater Company may extend, by written agreement, the time for response, reply, and final determination for each step below. At any time, the *Executive Director* may direct an ECC-Provider to investigate an ECC-Rater Company or discipline an ECC-Rater Company pursuant to Section 103.3.4 Item 8 *[Section 10-103.3(d)8]*.

9.1. **Step 1: Notice of Violation**. Upon identification of one or more violations of these regulations by an ECC-Rater Company, the ECC-Provider shall issue a notice of violation to the ECC-Rater Company and any affected homeowners.

9.1.1. The ECC-Provider may require the ECC-Rater Company to take additional training or other corrective action related to the violations within a specified timeframe.

9.1.2. The ECC-Provider shall inform the ECC-Rater Company of their responsibilities for the following: the ECC-Rater Company shall be responsible for the costs of quality assurance testing and additional training for the violations, and the ECC-Rater Company shall be responsible for the costs to the property owner for the original field verification and diagnostic test and any necessary retesting because of the violations. The ECC-Provider shall not be responsible for any costs related to flawed field verification and diagnostic test as performed by the ECC-Rater employed by the ECC-Rater Company.

9.1.3. The notice of violation shall be in writing and include a description of the regulatory requirements and violations, the date and approximate time of the violations, the parties affected by the violations, any corrective action the ECC-Rater Company must take, any costs the ECC-Rater Company must reimburse,

and the timeframe for complying with all requirements of the notice of violation.

9.1.4. The ECC-Rater Company will have 10 days of receipt of the notice of violation to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater Company. The ECC-Rater Company shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of the notice of violation or within 20 days of receiving a response or additional information from the ECC-Rater Company, whichever is later, the ECC-Provider shall provide a final determination of a violation to the ECC-Rater Company within 30 days. The violation shall not be effective until the ECC-Rater Company has exhausted its right to request reconsideration by the ECC-Provider or until the time to exercise that right has lapsed (Section 103.3.4 Item 8.1.4) *[(Section 10-103.3(d)8Aiv)]*.

9.2. **Step 2: Probation**. If an ECC-Rater Company fails to complete all corrective actions and reimburse all costs specified for a violation within the required timeframe or receives two violations within a three-month period, the ECC-Provider shall issue a notice of probation to the ECC-Rater Company.

9.2.1. The notice of probation shall be in writing and include the basis for probation, the duration of probation, and all corrective action the ECC-Rater Company must complete during probation.

9.2.2. The ECC-Rater Company will have 10 days of receipt of the notice of probation to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response, and, within 10 days, request additional information needed from the ECC-Rater Company. The ECC-Rater Company shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of notice of probation or within 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of probation to the ECC-Rater Company. The terms of probation shall last no more than six months and shall not be effective until the ECC-Rater Company has exhausted its right to request reconsideration by the ECC-Provider or until the time to exercise that right has lapsed (Section 103.3.4 Item 8.2.2) *[(Section 10-103.3(d)8Bii)]*.

9.3. **Step 3: Suspension**. If an ECC-Rater Company fails to fully comply with the terms of probation or receives a new notice of violation while on probation, the ECC-Provider shall issue a notice of suspension to the ECC-Rater Company.

8.3.1 The notice of suspension shall be in writing and include the basis for suspension, the duration of suspension, and all corrective action the ECC-Rater Company must complete during suspension.

9.4. During suspension, the ECC-Provider will disable access to its registry for all ECC-Raters of the ECC-Rater Company.

9.4.1. The ECC-Rater Company will have 10 days of receiving the notice of suspension to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater Company. The ECC-Rater Company shall have 10 days to provide additional information to the ECC-Provider. Within 30 days of the date of the notice of suspension or 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of suspension. The suspension shall not be effective until the ECC-Rater Company has exhausted its right to appeal pursuant to Section 103.3.8 *[Section 10-103(h)]* or until the time to exercise its right to appeal has lapsed.

9.5. **Step 4: Decertification**. If an ECC-Rater Company fails to comply with the terms of suspension or receives a new notice of violation while suspended or while a notice of suspension is pending, the ECC-Provider shall issue a notice of decertification to the ECC-Rater Company.

9.5.1. The notice of decertification shall be in writing and include the basis for decertification.

9.5.2. The ECC-Rater Company will have 10 days of receipt of the notice of decertification to respond in writing. If the ECC-Provider receives a response, the ECC-Provider shall acknowledge the response and, within 10 days, request additional information needed from the ECC-Rater Company. The ECC-Rater Company shall have 10 days to provide additional information to the ECC-Provider. No earlier than 30 days of the date of the notice of suspension or 20 days of receiving a response or additional information from the ECC-Rater, whichever is later, the ECC-Provider shall provide a final determination of decertification. The decertification shall not be effective until the ECC-Rater Company has exhausted its right to appeal pursuant to Section 103.3.8 *[Section 10-103.3(h)]* or until the time to exercise its right to appeal has lapsed.

10. **Data Recording**

10.1. **Data Recording for Field Verification and Diagnostic Tests**. Each ECC-Provider shall record all data collected by an ECC-Rater for a field verification and diagnostic test, including the following data:

10.1.1. The registered Certificate(s) of Compliance, Certificate(s) of Installation, Certificate(s) of Verification, and their associated Compliance Registration Packages.

10.2. The energy efficiency improvements verified or tested, if applicable.

10.2.1. Whether the builder chose to include the home in a sample for FV&DT as specified in the Residential Appendices.

10.2.2. Whether initial FV&DT as specified in the Residential Appendices was conducted on the home.

10.2.3. Whether the home in a sample was selected and verified or tested as specified in the Residential Appendices.

10.2.4. Whether the home in a sample was selected for resampling and verified or tested after a sampling failure was found in the sample as specified in the Residential Appendices.

10.2.5. Whether the home in a sample was verified or tested and corrective action was taken after a resampling failure was found in the sample as specified in the Residential Appendices.

10.2.6. Whether the homeowner declined to have verification or testing, and corrective action taken after *occupancy* as specified in the Residential Appendices.

10.3. **Data Recording for Quality Assurance Actions**.

10.3.1. An ECC-Provider shall record all Quality Assurance and disciplinary actions taken against each ECC-Rater and ECC-Rater Company.

10.3.2. The ECC-Provider shall maintain a database tracking system indicating the certificate status of all certified ECC-Raters and ECC-Rater Companies and all Quality Assurance or disciplinary actions taken against each ECC-Rater and ECC-Rater Company.

10.3.3. Quality Assurance Data regarding ECC-Raters and ECC-Rater Companies shall include all of the following:

10.3.3.1. Name, business address, and contact information for each certified ECC-Rater, ECC-Rater Company, or applicant.

10.3.3.2. Current status of certification, limited to one of the following: Application-in-Review, In-training, Certified, Exemplary, Under Notice of Violation, on Probation, on Suspension, Decertified, Certification Dormant (no data registration activity in one year).

10.3.3.3. Current ECC-Provider pricing assigned to the ECC-Rater or ECC-Rater Company for the costs and services for field verification and diagnostic testing registration including any Quality Assurance fees.

10.3.3.4. **Quality Assurance Actions**. List and indicate pass or fail with an explanation of all of the following audits for each certified ECC-Rater:

10.3.3.4.1. Onsite audits (Section 103.3.4 Item 5.3.1) *[(Section 10-103.3(d)5Ci)]*.

10.3.3.4.2. Shadow audits (Section 103.3.4 Item 5.3.2) *[(Section 10-103.3(d)5Cii)]*.

10.3.3.4.3. Desk-audits (Section 103.3.4 Item 5.3.3) *[(Section 10-103.3(d)5Civ)]*.

10.3.4. **Detailed Quality Assurance Action Records**. The ECC-Provider shall keep all field notes and associated records regarding passed, warnings issued, or failed quality assurance tests for each certified ECC-Rater for no less than 5 years.

11. **Data Retention**.

    11.1. An ECC-Provider shall maintain all information in the original format in which it collects, receives, or records the data for a minimum of 10 years.

    11.2. ECC-Providers shall maintain a system that allows the *Energy Commission* to readily search and query compliance documents, quality assurance data, and ECC-Rater and ECC-Rater Company information collected in accordance with ECC-Provider responsibilities (Section 103.3.4) *[(Section 10-103.3(d))]*. The *Energy Commission* shall be able to search and query the information stored on the ECC-Provider's system in a way that is not substantially limited compared to the ability of the ECC-Provider.

    11.3. ECC-Providers may not restrict or degrade the *Energy Commission*'s ability to query, access, sort, or filter this information in any way that is substantially different compared to the ability of the ECC-Provider.

    11.4. ECC-Providers shall maintain digital copies of all files that can be indexed and searched at a minimum by calendar year or designated code cycle. It is the responsibility of ECC-Providers to maintain the necessary systems to support these functions, unless the *Energy Commission* or *Executive Director* explicitly authorizes the ECC-Provider, in writing, to operate without this functionality or process.

    11.5. Nothing in this subsection shall be construed as requiring an ECC-Provider to process, re-package, or otherwise modify any historical information collected prior to January 1, 2026.

12. **Data Reporting.** ECC-Providers shall comply with the following reporting requirements:

    12.1. ECC-Providers shall maintain a database of the information specified in Section 103.3.4 Item 9.1 *[Section 10-103.3(d)9A]* and in compliance with ~~Building Energy Efficiency Standards~~the Energy Code, Reference Appendix JA7, for the greater of: 500 *buildings* field verified and diagnostically tested by ECC-Raters certified by the respective ECC-Provider each year, or a 10 percent random sample of *buildings* field verified and diagnostically tested by ECC-Raters certified by the respective ECC-Provider each year. Requests for data shall be limited to information needed to confirm compliance with and/or assess the ECC program.

    12.2. Beginning January 1, 2027, ECC-Providers shall provide this information annually in electronic form to the *Energy Commission* for evaluating the effectiveness of field verification and diagnostic testing.

    12.3. This information shall be organized according to *climate zones* as defined in the ~~Building Energy Efficiency Standards~~Energy Code, Section 201 *[Section 100.1(b)]*.

    12.4. **FV&DT Data Reporting**. Within ninety days of the *Executive Director* approving a CEC-maintained electronic document repository, an ECC-Provider shall transmit to the *Energy Commission* electronic document depository Certificate(s) of Certification, Certificate(s) of Installation, Certificate(s) of Verification documents (Section 10-103) and their associated Compliance Registration Packages that are registered and retained by a data registry in accordance with Section 103 *[Section 10-103]* and ~~Building Energy Efficiency Standards~~Energy Code, Appendix JA7. The ECC-Provider shall submit this data no less than

once per calendar quarter and in a manner as directed by the *Energy Commission*. Once implemented, this requirement shall supersede the requirements of Section 103.3.4 Items 11.1, 11.2, and 11.3 *[Sections 10-103.3(d)11A, 10-103.3(d)11B and 10-103.3(d)11C]*.

12.5. **Quality Assurance Quarterly Report**. The ECC-Provider shall send a report each quarter to the *Energy Commission* that includes all failed quality assurance audits (Section 103.3.4 Item 5) *[(Section 10-103.3(d)5)]*. The ECC-Provider shall comply with all of the following:

12.5.1. Submit a Quality Assurance Quarterly Report for each project where an audit (Section 103.3.4 Item 5) *[(Section 10-103.3(d)5)]* was performed and failed within the calendar quarter. The Quality Assurance Quarterly Report shall be submitted no less than 60 days after the end of the calendar quarter. Each reported project shall list the contractor information, ECC-Rater information, project address, project permit code (if available), other project identification available to help identify the project, and code violations for each failed audit (as prescribed in Section 103.3.4 Item 5 *[Section 10-103.3(d)5)]*.

12.5.2. The ECC-Provider shall submit all Quality Assurance Quarterly Reports to the *Energy Commission* in a docket prepared by the *Energy Commission*.

12.6. **Quality Assurance Annual Report**.

12.6.1. An ECC-Provider shall submit a Quality Assurance Annual Report to the *Energy Commission* for each calendar year no later than the end of February of the following year.

12.6.2. The Quality Assurance Annual Report shall include all specified records within the annual timeframe.

12.6.3. The Quality Assurance Annual Report shall summarize all quality assurance actions taken for each ECC-Rater certified by the ECC-Provider during the preceding year.

12.6.4. Detailed Quality Assurance Action Records (Section 103.3.4 Item 9.2.3.4) *[(Section 10-103.3(d)9Biiid)]* are not required to be submitted annually to the *Energy Commission* but shall be subject to *Energy Commission* requests for information made pursuant to Section 103.3.4 Item 12 *[Section 10-103.3(d)12]*.

12.7. **Annual Reporting Requirements Regarding ECC-Rater Companies**.

12.7.1. By the first of June of each year starting in 2027, an ECC-Provider shall submit an ECC-Rater Company Annual Report to the *Energy Commission*. The report shall be clearly labeled as confidential and transmitted to the *Energy Commission* as confidential submission and will be treated as such as permitted by law. The report becomes nonconfidential 5 years following submission but may receive confidential redesignation if the ECC-Provider requests extension of confidential status using the steps outlined in Title 20 Cal. Code. Regs., Section 2505 et seq.

~~13. Reserved~~

13.1.1. The ECC-Provider shall ensure that the ECC-Rater Company Annual Report includes the current ECC-Provider pricing assigned to each ECC-Rater Company

and Independent ECC-Rater for the costs of all services for field verification and diagnostic testing registration, including any Quality Assurance fees.

13.2. **Immediate Reporting of Disciplinary Actions**. The ECC-Provider shall provide written notification of any ECC-Rater or ECC-Rater Company decertification to the *Energy Commission* within 24 hours of decertification. The *Energy Commission* shall notify all ECC-Providers of the decertification and instruct all ECC-Providers to immediately suspend the ECC-Rater's or ECC-Rater Company's access credentials to their respective data registries.

14. **Responses to *Energy Commission* Requests for Data.**

14.1. At any time, the *Executive Director* may request access to or a digital copy of one or more registered compliance documents, associated with Compliance Registration Packages, and quality assurance records that an ECC-Provider is required to maintain pursuant to Section 103.3.4 Item 9 *[Section 10-103.3(d)9]* and the Energy Code~~Building Energy Efficiency Standards~~, Reference Joint Appendix JA7. Requests for data shall be limited to information needed to confirm compliance with, assess the Section 103.3 *[Section 10-103.3]* ECC Program, or both.

14.2. The provider shall comply with the request in the timeframe specified by the *Executive Director*.

14.3. ECC-Providers have the sole responsibility to ensure that their systems can comply with the data request provisions of this subsection, including providing the *Energy Commission* with reasonable access to any and all compliance documents, including Compliance Registration Packages, submitted within the past 10 years.

15. **Data Registry Requirements**. ECC-Providers must comply with all data registry requirements provided by the ~~Building Energy Efficiency Standards~~Energy Code, Reference Joint Appendix JA7, and Title 24, *Part 1,* Section 10-109.

16. **No Approved ECC-Providers**. If there are no certified ECC-Providers, the CEC may perform the ECC-Provider Responsibilities provided in Section 103.3.4 *[Section 10-103.3(d)]* or suspend all or a portion of the FV&DT program, including (but not limited to) relevant provisions of the ~~Building Energy Efficiency Standards~~Energy Code found in the Residential Appendices RA1, RA2, RA3 and RA4; Nonresidential Appendices NA1 and NA2; Reference Joint Appendix JA7; and Section 10-109.

17. **ECC-Provider Discipline**. If the *Executive Director* becomes aware of an ECC-Provider's violation of these regulations, including any Conditions of Approval, the *Executive Director* shall take the disciplinary steps necessary to address and correct the violation. Violations that trigger the disciplinary process include failure to comply with quality assurance requirements (Section 103.3.4 Item 5) *[(Section 10-103.3(d)5)]*, failure to investigate or discipline ECC-Raters and ECC-Rater Companies (Section 103.3.4 Items 7 and 8) *[(Section 10-103.3(d)7 and Section 10-103.3(d)8)]*, failure to allow the *Energy Commission* full access to the ECC-Provider data registry (Section 103.3.4 Item 12) *[(Section 10-103.3(d)12)]*, refusal to comply with *Energy Commission* data requests (Section 103.3.4 Item 12) *[(Section 10-103.3(d)12)]*, failure to cooperate in an *Energy Commission* complaint investigation (Section 103.3.4 Item 12) *[(Section 10-103.3(d)12)]*, and failure to otherwise comply with any applicable law or regulation. In the

event of a severe violation, the *Executive Director* may proceed immediately to issue a notice of suspension for the first severe violation and to issue a notice of decertification for a second severe violation. A severe violation of these regulations includes knowingly creating false field verification or diagnostic testing documents, any violation involving criminal activity, coordinating or participating in an organized scheme to violate these regulations, or a demonstrated pattern of violating these regulations.

17.1. **Step 1: Notice of Violation.** Upon identification of one or more violations of these regulations by an ECC-Provider, the *Executive Director* shall issue a notice of violation to the ECC-Provider's designated contact and publicly post the notice. The *Executive Director* shall require the ECC-Provider to take corrective action related to the violations within a specified timeframe. The notice of violation shall be in writing and include a description of the legal requirements and violations, any corrective action the ECC-Provider must take, and the timeframe for complying with all the notice of violation requirements. The ECC-Provider will have 10 days of receipt of the notice of violation to respond in writing. If the *Executive Director* receives a response, the *Executive Director* shall acknowledge the response and, within 5 days, request additional information needed from the ECC-Provider. The ECC-Provider will have 5 days to provide additional information to the *Executive Director*. Within 30 days of the date of the notice of violation or within 20 days of receiving additional information from the ECC-Provider, whichever is later, the *Executive Director* shall provide a final determination of a violation to the ECC-Provider.

17.2. **Step 2: Probation**. If an ECC-Provider fails to complete all corrective action prescribed by the *Executive Director* within the specified timeframe or receives a second notice of violation within a three-month period, the *Executive Director* shall issue a notice of probation to the ECC-Provider's designated contact. The *Executive Director* shall also publicly post the notice of probation. The notice shall be in writing, include a description of the regulatory requirements and violations, and specify the probation duration. The ECC-Provider will have 10 days of receipt of the notice of probation to respond in writing. If the *Executive Director* receives a response, the *Executive Director* shall acknowledge the response and, within 5 days, request additional information needed from the ECC-Provider. The ECC-Provider will have 5 days to provide additional information to the *Executive Director*. Within 30 days of the date of the notice of probation or within 20 days of receiving additional information from the ECC-Provider, whichever is later, the *Executive Director* shall provide a final determination of probation to the ECC-Provider.

17.3. **Step 3: Suspension**. If an ECC-Provider fails to complete all corrective action or receives a new notice of violation while on probation, the *Executive Director* shall issue a notice of suspension to the ECC-Provider's designated contact. The *Executive Director* shall also publicly post the notice of suspension. The notice shall be in writing and include a description of the regulatory requirements, violations, and proposed terms of suspension. The terms of suspension shall not be effective until the ECC-Provider has exhausted its right to appeal pursuant to Section 103.3.8 *[Section 10-103.3(h)]* or until the time to exercise its right to appeal has lapsed, at which time the terms of suspension shall be deemed to have been imposed by the *Energy Commission*.

17.3.1. The ECC-Provider shall have 10 days of receipt of the notice of suspension to respond in writing. If the *Executive Director* receives a response, the *Executive Director* shall acknowledge the response and, within 5 days, request additional information needed from the ECC-Provider. The ECC-Provider will have 5 days to provide additional information to the *Executive Director*. Within 30 days of the date of the notice of suspension or within 20 days of receiving additional information from the ECC-Provider, whichever is later, the *Executive Director* shall provide a final determination of a suspension to the ECC-Provider.

17.3.2. **Terms of Suspension**. Suspension may include conditionally or unconditionally restricting access to the Report Generator by the ECC-Provider. The duration of suspension shall be included in the terms of suspension.

17.3.3. **Amendment to Terms of Suspension**. The *Executive Director* may amend any term of the suspension by issuing a notice of amendment to terms of suspension to the ECC-Provider's Designated Contact that includes the new terms of suspension and proposed effective date. Within 30 days of the date of the notice, the ECC-Provider may appeal the new terms pursuant to Section 103.3.8 *[Section 10-103.3(h)]* or accept the new terms. If the ECC-Provider does not respond to the notice, the new terms shall go into effect on the 31st day after the date of the notice.

17.3.4. **180-day Report**. After 180 days of suspension, the *Executive Director* has 30 days to send to the ECC-Provider's Designated Contact and publicly post a 180-day report that includes each outstanding violation, a timeline of when notices of potential violation and notices of violation were given for each outstanding violation, the date the probation began, the date suspension began and all terms of suspension, any amendments during the suspension, all steps the *Executive Director* is aware that the ECC-Provider has taken to remedy each violation, and any other information the *Executive Director* deems relevant, including the *Executive Director*'s intentions moving forward with respect to the ECC-Provider.

17.4. **Step 4: Rescinding Approval**. If an ECC-Provider fails to comply with the terms of suspension or receives a new notice of violation while suspended or while a notice of suspension is pending, the *Executive Director* shall issue a notice of rescinding approval to the ECC-Provider's designated contact. The rescinded approval shall not be effective until the ECC-Provider has exhausted its right to appeal pursuant to Section 103.3.8 *[Section 10-103.3(h)]* or until the time to exercise its right to appeal has lapsed, at which time the rescinded approval shall be deemed to have been imposed by the *Energy Commission*.

17.4.1. The ECC-Provider shall have 10 days of receipt of the notice of rescinded approval to respond in writing. If the *Executive Director* receives a response, the *Executive Director* shall acknowledge the response and, within 5 days, request additional information needed from the ECC-Provider. The ECC-Provider will have 5 days to provide additional information to the *Executive Director*. Within 30 days of the date of the notice of rescinded approval or within 20 days of receiving additional information from the ECC-Provider, whichever is later, the

Executive Director shall provide a final determination of a rescinded approval to the ECC-Provider.

17.5. **Remediation** required to restore eligibility to apply to be an ECC-Provider. Once an ECC-Provider has been decertified, neither that entity nor any successor, subsidiary, or otherwise affiliated or substantially similar organization, is eligible to apply to operate as or apply to become a certified ECC-Provider until it has completed the following remediation process:

17.5.1. A decertified ECC-Provider may regain their eligibility to apply to become an ECC-Provider by submitting an Application for Remediation pursuant to Section 103.3.3 Item 9 *[Section 10-103.3(c)9]* and receiving the *Energy Commission*'s approval.

17.5.2. Once a decertified ECC-Provider has completed the remediation process by receiving the *Energy Commission*'s approval, the decertified ECC-Provider becomes a remediated ECC-Provider eligible to submit an ECC-Provider Application pursuant to Section 103.3.3 Item 3 *[Section 10-103.3(c)3]* according to the process set out in Section 10-110. A remediated ECC-Provider is only eligible for a full application pursuant to Section 103.3.3 Item 3 *[Section 10-103.3(c)3]*.

103.3.5 *[Part 1, 10-103.3(e)]* **ECC-Rater ~~Certification~~ certification and ~~Responsibilities~~responsibilities.**

1. **Certification**.

1.1. **Certification Process**. ECC-Rater applicants shall apply to an *Energy Commission* approved ECC-Provider for certification pursuant to the application process established by the ECC-Provider.

1.2. **Minimum Qualifications**. ECC-Rater applicants shall have completed all training set forth in Section 103.3.4 Item 1 *[Section 10-103.3(d)1]*.

1.3. **ECC-Rater Agreement**. Prior to being certified, an ECC-Rater applicant shall sign the ECC-Rater agreement with the ECC-Provider, in which the ECC-Rater shall agree, at minimum, to comply with all applicable laws and regulations, including the requirements provided in this Section 103.3 *[Section 10-103.3]*.

1.4. **Clean Certification Record**. ECC-Providers shall not issue a new ECC-Rater certification to any ECC-Rater applicant if that applicant has an ongoing disciplinary proceeding requiring resolution by another ECC-Provider.

1.4.1. At a minimum, the issuing ECC-Provider shall require an ECC-Rater applicant to attest that the ECC-Rater applicant is in good standing with all other ECC-Providers.

1.4.2. Any ECC-Provider may submit a complaint to the *Energy Commission* if it suspects that an ECC-Rater with an outstanding disciplinary status requiring resolution has been issued a new ECC-Rater certification by another ECC-Provider.

2. **Required Conduct**.

   2.1. ECC-Raters shall provide field verification services in compliance with these regulations, including any regulations contained in the Energy Code ~~California Building Energy Efficiency Standards~~ and related *Reference Appendices* RA1, RA2, RA3, RA4, JA7, NA1, and NA2.

   2.2. ECC-Raters shall not create, record, submit, or certify untrue, inaccurate, or incomplete field verification and diagnostic test information or report field verification and diagnostic test results that did not comply with these regulations.

   2.3. ECC-Raters shall not accept payment or other consideration in exchange for reporting a field verification and diagnostic test result not conducted and reported in compliance with these regulations.

   2.4. ECC-Raters shall comply with the conflict-of-interest prohibitions set forth in Section 103.3.2 Item 1 *[Section 10-103.3(b)1]*.

   2.5. ECC-Raters shall be present and personally participate in any field verification and diagnostic test or field verification activity. If an ECC-Rater relies on employees, designees, trainees, or any other individual to assist them in performing field verification and diagnostic test activity, the ECC-Rater shall be able to directly monitor and verify that any tests or measurements were performed properly in accordance with regulations.

   2.6. ECC-Raters shall not provide information based on assumptions, averages, or otherwise generated in any way other than by field verification and diagnostic testing performed in accordance with these regulations. Any such information is presumed to be untrue, inaccurate, and/or incomplete unless the ECC-Rater has the written permission of the *Executive Director* that explains how that information is collected and why such data is not untrue, inaccurate, and/or incomplete.

   2.7. ECC-Raters not employed by an ECC-Rater Company are considered independent. Independent ECC-Raters shall submit an Annual Activity Report no later than the end of March of each year starting in 2027 to the *Energy Commission* that includes the information listed in Section 103.3.6 Items 2.6.3 and 2.6.4 *[Sections 10-103.3(f)2Fiii and 10-103.3(f)2Fiv]*.

3. **Failure to Adhere to Required Conduct.** ECC-Raters are subject to the disciplinary action set forth in Section 103.3.4 Item 7 *[Section 10-103.3(d)7]* for the failure to adhere to the required conduct and these regulations.

4. **Appeal and Reconsideration of Discipline**.

   4.1. ECC-Raters may seek reconsideration and review of a disciplinary action as set forth in Section 103.3.4 Item 7 *[Section 10-103.3(d)7]*.

   4.2. ECC-Raters may appeal a disciplinary action imposed on them as set forth in Section 103.3.8 *[Section 10-103(h)]*.

103.3.6 *[Part 1, 10-103.3(f)]* ECC-Rater ~~Company~~ company ~~Certification~~ certification and ~~Responsibilities~~responsibilities.

1. **Certification**.

1.1. **Certification Process.** ECC-Rater Company applicants shall apply to an *Energy Commission* approved ECC-Provider pursuant to the application process established by the ECC-Provider.

1.2. **Minimum Qualifications**. At least one principal of the ECC-Rater Company applicant shall hold an active ECC-Rater certification issued by an *Energy -Commission* approved ECC-Provider or be actively pursuing certification as evidenced by enrollment in training courses. A principal of an ECC-Rater Company is defined as a senior management-level employee and is not limited to an owner or shareholder of the ECC-Rater Company.

1.3. **Training**. Prior to being certified, the ECC-Rater Company applicant shall complete all required training provided by the ECC-Provider.

1.4. **ECC-Rater Company Agreement**. Prior to being certified, the ECC-Rater Company applicant shall sign an agreement with the ECC-Provider, in which the ECC-Rater Company shall agree, at minimum, to comply with all applicable laws and regulations, including but not limited to the requirements provided in Section 103.3 *[Section 10-103.3]*.

2. **Required Conduct**.

~~3. Reserved~~

3.1. ECC-Rater Companies shall have view-only access to the compliance documents registered by its ECC-Rater.

3.2. ECC-Rater Companies shall not change data entered into the ECC-Provider data registry for any Certificates of Verification.

3.3. ECC-Rater Companies may be the "Document Author" for Certificates of Compliance and Certificates of Installation registered in the ECC-Provider data registry but may not sign as the "Responsible Person" or "Installing Technician" (Sections 100.5.1.1 and 100.5.1.2) *[(Sections 10-103(a)1 and 10-103(a)3)]*.

3.3.1. An ECC-Rater or ECC-Rater Company may sign the Certificate of Installation as the "Authorized Representative" if they have a Delegation of Signature Authority (Section 100.5.1.2 Item 1) *[(Section 10-103(a)3A)]* agreement with the Responsible Person and in place with ECC-Provider.

3.3.2. The ECC-Rater Company may not provide additional project services beyond field verification and diagnostic testing or as provided in Section 103.3.6 Items 2.4 and 2.4.1 *[Sections 10-103.3(f)2D and 10-103.3(f)2Di]*, including design, construction management, permitting, or "Responsible Person" signatories (Section 100.5.1.1 and 100.5.1.2) *[(Sections 10-103(a)1 and 10-103(a)3)]* unless the ECC-Rater Company submits a Declaration of ECC-Rater Company Separation of Services as provided in Section 103.3.6 Item 2.4.3 *[Section 10-103.3(f)2Diii]*.

3.3.3. **Declaration of ECC-Rater Company Separation of Services.** The Declaration of ECC-Rater Company Separation of Services provides proof to the ECC-Provider showing that the ECC-Rater(s) employed or contracted by the ECC-Rater Company to provide field verification and diagnostic services is in compliance with the requirements in Section 103.3.2 Item 1 *[Section 10-103.3(b)1]* and is

independent and acting as a third party as defined by Section 100.5.1.4 *[Section 10-103(a)5]* from the person(s) employed or contracted by the ECC-Rater Company to provide services beyond the field verifications and diagnostic testing services including design, construction management, permitting, or "Responsible Person" signatories (Sections 100.5.1.1 and 100.5.1.2) *[*(*Section 10-103(a)1 and Section 10-103(a)3)]* on the same project.

3.3.3.1. The ECC-Rater Company must show proof that the person(s) providing these additional services do not have management, hiring or firing, payment or any other authority over the ECC-Rater or direct the ECC-Rater activities in any regard on the same project(s).

3.3.3.2. The ECC-Rater Company must show proof that the person(s) providing these additional services is qualified to do so under Division 3 of the Business and Professions Code.

3.3.3.3. The ECC-Rater Company must show proof that the person(s) providing signatory services under (Sections 100.5.1.1 and 100.5.1.2) *[Section 10-103(a)1 and Section 10-103(a)3]* will be legally responsible for design, construction, or installation in the applicable classification for the scope of work and will sign as the Responsible Person.

3.3.3.4. The Declaration of ECC-Rater Company Separation of Services must be retained by the ECC-Provider to which all project compliance documentations are submitted.

3.4. ECC-Rater Companies shall use the approved data registry user interface of a data registry or an approved external digital data service for data input into the ECC-Provider data registry.

3.5. By the end of March of each year starting in 2027, each ECC-Rater Company shall submit an Annual Activity Report to the *Energy Commission*. The report must be clearly labeled as confidential and must be treated as such as permitted by law. The report becomes nonconfidential 5 years following submission but may receive confidential redesignation if the ECC-Provider requests extension of confidential status using the steps outlined in Title 20 Cal. Code. Regs., Section 2505 et seq. The report shall contain all of the following:

3.5.1. ECC-Rater Company Contact details, principals, and required certificates.

3.5.2. A list of all ECC-Raters working for the ECC-Rater Company.

3.5.3. The total number of field verifications and diagnostic tests performed by ECC-Raters working for the ECC-Rater Company during the prior calendar year, organized by *enforcement agency*.

3.5.4. The total and average cost of services charged for each type of field verification and diagnostic test performed by ECC-Raters working for the ECC-Rater Company during the prior calendar year.

3.6. The ECC-Rater Company is responsible for assuring all of its ECC-Raters comply with these regulations and all other applicable laws and regulations when providing field verification and diagnostic services.

3.7. The ECC-Rater Company shall support the ECC-Rater progressive discipline requirements (Section 103.3.4 Item 7) *[(Section 10-103.3(d)7)]* as follows:

3.7.1. **Notice of Violation**. The ECC-Rater Company shall ensure the ECC-Rater complies with any corrective action and reimbursement of costs prescribed in the notice of violation within the timeframe provided in the notice of violation. The ECC-Rater Company shall facilitate any refund to a homeowner.

3.7.2. **Probation**. The ECC-Rater Company shall ensure the ECC-Rater complies with any training and tests and reimbursement of costs prescribed in the notice of probation within the time provided in the notice of probation. The ECC-Rater Company shall not assign any new work to the ECC-Rater until probation is lifted.

3.7.3. **Suspension.** The ECC-Rater Company shall ensure the ECC-Rater complies with the terms of suspension prescribed in the notice of suspension.

3.7.4. **Decertification**. The ECC-Rater Company shall ensure the decertified ECC-Rater does not perform any FV&DT services.

3.8. ECC-Rater Companies shall not provide untrue, inaccurate, or incomplete field verification and diagnostic test information or report field verification and diagnostic test results that did not comply with these regulations.

3.9. ECC-Rater Companies shall not accept payment or other consideration in exchange for reporting a field verification and diagnostic test result not conducted and reported in compliance with these regulations.

3.10. **Prohibition of Conflicts of Interest**. ECC-Rater Companies shall comply with the conflict-of-interest prohibitions set forth in Section 103.3.2 Item 1 *[Section 10-103.3(b)1]*.

4. **Failure to Adhere to Required Conduct**. ECC-Rater Companies are subject to the disciplinary action set forth in Section 103.3.4 Item 8 *[Section 10-103.3(d)8]* for the failure to adhere to the required conduct and these regulations.

5. **Reconsideration of Discipline**. ECC-Rater Companies may request reconsideration and review of a disciplinary action as set forth in Section 103.3.4 Item 8 *[Section 10-103.3(d)8]*.

103.3.7 *[Part 1, 10-103.3(g)]* **Prohibition from ~~Practice~~ practice and ~~Rere~~-~~Entry~~entry.**

Any ECC-Rater, ECC-Rater Company, or ECC-Provider that is currently suspended, or that has been decertified by the *Executive Director* or *Energy Commission* pursuant to these regulations, is prohibited from operating pursuant to its certification under these regulations.

1. **ECC-Raters**.

1.1. While prohibited from practice, an ECC-Rater shall not submit field verification and diagnostic test information, including any compliance documents or Compliance Registration Packages, to an ECC-Provider, data registry, or the Commission.

1.2. Any such information submitted by an ECC-Rater who is prohibited from practicing is invalid and may not be relied on for purposes of permit compliance under the Energy Code.

2. **ECC-Rater Companies.** ECC-Rater Companies shall not act in any manner that leads to, encourages, or aids a violation of the prohibition to practice.

3. **ECC-Providers.**

3.1. No ECC-Provider shall accept or maintain field verification and diagnostic test information, including any compliance documents or Compliance Registration Packages, from an entity that is prohibited from practice at the time that information was either gathered or submitted.

3.2. Nothing in this subsection shall be interpreted as prohibiting an ECC-Provider from storing or relying on information submitted by an ECC-Rater while they were in good standing.

4. **Re-Entry**. The *Executive Director* or Commission may, for good cause, reinstate an entity's ability to practice pursuant to Section 103.3.3 *[Section 10-103.3(c)]*.

103.3.8 *[Part 1, 10-103.3(h)]* **Appeal to Energy Commission.**

Within 30 days of any decision or determination made by the *Executive Director* (Section 103.3.4 Item 15) *[(Section 10-103.3(d)15)]* or an ECC-Provider (Section 103.3.4 Item s7 and 8) *[(Sections 10-103.3(d)7 and 10-103.3(d)8)]*, an ECC-Provider, ECC-Rater, or ECC-Rater Company subject to the decision or determination ("appellant") may appeal the decision or determination to the *Energy Commission*. The following procedures apply to the appeal:

1. The appeal shall be in writing and signed by the appellant and served on the party whose decision is the subject of appeal ("respondent") and the *Energy Commission*. The appeal shall consist of a written argument, stating the grounds for modifying or reversing the decision, identifying the statutes and regulations relevant to the appeal, and stating whether an oral hearing is requested, and a copy of all relevant notices, responses, correspondence, documents, and decisions.

2. Within 30 days after the date the appeal was filed, the respondent shall serve on the appellant and the *Energy Commission* a written argument stating the grounds for affirming, modifying, or reversing the decision; identifying the statutes and regulations relevant to the appeal; and stating whether an oral hearing is requested. The respondent's written argument shall also be accompanied by any relevant notices, responses, correspondences, documents, and decisions not previously provided by the appellant.

3. ***Energy Commission*** **Consideration of Appeal**

3.1. The proceedings on appeal shall be conducted in a manner consistent with Chapter 4.5 of the Government Code (Section 11400 et seq.) and Title 20 *CCR* sections 1200-1216.

3.2. The *Energy Commission* shall review the decision or determination made pursuant to this section for substantial evidence.

NOTE: Authority: Sections 25402, 25402.1, 25213, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8 and 25943, Public Resources Code.

SUBCHAPTER 2
DEFINITIONS

SECTION 200

GENERAL

200.1 *[Section 100.1(b)]* **Terms defined in other codes.**

Terms, phrases, words and their derivatives in Part 6 shall be defined as specified in Section 201 *[Section 100.1]*. Terms, phrases, words and their derivatives not found in Section 201 *[Section 100.1]* shall be defined as specified in the "Definitions" chapters of Title 24, Parts 1 through 5 of the California Code of Regulations.

200.2 *[Section 100.1(b)]* **Terms not defined.**

Where terms, phrases, words and their derivatives are not defined in any of the references above, they shall be defined as specified in *Webster's Third New International Dictionary of the English Language, Unabridged* (1961 edition, through the 2002 addenda), unless the context requires otherwise.

200.3 *[Section 100.1(a)]* **Rules of construction.**

Where the context requires, the singular includes the plural and the plural includes the singular.

The use of "and" in a conjunctive provision means that all elements in the provision must be complied with, or must exist to make the provision applicable. Where compliance with one or more elements suffices, or where existence of one or more elements makes the provision applicable, "or" (rather than "and/or") is used.

"Shall" is mandatory and "may" is permissive.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

1.1SECTION 201

DEFINITIONS

A

AAMA/WDMA/CSA 101/ I.S.2/A440-17 are the American Architectural Manufacturers Association/ Window and Door Manufacturers Association/ Canadian Standards Association document titled "North American Fenestration Standard/Specification for windows, doors, and skylights" (2017).

ACCA is the Air Conditioning Contractors of America.

ACCA MANUAL J is the Air Conditioning Contractors of America document titled "Manual J - Residential Load Calculation" (ANSI/ACCA 2 Manual J – 2016).

ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE is a description of test procedures in the Reference Nonresidential Appendices that includes equipment and systems to be tested, functions to be tested, conditions under which the test shall be performed, the scope of the tests, results to be obtained, and measurable criteria for acceptable performance.

ACCESSIBLE is, for purposes of *Part 6,* having access thereto, but which first may require removal or opening of access panels, doors, or similar obstructions.

ADDITION is, for purposes of *Part 6,* any change to a building that increases conditioned floor area and conditioned volume. ~~See also "newly conditioned space." Addition is~~It also includes any change that increases the floor area and volume of an unconditioned building ~~of~~ in an occupancy group or type regulated by Part 6. ~~Addition is also any change that increases the illuminated area of an~~In outdoor lighting applications regulated by Part 6, an addition is any change that increase the illuminated area. See also "newly conditioned space."

ADIABATIC PAD is a material located before the heat transfer surface of an adiabatic condenser, which precools the ambient air by becoming fully wetted during precool mode operation.

AGRICULTURAL BUILDING is a structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products. ~~It is not a~~This structure ~~that is~~shall not be a place of human habitation~~,~~ or a place of employment where agricultural products are processed, treated or packaged, nor shall it be a place used by the public. (*CBC* Title 24, Part 2, Chapter 2)

AHAM is the Association of Home Appliance Manufacturers.

AHAM HRH-2 is the Association of Home Appliance Manufacturers document titled "Residential Kitchen Range Hood Performance Test Procedures," 2020 (AHAM HRH-2).

AHAM RKRH-CPPG is the Association of Home Appliance Manufacturers document titled "Residential Kitchen Range Hood Certification Program Procedural Guide" 2020 (version 3).

AHRI is the Air-Conditioning, Heating, and Refrigeration Institute.

AHRI 210/240 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment," 2023 (AHRI Standard 210/240-2023).

AHRI 310/380 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Packaged Terminal Air-Conditioners and Heat Pumps (CSA-C744-17)," 2004 (AHRI 310/380-2017).

AHRI 340/360 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment," 2019 (AHRI Standard 340/360-(I-P)-2019).

AHRI 365 is the Air-Conditioning, Heating, and Refrigeration Institute document titled " Performance Rating of Commercial and Industrial Unitary Air-Conditioning Condensing Units," 2009 (ANSI/AHRI Standard 365 (I-P)-2009).

ANSI/AHRI 390 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Performance Rating of Single Package Vertical Air-Conditioners and Heat Pumps," 2003 (ANSI/AHRI Standard 390 (I-P)-2003).

AHRI 400 is the Air-Conditioning, Heating, and Refrigeration Institute document titled " Performance Rating of Liquid to Liquid Heat Exchangers," 2015 (ANSI/AHRI Standard 400 (I-P)-2015).

AHRI 420 is the Air-Conditioning, Heating, And Refrigeration Institute document titled "2023 Standard for Performance Rating of Forced-Circulation Free-Delivery Unit Coolers," 2023 (AHRI Standard 420-2023 (I-P)).

AHRI 430 is the Air-Conditioning, Heating and Refrigeration Institute document titled "Performance Rating of Central Station Air-handling Unit Supply Fans". 2020 (AHRI Standard 430 (I-P)-2020)

AHRI 440 is the Air-Conditioning, Heating and Refrigeration Institute document titled "Performance Rating of Fan-coil Units". 2019 (AHRI Standard 440 (I-P)-2019)

AHRI 460 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Performance Rating of Remote Mechanical-Draft Air-Cooled Refrigerant Condensers," 2005 (ANSI/AHRI Standard 460-2005).

AHRI 540 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Performance Rating of Positive Displacement Refrigerant Compressors and Compressor Units," 2020 (AHRI Standard 540-2020).

AHRI 550/590 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Performance Rating of Water Chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle," 2020 (AHRI Standard 550/590 (I-P)-2020).

AHRI 560 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Absorption Water Chilling and Water Heating Packages," 2000 (AHRI Standard 560-2000).

AHRI 680 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Performance Rating of Residential Air Filter Equipment," 2017 (AHRI Standard 680 2017).

AHRI 920 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Performance Rating of Direct Expansion-Dedicated Outdoor Air System Units" 2020 (AHRI Standard 920 (I-P)-2020).

AHRI 1060 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment," 2018 (AHRI Standard 1060 (I-P)-2018).

AHRI 1230 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment," ~~2014~~ 2026 (AHRI Standard 1230-2026~~2014~~) ~~with Addendum 1~~.

AHRI 1240 is the Air-Conditioning, heating, and Refrigeration Institute document titled "2017 (R2023) Standard for Performance Rating of Active Chilled Beams," 2023 (AHRI Standard 1240-2017 (R2023) (I-P)).

AHRI 1250 is the Air-Conditioning, Heating, and Refrigeration Institute document title "2020 Standard for Performance Rating of Walk-in Coolers and Freezers." 2020 (AHRI Standard 1250-2020).

AHRI 1360 is the Air-Conditioning, Heating, and Refrigeration Institute document titled "Performance Rating of Computer and Data Processing Room Air Conditioners," 2017 (AHRI Standard 1360 (I-P)-2017).

AIR, AVAILABLE TRANSFER is that portion of total outdoor ventilation air that is not required to satisfy other exhaust needs or to maintain pressurization of other spaces and that is transferable according to Section 401.2.1.5 *[Section 120.1(g)]*.

AIR, INFILTRATION is outdoor air that enters a building or space through openings in the building or space envelope due to negative pressure in the space or building relative to the exterior of the building envelope.

AIR, MAKEUP, or COMPENSATING OUTDOOR AIR is outdoor air that is intentionally conveyed by openings or ducts into the building from the outside; is supplied to the vicinity of an exhaust hood; and replaces air, vapor and contaminants being exhausted by the exhaust hood. Makeup air is generally filtered and fan-forced, and it may be heated or cooled. Makeup air may be delivered through openings or ducts integral to the exhaust hood.

AIR, REPLACEMENT is air that is used to replace air removed from a building through an exhaust system. Replacement air may be derived from one or more of the following: makeup air, portions of supply air, transfer air, or infiltration air.

AIR, RETURN is air removed from a space to be recirculated or exhausted. Air may be extracted from a space and totally or partially returned to an air conditioner, furnace, or other heating, cooling, or ventilating system.

AIR, SUPPLY is air entering a space from an air-conditioning, heating, or ventilating system for the purpose of comfort conditioning. Supply air is generally filtered, fan-forced, and heated, cooled, humidified or dehumidified as necessary to maintain specified temperature and humidity conditions.

AIR, TRANSFER is air transferred, whether actively by fans or passively by pressure differentials, from one room to another within a building through openings in the room envelope.

AIR BARRIER is a combination of interconnected materials and assemblies joined and sealed together to provide a continuous barrier to air leakage through the building envelope that separates conditioned from unconditioned space, or that separates adjoining conditioned spaces of different occupancies or uses.

AIR CONDITIONER is an appliance that supplies cooled and dehumidified air to a space for the purpose of cooling objects within the space.

AIR-COOLED AIR CONDITIONER is an air conditioner using an air-cooled condenser.

AIR CURTAIN UNIT means equipment providing a directionally-controlled stream of air moving across the entire height and width of an opening that reduces the infiltration or transfer of air from one side of the opening.

AIR DRYER, COMPRESSED is a treatment device installed in a compressed air system to remove water vapor and prevent downstream condensation and corrosion.

AIR DRYER, DESICCANT is a type of compressed air dryer that uses regenerative desiccant material to remove moisture from compressed air with or without supplemental heat and with or without purge air supplied by the air compressor for regenerating the desiccant material.

AIR DRYER, REFRIGERATED is a type of compressed air dryer that uses a refrigeration cycle to remove moisture from compressed air. This includes equipment with hot gas bypass to prevent freezing that can occur from overcooling the air and condensate when the dryer capacity is greater than the needs at part-load conditions.

AIR FILTER, AIR FILTER EQUIPMENT, or AIR FILTER DEVICE is air-cleaning equipment used for removing particulate matter from the air.

AIR FILTER MEDIA is the part of the air filter equipment which is the actual particulate removing agent.

AIR-HANDLING UNIT or AIR HANDLER is a blower or fan that distributes supply air to a room, space, or area.

AIR-SOURCE HEAT PUMP is an appliance that consists of one or more factory-made assemblies, that includes an indoor conditioning coil, a compressor, and a refrigerant-to-air heat exchanger, and that provides heating and cooling functions.

AIR-TO-AIR HEAT EXCHANGER is a device which will reduce the heat losses or gains that occur when a building is mechanically ventilated, by transferring heat between the conditioned air being exhausted and outside air being supplied.

AIR-TO-WATER HEAT PUMP (AWHP) is a factory-made ~~packaged~~ heat pump system containing one or more compressors, ~~and~~ heat exchangers for transferring heat between refrigerant and air, as well as between refrigerant and water, and various other components. Its primary purpose is to generate heated or cooled water to meet space conditioning loads, domestic hot water loads, or both.

AIR PERMEABILITY is the airflow rate through a material per unit area under a specified pressure differential.

ALTERATION is, for purposes of *Part 6*, ~~is~~ any change to a building or system, excluding *additions,* that affects building features, such as ~~'s~~ water-heating ~~system~~, space-conditioning ~~system~~, lighting ~~system~~, electrical power distribution ~~system~~, or envelope. ~~that is not an addition. Alteration is~~ It also includes, but is not limited to, ~~any~~ changes ~~that is regulated by *Part 6* to an~~ outdoor lighting systems, ~~that is not an addition. Alteration is also any change that is regulated by *Part 6* to *signs*~~ located either indoors or outdoors, ~~. Alteration is also any change that is regulated by *Part 6* to a~~ and *covered processes* regulated by *Part 6*. ~~that is not an addition.~~ (See also "addition," "fenestration alteration".)

ALTERED COMPONENT is a component that has undergone an alteration.

ALTERNATING CURRENT-OUTPUT UNINTERRUPTIBLE POWER SUPPLY (AC-OUTPUT UPS) is a combination of convertors, switches, and energy storage devices, such as batteries, constituting a power system for maintaining continuity of load power in case of input power failure. Input power failure occurs when voltage and frequency are outside rated steady-state and transient tolerance bands or when distortion or interruptions are outside the limits specified for the uninterruptible power supply. An AC-output UPS is an uninterruptible power supply that supplies power with a continuous flow of electric charge that periodically reverses direction.

ALTERNATIVE CALCULATION METHODS (ACM) are compliance software, or alternative component packages, or exceptional methods approved by the Energy Commission under Section 10-109. ACMs are also referred to as Compliance Software or Approved Calculation Method.

AMCA is the Air Movement and Control Association.

ANNUAL FUEL UTILIZATION EFFICIENCY (AFUE) is a measure of the percentage of heat from the combustion of gas or oil which is transferred to the space being heated during a year, as determined using the applicable test method in the *Appliance Efficiency Regulations* or Section 400.5 *[Section 110.2]*.

ANNUNCIATED is a type of visual signaling device that indicates the on, off, or other status of a load.

ANSI is the American National Standards Institute.

ANSI/AMCA 220 is the Air Movement and Control Association document titled "Laboratory Methods for Testing Air Curtain Units for Aerodynamic Performance Rating". 2021 (ANSI/AMCA 220-21)

ANSI/AMCA 208 is the Air Movement and Control Association document titled "Calculation of the Fan Energy Index". 2018 (ANSI/AMCA 208-18)

ANSI/AMCA 210 is the Air Movement and Control Association document titled "Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating". 2016 (ANSI/AMCA 210-16)

ANSI/AMCA STANDARD 500-D is the American National Standards Institute / Air Movement and Control Association document titled “Laboratory Methods of Testing Dampers for Rating.” 2018 (ANSI/AMCA 500-D-2018).

ANSI/ASABE S640 is the American National Standards Institute/American Society of Agricultural and Biological Engineers document titled “Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms),” 2017 (ANSI/ASABE S640 JUL2017).

ANSI/ASSPE Z9.5 is the American National Standards Institute document titled “Laboratory Ventilation,” 2012 (ANSI/AIHA/ASSPE Z9.5-2012).

ANSI C82.6 is the American National Standards Institute document titled “AMERICAN NATIONAL STANDARD FOR LAMP BALLASTS – Ballasts For High-Intensity Discharge Lamps – Methods of Measurement,” 2020 (ANSI C82.6-2015 (R2020)).

ANSI/CTA-2045-B is the American National Standards Institute document titled "Modular Communications Interface for Energy Management," 2021 (ANSI/CTA-2045-B-2021).

ANSI/NEMA WD 6 is the National Electrical Manufacturers Association Document titled, “American National Standard for Wiring Devices – Dimensional Specification,” 2016 (ANSI/NEMA WD 6-2016).

ANSI Z21.40.4a is the American National Standards Institute document titled “Performance Testing and Rating of Gas-Fired, Air Conditioning and Heat Pump Appliances,” 2017 (ANSI Z21.40.4a-1996 (R2017)/CGA 2.94a-M96(R2017)).

ANSI Z21.47 is the American National Standards Institute document titled “Gas-Fired Central Furnaces,” 2021 (ANSI Z21.47-2021/CSA 2.3-2021).

ANSI Z83.8 is the American National Standards Institute document titled “Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters and Gas-Fired Duct Furnaces,” 2016 (ANSI Z83.8 - 2016/CSA 2.6-2016 (R2021)).

APPLIANCE EFFICIENCY REGULATIONS are the regulations in Title 20, Sections 1601 et seq. of the California Code of Regulations.

~~**APPROVED CALCULATION METHOD** (See “alternative calculation methods.”) is compliance software, or alternative component packages, or exceptional methods approved under *Part 1*, Section 10-109~~

ASCE 7-16 is the American Society of Civil Engineers Standard 7-16.

ASHRAE is the American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

ASHRAE CLIMATIC DATA FOR REGION X is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled "ASHRAE Climatic Data for Region X, Arizona, California, Hawaii and Nevada,” Publication SPCDX, 1982 and “Supplement,” 1994.

ASHRAE HANDBOOK, APPLICATIONS VOLUME is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled "ASHRAE Handbook: Heating, Ventilating, and Air-Conditioning Applications" (I-P) (20~~19~~23).

ASHRAE HANDBOOK, FUNDAMENTALS VOLUME is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled "ASHRAE Handbook: Fundamentals" (I-P) (2017).

ASHRAE HANDBOOK, SYSTEMS AND EQUIPMENT VOLUME is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled "ASHRAE Handbook: Heating, Ventilating, and Air-Conditioning Systems and Equipment" (I-P) (2020~~0~~4).

ASHRAE GUIDELINE 36 is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled “High-Performance Sequences of Operation for HVAC Systems”. 2021 (ASHRAE Guideline 36-2021).

ASHRAE STANDARD 52.2 is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size,” 2017 (ANSI/ASHRAE Standard 52.2-2017).

ASHRAE STANDARD 55 is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled " Thermal Environmental Conditions for Human Occupancy,” 2020 (ANSI/ASHRAE Standard 55-2020).

ASHRAE STANDARD 62.1 is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled “Ventilation for Acceptable Indoor Air Quality,” 2019 (ANSI/ASHRAE Standard 62.1-2022, including Addenda y, ao, P, B).

ASHRAE STANDARD 62.2 is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled "Ventilation and Acceptable Indoor Air Quality in Residential Buildings,” 2022 (ANSI/ASHRAE Standard 62.2-2022).

ASHRAE STANDARD 84 is the American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled “Method of Testing Air-to-Air Heat/Energy Exchangers”. 2020 (ANSI/ASHRAE 84-2020).

ASHRAE STANDARD 90.1 is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled “Energy Standards for Buildings Except Low-Rise Residential Buildings,” 2019 (ANSI/ASHRAE/IES Standards 90.1-2019).

ASHRAE STANDARD 154 is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled “Ventilation for Commercial Cooking Operations,” 2016 (ANSI/ASHRAE Standard 154-2016).

ASHRAE STANDARD 193 is the American Society of Heating, Refrigerating and Air-Conditioning Engineers document titled "Method of Test for Determining the Airtightness of HVAC Equipment," RA2014 (ANSI/ASHRAE Standard 193-RA2014).

ASHRAE STANDARD 230 is the American Society of Heating, Refrigerating, Air-Conditioning Engineers document titled “Commissioning Process for Existing Buildings and System”. 2022 (ANSI/ASHRAE 230-2022).

ASME is the American Society of Mechanical Engineers.

ASME A17.1/CSA B44 is the American Society of Mechanical Engineers document titled “Safety Code for Elevators and Escalators” 2019 (ASME A17.1-2019/CSAB44-19).

ASME A112.18.1/CSA B125.1 is the American Society of Mechanical Engineers document titled "Plumbing Supply Fittings," 2018 (ASME A112.18.1-2018/CSA B125.1-18).

ASTM is the American Society for Testing and Materials International.

ASTM C55 is the American Society for Testing and Materials document titled "Standard Specifications for Concrete Building Brick," 2017 (ASTM C55-17).

ASTM C177 is the American Society for Testing and Materials document titled "Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus," 2019 (ASTM C177-19).

ASTM C272 is the American Society for Testing and Materials document titled "Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions," 2018 (ASTM C272/C272M-18).

ASTM C335/C335M is the American Society for Testing and Materials document titled "Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation," 2017 (ASTM C335/C335M-17).

ASTM C518 is the American Society for Testing and Materials document titled "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus," 2017 (ASTM C518-17).

ASTM C731 is the American Society for Testing and Materials document titled "Standard Test Method for Extrudability, After Package Aging of Latex Sealants," 2015 (ASTM C731-15).

ASTM C732 is the American Society for Testing and Materials document titled "Standard Test Method for Aging Effects of Artificial Weathering on Latex Sealants," 2017 (ASTM C732-17).

ASTM C836 is the American Society for Testing and Materials document titled "Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course," 2018 (ASTM C836/C836M-18).

ASTM C1167 is the American Society for Testing and Materials document titled "Standard Specification for Clay Roof Tiles," 2017 (ASTM C1167-11(2017)).

ASTM C1371 is the American Society for Testing and Materials document titled "Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers," 2015 (ASTM C1371-15.

ASTM C1492 is the American Society for Testing and Materials document entitled "Standard Specification for Concrete Roof Tile," 2016 (ASTM C1492-03(2016)).

ASTM C1549 is the American Society for Testing and Materials document entitled "Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer,"2016 (ASTM C1549-16).

ASTM C1583 is the American Society for Testing and Materials document titled "Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)," 2020 (ASTM C1583/C1583M-20).

ASTM D448 is the American Society for Testing and Materials document titled "Standard Classification for Sizes of Aggregate for Road and Bridge Construction,"2017 (ASTM D448-12(2017)).

ASTM D522 is the American Society for Testing and Materials document titled “Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings,” 2017 (ASTM D522/D522M-17).

ASTM D737 is the American Society for Testing and Materials document titled “Standard Test Method for Air Permeability of Textile Fabrics,” 2023 (ASTM D737/ISO 9237).

ASTM D822 is the American Society for Testing and Materials document titled “Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings,” 2018 (ASTM D822/D822M-13(2018)).

ASTM D1003 is the American Society for Testing and Materials document titled “Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics,” 2021 (ANSI/ASTM D1003-21).

ASTM D1653 is the American Society for Testing and Materials document titled “Standard Test Methods for Water Vapor Transmission of Organic Coating Films,” 2021 (ASTM D1653-21).

ASTM D1863 is the American Society for Testing and Materials document titled "Standard Specification for Mineral Aggregate Used on Built-Up Roofs,"2018 (ASTM D1863/D1863M-05 (2018)).

ASTM D2202 is the American Society for Testing and Materials document titled “Standard Test Method for Slump of Sealants,” 2019 (ASTM D2202-00(2019))

ASTM D2370 is the American Society for Testing and Materials document titled “Standard Test Method for Tensile Properties of Organic Coatings,” 2016 (ASTM D2370-98-16).

ASTM D2824 is the American Society for Testing and Materials document titled “Standard Specification for Aluminum-Pigmented Asphalt Roof Coatings, Nonfibered, and Fibered without Asbestos,” 2018 (ASTM D2824/D2824M-18).

ASTM D3468 is the American Society for Testing and Materials document titled “Standard Specification for Liquid-Applied Neoprene and Chlorosulfonated Polyethylene Used in Roofing and Waterproofing,” 2020 (ASTM D3468/D3468M-99 (2020)).

ASTM D3805 is the American Society for Testing and Materials document titled “Standard Guide for Application of Aluminum-Pigmented Asphalt Roof Coatings,” 2016 (ASTM D3805/D3805M-16).

ASTM D4798 is the American Society for Testing and Materials document titled “Standard Practice for Accelerated Weathering Test Conditions and Procedures for Bituminous Materials (Xenon-Arc Method),” 2021 (ASTM D4798/D4798M-11(2021)).

ASTM D5870 is the American Society for Testing and Materials document titled “Standard Practice for Calculating Property Retention Index of Plastics,” 2016 (ASTM D5870-16).

ASTM D6083 is the American Society for Testing and Materials document titled “Standard Specification for Liquid Applied Acrylic Coatings Used in Roofing,” 2021 (ASTM D6083/D6083M-21).

ASTM D6694 is the American Society for Testing and Materials document titled “Standard Specification for Liquid-Applied Silicone Coating Used in Spray Polyurethane Foam Roofing Systems,” 2015 (ASTM D6694/D6694M-15).

ASTM E96 is the American Society for Testing and Materials document titled “Standard Test Methods for Water Vapor Transmission of Materials,” 2016 (ASTM E96/E96M-16).

ASTM E283 is the American Society for Testing and Materials document titled “Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylight, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen,” 2019 (ASTM E283/E238-19).

ASTM E408 is the American Society for Testing and Materials document titled “Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques,” 2019 (ASTM E408-13(2019)).

ASTM E779 is the American Society for Testing and Materials document titled “Standard Test Method for Determining Air Leakage Rate by Fan Pressurization,” 2019 (ASTM E779-19).

ASTM E903 is the American Society for Testing and Materials document titled "Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres,"2020 (ASTM E903-20).

ASTM E972 is the American Society for Testing and Materials document titled "Standard Test Method for Solar Photometric Transmittance of Sheet Materials Using Sunlight,"2021 (ASTM E972-96(2021)).

ASTM E1175 is the American Society for Testing and Materials document titled "Standard Test Method for Determining Solar or Photopic Reflectance, Transmittance, and Absorptance of Materials Using a Large Diameter Integrating Sphere," 2015 (ASTM E1175-87(2015)).

ASTM E1677 is the American Society for Testing and Materials document titled “Standard Specification for Air Barrier (AB) Material or Assemblies for Low-Rise Framed Building Walls,” 2019 (ASTM E1677-19).

ASTM E1680 is the American Society for Testing and Materials document titled “Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems,” 2016 (ASTM E1680-16).

ASTM E1918 is the American Society for Testing and Materials document titled "Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field,"2016 (ASTM E1918-16).

ASTM E1980 is the American Society for Testing and Materials document titled “Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surface,” 2019 (ASTM E1980-11(2019)).

ASTM E2178 is the American Society for Testing and Materials document titled "Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials," 2021 (ASTM E21778-21).

ASTM E2357 is the American Society for Testing and Materials document titled "Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies," 2018 (ASTM E2357-18).

ASTM E3087 is the American Society for Testing and Materials document titled "Standard Test Method for Measuring Capture Efficiency of Domestic Range Hoods," 2018 (ASTM E3087-18).

ATTIC is, for purposes of *Part 6*, an enclosed space directly below the roof deck and above the ceiling beams.

AUTOMATICED TELLER MACHINE (ATM) is any electronic information processing device ~~which~~ that accepts or dispenses ~~currency~~ cash in connection with a credit, deposit, or convenience account. The term does not include devices used solely to facilitate check guarantees or check authorizations, or which are used in connection with the acceptance or dispensing of cash on a person-to-person basis, such as by a store cashier ~~without involvement by a clerk~~. (*CBC* Title 24, Part 2, Chapter 2)

AUTOMATIC is capable of operating without human intervention.

AZIMUTH is the degrees of clockwise rotation from true north.

B

BACK-UP COMPRESSORS are those compressors not used to meet peak compressed air loads. Back-up compressors are physically connected to the compressed air piping system and can be automatically controlled to turn on if one of the ~~online~~ compressors used to serve peak load fails. Back-up compressors do not normally operate.

BATTERY ENERGY STORAGE SYSTEM (BESS) is a type of electrochemical energy storage system (*CBC* Title 24, Part 2, Chapter 2). It is a stationary equipment that receives electrical energy and then utilizes batteries to store that energy for later use to supply electrical energy when needed. The BESS consists of one or more modules, a power conditioning system, and balance of plant components.

BELOW-GRADE WALL is the portion of a wall, enclosing conditioned space that is below the grade line.

BESS READY INTERCONNECTION EQUIPMENT is equipment, including but not limited to a Battery Energy Storage System (BESS) ready panelboard or switchboard that can accommodate the connection of a distributed energy resource or a BESS capable of either automatic or manual isolation from the utility power source.

BESS READY PANELBOARD/SWITCHBOARD is a panelboard or switchboard that can accommodate either automatic or manual switching between a utility power source to a distributed energy resource or a BESS, such as a split bus panelboard or a switchboard.

BOILER SYSTEM is one or more boilers and their piping and controls that work together to supply steam or hot water to heat output devices remote from the boiler.

BUBBLE POINT is the liquid saturation temperature of a refrigerant at a specified pressure.

BUILDING is, for purposes of *Part 6*, any structure or space covered by Section 100 *[Section 100.0]* of the- Energy Code~~Building Energy Efficiency Standards~~. (See "*Use Designation*" and "*Group R occupancies*")

BUILDING COMMISSIONING is a systematic quality assurance process that spans the entire design and construction process, including verifying and documenting that building systems and components are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements.

BUILDING ENVELOPE is the ensemble of exterior and demising partitions of a building that enclose conditioned space.

C

CALL CENTER is a phone center that handles large number of phone calls including but not limited to help desk, customer and sales support, technical support, emergency response, telephone answering service, and inbound and outbound telemarketing.

CARBON DIOXIDE ENRICHMENT is injection of additional carbon dioxide into controlled environment horticulture spaces for the purpose of stimulating plant growth.

CASCADE REFRIGERATION SYSTEM is a type of refrigeration system that uses a low-stage refrigeration system where the heat rejected from condensing the low-stage refrigerant is absorbed using a heat-exchanger by a separate high-stage refrigeration system, and the ultimate heat rejection to ambient air is accomplished by the high-stage refrigeration system.

CATHEDRAL CEILING is an exterior partition with a slope less than 60 degrees from horizontal that is created by applying the ceiling directly to the underside of the roof framing members and applying structural roof sheathing directly to the top of the roof framing members/rafters. It may be flat or sloped and vented or unvented.

CCR is the California Code of Regulations.

CEILING FAN means a nonportable device that is suspended from a ceiling or overhead structure for circulating air via the rotation of fan blades as defined in 10 CFR 430.2.

CENTRAL FAN VENTILATION COOLING SYSTEM (CFVCS) is a ducting arrangement including outside air ducts, motorized dampers, and an automatic control system that allows a residential space conditioning system central fan and ducts to distribute outside air throughout a residential dwelling unit, intending to reduce or eliminate the need for mechanical cooling.

CERTIFIED TO THE ENERGY COMMISSION means, when used in association with appliances, certified under Section 1606 of Title 20 of the California Code of Regulations; and otherwise means certified by the manufacturer in a declaration, executed under penalty of perjury under the laws of the State of California, that all the information provided pursuant to the certification is true, complete, accurate and in compliance with all applicable provisions of Part 6; and if applicable that the equipment, product, or device was tested under the applicable test method specified in Part 6.

CERTIFYING ORGANIZATION is an independent organization recognized by the Energy Commission to certify manufactured devices for performance values in accordance with procedures adopted by the Energy Commission.

CFR is the Code of Federal Regulations.

CIE 13.3 is the International Commission on Illumination (Commission Internationale de l'Eclairage) document titled "Method of Measuring and Specifying Color Rendering Properties of Light Sources," 1995 (CIE 13.3-1995).

CIE 15 is the International Commission on Illumination (Commission Internationale de l'Eclairage) document titled "Technical Report: Colorimetry," 2018 (CIE 15: 2018).

CIRCULATING FAN means a fan that is not a ceiling fan, but that is used to move air within a space that has no provision for connection to ducting or separation of the fan inlet from its outlet, and designed to be used for the general circulation of air.

CLIMATE ZONES are, for the purposes of Part 6, the 16 geographic areas of California for which the Energy Commission has established typical weather data, prescriptive packages, and energy budgets. Climate zones are defined by ZIP code and listed in Reference Joint Appendix JA2. Figure 102.2-A *[FIGURE 100.1-A]* is an approximate map of the 16 Climate Zones.

CLOSED-CIRCUIT COOLING TOWER is a cooling tower that utilizes indirect contact between a heated fluid, typically water or glycol, and the cooling atmosphere to transfer the source heat load through sensible heat, latent heat, and mass transfer indirectly to the air, essentially combining a heat exchanger and cooling tower into an integrated and relatively compact device.

CODES, CALIFORNIA HISTORICAL BUILDING CODE is the California Historical Building Code, California Code of Regulations, Title 24, Part 8, and Part 2 (Chapter 34).

CODES, CBC is the 2025 *California Building Code*.

CODES, CEC is the 2025 *California Electrical Code*.

CODES, CFC is the 2025 C*alifornia Fire Code.*

CODES, CMC is the 2025 *California Mechanical Code*.

CODES, CPC is the 2025 *California Plumbing Code*.

COEFFICIENT OF PERFORMANCE (COP), COOLING is the ratio of the rate of net heat removal to the rate of total energy input, calculated under designated operating conditions and expressed in consistent units, as determined using the applicable test method in the *Appliance Efficiency Regulations* or Section 400.5 *[Section 110.2]*.

COEFFICIENT OF PERFORMANCE (COP), HEATING is the ratio of the rate of net heat output to the rate of total energy input, calculated under designated operating conditions and expressed in consistent units, as determined using the applicable test method in the *Appliance Efficiency Regulations* or Section 400.5 *[Section 110.2]*.

COEFFICIENT OF PERFORMANCE (COP), HEAT PUMP is the ratio of the rate of useful heat output delivered by the complete heat pump unit (exclusive of supplementary heating) to the corresponding rate of energy input, in consistent units and as determined using the applicable test method in *Appliance Efficiency Regulations* or Section 400.5 *[Section 110.2]*.

COMBINED ENERGY EFFICIENCY RATIO (CEER) is the ratio of net cooling capacity (in Btu/hr) to total rate of electrical energy input (in watts) of a cooling system under designated operating conditions, including standby mode, as determined using the applicable test method in the *Appliance Efficiency Regulations*.

COMBUSTION AIR POSITIVE SHUT-OFF is a means of restricting airflow through a boiler combustion chamber during standby periods, used to reduce standby heat loss. A flue damper and a vent damper are two examples of combustion air positive shut-off devices.

COMBUSTION EFFICIENCY is a measure of the percentage of heat from the combustion of gas or oil that is transferred to the medium being heated or lost as jacket loss.

COMMERCIAL BOILER is a type of boiler with a capacity (rated maximum input) of 300,000 Btu~~s~~ per hour (Btu/h) or more and serving a space heating or water heating load in a commercial building.

COMMON USE AREAS are private use areas within multifamily residential facilities where the use of these areas is limited exclusively to owners, residents and their guests. The areas may be defined as rooms or spaces or elements inside or outside of a *building.* (*CBC* Title 24, Part 2, Chapter 2)

COMMUNICATING SPACE is a directly adjacent space connected via permanent openings.

COMPARTMENTALIZATION is when a dwelling unit enclosure area, including walls, ceilings, and floors shared with exterior spaces or adjacent spaces in the building including but not limited to neighboring units, corridors, and elevator shafts, is constructed to prevent air leakage.

COMPLEX MECHANICAL SYSTEMS are systems that include 1) fan systems each serving multiple thermostatically controlled zones; or 2) ~~built-up~~field-assembled air handler systems, including ~~(~~nonunitary or nonpackaged HVAC equipment~~)~~; or 3) hydronic or steam heating systems; or 4) hydronic cooling systems. Complex mechanical systems are NOT the following: 1) unitary or packaged equipment listed in Tables 400.5-~~A~~(1), 400.5-~~B~~(2), 400.5-~~C~~(3), or 400.5-~~E~~(5) *[Table 110.2-A, 110.2-B, 110.2-C, or 110.2-E]* that each serves one zone, or 2) two-pipe, heating only systems serving one or more zones.

COMPLIANCE SOFTWARE is software that has been approved pursuant to Section 10-109 of Part 1 of Title 24 of the California Code of Regulations, to demonstrate compliance with the performance approach of Part 6.

COMPRESSED AIR SYSTEM is a system of at least one compressor providing compressed air at 40 psig or higher and all its components upstream of pneumatic end uses.

~~**COMPUTER ROOM** is a room within a building whose primary function is to house electronic *equipment* and that has a design information technology equipment (ITE) equipment power density exceeding 20 watts/ft^2 (215 watts/m^2) of conditioned floor area.~~

CONDENSATE RETURN SYSTEM is a system designed to return steam condensate to a boiler plant for reuse. These systems may include piping, condensate collection tanks, and mechanical pumping.

CONDENSER is a refrigeration component that condenses refrigerant vapor by rejecting heat to air mechanically circulated over its heat transfer surface.

CONDENSER, ADIABATIC is a condenser that has the ability to use two heat transfer processes in series as accomplished by a single factory-made unit. The first heat transfer process is the precooling of the entering air by lowering the entering air dry-bulb temperature. The second heat transfer process is forced-air circulation cooling over the heat transfer surface of the condenser.

~~DRY~~ Dry ~~MODE~~ Mode is an operating condition of an adiabatic condenser where~~in~~ the only means of heat transfer is accomplished through forced-air circulation over the heat transfer surface of the condenser without any precooling of the entering air.

~~PRECOOL~~ Precool Mode~~ODE~~ is an operating condition of an adiabatic condenser where~~in~~ the entering air is precooled.

CONDENSER SPECIFIC EFFICIENCY is the full load condenser Total Heat of Rejection (THR) capacity at standardized conditions divided all electrical input power including~~by the~~ power of all fans ~~input electric power (including but not limited to spray pump electric input power for evaporative condensers)~~ at 100 percent rated fan speed, and power of spray pumps for evaporative condensers.

CONDITIONED FLOOR AREA (CFA) is the floor area (in square feet) of enclosed conditioned space on all floors of a building, as measured at the floor level of the exterior surfaces of exterior walls enclosing the conditioned space.

CONDITIONED GREENHOUSE is a greenhouse that is provided with wood heating, mechanical heating that has a capacity exceeding 10 Btu/hr-ft², or mechanical cooling that has a capacity exceeding 5 Btu/hr-ft².

CONDITIONED SPACE is an enclosed space within a building that is directly conditioned or indirectly conditioned.

CONDITIONED SPACE, DIRECTLY is an enclosed space that is provided with wood heating, mechanical heating that has a capacity exceeding 10 Btu/hr-ft², or mechanical cooling that has a capacity exceeding 5 Btu/hr-ft². Directly conditioned space does not include *process space* or *Controlled Environment Horticulture (CEH) space*. (See "*process space*." and "*Controlled Environmental Horticulture (CEH) space*.")

CONDITIONED SPACE, INDIRECTLY is enclosed space that (1) is not directly conditioned space; and (2) either (a) has a thermal transmittance area product (UA) to directly conditioned space exceeding that to the outdoors or to unconditioned space and does not have fixed vents or openings to the outdoors or to unconditioned space, or (b) is a space through which air from directly conditioned spaces is transferred at a rate exceeding three air changes per hour.

CONDITIONED VOLUME is the total volume (in cubic feet) of the conditioned space within a building.

CONTINUOUS INSULATION (c.i.) is insulation that is continuous across all assemblies that separate conditioned from unconditioned space. It is installed on the exterior or interior or is integral to any opaque surface of the building envelope and has no thermal bridges other than fasteners and necessary service openings.

CONTROLLED ATMOSPHERE is an airtight space maintained at reduced oxygen levels for the purpose of reducing respiration of perishable product in long term storage.

CONTROLLED ENVIRONMENT HORTICULTURE (CEH) SPACE is a building space dedicated to plant production by manipulating indoor environmental conditions, such as through electric lighting, irrigation, mechanical heating, mechanical cooling, or dehumidification. *CEH space* does not include building space where plants are grown solely to decorate that same space.

COOLER is a space to be capable of operation at a temperature greater than or equal to 28°F but less than 55°F.

COOL ROOF is a roofing material with high thermal emittance and high solar reflectance, or low thermal emittance and exceptionally high solar reflectance as specified in *Part 6* that reduces heat gain through the roof.

~~**COOLING EQUIPMENT IS EQUIPMENT USED TO PROVIDE MECHANICAL COOLING FOR A ROOM OR ROOMS IN A BUILDING.**~~

COORDINATED DECOUPLED HVAC/D SYSTEM is a space-conditioning system serving an *Indoor Growing* space that uses separate commercial HVAC equipment and commercial dehumidification equipment controlled by a common control system that stages or modulates equipment to maintain temperature and humidity setpoints.

CRAWL SPACE is a space immediately under the first floor of a building adjacent to grade.

CRRC-1 is the Cool Roof Rating Council document titled “Product Rating Program Manual.” (2021)

CTI is the Cooling Technology Institute.

CTI ATC-105 is the Cooling Technology Institute document titled “Acceptance Test Code for Cooling Towers,” 2019 (CTI ATC-105-19).

CTI ATC-105DS is the Cooling Technology Institute document titled “Acceptance Test Code for Dry Fluid Coolers, 2018 (CTI ATC-105DS (18)).

CTI ATC-105S(11) is the Cooling Technology Institute document titled “Acceptance Test Code for Closed-Circuit Cooling Towers,” 2011 (CTI ATC-105 11).

CTI ATC-106 is the Cooling Technology Institute document titled “Acceptance Test Code for Mechanical Draft Evaporative Vapor Condensers”, 2011 (CTI ATC-106 11).

CTI STD-201 is the Cooling Technology Institute document titled “Standard for the Certification of Water Cooling Thermal Performance,”2017 (CTI STD-201RS(17)).

CURRENT AIR DEMAND is the actual cubic feet per minute (acfm) of total airflow necessary for end uses in a compressed air system.

C-VALUE (also known as C-factor) is the time rate of heat flow through unit area of a body induced by a unit temperature difference between the body surfaces, in Btu (hr × ft² × °F). It is not the same as K-value or K-factor.

CYCLES OF CONCENTRATION is the number of times the concentration of total dissolved solids (TDS) in cooling tower water is multiplied relative to the TDS in the makeup water. Because

evaporation of pure water leaves dissolved solids behind in the system water, TDS increases over time as the tower operates. The number of times the dissolved minerals are concentrated is relative to the TDS in the makeup water. For example, five cycles of concentration represents five times the concentration of solids in the cooling tower system water relative to the TDS in the makeup water entering the tower.

D

DATA CENTER is ~~a building whose primary function is to house computer room(s).~~a room or building, or portions thereof, used primarily to house *information technology equipment (ITE)* and serving a total ITE load greater than 10 kW and 20 W/ft^2 (215 W/m^2) of *conditioned floor area* (*CBC* Title 24, Part 2, Chapter 2).

Small Data Center is any space whose primary function is to house ITE with a design power density not exceeding 400 W/ft^2.

Large Data Center is any space whose primary function is to house ITE with a design power density exceeding 400 W/ft^2 and not exceeding 1,600 W/ft^2.

Hyperscale Data Center is any space whose primary function is to house ITE with a design power density exceeding 1,600 W/ft^2.

DAYLIT ZONE is the floor area under skylights or next to windows. Types of daylit zones include primary sidelit daylit zone, secondary sidelit daylit zone, and skylit daylit zone.

DEADBAND is the temperature range within which the HVAC system is neither calling for heating or cooling.

DECORATIVE GAS APPLIANCE is a gas appliance that is designed or installed for visual effect only, cannot burn solid wood, and simulates a fire in a fireplace.

DEDICATED OUTDOOR AIR SYSTEM (DOAS) is ventilation system that delivers 100 percent outdoor air and delivers ventilation supply air to each space, either directly or in conjunction with local or central space-conditioning systems serving those same spaces such as a DX-DOAS, HRV, ERV, or custom ventilation only unit.

DEGREE DAY, HEATING is a unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal annual heating load of a building. For any one day, when the mean temperature is less than 65°F, there exist as many degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and 65°F. The number of degree days for specific geographical locations are those listed in the Reference Joint Appendix JA2. For those localities not listed in the Reference Joint Appendix JA2, the number of degree days is as determined by the applicable enforcing agency.

DEHUMIDIFIER is a product other than a portable air conditioner, room air conditioner, or packaged terminal air conditioner that is a self-contained, electrically operated, and

mechanically encased assembly consisting of 1) a refrigerated surface (evaporator) that condenses moisture from the atmosphere, 2) a refrigerating system, including an electric motor, 3) an air-circulating fan, and 4) a means for collecting or disposing of the condensate.

DEHUMIDIFIER, COMMERCIAL is a dehumidifier that is marketed by the manufacturer for commercial use and meets one or more of the following criteria:

1. Is designed for operation on three-phase electric power;
2. Has a rated supply voltage of 208 volts or greater; or
3. Has a rated dehumidification capacity at one or more of the following conditions and, for at least one such condition, the rated capacity is equal to or greater than the corresponding threshold:
   3.1. 185 pints per day at 80°F dry-bulb temperature and 60 percent relative humidity;
   3.2. 155 pints per day at 73°F dry-bulb temperature and 60 percent relative humidity; or
   3.3. 125 pints per day at 65°F dry-bulb temperature and 60 percent relative humidity.

DEHUMIDIFIER, CONSUMER is a dehumidifier that meets all of the following criteria:

1. Is designed exclusively for operation on single-phase electric power;
2. Has a rated supply voltage below 208 volts; and
3. Has a rated dehumidification capacity at one or more of the following conditions and, for at least one such condition, the rated capacity is less than the corresponding threshold:
   3.1. 185 pints per day at 80°F dry-bulb temperature and 60 percent relative humidity;
   3.2. 155 pints per day at 73°F dry-bulb temperature and 60 percent relative humidity; or
   3.3. 125 pints per day at 65°F dry-bulb temperature and 60 percent relative humidity.

DEMAND CONTROL VENTILATION (DCV) is a ventilation control strategy that automatically modulates the rate of outdoor air delivered to a space in response to a measured indicator of occupancy, such as carbon dioxide (CO_2) concentration.

DEMAND FLEXIBILITY MEASURE is a measure that reduces LSC and/or Ssource Eenergy consumption using communication and control technology to shift electricity use across hours of the day to decrease energy use on-peak or increase energy use off-peak, including but not limited to energy storage, or HVAC or water heating load shifting.

DEMAND RESPONSE is short-term changes in electricity usage by end-use customers from their normal consumption patterns. Demand response may be in response to:

1. changes in the price of electricity; or
2. participation in programs or services designed to modify electricity use:
   2.1. in response to wholesale market prices; or
   2.2. when system reliability is jeopardized.

DEMAND RESPONSE PERIOD is a period of time during which electricity loads are modified in response to a demand response signal.

DEMAND RESPONSE SIGNAL is a signal that indicates a price or a request to modify electricity consumption for a limited time period.

DEMAND RESPONSIVE CONTROL is an automatic control that is capable of receiving and automatically responding to a demand response signal.

DEMISING PARTITION is, for the purposes of Part 6, a wall, fenestration, floor, or ceiling that separates conditioned space from enclosed unconditioned space or a controlled environment horticulture space.

DESICCANT DEHUMIDIFICATION SYSTEM is a mechanical dehumidification technology that uses a solid or liquid desiccant to remove moisture from the air.

DESIGN CONDITIONS are the parameters and conditions used to determine the performance requirements of space-conditioning systems. Design conditions for determining design heating and cooling loads are specified in Section 401.3.4 *[Section 140.4(b)]* for nonresidential and hotel/motel buildings in Section 402.2.2 *[Section 150.0(h)]* for single-family residential buildings, and in Sections 403.2.3.3 and 403.3 *[Sections 160.3(b) and 170.2(c)]* for multifamily buildings.

DESIGN HEAT GAIN RATE is the total calculated heat gain through the building envelope under design conditions.

DESIGN HEAT LOSS RATE is the total calculated heat loss through the building envelope under design conditions.

DESIGN REVIEW is an additional review of the construction documents (drawings and specifications) that seeks to improve compliance with existing Title 24 regulations, to encourage adoption of best practices in design, and to encourage designs that are constructible and maintainable. It is an opportunity for an experienced design engineer or architect to look at a project with a fresh perspective in an effort to catch missing or unclear design information and to suggest design enhancements.

DESIGN REVIEWER is a required signatory of the Design Review Kickoff Certificate(s) of Compliance and Construction Design Review Checklist Certificate(s) of Compliance required in Section 1001. ~~and specified in Section 10-103(a)1.~~

DESIGN TEAM consists of a project owner (or their representative), a design reviewer, and must also include other California licensed professionals as specified in Section 10-103(a)1 and Section 1001. Design Team members are responsible for reviewing the project designs for accuracy and code compliance and are required to be identified on the Design Review Kickoff Certificate(s) of Compliance and Construction Design Review Checklist Certificate(s) of Compliance required in Section 1001. ~~and specified in Section 10-103(a)1.~~

DEW POINT TEMPERATURE is the vapor saturation temperature at a specified pressure for a substance undergoing phase change from vapor to liquid.

DIRECT DIGITAL CONTROL (DDC) is a type of control where controlled and monitored analog or binary data, such as temperature and contact closures, are converted to digital format for

manipulation and calculations by a digital computer or microprocessor, then converted back to analog or binary form to control mechanical devices.

DIRECT-VENT APPLIANCE or "sealed combustion" appliance is an appliance that is constructed and installed so that air from combustion is derived directly from the outdoors and flue gases are discharged to the outdoors.

DISPLAY PERIMETER is the length of an exterior wall in a Group B; Group F, Division 1; or Group M, Occupancy that immediately abuts a public sidewalk, measured at the sidewalk level for each story that abuts a public sidewalk.

DOMESTIC WATER HEATING SYSTEMS (see "service water heating").

DOMESTIC HOT WATER SYSTEM APPURTENANCE are all elements that are in series in a domestic hot water distribution system, including fittings (elbows, tees, flanges, etc.), pumps, valves (isolation, mixing, balancing, check, etc.), strainers, hose bibs, coil u-bends, meters, sensors, heat exchangers and air separators.

DOOR is an operable opening in the building envelope, including swinging and roll-up doors, fire doors, pet doors and access hatches with less than 25 percent glazed area. When that operable opening has 25 percent or more glazed area it is a glazed door. See Fenestration: Glazed Door.

DOOR AREA is the total rough opening area which includes the door, and when present, the fenestration, and the fenestration frame components in the door frame assembly.

DRAIN WATER HEAT RECOVERY (DWHR) is a system that recovers heat from effluent in waste piping and uses it to preheat water in a domestic or service water heating system in order to reduce water heating energy usage.

DRY COOLER is a fan-powered heat rejection device that includes a water or glycol circuit connected by a closed circulation loop refrigerant condenser and is air-cooled.

DUAL-FUEL HEAT PUMP is an electric heat pump with gas furnace supplemental heat that alternates between the two fuel sources.

DUCT SEALING is a procedure for installing a space-conditioning distribution system that minimizes leakage of air from or to the distribution system. Minimum specifications for installation procedures, materials, diagnostic testing and field verification are contained in the Reference Residential Appendix RA3 and Reference Nonresidential Appendix NA1.

DUCT SYSTEM is all the ducts, duct fittings, plenums and fans when assembled to form a continuous passageway for the distribution of air.

DUCT WALL PENETRATIONS are openings to the duct wall made by pipes, holes, conduit, tie rods, or wires.

DUCTED SYSTEM is an air conditioner or heat pump, either a split system or single-packaged unit, that is designed to be permanently installed equipment and delivers conditioned air to an indoor space through a duct.

DWELLING is a building that contains one or two dwelling units used, intended or designed to be used, rented, leased, let or hired out to be occupied for living purposes (*CBC* Title 24, Part 2, Chapter 2).

DWELLING UNIT is a single unit providing complete, independent living facilities for one or more persons, including ~~access,~~ permanent provisions for living, sleeping, eating, cooking and sanitation. (*CBC* Title 24, Part 2, Chapter 2).

Dwelling Unit, Accessory is an attached or detached residential dwelling unit that provides complete independent living facilities for one or more persons and is located on a lot with a proposed or existing primary residence. Accessory dwelling units shall include permanent provisions for living, sleeping, eating, cooking and sanitation on the same parcel as the single-family or multifamily dwelling is or will be situated. (*CBC* Title 24, Part 2, Chapter 2).

Dwelling Unit, Attached ~~**WELLING UNIT, ATTACHED**~~ is a dwelling unit that shares a common wall or common floor/ceiling with another dwelling unit.

Dwelling ~~**WELLING**~~ **Unit** ~~**NIT**~~**, Junior** ~~**UNIOR**~~ **Accessory,** ~~**CCESSORY**~~**, or JADU** is a dwelling unit that is no more than 500 square feet in size and contained entirely within a newly constructed or existing single family building. A JADU includes a kitchen, a separate entrance from the main entrance to the building, and an interior entry to the main living area. A JADU may include separate sanitation facilities or may share sanitation facilities within the newly constructed or existing single family building.

DX-DEDICATED OUTDOOR AIR SYSTEM UNIT (DX-DOAS) is a type of air-cooled, water-cooled, or water-source DOAS unit that dehumidifies 100 percent outdoor air and includes reheat that is capable of controlling the supply dry-bulb temperature of the dehumidified air to the designed supply air temperature. This conditioned outdoor air is then delivered directly or indirectly to the conditioned spaces. It may precondition outdoor air by containing an enthalpy wheel, sensible wheel, desiccant wheel, plate heat exchanger, heat pipes, or other heat or mass transfer apparatus.

E

EAST-FACING (See "orientation.")

ECONOMIZER, AIR is a ducting arrangement, including dampers, linkages, and an automatic control system that allows a cooling supply fan system to supply outside air to reduce or eliminate the need for mechanical cooling.

ECONOMIZER, COMPUTER ROOM OR DATA CENTER is a system by which heat from ITE is rejected to the environment with reduced or no use of a refrigerant compressor depending on outdoor air conditions.

ECONOMIZER, PUMPED REFRIGERANT is a system by which the supply air of a cooling system is cooled directly by refrigerant pumped between indoor and outdoor units during cooler ambient temperatures in order to reduce or eliminate the need for mechanical cooling.

ECONOMIZER, WATER is a system by which the supply air of a cooling system is cooled directly or indirectly by evaporation of water in order to reduce or eliminate the need for mechanical cooling.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE) is the conductors, including the ungrounded, grounded, and equipment grounding conductors and the electric vehicle connectors, attachment plugs, personnel protection system, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the electric vehicle. (*CBC* Title 24, Part 11).

Direct Current Fast Charging Electric Vehicle Supply Equipment (DCFC EVSE) is electric vehicle supply equipment capable of providing not less than 400-volt DC output.

ELECTRICAL POWER DISTRIBUTION SYSTEMS. The following definitions are intended to apply to Section 601.2.6 *[Section 130.5]* only:

ELECTRICAL METERING is a device or system for measuring the electrical power and energy supplied to a customer or premise(s).

EQUIPMENT. A general term, including devices, luminaires, apparatus, machinery, and the like used as a part of, or in connection with, an electrical installation.

LOW VOLTAGE DRY-TYPE DISTRIBUTION TRANSFORMER is a distribution transformer that has an input voltage of 600 volts or less, that is air-cooled, and that does not use oil as a coolant.

PLUG LOAD is the energy consumed by any appliances or electronic device that is plugged into a receptacle or receptacle outlet. Plug loads are not related to general lighting, heating, ventilation, cooling, and water heating, domestic and service water system, renewable power, information technology equipment, computer room or data center electronic equipment, and electric vehicle charging.

SERVICE is the conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premise served.

SERVICE EQUIPMENT is the necessary equipment, usually consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the load end of service conductors to a building or other structure, or an otherwise designated area, and intended to constitute the main control and cutoff of the supply.

ELECTRONICALLY-COMMUTATED MOTOR is a brushless DC motor with a permanent magnet rotor that is surrounded by stationary motor windings, and an electronic controller that varies rotor speed and direction by sequentially supplying DC current to the windings.

ELEVATOR CONTROL SYSTEM. The overall system governing the starting, stopping, direction of motion, acceleration, speed, and slowing of the moving elevator, as defined in ASME A17.1/CSA B44.

EMITTANCE, THERMAL is the ratio of the radiant heat flux emitted by a sample to that emitted by a blackbody radiator at the same temperature.

ENCLOSED SPACE is space that is substantially surrounded by solid surfaces, including walls, ceilings or roofs, doors, fenestration areas, and floors or ground.

ENERGY BUDGET is the maximum energy consumption that a proposed building, or portion of a building, can be designed to consume, calculated using Energy Commission-approved

compliance software as specified by Section 10-109 of the Energy Code and the Alternative Calculation Method Reference Manual. The Energy Budget for newly constructed buildings are expressed in terms of the Long-tTerm System Cost (LSC) and Source Energy. The energy budget for additions and alterations is expressed in terms of LSC.

ENERGY COMMISSION ~~(CEC)~~ is the California State Energy Resources Conservation and Development Commission, which is also referred to as the California Energy Commission.

ENERGY EFFICIENCY RATIO (EER) is the ratio of net cooling capacity (in Btu/hr) to total rate of electrical energy input (in watts), of a cooling system under designated operating conditions, as determined using the applicable test method in the *Appliance Efficiency Regulations* or Section 400.5 *[Section 110.2]*.

ENERGY EFFICIENCY RATIO 2 (EER2) is the ratio of the average rate of space cooling capacity (Btu/h) delivered to the average rate of electrical energy consumed by the air conditioner or heat pump as determined in accordance to the test method in 10 CFR 430 Subpart B Appendix M1. EER2 is expressed in Btu/Wh.

ENERGY MANAGEMENT CONTROL SYSTEM (EMCS) is an automated control system that regulates the energy consumption of a building by controlling the operation of energy consuming systems, and is capable of monitoring loads and adjusting operations in order to optimize energy usage and respond to demand response signals.

ENERGY OBTAINED FROM DEPLETABLE SOURCES is electricity purchased from a public utility, or any energy obtained from coal, oil, natural gas, or liquefied petroleum gases.

ENERGY OBTAINED FROM NONDEPLETABLE SOURCES is energy that is not energy obtained from depletable sources.

ENFORCEMENT AGENCY is the city, county, or state agency responsible for issuing a building permit.

ENTHALPY RECOVERY RATIO (ERR) is a ratio of the change in enthalpy of the outdoor air supply to the difference in enthalpy between the entering supply airflow and the entering exhaust airflow, with no adjustment to account for that portion of the psychometric change in the leaving supply airflow that is the result of leakage of entering exhaust airflow rather than exchange of heat or moisture between the airstreams.

ENTIRE BUILDING is the ensemble of all enclosed space in a building, including the space for which a permit is sought, plus all existing conditioned and unconditioned space within the structure.

ENVELOPE (See “building envelope”.)

EXECUTIVE DIRECTOR is the Executive Director of the Energy Commission.

EXISTING BUILDING COMMISSIONING (EBCx) is a quality-focused process for attaining the current facility requirements of an existing facility and its systems and assemblies being commissioned. The process focuses on planning, investigating, implementing, verifying, and documenting that the facility and/or its systems and assemblies are operated and maintained to meet the current facility requirements, with a recommendation to implement continuous improvements for the remaining life of the facility.

Current Facility Requirements is a written document that details the current functional requirements of an existing facility and the expectations for how the facility should be used and operated, including goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information to meet the requirements of occupants, users, and owners of the facility.

EXISTING BUILDING COMMISSIONING AGENT (EBCxA) is an entity, identified by the owner or owner's representative, who leads, plans, schedules, and coordinates the necessary personnel required to implement the EBCx process.

EXFILTRATION is uncontrolled outward air leakage from inside a building, including leakage through cracks and interstices, around windows and doors, and through any other exterior partition or duct penetration.

EXTERIOR FLOOR/SOFFIT is a horizontal exterior partition, or a horizontal demising partition, under conditioned space. For *Single-family* and *Multifamily* with 3 stories or less~~low-rise residential occupancies~~, exterior floors also include those on grade.

EXTERIOR PARTITION is an opaque, translucent, or transparent solid barrier that separates conditioned space from ambient air or space. For *Single-family* and *Multifamily* with 3 stories or less ~~low-rise residential occupancies~~, exterior partitions also include barriers that separate conditioned space from unconditioned space, or the ground.

EXTERIOR ROOF/CEILING is an exterior partition, or a demising partition, that has a slope less than 60 degrees from horizontal, that has conditioned space below, and that is not an exterior door or skylight.

EXTERIOR ROOF/CEILING AREA is the area of the exterior surface of exterior roof/ceilings.

EXTERIOR WALL is any wall or element of a wall, or any member or group of members, which defines the exterior boundaries or courts of a building, and which has a slope of 60 degrees or greater with the horizontal plane. An exterior wall or partition is not an exterior floor/soffit, exterior door, exterior roof/ceiling, window, skylight, or demising wall.

EXTERIOR WALL AREA is the area of the opaque exterior surface of exterior walls.

F

FAÇADE is the contiguous exterior of a building surface, but not limited to fenestration products.

FACTORY is a building, structure, or space designated as Factory Group F that is used for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair, or processing operations.

FACTORY ASSEMBLED COOLING TOWERS are cooling towers constructed from factory-assembled modules either shipped to the site in one piece or put together in the field.

FAN, EMBEDDED is a fan that is part of a manufactured assembly where the assembly includes functions other than air movement.

FAN ARRAYS are multiple fans in parallel and in a single enclosure between two plenum sections in an air distribution system, where plenum means a compartment or chamber that forms a part of the air distribution system, and that is not used for occupancy or storage.

FAN ELECTRICAL INPUT POWER (FAN kWdesign) is the electrical input power in kilowatts required to operate an individual fan or fan array at design conditions. It includes the power consumption of motor controllers, if present.

FAN ENERGY INDEX (FEI) is the ratio of the electric input power of a reference fan to the electric input power of the actual fan as calculated per ANSI/AMCA 208-18 at fan system design conditions.

FAN NAMEPLATE ELECTRICAL INPUT POWER (kW) is the nominal electrical input power rating stamped on a fan assembly nameplate.

FAN SYSTEM includes all the fans that contribute to the movement of air through a point of a common duct, plenum, or cabinet.

FAN SYSTEM, COMPLEX means a fan system that combines a single-cabinet fan system with other supply fans, exhaust fans, or both.

FAN SYSTEM, EXHAUST/RELIEF is a fan system dedicated to the removal of air from interior spaces to the outdoors.

FAN SYSTEM, MULTI-ZONE VARIABLE AIR VOLUME (VAV) is a fan system that serves three or more space-conditioning zones where airflow to each zone is individually controlled based on heating, cooling and/or ventilation requirements, indoor fan airflow varies as a function of load, and the sum of the minimum zone airflows is 40% or less of the fan system design conditions.

FAN SYSTEM, RETURN is a fan system dedicated to removing air from interior spaces where some or all of the air is to be recirculated except during economizer operation.

FAN SYSTEM, SINGLE-CABINET is a fan system where a single fan, single fan array, a single set of fans operating in parallel, or fans or fan arrays in series and embedded in the same cabinet, that both supplies air to a space and recirculates the air.

FAN SYSTEM, SUPPLY-ONLY is a fan system that provides supply air to interior spaces and does not recirculate the air.

FAN SYSTEM, TRANSFER is a fan system that exclusively moves air from one occupied space to another.

FAN SYSTEM AIRFLOW (cfm) is the sum of the airflow of all fans with fan electrical input power greater than 1 kW at fan system design conditions, excluding the airflow that passes through downstream fans with fan input power less than 1 kW.

FAN SYSTEM DESIGN CONDITIONS are operating conditions that can be expected to occur during normal system operation that result in the highest supply airflow rate to or from the conditioned spaces served by the fan system.

FAN SYSTEM ELECTRICAL INPUT POWER (Fan kWdesign,system) is the sum of the fan electrical input power (Fan kWdesign) in kilowatts of all fans that are required to operate at fan system

design conditions to supply air from the heating or cooling source to the conditioned spaces, return it to the source, exhaust it to the outdoors, or transfer it to another space.

FAULT is a condition or a status in a system, equipment, or component that deviates from its intended operational state and results in measurable degradation of performance, efficiency, or control, such that corrective action is required to restore normal function.

FAULT DETECTION AND DIAGNOSTICS is an automated process to identify faults in building systems using sensors and data analytics to monitor system performance, determine potential solutions, and communicate findings.

FENESTRATION: Includes the following:

ACE is an NFRC-Approved Calculation Entity that conducts calculations of fenestration product ratings for certification authorization using the NFRC Component Modeling approach and issues label certificates to Specifying Authorities for product certification authorization in accordance with NFRC requirements.

~~**ALTERED COMPONENT**~~**Altered component** is a new fenestration component that has undergone an alteration other than a repair and is subject to all applicable standards requirements.

~~**BAY WINDOW**~~**Bay window** is a combination assembly which is composed of three or more individual windows either joined side by side or installed within opaque assemblies and which projects away from the wall on which it is installed. Center windows, if used are parallel to the wall on which the bay is installed, the end panels or two side windows are angled with respect to the center window. Common angles are 30° and 45°, although other angles may be employed.

~~**CHROMOGENIC GLAZING**~~**Chromogenic glazing** is a class of switchable glazing that includes active materials (e.g., electrochromic) and passive materials (e.g., photochromic and thermochromic) permanently integrated into the glazing assembly. Their primary function is to switch reversibly from a high transmission state to a low transmission state with associated changes in VT and SHGC.

~~**CLERESTORY FENESTRATION**~~**Clerestory fenestration** is fenestration installed above a roofline greater than or equal to 60° from the horizontal, or any portion of exterior vertical glazing greater than eight feet per floor above the finished floor of a space.

CMA (component modeling approach) is a fenestration product certification program from the National Fenestration Rating Council (NFRC) that enables energy-related performance ratings for nonresidential fenestration products, including the thermal performance U-factor, Solar Heat Gain Coefficient, and Visible Transmittance.

CMAST (Component Modeling Approach Software Tool) is an NFRC approved software that allows a user to create a fenestration product “virtually,” and generate its energy-related

performance ratings, including the thermal performance U-factor, Solar Heat Gain Coefficient, and Visible Transmittance.

~~**CURTAIN WALL/STOREFRONT**~~**Curtain wall/storefront** is an external non-bearing wall intended to separate the exterior nonconditioned and interior conditioned spaces. It also consists of any combination of framing materials, fixed glazing, opaque glazing, operable windows, or other in-fill materials**. Note:** Window wall is also included as part of the curtain wall/storefront fenestration category.

~~**DUAL-GLAZED GREENHOUSE WINDOWS**~~**Dual-glazed greenhouse windows** is a double glass pane separated by an air or other gas space that adds conditioned volume but not conditioned floor area to a building.

~~**DYNAMIC GLAZING SYSTEMS**~~**Dynamic glazing systems** are glazing systems that have the ability to reversibly change their performance properties, including U-factor, Solar Heat Gain Coefficient (SHGC), and/or Visible Transmittance (VT) between well-defined end points. These may include but are not limited to chromogenic glazing systems and integrated shading systems (defined below). Dynamic Glazing systems do not include internally mounted or externally mounted shading devices that attach to the window framing/glazing that may or may not be removable.

~~**FENESTRATION ALTERATION**~~**Fenestration alteration** is any change to an existing building's exterior fenestration product that is not a repair (see “fenestration repair”) that:

1. Replaces existing fenestration in an existing wall or roof with no net area added; or
2. Replaces existing fenestration and adds new net area in the existing wall or roof; or
3. Adds a new window that increases the net fenestration area to an existing wall or roof.

~~**FENESTRATION AREA**~~**Fenestration area** is the rough opening area of any fenestration product.

~~**FENESTRATION PRODUCT**~~**Fenestration product** is any transparent or translucent material plus any sash, frame, mullions and dividers, in the facade of a building, including, but not limited to, windows, glazed doors, skylights, curtain walls, dynamic glazing, garden windows, glass block, and glazing used in greenhouses.

~~**FENESTRATION REPAIR**~~**Fenestration repair** is the reconstruction or renewal for the purpose of maintenance of any fenestration product, component or system and shall not increase the preexisting energy consumption of the repaired fenestration product, component, system, or equipment. Replacement of any component, system, or equipment for which there are requirements in the Standards are considered an alteration (see “fenestration”, “alteration”) and not a repair and is subject to the requirements of Part 6 of the Standards.

~~**FIELD-FABRICATED**~~**Field-fabricated** is a fenestration product whose frame is made at the construction site of standard dimensional lumber or other materials that were not previously cut, or otherwise formed with the specific intention of being used to fabricate a fenestration product. Field fabricated does not include site-built fenestration.

~~**FIN**~~**Fin** is an opaque surface, oriented vertically and projecting outward horizontally from an exterior vertical surface.

~~**FIN OFFSET**~~**Fin offset** is the horizontal distance from the edge of exposed exterior glazing at the jamb of a window to the fin.

~~**FIN PROJECTION**~~**Fin projection** is the horizontal distance, measured outward horizontally, from the surface of exposed exterior glazing at the jamb of a window to the outward edge of a fin.

~~**FIXED**~~ **Fixed** is fenestration that is not designed to be opened or closed.

~~**GLAZED DOOR**~~**Glazed door** is an exterior door having a glazed area of 25 percent or greater of the area of the door. Glazed doors shall meet fenestration product requirements. See "door."

~~**GREENHOUSE or GARDEN WINDOW**~~**Greenhouse or garden window** is a window unit that consists of a three-dimensional, five-sided structure generally protruding from the wall in which it is installed. Operating sash may or may not be included.

~~**HORIZONTAL SLATS**~~**Horizontal slats**, when referring to a daylighting device, is a set of adjacent surfaces located directly adjacent to vertical fenestration, oriented horizontally and projecting horizontally from its interior or exterior vertical surface.

~~**INTEGRATED SHADING SYSTEM**~~**Integrated shading system** is a class of fenestration products including an active layer: e.g., shades, louvers, blinds or other materials permanently integrated between two or more glazing layers. The U-factor and/or SHGC and VT of the insulating glass assembly can be altered by reversibly changing the enclosed active layer.

~~**LIGHT SHELF**~~**Light shelf** is an adjacent, opaque surfaced daylighting device located at the sill of clerestory glazing, oriented horizontally and projecting horizontally from an interior or exterior vertical surface.

~~**MANUFACTURED** or **KNOCKED DOWN PRODUCT**~~**Manufactured or knocked down product** is a fenestration product constructed of materials which are factory cut or otherwise factory formed with the specific intention of being used to fabricate a fenestration product. Knocked down or partially assembled products may be sold as a fenestration product when provided with temporary and permanent labels as described in Section300.1.1.5 *[Section 10-111]*; or as a site-built fenestration product when not provided with temporary and permanent labels as described in Section300.1.1.5 *[Section 10-111]*.

NFRC 100 is the National Fenestration Rating Council document titled "Procedure for Determining Fenestration Product U-factors." (2020) (ANSI/NFRC 100-2020).

NFRC 200 is the National Fenestration Rating Council document titled "Procedure for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidence." (2020) (ANSI/NFRC 200-2020).

NFRC 202 is the National Fenestration Rating Council document titled "Procedures for Determining Translucent Fenestration Product Visible Transmittance at Normal Incidence." (2020) (ANSI/NFRC 202-2020).

NFRC 203 is the National Fenestration Rating Council document titled "Procedure for Determining Visible Transmittance of Tubular Daylighting Devices." (2020) (ANSI/NFRC 203-2020).

NFRC 400 is the National Fenestration Rating Council document titled "Procedure for Determining Fenestration Product Air Leakage." (2020) (ANSI/NFRC 400-2020).

~~**OPERABLE SHADING DEVICE**~~**Operable shading device** is a device at the interior or exterior of a building or integral with a fenestration product, which is capable of being operated, either manually or automatically, to adjust the amount of solar radiation admitted to the interior of the building.

~~**RELATIVE SOLAR HEAT GAIN COEFFICIENT (RSHGC)**~~ **Relative solar heat gain coefficient (RSHGC)** is the ratio of solar heat gain through a fenestration product (corrected for external shading) to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation, which is then reradiated, conducted, or convected into the space.

~~**SITE-BUILT**~~**Site-built** is fenestration designed to be field-glazed or field assembled units using specific factory cut or otherwise factory formed framing and glazing units, that are manufactured with the intention of being assembled at the construction site. These include storefront systems, curtain walls, and atrium roof systems.

~~**SKYLIGHT ROOF RATIO (SRR)**~~**Skylight roof ratio (SRR)** is the ratio of the skylight area to the gross exterior roof area.

~~**SOLAR HEAT GAIN COEFFICIENT (SHGC)**~~**Solar heat gain coefficient (SHGC)** is the ratio of the solar heat gain entering the space through the fenestration area to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation, which is then reradiated, conducted, or convected into the space.

~~**SPANDRAL**~~ **Spandrel** is opaque glazing material most often used to conceal building elements between floors of a building so they cannot be seen from the exterior, also known as "opaque in-fill systems".

~~**TINTED GLASS**~~**Tinted glass** is colored glass by incorporation of a mineral admixture resulting in a degree of tinting. Any tinting reduces both visible and radiant transmittance.

~~**VERTICAL FENESTRATION**~~**Vertical fenestration** is all fenestration other than skylights and doors with less than 25 percent of glazing.

~~**VISIBLE REFLECTANCE**~~**Visible reflectance** ~~is the reflectance of light at wavelengths from 410 to 722 nanometers.~~

~~**VISIBLE TRANSMITTANCE**~~**Visible transmittance (VT)** is the ratio (expressed as a decimal) of visible light that is transmitted through a glazing fenestration. The higher the VT rating, the more light is allowed through a window.

~~**WINDOW**~~ **Window** is fenestration that is not a skylight and that is an assembled unit consisting of a frame and sash component holding one or more pieces of glazing.

~~**WINDOW AREA**~~**Window area** is the area of the surface of a window, plus the area of the frame, sash, and mullions.

~~**WINDOW HEAD HEIGHT**~~**Window head height** is the height from the floor to the top of the vertical fenestration.

~~**WINDOW WALL RATIO**~~**Window wall ratio (WWR)** is the ratio of the window area to the gross exterior wall area.

FIELD ERECTED COOLING TOWERS are cooling towers which are custom designed for a specific application, and which cannot be delivered to a project site in the form of factory assembled modules due to their size, configuration, or materials of construction.

FIREPLACE is a hearth and fire chamber, or similar prepared place, in which a fire may be made, and which is built in conjunction with a flue or chimney, including but not limited to factory-built fireplaces, masonry fireplaces, and masonry heaters as further clarified in the *CBC*.

FLASH STEAM is water vapor that is generated when condensate is dropped to a lower pressure than its saturation pressure, which then vaporizes a fraction of the liquid in a process called flashing.

FLOOR/SOFFIT TYPE is a type of floor/soffit assembly having a specific heat capacity, framing type, and U-factor.

FLUID COOLER is a fan-powered heat rejection device that includes a water or glycol circuit connected by a closed circulation loop to a liquid-cooled refrigerant condenser, and may be either evaporative-cooled, air-cooled, or a combination of the two.

FLUX is the rate of energy flow per unit area.

FOOD PREPARATION EQUIPMENT is cooking equipment intended for commercial use, including coffee machines, espresso coffee makers, conductive cookers, food warmers including heated food servers, fryers, griddles, nut warmers, ovens, popcorn makers, steam kettles, ranges, and cooking appliances for use in commercial kitchens, restaurants, or other business establishments where food is dispensed.

FREEZER is a space designed to be capable of operation at less than 28°F.

G

GAS COOLER is a refrigeration component that reduces the temperature of a refrigerant vapor by rejecting heat to air mechanically circulated over its heat transfer surface. Used by a CO2 refrigeration system in transcritical mode, and normally also capable of operating in subcritical mode.

GAS COOLING EQUIPMENT is cooling equipment that produces chilled water or cold air using natural gas or liquefied petroleum gas as the primary energy source.

GAS HEATING SYSTEM is a system that uses natural gas or liquefied petroleum gas as a fuel to heat a conditioned space.

GAS LOG is a self-contained, free-standing, open-flame, gas-burning appliance consisting of a metal frame or base supporting simulated logs and designed for installation only in a vented fireplace.

GLAZING (See "fenestration product.")

GLOBAL WARMING POTENTIAL (GWP) is the radiative forcing impact of one mass-based unit of a given greenhouse gas relative to an equivalent unit of carbon dioxide over a given period of time.

GLOBAL WARMING POTENTIAL VALUE (GWP Value) is the 100-year GWP value published by the Intergovernmental Panel on Climate Change (IPCC) in either its Second Assessment Report (SAR) (IPCC, 1995), or its Fourth Assessment A-3 Report (AR4) (IPCC, 2007). Both the 1995 IPCC SAR values and the 2007 IPCC AR4 values are published in Table 2.14 of the 2007 IPCC AR4. The SAR GWP values are found in column "SAR (100-yr)" of Table 2.14.; the AR4 GWP values are found in column "100 yr" of Table 2.14."

GOVERNMENTAL AGENCY is any public agency or subdivision thereof, including, but not limited to, any agency of the state, a county, a city, a district, an association of governments, or a joint power agency.

GROSS EXTERIOR ROOF AREA is the sum of the skylight area and the exterior roof/ceiling area.

GROSS EXTERIOR WALL AREA is the sum of the window area, door area, and exterior wall area.

GROUND-LOOP HEAT PUMP is a brine-to-air heat pump using a brine solution circulating through a subsurface piping loop that functions as a heat source/heat sink.

GROUND-WATER HEAT PUMP is a water-to-air heat pump using water pumped from a well, lake, or stream that functions as a heat source/heat sink.

GROUP R OCCUPANCIES~~,~~ are residential occupancy groups, as defined by Title 24, Part 2, Section 302, and any subordinate uses or accessory occupancies that are incidental and subordinate to the Group R occupancy use designation, per Title 24, Part 2, Section 508. This includes, but is not limited to, sleeping rooms, guest rooms, dwelling units, lobbies, corridors, meeting rooms, offices, restrooms, food service spaces, and laundry facilities serving the Occupancy R.

H

HABITABLE SPACE is a space in a building for living, sleeping, eating, or cooking. ~~, excluding bathrooms~~Bathrooms, toilet rooms, closets, hall~~way~~s, storage or utility spaces~~areas, closets, utility rooms~~ and similar areas are not considered habitable spaces. (See also "occupiable space".) (*CBC* Title 24, Part 2, Chapter 2)

HABITABLE STORY is a story that contains *habitable space* and that has at least 50 percent of its volume above grade. Mezzanines are not considered habitable stories.

HEALTHCARE FACILITY is a health facility as defined in the California Health and Safety Code, Division 2, Chapter 2, Section ~~§~~1250 or clinic as defined in the California Health and Safety Code,

Division 2, Chapter 1, Section 1204 that is located within a health facility. Examples of healthcare facilities include hospitals, skilled nursing facilities, intermediate care facilities, congregate living health facilities, correctional treatment centers and hospice facilities and may be regulated by the California Department of Health Care Access and Information (HCAI) or by another authority with jurisdiction.

HCAI F~~ACILITY~~acility is a hospital or acute psychiatric hospital classified as Office of Statewide Health Planning and Development (OSHPD) 1 or OSHPD 5, or a skilled nursing facility classified as OSHPD 2 that ~~are~~is regulated by HCAI. An outpatient clinic classified as OSHPD 3 is included in this definition when it is located in an OSHPD 1, 2, or 5 facility. OSHPD classifications are defined in Part 2 of the California Building Code.

HEAT CAPACITY (HC) is the measurable physical quantity that characterizes the amount of heat required to change a substance's temperature by a given amount.

HEAT PUMP is an appliance, that consists of one or more assemblies; that uses an indoor conditioning coil, a compressor, and a refrigerant-to-outdoor air heat exchanger to provide air heating; and that may also provide air cooling, dehumidifying, humidifying, circulating, or air cleaning.

HEAT PUMP WATER HEATER (HPWH) (See "Water Heater.")

HEATED SLAB FLOOR is a concrete floor either, on-grade, raised, or a lightweight concrete slab topping. Heating is provided by a system placed within or under the slab and is sometimes referred to as a radiant slab floor.

~~**HEATING EQUIPMENT** is equipment used to provide mechanical heating for a room or rooms in a building.~~

HEATING SEASONAL PERFORMANCE FACTOR (HSPF) is the total heating output of a central air-conditioning heat pump (in Btu) during its normal use period for heating divided by the total electrical energy input (in watt-hours) during the same period, as determined using the applicable test method in the *Appliance Efficiency Regulations*.

HEATING SEASONAL PERFORMANCE FACTOR 2 (HSPF2) is the HSPF metric for residential central heat pumps effective January 1, 2023, as created by the U.S. Department of Energy "ISSUANCE 2016-11-30 Energy Conservation Program: Test Procedures for Central Air Conditioners and Heat Pumps, Final Rule."

HIGH-RISE RESIDENTIAL BUILDING is a building, other than a hotel/motel, of Occupancy Group R-2 or R-4 with four or more habitable stories.

HORTICULTURAL LIGHTING consists of luminaires used for plant growth and maintenance. Horticultural luminaires may have either plug-in or hard-wired connections for electric power.

HOTEL/MOTEL ~~is a building or buildings that has six or more guest rooms or a lobby serving six or more guest rooms, where the guest rooms are intended or designed to be used, or which are used, rented, or hired out to be occupied, or which are occupied for sleeping purposes by guests, and all conditioned spaces within the same building envelope. Hotel/motel includes all conditioned spaces which are (1) on the same property as the hotel/motel, (2) served by the same central heating, ventilation, and air-conditioning system as the hotel/motel, and (3)~~

~~integrally related to the functioning of the hotel/motel as such, including, but not limited to, exhibition facilities, meeting and conference facilities, food service facilities, lobbies, and laundries. Hotel/motel also includes the following:~~

~~1. A building of Occupancy Group R-1,~~

~~2. Vacation timeshare properties and hotel or motel buildings of Occupancy Group R-2, and~~

~~3. The following types of Occupancy Group R-3:~~

~~3.1. Congregate residences for transient use,~~

~~3.2. Boarding houses of more than 6 guests, and~~

~~Alcohol or drug abuse recovery homes of more than 6 guests.~~See *Use Designation.*

HVAC SYSTEM is a space-conditioning system or a ventilation system.

HVI 915 is the Home Ventilating Institute document titled "HVI Loudness Testing and Rating Procedure," 2020 (HVI Publication 915-2020).

HVI 916 is the Home Ventilating Institute document titled "VI Airflow Test Procedure," 2020 (HVI Publication 916-2020).

HVI 920 is the Home Ventilating Institute document titled "HVI Product Performance Certification Procedure Including Verification and Challenge," 2020 (HVI Publication 920-2020).

I

IES HB (See "IES Lighting Library.")

IES LIGHTING LIBRARY, formerly called the **"**IES Lighting Handbook (IES HB)," is the Illuminating Engineering Society document titled "The IES Lighting Library™."

INTEGRATED SEASONAL COEFFICIENT OF PERFORMANCE (ISCOP) is a seasonal efficiency number that is a combined value based on the formula listed in AHRI Standard 920 of the two COP values for the heating season of a DX-DOAS unit water or air source heat pump, expressed in W/W.

INTEGRATED SEASONAL MOISTURE REMOVAL EFFICIENCY (ISMRE) is a seasonal efficiency number that is a combined value based on the formula listed in AHRI Standard 920 of the four dehumidification moisture removal efficiency (MRE) ratings required for DX-DOAS units, expressed in lb. of moisture/kWh.

IES LM-79 is an American National Standard authored by the Illuminating Engineering Society and titled, "Approved Method: Optical and Electrical Measurements of Solid State Lighting Products" (2019) (ANSI/IES LM-79-19).

IES LS-1-20 is the American National Standard authored by the Illuminating Engineering Society and titled "Lighting Science: Nomenclature and Definitions for Illuminating Engineering" 2020 (ANSI/IES LS-1-20)

IES TM-15-20 is an American National Standard authored by the Illuminating Engineering Society and titled "Technical Memorandum: Luminaire Classification System for Outdoor Luminaires" (2020) (ANSI/IES TM-15-20).

INDOOR GROWING is a type of CEH space in a building with a Skylight Roof Ratio less than 50 percent. Growing plants in a warehouse with or without skylights is an example of indoor growing.

INDOOR GROWING SPACE--CONDITIONING SYSTEM is a system that provides dehumidification, mechanical cooling, reheating, or mechanical heating, and incorporates components, sensors, and controls that manage temperature and humidity within an indoor growing space.

INFILTRATION is uncontrolled inward air leakage from outside a building or unconditioned space, including leakage through cracks and interstices, around windows and doors, and through any other exterior or demising partition or pipe or duct penetration. See AIR BARRIER.

INFORMATION TECHNOLOGY EQUIPMENT (ITE) includes computers, data storage, servers, and network /communication equipment located in a computer room. (*CBC* Title 24, Part 2, Chapter 2)

Facility water is the cooling fluid loop that carries heat away from liquid-cooled ITE (typically via a coolant distribution unit heat exchanger) toward plant-level heat rejection infrastructure, including, but not limited to, chillers, cooling towers, and dry coolers.

ITE, Air-cooled are the components of ITE that are cooled by the flow of air through the ITE equipment. Onboard server fans are typically used to move air through servers.

ITE, Liquid-cooled are the components of ITE that are cooled by a liquid and that do not use server fans to flow air across the components. Common liquid cooling fluids include water, glycol, and refrigerant. Individual servers can be partially liquid-cooled and partially air-cooled, with server fans serving the air-cooled components and pumps serving the liquid-cooled components.

ITE design load is the combined power of all the ITE loads for which the ITE cooling system is designed.

Information technology equipment facilities (ITEF) are data centers and computer rooms used primarily to house information technology equipment. (*CBC* Title 24, Part 2, Chapter 2)

INTEGRATED ENERGY EFFICIENCY RATIO (IEER) is a single-number cooling part load efficiency figure of merit calculated as specified by the method described in ANSI/AHRI Standard 340/360/1230. This metric replaces the IPLV for ducted and non-ducted units.

INTEGRATED DX HVAC/D SYSTEM is an direct expansion HVAC system and dehumidification system designed to handle both sensible and latent heat removal. Integrated DX HVAC/D systems may include but are not limited to: HVAC systems with a sensible heat ratio of 0.65 or less and the capability of providing cooling, dedicated outdoor air systems, single package air

conditioners with at least one refrigerant circuit providing hot gas reheat, and dehumidifiers modified to allow external heat rejection.

INTEGRATED SPACE-~~-~~CONDITIONING SYSTEM is an HVAC and dehumidification system designed to handle both sensible and latent heat removal. These systems can use, but are not limited to, one or more heat or moisture exchange mediums, including refrigerant, chilled water, and liquid desiccants, to dehumidify and cool air. Integrated space-conditioning systems use recovered heat to *reheat* air to meet supply air setpoints and/or regenerate desiccant media.

INTEGRATED PART LOAD VALUE (IPLV) is a single-number cooling part-load efficiency figure of merit calculated as specified by the method described in ANSI/AHRI Standard 550/590 for use with chillers.

INTERNAL GREENHOUSE CURTAIN SYSTEM is a retractable assembly installed within a greenhouse envelope above the plant canopy, consisting of one or more curtain layers that operate as a single system, and when deployed, span the primary roof glazing area and reduce conductive, convective, and radiative heat transfer through the roof or upper glazing.

ISO 5801 is the International Organization for Standardization document titled “Fans – Performance testing using standardized airways,”~~-~~ 2017 (ISO 5801:2017).

ISO 9237 is the International Organization for Standardization document titled “Textiles - Determination of the Permeability of Fabrics to Air,” 1997 (ISO 9237:1995).

ISO 13256-1 is the International Organization for Standardization document titled "Water-source heat pumps -- Testing and rating for performance - Part 1: Water-to-air and brine-to-air heat pumps," 2012 (ANSI/AHRI/ASHRAE ISO 13256-1:1998 (RA 2012).

ISO 13256-2 is the International Organization for Standardization document titled "Water-source heat pumps - Testing and rating for performance - Part 1: Water-to-water and brine-to-water heat pumps," 2012 (ANSI/AHRI/ASHRAE ISO 13256-2 (R2012)).

ISO 17025 is the International Organization for Standardization document titled "General Criteria for the Competence of Testing and Calibration Laboratories", 2017 (ISO/IEC 17025:2017).

~~**ITE DESIGN LOAD** is the combined power of all the ITE loads for which the ITE cooling system is designed.~~

K

KITCHEN, FULL-SERVICE COMMERCIAL is a kitchen dedicated to an establishment that offers table service by waitstaff.

KITCHEN, INSTITUTIONAL COMMERCIAL is a kitchen dedicated to a foodservice establishment that provides meals at institutions including schools, colleges and universities, hospitals, correctional facilities, private cafeterias, nursing homes, and other buildings or structures in which care or supervision is provided to occupants.

KITCHEN, QUICK-SERVICE COMMERCIAL is a kitchen dedicated to an establishment primarily engaged in providing fast food, fast casual, or limited services. Food and drink may be consumed on premises, taken out, or delivered to the customer's location.

L

LANGELIER SATURATION INDEX (LSI) is expressed as the difference between the actual system pH and the saturation pH. LSI indicates whether water will precipitate, dissolve, or be in equilibrium with calcium carbonate, and is a function of hardness, alkalinity, conductivity, pH and temperature.

LARGEST NET CAPACITY INCREMENT is the largest increase in capacity when switching between combinations of base compressors that is expected to occur under the compressed air system control scheme.

LIGHTING definitions:

Accent Lighting is directional lighting to emphasize a particular object or surface feature, or to draw attention to a part of the field of view. It can be recessed, surface mounted, or mounted to a pendant, stem, or track, and can be display lighting. It shall not provide general lighting.

Astronomical Time-Switch Control is a lighting control that controls lighting based on the time of day and astronomical events such as sunset and sunrise, accounting for geographic location and calendar date.

Automatic Scheduling Control is a time-based lighting control that is capable of being programmed to reduce or turn off lighting power for a portion of the night and to turn off lighting power for the day.

Automatic Time Switch Control controls lighting based on the time of day.

Captive-Key Override is a type of lighting control in which the key that activates the override cannot be released when the lights are in the on position.

Ceiling Bulkhead Walls are interior vertical walls or vertical partitions that span the transition in height between adjacent ceilings of different heights.

Chandelier is a ceiling-mounted, close-to-ceiling, or suspended decorative luminaire that uses glass, crystal, ornamental metals, or other decorative material.

Color Rendering Index (CRI) is a measure of the degree of color shift that objects undergo when illuminated by the lighting source as compared with the color of the same objects when illuminated by a reference source of comparable color temperature. CRI is calculated according to CIE 13.3.

Colored light source is a light source designed and marketed as a colored light source and not designed or marketed for general lighting applications with either of the following characteristics maintained throughout all modes of operation including color changing operation:

1. A Color Rendering Index (CRI) less than 40, as determined according to the method set forth in CIE Publication 13.3; or
2. A Correlated Color Temperature as measured with ANSI/IES LM-66-20 or ANSI/IES LM-79-19 (as appropriate) and calculated with CIE 15, which does not have a corresponding nominal CCT designation in ANSI C78.377-2017.

Compact Fluorescent Lamp is a fluorescent lamp with a small diameter glass tube (T5 or smaller) that is folded, bent, or bridged to create a long discharge path in a small volume. The lamp designs generally include an amalgam and a cold chamber, or a cold spot, to control the mercury vapor pressure and light output.

Correlated Color Temperature (CCT) is the absolute temperature of a blackbody whose chromaticity most nearly resembles that of the light source.

Countdown Timer Switch turns lighting or other loads ON when activated using one or more selectable countdown time periods and then automatically turns lighting or other loads OFF when the selected time period has elapsed.

Daylight Continuous Dimming Controls are automatic ~~a continuous~~ dimming controls that vary the luminous flux of the electric lighting system continuously between 100 percent and 10 percent or lower of lighting power in response to available daylight.

Daylight Stepped Switching Controls vary the luminous flux or lighting power of the electric lighting system to two levels: 100 percent and OFF, in response to available daylight.

Daylight Responsive Control adjusts the luminous flux of the electric lighting system in either a series of steps or by continuous dimming in response to available daylight. This kind of control uses one or more photosensors to detect changes in daylight illumination and then automatically adjusts the electric lighting levels in response.

Decorative (Lighting/Luminaires) is lighting or luminaires installed only for aesthetic purposes and that does not serve as display lighting or general lighting. Decorative luminaires are chandeliers, sconces, lanterns, neon or cold cathode, light emitting diodes, theatrical projectors, moving lights, and light color panels, not providing general lighting or task lighting.

Dimmer is a device used to control the intensity of light emitted by a luminaire by controlling the voltage or current available to it.

Dimmer, Continuous means a dimmer that varies the luminous flux of the electric lighting system over a continuous range from the device's maximum light output to the device's minimum light output without visually apparent abrupt changes in light level between the various steps.

Dimmer, Forward Phase Cut, varies the luminous flux of the electric lighting system in which a portion of the alternating current voltage waveform supplying to the light source is removed.

Dimmer, Stepped varies the luminous flux of the electric lighting system in one or more predetermined discrete steps between maximum light output and OFF with changes in light level between adjacent steps being visually apparent.

Display Lighting, Case is lighting that provides a higher level of illuminance to a specific area than the level of surrounding ambient illuminance of small art objects, artifacts, or valuable collections which involves customer inspection of very fine detail from outside of a glass enclosed display case.

Display Lighting, Floor is supplementary lighting that provides a higher level of illuminance to a specific area than the level of surrounding ambient illuminance required to highlight features, such as merchandise on a clothing rack or sculpture or free standing of artwork, which is not displayed against a wall.

Display Lighting, Wall is supplementary lighting that provides a higher level of illuminance to a specific area than the level of surrounding ambient illuminance required to highlight features, such as merchandise on a shelf or wall-mounted artwork, which is displayed on perimeter walls.

Display Lighting, Window is lighting that provides a higher level of illuminance to a specific area than the level of surrounding ambient illuminance of objects such as merchandise, goods, and artifacts, in a show window, to be viewed from the outside of a space through a window.

Driver, when used in relation to solid state lighting, is a device that uses semiconductors to control and supply DC power for LED starting and operation.

Enclosed Luminaires are luminaires which contain enclosed lamp compartments where ventilation openings are less than 3 square inches per lamp in the lamp compartment as defined by UL 1598.

General Lighting is installed electric lighting that provides a uniform level of illumination throughout an area, exclusive of any provision for special visual tasks or decorative effect, exclusive of daylighting, and also known as ambient lighting.

GU-24 is the designation of a lamp holder and socket configuration, based on a coding system by the International Energy Consortium, where “G” indicates the broad type of two or more projecting contacts, such as pins or posts, “U” distinguishes between lamp and holder designs of similar type but that are not interchangeable due to electrical or mechanical requirements, and “24” indicates 24 millimeters center to center spacing of the electrical contact posts.

Illuminance is the area density of the luminous flux incident at a point on a surface.

Illumination is commonly used in a qualitative sense to designate the act of illuminating or the state of being illuminated.

Inseparable Solid State Lighting (SSL) Luminaire is a luminaire featuring solid state lighting components such as LEDs, light engines, and/or driver components which cannot be easily removed or replaced by the end user, thus requiring replacement of the entire luminaire. Removal of solid state lighting components may require the cutting of wires, use of a soldering iron, or damage to or destruction of the luminaire. If solid state lighting components are not removable without destruction to the luminaire, the luminaire is deemed inseparable.

Institutional Tuning is the process of adjusting the maximum light output of lighting systems to support visual needs or save energy. Institutional tuning differs from personal tuning in that the control strategy is implemented at the institutional rather than the individual user level, and maximum light level adjustments are available only to authorized personnel.

Integrated LED lamp is an integrated assembly composed of light emitting diode (LED) packages (components) or LED arrays (modules), as well as an LED driver, an ANSI standard base, and other optical, thermal, mechanical, and electrical components. The device is intended to connect directly to the branch circuit through a corresponding ANSI standard lamp-holder (socket). (ANSI/IES LS-1-20).

Lamp is an electrical appliance that produces optical radiation for the purpose of visual illumination, designed with a base to provide an electrical connection between the lamp and a luminaire, and designed to be installed into a luminaire. A lamp is not a luminaire and is not an LED retrofit kit.

Landing, Elevator is the portion of a floor, balcony, or platform used to receive and discharge passengers or freight.

Landscape Lighting is a type of outdoor lighting that is recessed into or mounted on the ground, paving, or raised deck, which is mounted less than 42 inches above grade or mounted onto trees or trellises, and that is intended to be aimed only at landscape features.

Lantern is an outdoor luminaire that uses an electric lamp to replicate the appearance of a pre-electric lantern, which used a flame to generate light.

LED Driver is a device composed of a power source and light emitting diode (LED) control circuitry designed to operate an LED package (component), an LED array (module), or an LED lamp. LED Driver is a power source that adjusts the voltage or current to LEDs, ranging in complexity from a resistor to a constant voltage or constant current power supply. LED Driver is also known and referred to as Lamp Control Gear.

LED Light Engine is an integrated assembly composed of light emitting diode (LED) packages (components) or LED arrays (modules), as well as an LED driver and other optical, thermal, mechanical, and electrical components. The device is intended to connect directly to the branch circuit through a custom connector compatible with the LED luminaire for which it was designed. It does not use an ANSI standard base.

LED Retrofit Kit is a solid state lighting product intended to replace existing light sources and systems, including incandescent and fluorescent light sources, in previously installed luminaires that already comply with safety standards. These kits replace the existing light source and related electrical components and are classified or certified to UL 1598C. They may employ an ANSI standard lamp base, either integral or connected to the retrofit by wire leads. LED retrofit kit does not include self-ballasted lamps.

Very Valuable Display Case Lighting is lighting contained inside of a locked display case containing rare or precious objects, including, but not limited to, jewelry, coins, small art objects, crystal, ceramics, or silver.

Light is a form of radiant energy that is capable of exciting the retina and producing a visual sensation. The visible portion of the electromagnetic spectrum extends from about 380 to about 770 nanometers.

Lighting, or illumination, is commonly used in a qualitative or general sense to designate the act of illuminating or the state of being illuminated.

Lighting Control, Self-Contained is a unitary lighting control module that requires no additional components to be a fully functional lighting control.

Lighting Control System requires two or more components to be installed in the building to provide all of the functionality required to make up a fully functional and compliant lighting control.

Light Emitting Diode (LED) is a p-n junction semiconductor device that emits incoherent optical radiation when forward-biased. The optical emission may be in the ultraviolet, visible, or infrared wavelength regions.

Line-Voltage Track Lighting is equipped with luminaires that use line-voltage lamps or that are equipped with integral transformers at each luminaire.

Low Voltage is less than 90 volts.

Low-Voltage Track Lighting is equipped with remote transformers for use with low-voltage equipment along the entire length of track.

Luminaire is a complete lighting unit consisting of a light source such as a lamp or lamps, together with the parts that distribute the light, to position and protect the light source, and to connect the light source to the power supply.

Luminaire Alteration is adding luminaires, removing and reinstalling luminaires, or combined replacement of lamps and ballasts or drivers. Luminaire alterations do not include repairs, such as replacing lamps only, ballasts or drivers only, diffusers, shades, or luminaire covers.

Luminance is the luminous intensity of the source or surface divided by the area of the source or surface seen by the observer.

Luminous Efficacy is a measure of the luminous efficiency of a light source. It is the quotient of the total luminous flux emitted by the total light source power input, expressed in lm/W.

Luminous Flux is the time rate of flow of radiant energy, evaluated in terms of a standardized visual response.

Luminous Maintenance (often referred to as “lumen flux maintenance” or “lumen maintenance”) is the remaining luminous flux output, typically expressed as a percentage of initial luminous flux output, at any selected elapsed operating time. Luminous maintenance is the converse of luminous flux depreciation (or “lumen depreciation”).

Manual Dimming Control provides a means for occupants to vary the luminous flux of the electric lighting system over a continuous range from 100 percent to 10 percent or lower of the lighting power.

Marquee Lighting is a permanent lighting system consisting of one or more rows of many small lamps, including light emitting diodes (LEDs) lamps, tungsten lamps, low pressure discharge lamps or fiber optic lighting, attached to a canopy.

Multilevel Astronomical Time Switch is an Astronomical Time Switch Control that reduces lighting power in multiple steps.

Multilevel Lighting Control enables the intensity of lighting to be adjusted upward and downward.

Multi-scene Programmable Control allows for two or more predefined lighting settings, in addition to all-OFF, for two or more groups of luminaires to suit multiple activities in the space.

Narrow Band Spectrum is a limited range of wavelengths (nm) concentric to a dominant peak wavelength in the visible spectrum. The limited range of wavelength shall be within 20 nm on either side of the peak wavelength at 50 percent of the peak wavelength's relative spectral power, and within 75 nm on either side of the peak wavelength at 10 percent of the peak wavelength's relative spectral power.

NEMA LSD 57 is the National Electrical Manufacturers Association document titled "Polyurethane Foam Application: Lighting Equipment," 2018 (NEMA LSD 57-2018).

NEMA SSL 7A is the National Electrical Manufacturers Association document titled "Phase Cut Dimming for Solid State Lighting: Basic Compatibility," 2015 (NEMA SSL 7A-2015).

Non-integrated LED lamp is an assembly composed of a light emitting diode (LED) array (module) or LED packages (components), and an ANSI standard base. The device is intended to connect to the LED driver of an LED luminaire through an ANSI standard lamp-holder (socket). The device cannot be connected directly to the branch circuit. (ANSI/IES LS-1-20).

Occupant Sensing Controls automatically control levels of illumination, allow for manual operation, and consist of the following types:

1. **Motion Sensing Control** is used outdoors, automatically reduces lighting power, or turns lights OFF after an area is vacated of occupants, and automatically turns the lights ON when the area is occupied.
2. **Occupant Sensing Control** is used indoors, automatically reduces lighting power, or turns lights OFF after an area is vacated of occupants and is capable of automatically turning the lighting load ON when an area is occupied.
3. **Partial-ON Occupant or Motion Sensing Control** automatically turns lights OFF after an area is vacated of occupants and is capable of automatically or manually turning ON part of the lighting load when an area is occupied.
4. **Partial-OFF Occupant or Motion Sensing Control** automatically dims the lighting or turns OFF part of the lighting load after an area is vacated of occupants, and is capable of automatically turning ON the lighting load or restoring it to full when an area is occupied.
5. **Vacancy Sensing Control** automatically turns lights OFF after an area is vacated of occupants but requires lights to be turned ON manually.

One-to-One Alteration is either replacement of whole luminaires one for one, in which the only electrical modification involves disconnecting the existing luminaire and reconnecting the replacement luminaire, or when components of a luminaire are modified without replacing the entire luminaire.

Ornamental (Lighting/Luminaires) is lighting or luminaires installed outdoor which are rated for 50 watts or less that are post-top luminaires, lanterns, pendant luminaires, chandeliers, and marquee lighting, not providing general lighting or task lighting.

Pendant Luminaire (Suspended Luminaire) is a luminaire that is hung from a ceiling by supports.

Permanently Installed lighting consists of luminaires that are affixed to land, within the meaning of Civil Code Sections 658 and 660, except as provided below. Permanently installed luminaires may be mounted inside or outside of a building or site. Permanently installed luminaires may have either plug-in or hardwired connections for electric power. Examples include track and flexible lighting systems; lighting attached to walls, ceilings, columns, inside or outside of permanently installed cabinets, internally illuminated cabinets, mounted on poles, in trees, or in the ground; attached to ceiling fans and integral to exhaust fans. Permanently installed lighting does not include portable lighting or lighting that is installed by the manufacturer in exhaust hoods for cooking equipment, refrigerated cases, food preparation equipment, and scientific and industrial equipment.

Photo Control automatically turns lights ON and OFF, or automatically adjusts lighting levels, in response to the amount of daylight that is available. A Photo Control may also be one component of a field assembled lighting system, the component having the capability to provide a signal proportional to the amount of daylight to a Lighting Control System to dim or brighten the electric lights in response.

Portable Lighting is lighting equipment designed for manual portability, with plug-in connections for electric power, that is: table and freestanding floor lamps; attached to modular furniture; workstation task luminaires; luminaires attached to workstation panels; attached to movable displays; or attached to other personal property.

Post Top Luminaire is an outdoor luminaire that is mounted directly on top of a lamppost.

Precision Lighting is task lighting for commercial or industrial work that illuminates low contrast, finely detailed, or fast moving objects.

Radiant Energy is energy travelling in the form of electromagnetic waves. It is measured in units of energy such as joules or kilowatt hours.

Radiant Power is the time rate of flow of radiant energy. It is expressed preferably in watts.

Recessed Luminaire is a luminaire that is mounted in the ceiling or behind a wall or other surface with the opening of the luminaire flush with the surface.

Sconce is a wall mounted decorative accent luminaire.

Security Cameras are any operational camera used to enhance the safety and security within a general hardscape area.

Shut-off Controls is any lighting control capable of automatically shutting OFF the lighting in a space when the space is typically unoccupied.

~~SIDELIT~~idelit D~~AYLIT~~aylit Z~~ONE~~one, P~~RIMARY~~rimary is the area in plan view directly adjacent to each vertical glazing, one window head height deep into the area, and window width plus 0.5 times window head height wide on each side of the rough opening of the window, minus any area on a plan beyond a permanent obstruction that is 6 feet or taller as measured from the floor.

~~SIDELIT~~idelit D~~AYLIT~~aylit Z~~ONE~~one, S~~ECONDARY~~econdary is the area in plan view directly adjacent to each vertical glazing, two window head heights deep into the area, and window width plus 0.5 times window head height wide on each side of the rough opening of the window, minus any area on a plan beyond a permanent obstruction that is 6 feet or taller as measured from the floor.

Solid State Lighting (SSL) is a family of light sources that includes semiconductor light emitting diodes (LEDs); and organic light emitting diodes (OLEDs).

Source (light) is the general term used to reference a source of light. It can refer variously to an electric lamp, a light emitting diode (LED), an entire luminaire with lamp and optical control, or fenestration for daylighting.

Special Effects Lighting is lighting installed to give off luminance instead of providing illuminance, which does not serve as general, task, or display lighting.

Task Lighting is lighting directed to a specific surface or area, providing illumination for visual tasks. Task lighting is not general lighting.

Temporary Lighting is a lighting installation, with plug-in connections, that does not persist beyond the time constraints specified in California Electrical Code Article 590.

Track Lighting is a lighting equipment system consisting of an electrified power channel (track) and removable luminaires (lamp holders; track heads) that can be mechanically attached anywhere along the power channel. The luminaires can be repositioned and re-aimed as desired. Track lighting includes the following types:

Track Lighting Integral Current Limiter consists of a current limiter integral to the end-feed housing of a manufactured line-voltage track lighting system.

Track Lighting Supplementary Overcurrent Protection Panel is a panelboard containing Supplementary Overcurrent Protection Devices as defined in Article 100 of the California Electrical Code, and used only with line voltage track lighting.

Track Mounted Luminaires are luminaires designed to be attached at any point along a track lighting system. Track mounted luminaires may be line-voltage or low-voltage.

Tunable Lighting are light sources with the ability to alter their luminous flux and/or spectral power distribution. Tunable lighting includes the following types:

1. **Color tunable** light source is capable of emitting highly saturated light of varying hues, as well as white light, for example by varying the relative intensity of individual emitters within the light source**.**
2. **Dim-to-warm** (also known as warm dim) light source is capable of simultaneously decreasing its correlated color temperature as its light output decreases, typically resembling the change in color temperature of an incandescent lamp as it dims.
3. **Tunable white** light source is capable of adjusting its correlated color temperature while maintaining its relative light output and capable of adjusting its light output while maintaining its correlated color temperature.

~~**LISTED** is in accordance with Article 100 of the California Electrical Code.~~

LONG-TERM SYSTEM COST (LSC) is the CEC-projected present value of costs to California's energy system over a period of 30 years. LSC does not represent a prediction of individual utility bills.

LOW-GWP REFRIGERANT is a compound used as a heat transfer fluid or gas that is: (A) any compound or blend of compounds, with a GWP Value less than 150; and (B) U.S. EPA Significant New Alternatives Policy (SNAP)-approved; and (C) not an ozone depleting substance as defined in Title 40 of the Code of Federal Regulations, Part 82, §82.3 (as amended March 10, 2017).

LOW-RISE RESIDENTIAL BUILDING See *Use Designation.* ~~is a building, other than a hotel/motel, that is Occupancy Group:~~

~~R-2, multifamily, with three habitable stories or less; or~~

~~R-3, single-family; or~~

~~U-building, located on a residential site.~~

LPG is liquefied petroleum gas.

M

MANUAL is capable of being operated by personal intervention.

MANUFACTURED DEVICE is any heating, cooling, ventilation, lighting, water heating, refrigeration, cooking, plumbing fitting, insulation, door, fenestration product, or any other appliance, device, equipment, or system subject to Sections 101.2, 101.3, 101.4, 300.1, 300.2, 300.3, 400.2, 500.3, 600.2, 800 *[Sections 110.0 through 110.9]* of Part 6.

MECHANICAL COOLING is lowering the temperature within a space using refrigerant compressors or absorbers, desiccant dehumidifiers, or other systems that require energy to directly condition the space. Systems that are solely energy recovery ventilation (ERV) or heat recovery ventilation (HRV) are not considered mechanical cooling. In nonresidential, multifamily buildings, and hotel/motel buildings, cooling of a space by direct or indirect evaporation of water alone is not considered mechanical cooling.

MECHANICAL HEATING is raising the temperature within a space using electric resistance heaters, fossil fuel burners, heat pumps, or other systems that require energy to directly condition the space. Systems that only use solar energy or heat recovery as the heat source are not mechanical heating systems.

MERV is the minimum efficiency reporting value as determined by ASHRAE Standard 52.2 Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

METAL BUILDING is, for purposes of part 6, a complete integrated set of mutually dependent components and assemblies that form a building, which consists of a steel-framed superstructure and metal skin. This does not include structural glass or metal panels such as in a curtainwall system.

MICROCHANNEL CONDENSER is an air-cooled condenser for refrigeration systems which utilizes multiple small parallel gas flow passages in a flat configuration with fin surfaces bonded between the parallel gas passages.

MINI-SPLIT AIR CONDITIONERS AND HEAT PUMPS are air conditioner or heat pump systems that have a single outdoor ~~section~~ unit and one or more indoor ~~sections~~units connected with a single refrigeration circuit. The indoor sections cycle on and off in unison in response to a single indoor thermostat.

MIXED USE structures contain multiple occupancy groups in accordance with Title 24, Part 2, Section 302.

MODELING ASSUMPTIONS are the conditions (such as weather conditions, thermostat settings and schedules, internal gain schedules, etc.) that are used for calculating a building's annual energy consumption as specified in the Section 10-109(c) and Section 10-116.

MULTIFAMILY BUILDING ~~is any of the following:~~

~~1. A building of Occupancy Group R-2, other than a hotel/motel building or timeshare property,~~

~~2. A building of Occupancy Group R-3 that is a nontransient congregate residence, other than boarding houses of more than 6 guests and alcohol or drug abuse recovery homes of more than 6 guests, or~~

~~A building of Occupancy Group R-4.~~sSee *Use Designation.*

MULTIPLE-SPLIT AIR CONDITIONERS AND HEAT PUMPS are air conditioner or heat pump systems that have ~~two or more indoor sections~~ two or more indoor units connected with a single refrigeration circuit. The indoor sections operate independently and can be used to condition multiple zones in response to ~~multiple indoor thermostats~~ at least two indoor thermostats or temperature sensors.

MULTIPLE ZONE SYSTEM (or multi-zone system) is a space conditioning system that conditions more than one space conditioning zone, each of which has one or more devices (such as dampers, cooling coils, and heating coils) that regulate airflow, cooling, or heating capacity to the zone.

N

NATURAL GAS AVAILABILITY. For newly constructed buildings, natural gas is available if a gas service line can be connected to the site without a gas main extension. For addition and alteration, natural gas is available if a gas service line is connected to the existing building.

NEEA is the Northwest Energy Efficiency Alliance.

NEEA ADVANCED WATER HEATER SPECIFICATION is the Northwest Energy Efficiency Alliance (NEEA) specification version 8.1, effective date July 15, 2024 for heat pump water heaters.

NET EXHAUST FLOW RATE is the exhaust flow rate for a hood, minus any internal discharge makeup airflow rate.

NET FREE AREA (NFA) is the total unobstructed area within the air gaps between louver and grille slats in a vent, allowing the passage of air. The narrowest distance between two slats, perpendicular to the surface of both slats is the air gap height. The narrowest width of the gap is the air gap width. The NFA is the air gap height multiplied by the air gap width multiplied by the total number of air gaps between slats in the vent.

NET SENSIBLE COEFFICIENT OF PERFORMANCE (COP) is defined by AHRI 1360 and includes all indoor unit power and air-cooled condenser/condensing unit power for air-cooled units and includes all indoor unit power and the power allowance for pump and heat rejection as described in the Heat Rejection/Cooling Fluid Standard Rating Conditions table of AHRI 1360 for water, glycol, and chilled water units.

NEWLY CONDITIONED SPACE is any space being converted from unconditioned to directly conditioned or indirectly conditioned space. Newly conditioned space must comply with the requirements for an addition.

NEWLY CONSTRUCTED BUILDING is a building that has never been used or occupied for any purpose.

NONDUCTED SYSTEM is an air conditioner or heat pump that is permanently installed; directly heats or cools air within the conditioned space; and uses one or more indoor coils that are mounted on walls or ceilings within the conditioned space. The system may be of a modular design that allows for combining multiple outdoor coils and compressors to create one unified system.

NONRESIDENTIAL BUILDING is any *building* ~~which is identified in the California Building Code Table; Description of~~includes in Occupancy~~(s)~~ ~~as~~ Group(s) A, B, E, F, H, I, L, M, ~~or~~ S, and ~~is a~~ U.~~; as defined by Part 2 of Title 24 of the California Code or Regulation.~~ ~~(s~~See *"Use Designation~~s~~".~~)~~
NOTE: Requirements for hotels/motels are included in the nonresidential sections of Part 6.

~~**NONRESIDENTIAL BUILDING TYPES**:~~

~~**Assembly Building** is a building with meeting halls in which people gather for civic, social, or recreational activities. These include civic centers, convention centers and auditoriums.~~

~~**Commercial and Industrial (C&I) Storage Building** is a building with building floor areas used for storing items.~~

Events and Exhibits Building is a Museum Building, Motion Picture or Performance Arts Theater Building, or other building that is comprised of Auditorium Area, Convention, Conference, Multipurpose and Meeting Area, or Civic Meeting Place Area.

Financial Institution Building is a building with floor areas used by an institution which collects funds from the public and places them in financial assets, such as deposits, loans, and bonds.

Grocery Store Building is a building with building floor areas used for the display and sale of food.

Gymnasium Building is a building with building floor areas used for physical exercises and recreational sport events and activities.

Industrial/Manufacturing Facility Building is a building with building floor areas used for performing a craft, assembly or manufacturing operation.

Library Building is a building with building floor area used for repository of literary materials, and for reading reference such as books, periodicals, newspapers, pamphlets and prints.

Motion Picture Theater Building is a building with building floor areas used for showing motion pictures to audiences.

Museum Building is a building with building floor areas in which objects of historical, scientific, artistic or cultural interests are curated, treated, preserved, exhibited and stored.

Office Building is a building of CBC Group B Occupancy with building floor areas in which business, clerical or professional activities are conducted.

Parking Garage Building is a building with building floor areas used for parking vehicles, and consists of at least a roof over the parking area enclosed with walls on all sides. The building includes areas for vehicle maneuvering to reach designated parking spaces. If the roof of a parking structure is also used for parking, the section without an overhead roof is considered an outdoor parking lot instead of a parking garage.

Performance Arts Theater Building is a building with building floor areas used for showing performing arts that include plays, music, or dance to audiences.

Religious Worship Building is a building that is comprised of Religious Worship Area.

Restaurant Building is a building with building floor areas in which food and drink are prepared and served to customers in return for money.

Retail Store Building is a building with building floor areas used for the display and sale of merchandise except food.

School Building is a building used by an educational institution. The building floor area can include classrooms or educational laboratories, and may include an auditorium, gymnasium, kitchen, library, multipurpose room, cafeteria, student union, or workroom. A maintenance or storage building is not a school building.

~~**Sports Arena Building** is a building with building floor areas used for public viewing of sporting events and activities. Sports arenas are classified according to the number of spectators they are able to accommodate, as follows:~~

~~1. Class I Facility is used for competition play for 5,000 or more spectators.~~

~~2. Class II Facility is used for competition play for up to 5,000 spectators.~~

~~3. Class III Facility is used for competition play for up to 2,000 spectators.~~

~~4. Class IV Facility is normally used for recreational play and there is limited or no provision for spectators.~~

~~**Sports and Recreation Building** is a building that is comprised of Exercise/Fitness Center and Gymnasium Area, or other area where recreational sports are practiced.~~

~~**Warehouse Building** is a building that is constructed for storage or handling of products.~~

NONRESIDENTIAL COMPLIANCE MANUAL is the manual developed by the Energy Commission, under Section 25402.1(e) of the Public Resources Code, to aid designers, builders, and contractors in meeting the energy efficiency requirements for nonresidential, high-rise residential, and hotel/motel buildings.

NONRESIDENTIAL FUNCTION AREAS are those areas, rooms, and spaces within Nonresidential Buildings that fall within the following particular definitions, and are defined according to the most specific definition:

Aisle Way is the passage or walkway between storage racks permanently anchored to the floor in a Commercial or Industrial Storage Building, where the racks are used to store materials such as goods and merchandise.

Atrium is a large-volume indoor space created by openings between two or more stories but is not used for an enclosed stairway, elevator hoistway, escalator opening, or utility shaft for plumbing, electrical, air-conditioning or other equipment.

Audience Seating Area is a room or area with fixed seats for public meetings or gatherings.

Auditorium Area is a room or area with a stage and fixed seats used for public meetings or gatherings.

Auto Repair / Maintenance Area is an area used to repair or maintain automotive equipment and/or vehicles.

Ballroom is a large room inside a building, typically designed for dancing, formal parties, or social gatherings, such as balls, banquets, or ceremonies.

Barber, Beauty Salon, Spa Area is a room or area in which the primary activity is manicures, pedicures, facials, or the cutting or styling of hair.

Civic Meeting Place Area is a space in a government building designed or used for public debate, discussion, or public meetings of governmental bodies.

Classroom, Lecture, Training, Vocational Area is a room or area where an audience or class receives instruction.

Commercial and Industrial Storage Area (refrigerated) is a room or area used for storing items where mechanical refrigeration is used to maintain the space temperature at 55° F or less.

Computer room is a room or portions of ~~within~~ a building ~~whose primary function is~~used primarily to house ~~electronic~~*information technology equipment (ITE)* and ~~that has a design information technology equipment (ITE) equipment power~~serving an ITE load less than or equal to 10 kW or ~~density exceeding~~ 20 watts/ft^2 (215 watts/m^2) of *conditioned floor area*. (*CBC* Title 24, Part 2, Chapter 2)

Concourse is a large, open space or hall in public buildings, such as convention centers, transportation buildings, or stadiums, designed for crowds to gather and walk through**.**

Control room is a centralized location where operators monitor and manage production processes.

Convention, Conference, Multipurpose and Meeting Area are rooms or areas that are designed or used for meetings, conventions, or events, and that have neither fixed seating nor fixed staging.

Copy Room is a room or area used for copying, scanning, or binding documents.

Corridor Area is a passageway or route into which compartments or rooms open.

Dining Areas include the following:

1. **Bar/Lounge** is a room or area where wait staff serve patrons with liquor, cocktails, wine and beer in a relaxed atmosphere, usually with tables and chairs.
2. **Cafeteria/Fast Food** is a room or area where customers pick up their food at a counter and there is little or no wait staff or table service.
3. **Family Dining** is a room or area where wait staff serve patrons with meals in a causal atmosphere.
4. **Fine Dining** is a room or area where wait staff serve patrons with meals in an elegant and formal atmosphere.

Dressing room is a backstage space where actors prepare for a performance, with things such as dressing, applying makeup, and accessing costumes and props.

Electrical/Mechanical/Telephone Room is a room in which the building's electrical switchbox or control panels, telephone switchbox, and/or HVAC controls or equipment is located.

Exercise/Fitness Center and Gymnasium Area is a room or area equipped for gymnastics, exercise equipment, or indoor athletic activities.

Exhibit Space is an area specifically designed in a convention center for the purpose of putting things on display, including, but not limited to, goods, services, or information.

Financial Transaction Area is a room or area used by an institution that collects funds from the public and places them in financial assets such as deposits, loans, and bonds, and includes tellers, workstations, and customers' waiting areas; to complete financial

transactions. Financial transaction areas do not include private offices, hallways, restrooms, or other support areas.

Healthcare Facilities may have a room or area as follows:

1. **Exam/Treatment Room** is a room or area that does not provide overnight patient care and that is used to provide physical and mental care through medical, dental, or psychological examination and treatment, including laboratories and treatment spaces.
2. **Imaging Room** is a diagnostic room and area for application and review of results from imaging technologies including x-ray, ultrasound, computerized tomography (CT), and magnetic resonance imaging (MRI).
3. **Medical Supply Room** is a room or area used for storing medical supplies.
4. **Nursery** is a room or area for providing medical care for newly born infants.
5. **Nurse's Station** is a room or area where health care staff work when not directly interacting with patients.
6. **Operating Room** is a room or area where surgical operations are carried out in a sterile environment. This category also applies to veterinary operating rooms.
7. ~~7.~~ **Patient Room** is a room or area that is occupied by one or more patients during a stay in a healthcare facility or hospital.
8.
9. **Patient Room (Critical care)** is a specialized hospital space for treating patients with life-threatening illnesses or injuries, featuring advanced technology and continuous monitoring by specialized staff.
10. **Physical Therapy Room** is a room or area for providing physical therapy treatment.
11. **Recovery Room** is a room or area that is equipped with apparatus for meeting postoperative emergencies and in which surgical patients are kept during the immediate postoperative period for care and recovery from anesthesia.

Hotel Function Area is a hotel room or area such as a hotel ballroom, meeting room, exhibit hall or conference room, together with prefunction areas and other spaces ancillary to its function.

Kitchen/Food Preparation Area is a room or area with cooking facilities or where food is prepared. See Kitchen definitions for various kitchen types.

Laboratory is a space or room where hazardous materials are used for activities such as testing, analysis, instruction, research, or developmental activities.

Laboratory Suite is a Group L occupancy space within a building or structure, which may include multiple laboratories, offices, storage, equipment rooms or similar support functions.

Laboratory, Scientific and Teaching Area is a room or area where research, experiments, and measurement in medical and physical sciences are performed requiring examination of fine details. The area may include workbenches, countertops, scientific instruments, and

associated floor spaces. Scientific ~~laboratory~~ and teaching area does not refer to film, computer, and other laboratories where scientific experiments are not performed. The area may include teaching spaces where students are taught laboratory techniques.

Laundry Area is a room or area primarily designed or used for laundering activities.

Library Area is a room or area primarily designed or used as a repository for literary materials, such as books, periodicals, newspapers, pamphlets, and prints, kept for reading or reference.

1. **Reading Area** is a room or area in a library containing tables, chairs, or desks for patrons to use for the purpose of reading books and other reference documents. Library reading areas include reading, circulation, and checkout areas. Reading areas do not include private offices, meeting, photocopy, or other rooms not used specifically for reading by library patrons.
2. **Stack Area** is a room or area in a library with grouping of shelving sections. Stack aisles include pedestrian paths located in stack areas.

Lobby, Main Entry is the contiguous area in buildings including hotel/motel that is directly located by the main entrance of the building through which persons must pass, including any ancillary reception, waiting and seating areas.

Locker Room is a room or area for changing clothing, sometimes equipped with lockers.

Lounge/Breakroom or Waiting Area is a room or area in which people sit, wait and relax.

Mall is a roofed or covered common pedestrian area within a mall building that serves as access for two or more tenants.

Manufacturing, Commercial and Industrial Work Area is a room or area in which an art, craft, assembly, or manufacturing operation is performed. Lighting installed in these areas is classified as follows:

1. **High bay**: Where the luminaires are 25 feet or more above the floor.
2. **Low bay**: Where the luminaires are less than 25 feet above the floor.
3. **Precision**: Where visual tasks of small size or fine detail such as electronics assembly, fine woodworking, metal lathe operation, fine hand painting and finishing, egg processing operations, or tasks of similar visual difficulty are performed.

Meeting Room is a designated space within a convention center or other venue designed for gatherings, presentations, or discussions.

Multipurpose Room is a room that can be used for ~~multipurpose activities~~multiple functions such as meetings, instructional activities, and social gatherings. Multipurpose rooms are typically found in offices, schools, convention centers, multifamily buildings, and assisted living facilities. In educational and civic uses, a multipurpose room is a flexible learning or activity space.

Museum Areas include the following:

1. **Exhibit/Display** is a room or area in a museum that has for its primary purpose exhibitions, having neither fixed seating nor fixed staging. An exhibit does not include a gallery or other place where art is for sale. An exhibit does not include a lobby, conference room, or other occupancies where the primary function is not exhibitions.
2. **Restoration Room** is a room or area in which the primary function is the care of works of artistic, historical, or scientific value. A restoration does not include a gallery or other place where art is for sale. A restoration does not include a lobby, conference room, or other occupancies where the primary function is not the care or exhibit of works of artistic, historical, or scientific value.

Office Area is a room or area in a building of CBC Group B Occupancy in which business, clerical or professional activities are conducted.

Parking Garage Areas include the following:

1. **Daylight Adaptation Zone** in a Parking Garage is the interior path of travel for vehicles adjacent to the entrance or exit of a parking garage as needed for visual adaptation to transition from exterior daylight levels to interior light levels. Daylight Adaptation Zones only include the path of vehicular travel and do not include adjacent Parking Areas.
2. **Parking Zone and Ramps** in a Parking Garage is used for the purpose of parking and maneuvering of vehicles. Parking areas include sloping floors of a parking garage. Ramps and driveways specifically for the purpose of moving vehicles between floors of a parking garage. Parking areas and ramps do not include Daylight Adaptation Zones or the roof of a Parking Garage, which may be present in a Parking Garage.

Pharmacy Area is a room or area where medicinal drugs are dispensed and sold, usually in a retail store.

Playing Area for Sports Arena is an area where sports are played in front an audience.

Religious Worship Area is a room or area in which the primary function is for an assembly of people to worship. Religious worship does not include classrooms, offices, or other areas in which the primary function is not for an assembly of people to worship.

Restroom is a room providing personal facilities such as toilets and washbasins.

Retail Sales Areas include the following:

1. **Fitting Room** is a room or area where the retail customers try out clothing before purchasing.
2. **Grocery Sales** is a room or area that has as its primary purpose the sale of foodstuffs requiring additional preparation prior to consumption.
3. **Retail Merchandise Sales** is a room or area in which the primary activity is the sale of merchandise.

~~**Server Room** is a room smaller than 500 square feet, within a larger building, in which networking equipment and Information Technology (IT) server equipment is housed, and a minimum of five IT servers are installed in frame racks.~~

Server Aisle is an aisle of racks of Information Technology (IT) server equipment in ~~a Server Room~~ any computer room or data center. While networking equipment may also be housed on these racks, it is ~~largely~~ generally a ~~room to~~group of one or more racks to manage server or networking equipment.

Stairs is a series of steps providing passage for persons from one level of a building to another, including escalators.

Stairwell is a vertical shaft in which stairs are located.

Storage, Commercial and Industrial Area includes the following:

1. **Warehouse** is a room or area used for storing of items such as goods, merchandise, and materials.
2. **Shipping and Handling** is a room or area used for packing, wrapping, labeling, and shipping out goods, merchandise, and materials.

Support Area is a room or area used as a passageway, utility room, storage space, or other type of space associated with or secondary to the function of an occupancy that is listed in these regulations.

Unleased Tenant ~~Lease~~ Area is a room or area in a building intended for lease for which a specific tenant is not identified ~~at the time of~~ submitting when a building permit application is submitted.

Theater Areas include the following:

1. **Motion Picture Theater** is an assembly room or area with rows of seats for the showing of motion pictures.
2. **Performance Theater** is an assembly room or area with rows of seats for the viewing of dramatic performances, lectures, musical events, and similar live performances.

Transportation Function Areas include the following:

1. **Baggage Area** is a room or area in a transportation facility such as an airport where the travelers reclaim their baggage.
2. **Ticketing Area** is a room or area in a transportation facility such as an airport or a train station where travelers purchase tickets, check in baggage, or inquire about travel information.
3. **Waiting Area** is a designated space within a transportation facility where passengers can wait for their scheduled service.

Videoconferencing Studio is a room or area with permanently installed videoconferencing cameras, audio equipment, and playback equipment for both audio-based and video-based two-way communication between local and remote sites.

NONSTANDARD PART LOAD VALUE (NPLV) is a single- number part-load efficiency figure of merit for chillers referenced to conditions other than IPLV conditions. (See "integrated part load value.")

NORTH-FACING (See "orientation.")

O

OCCUPANCY is the purpose for which a building or part thereof is used or intended to be used.

OCCUPANCY, HUMAN is any occupancy that is intended primarily for human activities.

OCCUPANCY GROUP is a classification of occupancy defined in Chapter 3 of the *CBC* (Title 24, Part 2).

OCCUPANCY TYPE is a description of occupancy that is more specific than occupancy group and that relates to determining the amount of lighting, ventilation, or other services needed for that portion of the building.

OCCUPIABLE ROOF is an exterior space on a roof that is designed for human occupancy, other than maintenance or repair, and is equipped with a means of egress system meeting the requirements of the *CBC*. (*CBC* Title 24, Part 2, Chapter 2).

OCCUPIABLE SPACE is a room or ~~any~~ enclosed space ~~that is intended~~designed for human occupancy in which individuals congregate for amusement, educational or similar purposes or in which occupants are engaged at labor, and which is equipped with means of egress and light and ventilation facilities meeting the requirements of the CBC. (*CBC* Title 24, Part 2, Chapter 2). Occupiable space ~~, including~~ includes all habitable spaces as well as bathrooms, toilets, closets, halls, storage and utility areas, laundry areas, and similar areas. (See also "habitable space".)

OCCUPIED STANDBY MODE is when a zone is scheduled to be occupied and an occupant sensor indicates zero population within the zone.

~~**ONLINE CAPACITY** is the total combined capacity in actual cubic feet per minute of compressed air at a given pressure from all online compressors.~~

~~**ONLINE COMPRESSORS** are all the compressors that are physically connected to compressed air piping and are available to serve peak load. Online compressors do not include back up compressors whose only purpose is to be available when an online compressor fails.~~

OPEN COOLING TOWER, or OPEN-CIRCUIT COOLING TOWER is an open, or direct contact, cooling tower which exposes water directly to the cooling atmosphere, thereby transferring the source heat load from the water directly to the air by a combination of heat and mass transfer.

~~**OPENADR** **OpenADR 2.0a** is the OpenADR Alliance document titled, "OpenADR 2.0 Profile Specification A Profile," 2011.

~~**OPENADR** **OpenADR 2.0b** is the OpenADR Alliance document titled, "OpenADR 2.0 Profile Specification B Profile," 2015.

OpenADR 3.0, Baseline Profile is the specific baseline profile defined in the OpenADR Alliance document titled, "OpenADR 3.0 Specification," 2023.

OPERABLE FENESTRATION is designed to be opened or closed.

OPTIMUM START CONTROLS are controls that are designed to automatically adjust the start time of a space conditioning system each day with the intent of bringing the space to desired occupied temperature levels at the beginning of scheduled occupancy.

OPTIMUM STOP CONTROLS are controls that are designed to setup or setback thermostat setpoints before scheduled unoccupied periods based upon the thermal lag and acceptable drift in space temperature that is within comfort limits.

OSHPD is the California Office of Statewide Health Planning and Development

ORIENTATION, CARDINAL is one of the four principal directional indicators, north, east, south, and west, which are marked on a compass, also called cardinal directions.

ORIENTATION, EAST-FACING is oriented to within 45° of true east, including 45°00'00" south of east (SE), but excluding 45°00'00" north of east (NE).

ORIENTATION, NORTH-FACING is oriented to within 45° of true north, including 45°00'00" east of north (NE), but excluding 45°00'00" west of north (NW).

ORIENTATION, SOUTH-FACING is oriented to within 45° of true south including 45°00'00" west of south (SW), but excluding 45°00'00" east of south (SE).

ORIENTATION, WEST-FACING is oriented to within 45° of true west, including 45°00'00" north of due west (NW), but excluding 45°00'00" south of west (SW).

OUTDOOR AIR (Outside air) is air taken from outdoors and not previously circulated in the building.

OUTDOOR AREAS are areas external to a building. These include but are not limited to the following areas:

1. **Building entrance way** is the external area of any operable doorway in or out of a building, including overhead doors. These areas serve any doorway, set of doors (including elevator doors such as in parking garages), turnstile, vestibule, or other form of portal that is ordinarily used to gain access to the building by its users and occupants. Where buildings have separate one-way doors to enter and to leave, this also includes any area serving any doors ordinarily used to leave the building.
2. **Building façade** is the exterior surfaces of a building, not including horizontal roofing, signs, and surfaces not visible from any public accessible viewing location.
3. **Canopy** is a permanent structure, other than a parking garage area, consisting of a roof and supporting building elements, with the area beneath at least partially open to the elements. A canopy may be freestanding or attached to surrounding structures. A canopy roof may serve as the floor of a structure above.
4. **Carport** is a covered, open-sided structure designed or used primarily for the purpose of parking vehicles, having a roof over the parking area. Typically, carports are free-standing or projected from the side of the building and are only two or fewer car lengths deep. A Carport is not a Garage.
5. **Hardscape** is the area of an improvement to a site that is paved or has other structural features such as curbs, plazas, entries, parking lots, site roadways, driveways, walkways, sidewalks, bikeways, water features and pools, storage or service yards, loading docks, amphitheaters, outdoor sales lots, and private monuments and statuary.
6. **Outdoor Sales canopy** is a canopy specifically to cover and protect an outdoor sales area.

7. **Outdoor sales frontage** is the portion of the perimeter of an outdoor sales area immediately adjacent to a public street, road, or sidewalk.
8. **Outdoor sales lot** is an uncovered paved area used exclusively for the display of vehicles, equipment, or other merchandise for sale. All internal and adjacent access drives, walkway areas, employee and customer parking areas, vehicle service or storage areas are not outdoor sales lot areas, but are considered hardscape.
9. **Parking lot** is an uncovered area for the purpose of parking vehicles. Parking lot is a type of hardscape.
10. **Paved area** is an area that is paved with concrete, asphalt, stone, brick, gravel, or other improved wearing surface, including the curb.
11. **Principal viewing location** is anywhere along the adjacent highway, street, road, or sidewalk running parallel to an outdoor sales frontage.
12. **Public monuments** are statuary, buildings, structures, and/or hardscape on public land.
13. **Stairways and Ramps.** Stairways are one or more flights of stairs with the necessary landings and platforms connecting them to form a continuous and uninterrupted passage from one level to another. An exterior stairway is open on at least one side, except for required structural columns, beams, handrails, and guards. The adjoining open areas shall be either yards, courts, or public ways. The other sides of the exterior stairway need not be open. Ramps are walking surfaces with a slope steeper than 5 percent.
14. **Vehicle service station** is a gasoline, natural gas, diesel, or other fuel dispensing station.

OUTDOOR LIGHTING is electrical lighting used to illuminate outdoor areas.

OUTDOOR LIGHTING ZONE is a geographic area designated by the California Energy Commission in accordance with Section 601.3.2.3.5 *[Part 1, Section 10-114]*, that determines requirements for outdoor lighting, including lighting power densities and specific control, equipment, or performance requirements. Lighting zones are numbered LZ0, LZ1, LZ2, LZ3 and LZ4.

OVERHANG is a contiguous opaque surface, oriented horizontally and projecting outward horizontally from an exterior vertical surface.

P

PART 1 means Part 1 of Title 24 of the California Code of Regulations.

PART 6 means Part 6 of Title 24 of the California Code of Regulations.

PART-LOAD OPERATION occurs when a system or device is operating below its maximum rated capacity.

PARTICLE SIZE EFFICIENCY is the fraction (percentage) of particles that are captured on air filter equipment as determined during rating tests conducted in accordance with ASHRAE Standard

52.2 or AHRI Standard 680. Particle Size Efficiency is measured in three particle size ranges: 0.3-1.0, 1.0-3.0, 3.0-10 microns.

PERIMETER ZONE is a *space--conditioning zone* with independent controls where not less than 75 percent of the zone's floor area lies within 15 feet horizontally of an above-grade *exterior wall*. A perimeter zone is limited to a single *cardinal orientation*.

PHOTOSYNTHETIC ACTIVE RADIATION (PAR) is a unit of measurement of radiation relevant to plant growth that~~,~~ falls within the wavelength range of 400-700 nanometers.

PHOTOSYNTHETIC ACTIVE RADIATION (PAR) SENSOR is a device that measures photosynthetic photon flux density (PPFD) in the photosynthetically active radiation (PAR) range of 400 to 700 nanometers, typically expressed in micromoles per square meter per second (µmol/m²/s) and used to monitor light levels for the purpose of managing and controlling CEH lighting systems.

PHOTOSYNTHETIC PHOTON EFFICACY (PPE) is photosynthetic photon flux emitted by a luminaire between 400 and 700 nanometers divided by input electric power in units of micromoles per second per W~~w~~att, or micromoles per J~~j~~oule as defined by ANSI/ASABE S640. Luminaire is inclusive of both integrated lamps and luminaires with removable, serviceable lamps.

PHOTOSYNTHETIC PHOTON FLUX (PPF) is the rate of flow of photons between 400 ~~to~~ and 700 nanometers in wavelength from a radiation source as defined by ANSI/ASABE S640.

PHOTOSYNTHETIC PHOTON FLUX DENSITY (PPFD) is the photosynthetic photon flux per unit of surface area, expressed in micromoles per square meter per second (µmol/m²/s), as defined by ANSI/ASABE S640.

> **DAILY LIGHT INTEGRAL (DLI)** is the photosynthetic photon flux density (PPFD) of daylight and electric light integrated over 24 hours in units of mol/m^2/day.
>
> **DAILY LIGHT INTEGRAL (DLI) CONTROL** is a lighting control strategy that uses the calculated Daily Light Integral (DLI) of the daylight and electric light to adjust supplemental lighting intensity to achieve a DLI target.

PLANT CANOPY AREA is the area, in square feet, where mature or flowering plants are grown. Each part of the total canopy area is defined by clearly identifiable physical boundaries around all areas that will contain plants. Physical boundaries include, but are not limited to, interior walls, shelves, or greenhouse walls delineating the perimeter. Where plants will be grown in multiple tiers, the area of each tier shall be summed to determine the plant canopy area. Plant canopy area includes all actively used growing surfaces and excludes aisles, non-plant production zones, and equipment-only areas.

POINT-OF-USE AIR DRYER is an air dryer that is dedicated to conditioning air for a single end-use that requires a pressure dew point that differs from the rest of the plant and is installed in close proximity to that end-use.

POOLS is, for purposes of *Part 6*, any structure or product intended for swimming, bathing or wading; designed and manufactured to be connected to a circulation system; and not intended to be drained and filled with each use. This includes, but is not limited to, inground, aboveground, ~~and~~ on ground ~~pools,~~ and wading pools.

~~Pools~~OOLS, ~~A~~uxiliary~~UXILIARY~~ ~~P~~ool~~OOL~~ ~~L~~oads~~OADS~~ are features or devices that circulate pool water in addition to that required for pool filtration, including, but not limited to, solar pool heating systems, filter backwashing, pool cleaners, waterfalls, fountains, and spas.

~~Pools~~OOLS, ~~B~~ackwash~~ACKWASH~~ ~~V~~alve~~ALVE~~ (Pools) is a diverter valve designed to backwash filters located between the circulation pump and the filter, including, but not limited to, slide, push-pull, multiport, and full-flow valves.

~~Pools~~OOLS, ~~M~~ultispeed~~ULTISPEED~~ Pool ~~P~~ump~~UMP~~ is a pump capable of operating at two or more speeds and includes two-speed and variable-speed pumps.

~~Pools~~OOLS, NSF/ANSI/CAN 50 is the NSF International (formerly National Sanitation Foundation) Standard and American National Standards Institute document titled "Equipment and Chemicals for Swimming Pools, Spas, Hot Tubs, and Other Recreational Water Facilities" 2020 (NSF/ANSI/CAN 50 – 2020).

~~Pool~~OOL P~~ump~~UMP, ~~D~~edicated~~EDICATED~~ ~~P~~urpose~~URPOSE~~ Pool Pump refers to a category of pumps designed specifically for various pool related functions. This includes self-priming pool filter pumps, non-self-priming pool filter pumps, waterfall pumps, pressure cleaner booster pumps, integral sand-filter pool pumps, integral-cartridge filter pool pumps, storable electric spa pumps, and rigid electric spa pumps, as defined by Title 20 CCR § 1602(g)(4).

~~Pool~~OOL, ~~P~~ublic~~UBLIC~~ Pool is a pool other than a residential pool, that is intended to be used for swimming or bathing and is operated by an owner, lessee, operator, licensee, or concessionaire, regardless of whether a fee is charged for use. Public pools include pools installed in private settings such as multifamily residential buildings or hotels that are available exclusively for use by tenants or guests.

~~P~~ortable~~ORTABLE~~ ~~E~~lectric~~LECTRIC~~ Spa~~PA~~ is a factory-built electric spa or hot tub, supplied with equipment for heating and circulating water at the time of sale or sold separately for subsequent attachment, as defined by Title 20 CCR § 1602(g)(2).

~~POOLS~~Pools, ~~R~~esidential~~ESIDENTIAL~~ Pool is a pool intended for use that is accessory to a residential setting and available only to the household and its guests, and with specifications as defined within the scope of either ANSI/APSP/ICC-4, 2012 (R2022) or ANSI/APSP/ICC-5, 2011 (R2022).

POWER CONDITIONING SYSTEM (PCS) is a device, which may be either integrated into a Battery Energy Storage System (BESS) or standalone, that allows for the BESS to interact with other electrical infrastructure, such as the electrical network. The PCS may include an inverter like that used for a photovoltaic (PV) system.

PRESSURE BOUNDARY is the primary air enclosure boundary separating indoor and outdoor air. For example, a volume that has more leakage to the outside than to the conditioned space would be considered outside the pressure boundary. Exposed earth in a crawlspace or basement shall not be considered part of the pressure boundary.

PRESSURIZED CONDENSATE RETURN is a steam condensate return system that continuously operates at a pressure above 15 psig during normal operation and is not vented to atmosphere.

The system contains liquid condensate and any associated steam vapor that may be present in the piping.

PRIMARY AIRFLOW is the airflow (cfm or L/s) supplied to the zone from the air-handling unit at which the outdoor air intake is located. It includes outdoor intake air and recirculated air from that air-handling unit but does not include air transferred or air recirculated to the zone by other means.

PRIMARY STORAGE is compressed air storage located upstream of the distribution system and any pressure flow regulators.

PROCESS is an activity or treatment that is not related to the space conditioning, lighting, service water heating, or ventilating of a building as it relates to human occupancy.

PROCESS BOILER is a type of boiler with a capacity (rated maximum input) of 300,000 Btus per hour (Btu/h) or more that serves a process.

PROCESS, COVERED is a process used to support manufacturing, industrial, or commercial operations, excluding any activity whose primary purpose is conditioning spaces or maintaining comfort and amenities for building occupants. Covered processes include, but are not limited to, computer rooms and data centers; elevator ventilation, energy recovery, and lightings; escalators and moving walkways; laboratory and factory exhaust systemsies; enclosed parking garages; commercial kitchens; refrigerated warehouses; commercial refrigeration; compressed air systems; process boilers; process steam systems; process heating and coolingsystem piping; and controlled environment horticultural spaces.

PROCESS, NON-COVERED is a process that is not a covered process regulated under Part 6.

PROCESS LOAD is an energy load resulting from a process.

PROCESS SPACE is a nonresidential space that is designed to be thermostatically controlled to maintain a process environment temperature less than 55° F or to maintain a process environment temperature greater than 90° F for the whole space that the system serves, or that is a space with a space-conditioning system designed and controlled to be incapable of operating at temperatures above 55° F or incapable of operating at temperatures below 90° F at design conditions, or that is a *Controlled Environment Horticulture (CEH) Space*.

PROCESS STEAM SYSTEM is a steam system that has one or more connected process boilers and serves one or more process loads.

PROGRAMMING LIBRARY is a collection of programming logic used for controlling HVAC equipment with direct digital control systems.

PROPOSED DESIGN BUILDING is a building that is simulated by Energy Commission-approved compliance software to determine the energy consumption resulting from all of the characteristics and energy consuming features that are actually proposed for a building, as specified by Section 10-109(c) and Section 10-116.

PUBLIC AREAS are spaces generally open to the public at large, customers or congregation members, or similar spaces where occupants need to be prevented from controlling lights for safety, security, or business reasons.

R

R-VALUE is the measure of the thermal resistance of insulation or any material or building component expressed in ft^2-hr-°F/Btu.

RADIANT BARRIER is, for purposes of *Part 6*, a highly reflective, low emitting material installed at the underside surface of the roof deck and the inside surface of gable ends or other exterior vertical surfaces in attics to reduce solar heat gain.

RAISED FLOOR is a floor (partition) over a crawl space, or an unconditioned space, or ambient air.

READILY ACCESSIBLE is capable of being reached quickly for operation, repair, or inspection, without requiring climbing or removing obstacles, or resorting to access equipment.

RECOOL is the cooling of air that has been previously heated by space-conditioning equipment or systems serving the same building.

RECOVERED ENERGY is energy used in a building that (1) is recovered from space conditioning, service water heating, lighting, or process equipment after the energy has performed its original function; (2) provides space conditioning, service water heating, or lighting; and (3) would otherwise be wasted.

RECOVERED ENERGY, ON-SITE is recovered energy that is captured at the building site.

REFERENCE APPENDICES is the support document for the ~~Building Energy Efficiency Standards~~Energy Code. The document consists of three sections: the Reference Joint Appendices (JA), the Reference Residential Appendices (RA), and the Reference Nonresidential Appendices (NA).

REFLECTANCE~~, : SOLAR~~ ~~is the ratio of the reflected solar flux to the incident solar flux.~~ includes the following:

1. **Solar ~~R~~reflectance** is the ratio of the reflected solar flux to the incident solar flux.
2. **Visible reflectance** is the reflectance of light at wavelengths from 410 to 722 nanometers.
3. **Solar reflectance index (SRI)** is a measure of the roof's ability to reject solar heat, which includes both reflectance and emittance.

REFRIGERATED CASE is a manufactured commercial refrigerator or freezer, including but not limited to display cases, reach-in cabinets, meat cases, and frozen food and soda fountain units.

REFRIGERATED SPACE is a space constructed for storage or handling of products, where mechanical refrigeration is used to maintain the space temperature at 55° F or less.

REFRIGERATED WAREHOUSE is a building or a space greater than or equal to 3,000 square feet constructed for storage or handling of products, where mechanical refrigeration is used to maintain the space temperature at 55° F or less.

REHEAT is the heating of air that has been previously cooled by cooling equipment or supplied by an economizer.

REHEAT CAPACITY is the amount of energy introduced into the airstream, downstream of the cooling and dehumidification coil, for the purposes of meeting the required air supply temperature setpoints.

RELOCATABLE PUBLIC SCHOOL BUILDING is a relocatable building as defined by Title 24, Part 1, Section 4-314, which is subject to Title 24, Part 1, Chapter 4, Group 1.

REPAIR is, for purposes of *Part 6*, ~~is~~ the reconstruction or renewal for the purpose of maintenance of any component, system, or equipment of an existing building. Repairs shall not increase the preexisting energy consumption of the repaired component, system, or equipment. Replacement of any component, system, or equipment for which there are requirements in ~~the Standards~~*Part 6* is considered an alteration and not a repair.

RESIDENTIAL BUILDING (See "Use Designation Multifamily 3 Stories or Less, Multifamily More than 3~~4~~ Stories, Single-family, Hotel/motel" and "Group R Occupancies")~~"high-rise residential building" and "low-rise residential building.")~~

RESIDENTIAL COMPLIANCE MANUAL is the manual developed by the Energy Commission, under Section 25402.1 of the Public Resources Code, to aid designers, builders, and contractors in meeting Energy Efficiency Standards for low-rise residential buildings.

RESIDENTIAL SPACE TYPE is one of the following:

1. **Bathroom** is a room or area containing a sink used for personal hygiene, toilet, shower, or a tub.
2. **Closet** is a nonhabitable room used for the storage of linens, household supplies, clothing, nonperishable food, or similar uses, and which is not a hallway or passageway.
3. **Garage** is a nonhabitable building or portion of building, attached to or detached from a residential dwelling unit, in which motor vehicles are parked.
4. **Kitchen** is a room or area used for cooking, food storage and preparation and washing dishes, including associated counter tops and cabinets, refrigerator, stove, ovens, and floor area.
5. **Laundry** is a nonhabitable room or space which contains plumbing and electrical connections for a washing machine or clothes dryer.
6. **Storage building** is a nonhabitable detached building used for the storage of tools, garden equipment, or miscellaneous items.
7. **Utility room** is a nonhabitable room or building which contains only HVAC, plumbing, or electrical controls or equipment; and which is not a bathroom, closet, garage, or laundry room.

RESNET 380 is the Residential Energy Services Network document titled "Standard for Testing Airtightness of Building Enclosures, Dwelling Unit, and Sleeping Unit Enclosures, Airtightness of Heating and Cooling Air Distribution Systems; and Airflow of Mechanical Ventilation Systems" 2019 (ANSI/RESNET/ICC 380-2019).

ROOF is the outside cover of a building or structure including the structural supports, decking, and top layer that is exposed to the outside with a slope less than 60° from the horizontal.

ROOF, LOW-SLOPED is a roof that has a ratio of rise to run of less than 2:12 (9.5° from the horizontal).

ROOF, STEEP-SLOPED is a roof that has a ratio of rise to run of greater than or equal to 2:12 (9.5° from the horizontal).

ROOF RECOVER is the process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering. (*CBC* Title 24, Part 2, Chapter 2)

ROOF RECOVER BOARD is a rigid type board, installed directly below a low-sloped roof membrane, with or without above deck thermal insulation, to: (a) improve a roof system's compressive strength, (b) physically separate the roof membrane from the thermal insulation, or (c) physically separate a new roof covering from an underlying roof membrane as part of a roof overlay project.

ROOF REPLACEMENT is the process of removing the existing roof covering, repairing any damaged substrate, and installing a new roof covering. (*CBC* Title 24, Part 2, Chapter 2)

ROOFING PRODUCT is the top layer of the roof that is exposed to the outside, which has properties including but not limited to solar reflectance, thermal emittance, and mass.

RUNOUT is piping that is no more than 12 feet long and that connects to a fixture or an individual terminal unit.

S

SAE J1772 is the SAE International document titled "SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler" (SAE J1772_201710).

SATURATED CONDENSING TEMPERATURE (also known as CONDENSING TEMPERATURE) is: (a) for single component and azeotropic refrigerants, the saturation temperature corresponding to the refrigerant pressure at the condenser entrance, or (b) for zeotropic refrigerants, the arithmetic average of the Dew Point and Bubble Point temperatures corresponding to the refrigerant pressure at the condenser entrance.

SCIENTIFIC EQUIPMENT is measurement, testing or metering equipment used for scientific research or investigation, including but not limited to manufactured cabinets, carts, and racks.

SEAL CLASS A is a ductwork sealing category that requires sealing all transverse joints, longitudinal seams, and duct wall penetrations. Duct wall penetrations are openings made by pipes, conduit, tie rods, or wires. Longitudinal seams are joints oriented in the direction of airflow. Transverse joints are connections of two duct sections oriented perpendicular to airflow. Openings for rotating shafts shall be sealed with bushings or other devices that seal off air leakage. All connections shall be sealed, including but not limited to spin-ins, taps, other branch connections, access doors, access panels, and duct connections to equipment. Sealing that would void product listings is not required. All duct pressure class ratings shall be designated in the design documents.

SEASONAL ENERGY EFFICIENCY RATIO (SEER) is the total cooling output of an air conditioner in Btu during its normal usage period for cooling divided by the total electrical energy input in

watt-hours during the same period, as determined using the applicable test method in the *Appliance Efficiency Regulations*.

SEASONAL ENERGY EFFICIENCY RATIO 2 (SEER2) is the SEER metric for residential central air conditioners and heat pumps effective January 1, 2023, as created by the U.S. Department of Energy "ISSUANCE 2016-11-30 Energy Conservation Program: Test Procedures for Central Air Conditioners and Heat Pumps, Final Rule".

SELF-UTILIZATION CREDIT is the limited Efficiency LSC energy budget compliance credit available for combined PV and battery energy storage systems for single-family, as specified by the Residential ACM Reference Manual, and low-rise multifamily, as specified by the Nonresidential and Multifamily ACM Reference Manual.

SENSIBLE ENERGY RECOVERY RATIO is a ratio of the change in the dry-bulb temperature of the outdoor air supply to the difference in dry-bulb temperature between the outdoor air and entering exhaust airflow, with no adjustment to account for that portion of the dry-bulb temperature change in the leaving supply airflow that is the result of leakage of entering exhaust airflow rather than heat exchange between the airstreams.

SENSIBLE HEAT RATIO (S/R) is the ratio of an HVAC system's sensible cooling capacity to its total cooling capacity at specified operating conditions, calculated as Sensible Cooling Capacity / Total Cooling Capacity, where total cooling capacity is the sum of sensible and latent cooling capacities.

SERVICE WATER HEATING is heating of water for sanitary purposes for human occupancy, other than for comfort heating.

SHADING is the protection from heat gains because of direct solar radiation by permanently attached exterior devices or building elements, interior shading devices, glazing material, or adherent materials.

SHADING COEFFICIENT (SC) is the ratio of the solar heat gain through a fenestration product to the solar heat gain through an unshaded 1/8-inch-thick clear double strength glass under the same set of conditions. For nonresidential, high-rise residential, and hotel/motel buildings, this shall exclude the effects of mullions, frames, sashes, and interior and exterior shading devices.

~~**SIDELIT DAYLIT ZONE, PRIMARY** is the area in plan view directly adjacent to each vertical glazing, one window head height deep into the area, and window width plus 0.5 times window head height wide on each side of the rough opening of the window, minus any area on a plan beyond a permanent obstruction that is 6 feet or taller as measured from the floor.~~

~~**SIDELIT DAYLIT ZONE, SECONDARY** is the area in plan view directly adjacent to each vertical glazing, two window head heights deep into the area, and window width plus 0.5 times window head height wide on each side of the rough opening of the window, minus any area on a plan beyond a permanent obstruction that is 6 feet or taller as measured from the floor.~~

SIGN definitions include the following:

1. **Electronic Message Center (EMC)** is a pixelated image producing electronically controlled sign formed by any light source. Bare lamps used to create linear lighting animation

sequences through the use of chaser circuits, also known as “chaser lights” are not considered an EMC.

2. **Illuminated face** is a side of a sign that has the message on it. For an exit sign it is the side that has the word “EXIT” on it.
3. **Sign, cabinet** is an internally illuminated sign consisting of frame and face, with a continuous translucent message panel, also referred to as a panel sign.
4. **Sign, channel letter** is an internally illuminated sign with multiple components, each built in the shape of an individual three dimensional letter or symbol that are each independently illuminated, with a separate translucent panel over the light source for each element.
5. **Sign, double-faced** is a sign with two parallel opposing faces.
6. **Sign, externally illuminated** is any sign or a billboard that is lit by a light source that is external to the sign directed towards and shining on the face of the sign.
7. **Sign, internally illuminated** is a sign that is illuminated by a light source that is contained inside the sign where the message area is luminous, including cabinet signs and channel letter signs.
8. **Sign, traffic** is a sign for traffic direction, warning, and roadway identification.
9. **Sign, unfiltered** is a sign where the viewer perceives the light source directly as the message, without any colored filter between the viewer and the light source, including neon, cold cathode, and LED signs.

SIMULTANEOUS MECHANICAL HEAT RECOVERY is the simultaneous utilization of heat rejected from mechanical cooling for space heating or water heating.

SINGLE-FAMILY BUILDING ~~is any of the following:~~

~~A residential building of Occupancy Group R-3 with two or less dwelling units,~~

~~A building of Occupancy Group R-3, other than a multifamily building or hotel/motel building,~~

~~A townhouse,~~

~~A building of Occupancy Group R-3.1, or~~

~~A building of Occupancy Group U when located on a residential site~~ sSee *Use Designation*.

SINGLE PACKAGE VERTICAL AIR CONDITIONER (SPVAC) is a type of air-cooled small or large commercial package air-conditioning and heating equipment; factory assembled as a single package having its major components arranged vertically, which is an encased combination of cooling and optional heating components; is intended for exterior mounting on, adjacent interior to, or through an outside wall; and is powered by single or three-phase current. It may contain separate indoor grille, outdoor louvers, various ventilation options, indoor free air discharge, ductwork, wall plenum, or sleeve. Heating components may include electrical resistance, steam, hot water, gas, or no heat but may not include reverse cycle refrigeration as a heating means.

SINGLE PACKAGE VERTICAL HEAT PUMP (SPVHP) is an SPVAC that utilizes reverse cycle refrigeration as its primary heat source, with secondary supplemental heating by means of electrical resistance, steam, hot water, or gas.

SINGLE ZONE CONSTANT VOLUME HEAT PUMP (SZHP): Is an Air-source Heat Pump which uses a supply fan whose speed does not vary.

SINGLE ZONE SYSTEM is an air distribution system that supplies air to one thermal zone controlled by a single thermostat.

SITE SOLAR ENERGY is thermal, chemical, or electrical energy derived from direct conversion of incident solar radiation at the building site.

SKYLIGHT is fenestration installed on a roof less than 60° from the horizontal.

Skylight~~KYLIGHT~~ Area~~REA~~ is the area of the rough opening for the skylight.

Skylight~~KYLIGHT~~ Type~~YPE~~ is one of the following three types of skylights: glass mounted on a curb, glass not mounted on a curb or plastic (assumed to be mounted on a curb).

Skylit~~KYLIT~~ Daylit~~AYLIT~~ ~~ZONE~~ Zone is the rough area in plan view under each skylight, plus 0.7 times the average ceiling height in each direction from the edge of the rough opening of the skylight, minus any area on a plan beyond a permanent obstruction that is taller than one-half of the distance from the floor to the bottom of the skylight. The bottom of the skylight is measured from the bottom of the skylight well for skylights having wells, or the bottom of the skylight if no skylight well exists. For the purpose of determining the skylit daylit zone, the geometric shape of the skylit daylit zone shall be identical to the plan view geometric shape of the rough opening of the skylight; for example, for a rectangular skylight the skylit daylit zone plan area shall be rectangular, and for a circular skylight the skylit daylit zone plan area shall be circular. For skylight located in an atrium, the skylit daylit zone shall include the floor area directly under the atrium, and the area of the top floor that is directly under the skylight, plus 0.7 times the average ceiling height of the top floor, in each direction from the edge of the rough opening of the skylight, minus any area on a plan beyond a permanent obstruction that is taller than one-half of the distance from the top floor to the bottom of the skylight.

SMACNA is the Sheet Metal and Air-Conditioning Contractors National Association.

SMACNA HVAC DUCT CONSTRUCTION STANDARDS is the Sheet Metal Contractors' National Association document "HVAC Duct Construction Standards Metal and Flexible - 3rd Edition," 2006 (2006 ANSI/SMACNA-006-2006 HVAC Duct Construction Standards Metal and Flexible 3rd Edition).

SMACNA RESIDENTIAL COMFORT SYSTEM INSTALLATION STANDARDS is the Sheet Metal Contractors' National Association document titled "Residential Comfort System Installation Standards, Eighth Edition." (2016).

SOCIAL SERVICES BUILDING is a space where public assistance and social services are provided to individuals or families.

SOLAR ACCESS ROOF AREA (SARA) is roof area that provides solar access and is available and suitable for installation of a photovoltaic (PV) and solar water heating system, as specified in Chapters 7 and 8 of *Part 6*.

SOLAR ELECTRIC GENERATION SYSTEM or **PHOTOVOLTAIC SYSTEM** is, for the purposes of *Part 6*, the complete set of all components for converting sunlight into electricity through the photovoltaic process, including the array of panels, inverter(s) and the balance of system components required to enable the system to effectively deliver power to reduce a building's consumption of electricity from the utility grid.

SOLAR POOL HEATING SYSTEM is an assembly of components designed to heat water for swimming pools, spas or swimming pool and spa combinations by solar thermal means, excluding pool recirculation components.

~~**SOLAR REFLECTANCE INDEX (SRI)** is a measure of the roof's ability to reject solar heat which includes both reflectance and emittance.~~

SOLAR SAVINGS FRACTION (SSF) is the fraction of domestic hot water demand provided by a solar water-heating system.

SOLAR ZONE is a section of the roof designated and reserved for the future installation of a solar electric or solar thermal system.

SOURCE ENERGY is defined as the long run hourly marginal source energy of fossil fuels that are combusted as a result of building energy consumption either directly at the building site or caused to be consumed to meet the electrical demand of the building considering the long-term effects of Energy Commission-projected energy resource procurement. For a given hour, the value in that hour for each forecasted year is averaged to establish a lifetime average source energy.

SOUTH-FACING (See "orientation.")

SPA is a vessel that contains heated water in which humans can immerse themselves, is not a pool, and is not a bathtub.

SPACE-CONDITIONING SYSTEM is a system that provides mechanical heating, or mechanical cooling within or associated with conditioned spaces in a building and may incorporate use of components such as chillers/compressors, fluid distribution systems (e.g., air ducts, water piping, refrigerant piping), pumps, air handlers, cooling and heating coils, air or water cooled condensers, economizers, terminal units, and associated controls.

SPLIT SYSTEM is any central air-conditioner or heat pump that has at least two separate assemblies that are connected with refrigerant piping when installed. At least one of these assemblies is an indoor unit and at least one of these assemblies is an outdoor unit. Split systems can be either blower coil systems or coil-only systems.

STAGE-OFF refers to the operating state of equipment connected to a hydronic loop when an automatic control sequence turns the equipment off in response to the heating or cooling load~~,~~

and stops fluid flow through the equipment by closing control valves or sequencing the associated circulation pump off.

STANDARD DESIGN BUILDING is a building that is automatically simulated by Energy Commission-approved compliance software to establish the Energy Budget that is the maximum energy consumption allowed by a Proposed Design Building to comply with the Energy Code. ~~Title 24 Building Energy Efficiency Standards.~~ The Standard Design building is simulated using the same location and having the same characteristics of the Proposed Design building, but assuming minimal compliance with the mandatory and prescriptive requirements that are applicable to the proposed building, as specified by Section 10-109(c) and Section 10-116.

STORAGE, COLD is a storage area within a refrigerated warehouse where space temperatures are maintained at or above 32° F.

STORAGE, FROZEN is a storage area within a refrigerated warehouse where the space temperatures are maintained below 32° F.

T

TENANT SPACE is a portion of a building occupied by a tenant.

THERMAL MASS is solid or liquid material with a high overall heat capacity to store energy for heating or cooling requirements.

THERMAL RESISTANCE (R) is a measurement of the resistance over time of a material or building component to the passage of heat in (hr × ft² × °F)/Btu.

THERMOSTAT is an automatic control device or system used to maintain temperature at a fixed or adjustable setpoint.

THERMOSTATIC EXPANSION VALVE (TXV) is a refrigerant metering valve, installed in an air conditioner or heat pump, which controls the flow of liquid refrigerant entering the evaporator in response to the superheat of the gas leaving it.

TOTAL HEAT OF REJECTION (THR) is the heat rejected by refrigeration system compressors at design conditions, consisting of the design cooling capacity plus the heat of compression added by the compressors.

TOWNHOUSE is, for purposes of *Part 6*, a single-family dwelling unit constructed in a group of three or more attached units in which each unit extends from the foundation to roof and with open space on at least two sides.

TRANSCRITICAL CO_2 REFRIGERATION SYSTEM is a type of refrigeration system that uses CO_2 as the refrigerant where the ultimate heat rejection to ambient air can take place above the critical point.

1. **SUBCRITICAL MODE** is a system operating condition for a refrigeration system wherein the refrigerant pressure and temperature leaving the compressor is such that the refrigerant is below the critical point. Typically used in reference to CO_2 refrigeration systems.

2. **TRANSCRITICAL MODE** is a system operating condition for a refrigeration system wherein the refrigerant pressure and temperature leaving the compressor is such that the refrigerant is at or above the critical point. Typically used in reference to CO_2 refrigeration systems.

TRANSIENT is the occupancy of a dwelling unit or sleeping unit for not more than 30 days. ~~of a dwelling unit or sleeping unit.~~ (*CBC* Title 24, Part 2, Chapter 2)

TRIM COMPRESSOR is a compressor that is designated for part-load operation, handling the short term variable trim load of end uses, in ~~addition to the~~ contrast to always fully loaded base compressors.

U

U-FACTOR is the overall coefficient of thermal transmittance of a fenestration, wall, floor, or roof/ceiling component, in Btu/(hr × ft² × ºF), including air film resistance at both surfaces.

UL is the Underwriters Laboratories.

UL 181 is the Underwriters Laboratories document titled "Standard for Safety for Factory-Made Air Ducts and Air Connectors," 2017 (UL 181).

UL 181A is the Underwriters Laboratories document titled "Standard for Safety for Closure Systems for Use With Rigid Air Ducts," 2017 (UL 181A).

UL 181B is the Underwriters Laboratories document titled "Standard for Safety for Closure Systems for Use With Flexible Air Ducts and Air Connectors," 2017 (UL 181B).

UL 723 is the Underwriters Laboratories document titled "Standard for Safety for Test for Surface Burning Characteristics," 2018 (UL 723).

UL 727 is the Underwriters Laboratories document titled "Standard for Safety for Oil-Fired Central Furnaces,"2018 (UL727).

UL 731 is the Underwriters Laboratories document titled "Standard for Safety for Oil-Fired Unit Heaters," 2018 (UL 731).

UL 1077 is the Underwriters Laboratories document titled "Standard for Safety for Supplementary Protectors for Use in Electrical Equipment", 2016 (UL 1077)**.**

UL 1574 is the Underwriters Laboratories document titled " Standard for Safety for Track Lighting Systems," 2020 (UL 1574).

UL 1598 is the Underwriters Laboratories document titled "Standard for Safety for Luminaires," 2021 (UL 1598).

UL 1741 is the Underwriter Laboratories document titled "Standard for Safety for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources," 2021 (UL 1741).

UL 1741 SB is the Underwriter Laboratories document titled "Supplement SB – Grid Support Utility Interactive Inverters and Converters," to UL 1741, 3rd Edition, 2021 (UL 1741 SB).

UL 1973 is the Underwriter Laboratories document titled "Standard for Safety for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications)," 2018 (ANSI/CAN/UL 1973:2018).

UL 2108 is the Underwriters Laboratories document titled "Standard for Safety for Low Voltage Lighting Systems," 2019 (UL 2108).

UL 8750 is the Underwriters Laboratories document titled "Standards for Safety for Light Emitting Diode (LED) Equipment for Use in Lighting Products,"2021 (UL 8750).

UL 9540 is the Underwriter Laboratories document titled "Standard for Safety for Energy Storage Systems and Equipment" 2023 (ANSI/CAN/UL 9540:2023)

UNCONDITIONED SPACE is enclosed space within a building that is not directly conditioned, or indirectly conditioned.

UNIFORM ENERGY FACTOR (UEF) of a water heater is a measure of overall water heater efficiency, as determined using the applicable test method in the *Appliance Efficiency Regulations*.

USE DESIGNATION (also known as "Building Type") is a specific use within an Occupancy Classification Use Designation, per Title 24, Part 2, Section 302, including any subordinate uses or accessory spaces that are incidental and subordinate to the primary occupancy use designation, per Title 24, Part 2, Section 508. The *Use Designations* subject to *Part 6* are limited to the following:

Nonresidential Use Designations

Assembly Use (CBC Group A occupancy) with meeting halls in which people gather for civic, social, or recreational activities as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Commercial/Industrial Storage Use (CBC Groups H and S occupancies) with commercial or industrial storage as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Exhibits and Events Use (CBC Group A occupancy) with museums, motion picture or performance arts theaters, auditoriums, conventions, conferences, multipurpose, or civic meetings as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Financial Institution Use (CBC Group B occupancy) with institutions which collects funds from the public and places them in financial assets, such as deposits, loans, and bonds as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Grocery Store Use (CBC Group M occupancy) with display and sale of food as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Industrial/manufacturing Use (CBC Group F occupancy, or CBC Group H occupancy when used for manufacturing or processing) with assembly or manufacturing as the

primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Library Use (CBC Group A occupancy) with repository of literary materials for reading reference, such as books, periodicals, newspapers, pamphlets, and prints as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Medical/Clinic Office Use (CBC Group B occupancy) with medical business professional activities ~~are~~ conducted as the primary use, including any subordinate uses or accessory spaces. This includes, but is not limited to, exam rooms, lobbies, labs, doctors' offices supporting primary and family medicine, outpatient services, and veterinary clinics. *(CBC* Title 24, Part 2, Chapter 3)

Office Use (CBC Group B occupancy) with business, clerical, or professional activities ~~are~~ conducted as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Parking Garage Use (CBC Group S occupancy) used for parking vehicles~~,~~ and consists of at least a roof over the parking area enclosed with walls on all sides. Includes areas for vehicle maneuvering to reach designated parking spaces. If the roof of a parking structure is also used for parking, the section without an overhead roof is considered an outdoor parking lot instead of a parking garage. *(CBC* Title 24, Part 2, Chapter 3)

Religious Worship Use (CBC Group A occupancy) with religious worship being the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Restaurant Use (CBC Group A occupancy) with food and drink being prepared and served to customers in return for money as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Retail Use (CBC Group M occupancy) with display and sale of merchandise, not including restaurants, as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

School, K-12 Use (CBC Group E occupancy) with classrooms or educational laboratories~~,~~ as the primary use serving an educational institution through 12th grade, including any subordinate uses or accessory spaces. ~~A maintenance or storage building is not a school building.~~ *(CBC* Title 24, Part 2, Chapter 3)

School, Higher Education Use (CBC Group B occupancy) with classrooms, lecture halls, or educational laboratories~~,~~ as the primary use serving an educational institution above the 12th grade, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Service Facility (CBC Group B and S occupancies) is a building in which some type of service is provided, other than food service or retail sales of goods~~,~~ such as~~:~~ vehicle

service or repair, barber, beauty salon, spa, laundromat, ~~post office,~~ copy center, or kennel ~~etc~~. *(CBC* Title 24, Part 2, Chapter 3)

Sports and Recreation Use (CBC Group A occupancy) with exercise, fitness, or gymnasiums for recreational sports as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Sports Arena Use (CBC Group A occupancy) used for public viewing of sporting events and activities as the primary use, including any subordinate uses or accessory spaces. (*CBC* Title 24, Part 2, Chapter 3)

Unleased Tenant Use are spaces for lease whose use designation is unknown at the time of permit application.

Warehouse Use (CBC Group S occupancy) with storage or handling of products as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

Residential Use Designations

Hotel/Motel Use (CBC Groups R-1; R-3 ~~Congregate Residences Boarding Houses~~serving Transient Occupants) with sleeping or guest units, where the occupants are primarily transient in nature as the primary use, including any subordinate uses or accessory spaces. This includes, but is not limited to, sleeping units, guest rooms, lobbies, corridors, meeting rooms, food service spaces, and laundry serving the hotel/motel building use. *(CBC* Title 24, Part 2, Chapter 3)

Multifamily 3 Stories or less Use (CBC Groups R-2; R-3 serving Nontransient Occupants; R-4. Does not includ~~inge~~ Hotel, Motel~~, and Vacation Timeshare Properties; R-3 not including Transient Congregate Residences, Boarding Houses, and Alcoholism or Drug Abuse Recovery Homes; R-4 not including Healthcare Facility~~) including more than two dwelling units, where the occupants are primarily permanent in nature as the primary use, including any subordinate uses or accessory spaces, when the building has three habitable or occupied floors or less. This includes, but is not limited to, dwelling units, lobbies, corridors, mail rooms, offices and, laundry serving the occupants and guests of the multifamily building. *(CBC* Title 24, Part 2, Chapter 3)

Multifamily More than 3 Stories Use (CBC Groups R-2; R-3 serving Nontransient Occupants; R-4. Does -not includ~~inge~~ Hotel, Motel~~, and Vacation Timeshare Properties; R-3 not including Transient Congregate Residences, Boarding Houses, and Alcoholism or Drug Abuse Recovery Homes; R-4 not including Healthcare Facility~~) including more than two dwelling units, where the occupants are primarily permanent in nature as the primary use, including any subordinate uses or accessory spaces, when the building has more than three habitable stories or occupied floors. This includes, but is not limited to,

dwelling units, lobbies, corridors, mail rooms, offices, and laundry serving the occupants and guests of the multifamily building. *(CBC* Title 24, Part 2, Chapter 3)

Single-family Use: (CBC Group R-3, not including ~~Transient~~ Congregate Residences, Boarding Houses, and Group R-3.1 ~~alcoholism or drug abuse recovery homes that are ambulatory and serve six or fewer clients.~~ Includes Occupancy U when located on a single-family site) with two or less dwelling units, where the occupants are primarily permanent in nature as the primary use, including any subordinate uses or accessory spaces. *(CBC* Title 24, Part 2, Chapter 3)

USDOE 10 CFR 430 is the regulation issued by Department of Energy and available in the Code of Federal Regulation - Title 10, Chapter II, Subchapter D, Part 430 – Energy Conservation Program for Consumer Products. Relevant testing methodologies are specified in applicable appendices.

USDOE 10 CFR 431 is the regulation issued by Department of Energy and available in the Code of Federal Regulation - Title 10, Chapter II, Subchapter D, Part 431 - Energy Conservation Program for Certain Commercial and Industrial equipment. Relevant testing methodologies are specified in "Subpart E to Part 431 – Uniform test method for the measurement of energy efficiency of commercial packaged boilers."

V

VAPOR RETARDER CLASS is a measure of the ability of a material or assembly to limit the amount of moisture that passes through the material or assembly meeting Section 202 of the California Building Code.

VARIABLE AIR VOLUME (VAV) SYSTEM is a space-conditioning system that maintains comfort levels by varying the volume of supply air to the zones served.

VARIABLE CAPACITY HEAT PUMP (VCHP) is a centrally ducted, ductless, or mixed ducted and ductless heat pump, other than a packaged terminal heat pump, that has a variable capacity compressor and whose indoor units produce greater than 0.01 in. wc. and a maximum of 0.35 in. wc. external static pressure when operated at the cooling full-load air volume rate.

VENDING MACHINE is a machine for vending and dispensing refrigerated or nonrefrigerated food and beverages or general merchandise.

VENTILATION SYSTEM, BALANCED is at least one mechanical device intended to remove air from buildings, and simultaneously replace it with outdoor air.

VENTILATION SYSTEM, CENTRAL FAN INTEGRATED, or CFI is a ventilation system configuration in which the ventilation ductwork is connected to the duct system of a dwelling unit space conditioning system to enable distribution of ventilation air to the dwelling unit while the space conditioning system air handling unit is operating.

VENTILATION SYSTEM, ENERGY RECOVERY, or ERV is a mechanical device intended to remove air from buildings, simultaneously replace it with outdoor air, and in the process transfer heat

from the warmer to the colder of the simultaneous airflows and transfer moisture from the most humid to least humid of the simultaneous airflows.

VENTILATION SYSTEM, EXHAUST is at least one mechanical device intended to remove air from buildings, causing outdoor air to enter by ventilation inlets or normal leakage paths through the building envelope.

VENTILATION SYSTEM, HEAT RECOVERY, or HRV is a mechanical device intended to remove air from buildings, simultaneously replace it with outdoor air, and in the process transfer heat from the warmer to the colder of the simultaneous airflows.

VENTILATION SYSTEM, SUPPLY is at least one mechanical device intended to bring outdoor air into buildings, causing indoor air to flow out of the building through ventilation relief outlets or normal leakage paths through the building envelope.

VENTLESS SURFACE is any door, wall, or ceiling surface that does not have a vent installed to allow airflow to a *communicating space.*

VERY VALUABLE MERCHANDISE is rare or precious objects, including, but not limited to, jewelry, coins, small art objects, crystal, ceramics, or silver, the selling of which involves customer inspection of very fine detail from outside of a locked case.

VIRTUAL END NODE (VEN) is an interface with a demand responsive control system that accepts signals transmitted through OpenADR, consistent with the specifications in OpenADR 2.0a, 2.0b, or Baseline Profile OpenADR 3.0.

W

WALL TYPE is a type of wall assembly having a specific heat capacity, framing type, and U-factor.

WATER BALANCE IN EVAPORATIVE COOLING TOWERS The water balance of a cooling tower is:

M = E + B, where:

M = makeup water (from the mains water supply)

E = losses due to evaporation

B = losses due to blowdown

WATER-TO-WATER HEAT PUMP (WWHP) is a factory-made heat pump system containing one or more compressors, heat exchangers for transferring heat between refrigerant and water distributed to meet building loads, as well as between refrigerant and a separate water loop serving as the heating or cooling energy source, and various other components. Its primary purpose is to generate heated or cooled water to meet space conditioning loads, domestic hot water loads, or both.

WATER HEATER definitions include the following:

1. **CONSUMER WATER HEATER** is a water heater that meets the definition of a consumer product under USDOE 10 CFR 430.

2. **COMMERCIAL HEAT PUMP WATER HEATER** is a water heater (including all ancillary equipment such as fans, blowers, pumps, storage tanks, piping, and controls, as applicable) that uses a refrigeration cycle, such as vapor compression, to transfer heat from a low-temperature source to a higher-temperature sink for the purpose of heating potable water, and operates with a current rating greater than 24 amperes or a voltage greater than 250 volts. (USDOE 10 CFR 431.102)
3. **HEAT PUMP WATER HEATER (HPWH)** is a water heater that transfers thermal energy from one temperature level to another temperature level for the purpose of heating water, including all ancillary equipment such as fans, storage tanks, pumps, or controls necessary for the device to perform its function.
   3.1. **INTEGRATED HEAT PUMP WATER HEATER** is a HPWH which has all components, including fans, storage tanks, pumps, or controls necessary for the device to perform its function contained in a single factory-made assembly.
   3.2. **SPLIT-REFRIGERANT HEAT PUMP WATER HEATER** is a HPWH which has a single outdoor section and one or more indoor sections connected to the outdoor section via a refrigerant circuit.
   3.3. **SPLIT-HYDRONIC HEAT PUMP WATER HEATER** is a HPWH that consists of multiple separate sections. One section houses all the refrigerant components, while one or more additional sections are designated for water storage. These sections are interconnected through a hydronic circuit.
4. **MULTI-PASS WATER HEATER** is a water heater which the cold water passes through multiple times. The water temperature increases with each pass, until the storage tank reaches the intended storage temperature.
5. **PRIMARY HEAT PUMP STORAGE TANK** is a tank that is primarily heated by a separate detached heat pump unit(s). The primary heat pump storage tank can also be used to maintain the temperature in the recirculation loop in Return to Primary configuration.
6. **RETURN TO PRIMARY CONFIGURATION** is a heat pump water heater configuration where the hot water from the recirculation loop hot water return is piped to the cold-water supply inlet directly upstream of the primary heat pump storage tank(s), or directly to a dedicated recirculation return inlet of the primary heat pump storage tank(s).
7. **SINGLE-PASS WATER HEATER** is a water heater which the cold water passes through once and is heated to the intended use temperature.
8. **TEMPERATURE MAINTENANCE HEATER IN PARALLEL CONFIGURATION** is a configuration where a secondary water heater is in parallel with the primary heat pump generation and storage system. The secondary heater is designed to meet the temperature maintenance load.
9. **TEMPERATURE MAINTENANCE HEATER IN SERIES CONFIGURATION** is a configuration where a secondary water heater is in series and downstream from the primary heat pump generation and storage system. The secondary heater is designed to meet the temperature maintenance load.

10. **UNITARY WATER HEATER** is a water heater with the heating source and storage tank integrated into a single piece of equipment.

WATER-LOOP HEAT PUMP is a water-to-air heat pump using liquid circulating in a common piping loop as a heat source/heat sink.

WATER-SOURCE HEAT PUMP is a single-phase or three-phase reverse-cycle heat pump that uses a circulating water loop as the heat source for heating and as the heat sink for cooling. The main components are a compressor, refrigerant-to-water heat exchanger, refrigerant-to-air heat exchanger, refrigerant expansion devices, refrigerant reversing valve, and indoor fan. Examples of water-source heat pumps include, but are not limited to:

~~1.~~ **WATER-LOOP HEAT PUMP** (See “water-loop heat pump”)

2. **GROUND-WATER HEAT PUMP** (See “ground-water heat pump")

3. **GROUND-LOOP HEAT PUMP** (See "ground-loop heat pump”)

WEST-FACING (See “orientation”)

WINDOW FILM is a fenestration attachment product that consists of a flexible adhesive-backed polymer film which may be applied to the interior or exterior surface of an existing glazing system.

WOOD HEATER is an enclosed wood-burning appliance used for space heating and/or domestic water heating.

WOOD STOVE (See “wood heater.”)

Z

ZONAL describes characterized by or relating to a zone or zones.

ZONE, CRITICAL is a zone serving a process where reset of the zone temperature setpoint during a demand shed event might disrupt the process, including but not limited to computer rooms, data centers, telecom and private branch exchange (PBX) rooms, and laboratories.

ZONE, NONCRITICAL is a zone that is not a critical zone.

ZONE, SPACE-CONDITIONING is a space or group of spaces within a building with sufficiently similar comfort conditioning requirements so that comfort conditions, as specified in Section 401.3.4.3 or 402.2.2 *[Section 140.4(b)3 or 150.0(h)]*, as applicable, can be maintained throughout the zone by a single controlling device.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SUBCHAPTER 3
ENVELOPE

SECTION 300
MANDATORY REQUIREMENTS FOR ALL OCCUPANCIES
(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

300.1 *[Section 110.6]* **Fenestration products and exterior doors.**

300.1.1 *[Section 110.6(a), Part 1, 10-112]* **Certification of fenestration products and exterior doors other than field-fabricated.**

1. Any *fenestration product* and exterior *door*, other than *field-fabricated fenestration products* and *field-fabricated* exterior *doors*, may be installed only if the manufacturer has *certified to the Energy C~~c~~ommission*, or if an independent *certifying organization* approved by the *Energy C~~c~~ommission* has certified, that the product complies with all of the applicable requirements of this subsection; or~~.~~
2. Products shall demonstrate compliance using *Energy C~~c~~ommission* default values. The *Energy Commission* shall maintain tables of default *U-factors* and *SHGCs* for use as an alternative to *U-factors* and *SHGCs* derived based on the NFRC Rating Procedure. The default values shall meet the following criteria:
   2.1. The values shall be derived from simulations of products using the same computer simulation program(s) used in the NFRC Rating Procedure.
   2.2. The default values shall be set so that they do not provide to any significant number of products a lower *U-factor* or *SHGC* than those products would obtain if they were rated using the full NFRC Rating Procedure.

   The *Energy Commission* shall periodically review and revise the default tables as necessary to ensure that the criteria are met.

Exception to Section 300.1.1: *Fenestration products* removed and reinstalled as part of a *building alteration* or *addition*.

300.1.1.1 *[Section 110.6(a)1]* **Air leakage.**

Manufactured fenestration products and exterior *doors* shall have *air infiltration* rates not exceeding 0.3 cfm/ft^2 of *window area*, 0.3 cfm/ft^2 of *door area* for residential *doors*, 0.3 cfm/ft^2 of *door area* for nonresidential single *doors* (swinging and sliding), and 1.0 cfm/ft^2 for nonresidential double *doors* (swinging), when tested according to NFRC-400 or *ASTM E283* at a pressure differential of 75 pascals (or 1.57 pounds/ft^2), incorporated herein by reference.

~~**Exception to Section 300.1.1.1:** *Field-fabricated* fenestration and *field-fabricated* exterior *doors.*~~

~~**NOTE:**~~ Pet *doors* must meet 0.3 cfm/ft^2 when tested according to *ASTM E283* at 75 pascals (or 1.57 pounds per square foot). *AAMA/WDMA/CSA 101/I.S.2/A440-2011* specification is equivalent to *ASTM E283* at a pressure differential of 75 pascals (or 1.57 pounds per square foot) and satisfies the air leakage certification requirements of this section.

300.1.1.2 *[Section 110.6(a)2]* **U-factor.**

The *fenestration product* and exterior *door's U-factor* shall be rated in accordance with *NFRC 100*, or use the applicable default *U-factor* set forth in Table 300.1-(1) *[Table 110.6-A]*.

Exception 1 to Section 300.1.1.2: If the *fenestration product* is a *skylight* in a *building* covered by the nonresidential standards with less than 200 square feet of *skylight area*, the default *U-factor* may be calculated as set forth in Reference Nonresidential Appendix NA6.

Exception 2 to Section 300.1.1.2: If the *fenestration product* is an *alteration* consisting of any area replacement of glass in a *skylight* product in a *building* covered by the nonresidential standards, the default *U-factor* may be calculated as set forth in Reference Nonresidential Appendix NA6.

TABLE 300.1-(1) [TABLE 110.6-A] DEFAULT FENESTRATION PRODUCT U-FACTORS

FRAME	PRODUCT TYPE	SINGLE PANE ~~3, 4~~ c, d *U-FACTOR*	DOUBLE PANE ~~1, 3, 4~~ a, c, d *U-FACTOR*	GLASS BLOCK ~~2, 3~~ b, c *U-FACTOR*
Metal	Operable	1.28	0.79	0.87
Metal	*Fixed*	1.19	0.71	0.72
Metal	*Greenhouse/Garden Window*	2.26	1.40	N.A.
Metal	*Glazed Doors*	1.25	0.77	N.A.
Metal	*Skylight*	1.98	1.30	N.A.
Metal, Thermal Break	Operable	N.A.	0.66	N.A.
Metal, Thermal Break	*Fixed*	N.A.	0.55	N.A.
Metal, Thermal Break	*Greenhouse/Garden Window*	N.A.	1.12	N.A.
Metal, Thermal Break	*Glazed Doors*	N.A.	0.59	N.A.
Metal, Thermal Break	*Skylight*	N.A.	1.11	N.A.
Nonmetal	Operable	0.99	0.58	0.60
Nonmetal	*Fixed*	1.04	0.55	0.57
Nonmetal	*Glazed Doors*	0.99	0.53	N.A.
Nonmetal	*Greenhouse/Garden Windows*	1.94	1.06	N.A.
Nonmetal	*Skylight*	1.47	0.84	N.A.

Footnotes for Table 300.1(1) *[Table 110.6-A]*:

a. For all dual-glazed *fenestration products*, adjust the listed *U-factors* as follows:

1. Add 0.05 for products with dividers between panes if spacer is less than 7/16 inch wide.

2. Add 0.05 to any product with true divided lite (dividers through the panes).

b. Translucent or transparent panels shall use glass block values when not rated by *NFRC 100*.

c. *Visible Transmittance (VT)* shall be calculated by using Reference Nonresidential Appendix NA6.

d. *Windows* with *window film* applied that is not rated by *NFRC 100* shall use the default values from this table.

~~Footnotes for Table 300.1-A *[Table 110.6-A]*:~~

~~e. For all dual-glazed *fenestration products*, adjust the listed *U-factors* as follows:~~

~~1. Add 0.05 for products with dividers between panes if spacer is less than 7/16 inch wide.~~

~~2. Add 0.05 to any product with true divided lite (dividers through the panes).~~

~~f. Translucent or transparent panels shall use glass block values when not rated by *NFRC 100*.~~

~~g. *Visible Transmittance (VT)* shall be calculated by using Reference Nonresidential Appendix NA6.~~

~~h. *Windows* with *window film* applied that is not rated by *NFRC 100* shall use the default values from this table.~~

300.1.1.3 *[Section 110.6(a)3]* **Solar heat gain coefficient (SHGC).**

The *fenestration product's SHGC* shall be rated in accordance with *NFRC 200*, or use the applicable default *SHGC* set forth in Table 300.1~~-B~~(2) *[TABLE 110.6-B]*.

Exception 1 to Section 300.1.1.3: If the *fenestration product* is a *skylight* in a *nonresidential* or *hotel/motel building* ~~covered by the nonresidential standards~~ with less than 200 square feet of *skylight area*, the default *SHGC* may be calculated as set forth in Reference Nonresidential Appendix NA6.

Exception 2 to Section 300.1.1.3: If the *fenestration product* is an *alteration* consisting of any area replacement of glass in a *skylight* product in a *nonresidential* or *hotel/motel building* ~~covered by the nonresidential standards~~, the default *SHGC* may be calculated as set forth in Reference Nonresidential Appendix NA6.

TABLE 300.1(2) ~~B~~ [TABLE 110.6-B] DEFAULT SOLAR HEAT GAIN COEFFICIENT (SHGC)

FRAME TYPE	PRODUCT	*GLAZING*	*FENESTRATION PRODUCT SHGC* SINGLE PANE ~~2,~~ 3b, c ~~SHGC~~	*FENESTRATION PRODUCT SHGC* DOUBLE PANE ~~2,~~ 3b, c ~~SHGC~~	*FENESTRATION PRODUCT SHGC* GLASS BLOCK ~~1,~~ 2a, b ~~SHGC~~
Metal	Operable	Clear	0.80	0.70	0.70
Metal	*Fixed*	Clear	0.83	0.73	0.73
Metal	Operable	Tinted	0.67	0.59	N.A.
Metal	*Fixed*	Tinted	0.68	0.60	N.A.
Metal, Thermal Break	Operable	Clear	N.A.	0.63	N.A.
Metal, Thermal Break	*Fixed*	Clear	N.A.	0.69	N.A.
Metal, Thermal Break	Operable	Tinted	N.A.	0.53	N.A.
Metal, Thermal Break	*Fixed*	Tinted	N.A.	0.57	N.A.
Nonmetal	Operable	Clear	0.74	0.65	0.70
Nonmetal	*Fixed*	Clear	0.76	0.67	0.67
Nonmetal	Operable	Tinted	0.60	0.53	N.A.
Nonmetal	*Fixed*	Tinted	0.63	0.55	N.A.

Footnotes for Table 300.1(2) *[Table 110.6-B]*:

a. Translucent or transparent panels shall use glass block values when not rated by *NFRC 200*.

b. *Visible Transmittance (VT)* shall be calculated by using Reference Nonresidential Appendix NA6.

c. *Windows* with *window film* applied that is not rated by *NFRC 200* shall use the default values from this table.

~~Footnotes for Table 300.1-B *[Table 110.6-B]*:~~

~~d. Translucent or transparent panels shall use glass block values when not rated by *NFRC 200*.~~

~~e. *Visible Transmittance (VT)* shall be calculated by using Reference Nonresidential Appendix NA6.~~

~~f. *Windows* with *window film* applied that is not rated by *NFRC 200* shall use the default values from this table.~~

300.1.1.4 *[Section 110.6(a)4]* **Visible transmittance (VT).**

The *fenestration product's VT* shall be rated in accordance with *NFRC 200* or *ASTM E972*, for tubular daylighting devices *VT* shall be rated using *NFRC 203***.**

Exception 1 to Section 300.1.1.4: If the *fenestration product* is a *skylight* in a *nonresidential* or *hotel/motel building* ~~covered by the nonresidential standards~~ with less than 200 square feet of *skylight area*, the default *VT* may be calculated as set forth in Reference Nonresidential Appendix NA6.

Exception 2 to Section 300.1.1.4: If the *fenestration product* is an *alteration* consisting of any area; replacement of glass in a *skylight* product in a *nonresidential* or *hotel/motel building* ~~covered by the nonresidential standards~~, the default *VT* may be calculated as set forth in Reference Nonresidential Appendix NA6.

300.1.1.5 *[Section 110.6(a)5]* **Labeling.**

Fenestration products and exterior *doors* shall:

1. Have a temporary label for *manufactured fenestration products* and exterior *doors*, or a label certificate when the Commercial Fenestration Energy Performance Certification Program ~~Component Modeling Approach (CMA)~~ is used ~~and~~ for *site-built fenestration* meeting the requirements of Section 300.1.1.5.1 *[Section 10-111(a)1]*. The temporary label shall not be removed before inspection by the *enforcement agency*; and

2. Have a permanent label or label certificate when the Commercial Fenestration Energy Performance Certification Program ~~Component Modeling Approach (CMA)~~ is used and for *site-built fenestration* meeting the requirements of Section 300.1.1.5.2 *[Section 10-111(a)2]* if the product is rated using NFRC procedures.

300.1.1.5.1 *[Part 1, Section 10-111(a)1]* **Temporary labels.**

1. Every manufactured *fenestration product* and exterior *door* shall have attached to it a clearly visible temporary label that lists the *U-factor*, the *solar heat gain coefficient* (*SHGC*) and *Visible Transmittance* (*VT*) and that certifies compliance with the air leakage requirements of Section 300.1.1.1 *[110.6(a)1]*. Temporary labels for manufactured *fenestration products* and exterior *doors* are to

incorporate the values determined by ~~Section 10-111(a)1B~~Item 2 and shall comply with the labeling requirements of NFRC 700. No other values for *U-factor*, *SHGC*, *VT* and Air Leakage are allowed on the temporary label attached to the manufactured *fenestration product* or exterior *door*. Commercial Fenestration Energy Performance Certification Program ~~Component Modeling Approach (CMA)~~ and *site-built fenestration products* shall have an NFRC label certificate that lists the *U-factor*, the *Solar Heat Gain Coefficient* (*SHGC*), and the *Visible Transmittance* (*VT*) and shall comply with the labeling requirements of NFRC 700~~5~~ for the Component Modeling Approach or NFRC 7150~~0~~ for *site-built fenestration products*.

2. *U-factor*, *SHGC*, *VT* and Air Leakage shall be determined by either:

   2.1. *Fenestration products* and exterior *doors* rated and certified using *NFRC 100*, *NFRC 200*, *NFRC 202 NFRC 203* or *NFRC 400* Rating Procedures. The manufacturer shall stipulate that the ratings were determined in accordance with applicable NFRC procedures. For manufactured *fenestration products* and exterior *doors*, a temporary label certificate approved by the supervisory entity (NFRC) meets the requirements of this section.
   For component modeling and *site-built fenestration products*, a label certificate approved by the supervisory entity (NFRC) meets the requirements of this section.

   2.2. For manufactured or *site-built fenestration products* and exterior *doors* not rated by NFRC, a temporary label with the words "CEC Default *U-factor*," followed by the appropriate default *U-factor* specified in Section 300.1.1.2 *[110.6(a)2]* and with the words "CEC Default *SHGC*," followed by the appropriate default *SHGC* specified in Section 300.1.1.3 *[110.6(a)3]* and with the words "CEC Default *VT*," followed by the appropriate *VT* as specified in Section 300.1.1.4 *[110.6(a)4]*, meets the requirements of this Subsection B.

3. Temporary labels shall also certify that the manufactured *fenestration product* or exterior *door* complies with the air leakage requirements of Section 300.1.1.1 *[110.6(a)1]* of the Standards.

300.1.1.5.2 *[Part 1, Section 10-111(a)2]* **Permanent labels.**

Rated products shall have a permanent label consistent with their rating and certification that is either a stand-alone label, an extension or tab of an existing permanent certification label being used by the manufacturer/responsible party, or a series of marks or etchings on the product. The permanent label coupled with observable product characteristics, shall be usable to trace the product to certification information on file with the supervisory entity or to a directory of certified products, published by the supervisory entity. For the Commercial *Fenestration* Energy Performance Certification Program ~~CMA~~ and *site-built fenestration products*, a label certificate approved by the supervisory entity meets the requirements of this section.

~~**Exception to Section 300.1.1.5:** Field-fabricated fenestration products.~~

300.1.1.6 *[Part 1, Section 10-111(b)]* **Certification requirements.**

1. **Certification to default ratings.** The manufacturer shall certify on the Default Label that the product's *U-factor*, *SHGC* and *VT* meets the default criteria in Sections 300.1.1.2 *[110.6(a)2]*, 300.1.1.3 *[110.6(a)3]*, and 300.1.1.4 *[110.6(a)4]*; and

   1.1. A temporary label, affixed to the product, that meets the requirements of Section 300.1.1.5.1 Item 2 *[10-111(a)1B]* meets this requirement.

   1.2. If the product claims the default *U-factor* for a thermal break product, the manufacturer shall also certify on the label that the product meets the thermal break product criteria, specified on the default table, on which the default value is based. Placing the terms "Meets Thermal Break Default Criteria" on the default temporary label or default label certificate meets this requirement.

2. **Certification to NFRC rating procedure.** If a product's *U-factor*, *SHGC* or *VT* is based on the NFRC Rating Procedure, the *U-factor*, *SHGC* or *VT* shall be certified by the manufacturer according to the procedures of an independent *certifying organization* approved by the *Energy Commission*.

   2.1. A temporary label, affixed to the product or label certificate for the Commercial *Fenestration* Energy Performance Certification Program ~~CMA~~ and *site-built fenestration*, meeting the requirements of Section 300.1.1.5.1 and 300.1.1.5.2 *[Section 10-111(a)]* certified by the independent *certifying organization* complies with this requirement.

   2.2. An "independent *certifying organization* approved by the *Energy Commission*" means any organization authorized by the supervisory entity to certify *U-factor* ratings, *Solar Heat Gain Coefficient* and *Visible Transmittance* ratings in accordance with the NFRC Rating Procedure. If the *Energy Commission* designates the NFRC as the supervisory entity, any independent certification and inspection agency (IA) licensed by NFRC shall be deemed to be an "independent *certifying organization* approved by the *Energy Commission*."

   2.3. The "supervisory entity" means the NFRC, except as provided in Section 300.1.1.6.1 Item 1 *[Section 10-111(c)1]*.

   300.1.1.6.1 *[Part 1, Section 10-111(c)]* **Designation of Supervisory Entity.**

   The NFRC shall be the supervisory entity to administer the certification program relating to *U-factors*, *SHGC*, and *VT* ratings for *fenestration products* and exterior *doors*, provided the *Energy Commission* determines that the NFRC meets the criteria in Section 300.1.1.6.2 *[Section 10-111(d)]*.

   1. The *Energy Commission* may consider designating a supervisory entity other than NFRC only if the *Energy Commission* determines that the NFRC cannot meet the criteria in Section 300.1.1.6.2 *[Section 10-111(d)]*. Such other supervisory entity shall meet the criteria in Section 300.1.1.6.2 *[Section 10-111(d)]* prior to being designated.

2. The *Energy Commission* shall periodically review, at least annually, the structure and operations of the supervisory entity to ensure continuing compliance with the criteria in Section 300.1.1.6.2 *[Section 10-111(d)].*

300.1.1.6.2 *[Part 1, Section 10-111(d)]* **Criteria for Supervisory Entity.**

1. Membership in the entity shall be open on a nondiscriminatory basis to any person or organization that has an interest in uniform thermal performance ratings for *fenestration products* and exterior *doors*, including, but not limited to, members of the *fenestration* industry, *glazing* infill industry, *building* industry, design professionals, specifiers, utilities, government agencies, and public interest organizations. The membership shall be composed of a broad cross section of those interested in uniform thermal performance ratings for *fenestration products*.
2. The governing body of the entity shall reflect a reasonable cross section of the interests represented by the membership.
3. The entity shall maintain a program of oversight of product manufacturers, laboratories, and independent *certifying organizations* that ensures uniform application of the NFRC Rating Procedures, labeling and certification, and such other rating procedures for other factors affecting energy performance as the NFRC and the *Energy Commission* may adopt.
4. The entity shall require manufacturers and independent *certifying organizations* within its program to use laboratories accredited by the supervisory entity to perform simulations and tests under the NFRC Rating Procedure or by an NFRC Approved Calculation Entity (*ACE*) under the Commercial Fenestration Energy Performance Certification Program~~Component Modeling Approach (CMA) Product Certification Program (PCP)~~.
5. The entity shall maintain appropriate guidelines for testing and simulation laboratories, manufacturers, and certifying agencies, including requirements for adequate:
    5.1. Possession and calibration of equipment;
    5.2. Education, competence, and training of personnel;
    5.3. Quality control;
    5.4. Record keeping and reporting;
    5.5. Periodic review (including, but not limited to, blind testing by laboratories; inspections of products; and inspections of laboratories, manufacturing facilities, and certifying agencies);
    5.6. Challenges to certified ratings; and
    5.7. Guidelines to maintain the integrity of the program, including, but not limited to, provisions to avoid conflicts of interest within the rating and certification process.

6. The entity shall be a nonprofit organization and shall maintain reasonable, nondiscriminatory fee schedules for the services it provides and shall make its fee schedules, the financial information on which fees are based, and financial statements available to its members for inspection.
7. The entity shall provide hearing processes that give laboratories, manufacturers, and certifying agencies a fair review of decisions that adversely affect them.
8. The entity shall maintain a certification policy committee whose procedures are designed to avoid conflicts of interest in deciding appeals, resolving disputes, and setting policy for the *certifying organizations* within its program.
9. The entity shall publish at least annually a directory of products certified and decertified within its program.
10. The entity itself shall be free from conflict-of-interest ties or to undue influence from any particular manufacturing interest(s), testing or simulation lab(s), or independent *certifying organization*(s).
11. The entity shall provide or authorize the use of labels and label certificates for Component Modeling Approach and *site-built fenestration products* that can be used to meet the requirements of Sections 300.1.1.2, 3001.1.3, and 3001.1.14 *[110.6(a)2, 110.6(a)3 and 110.6(a)4]*, and this section.
12. The entity's certification program shall allow for multiple participants in each aspect of the program to provide for competition between manufacturers, testing labs, simulation labs, and independent *certifying organizations*.

300.1.1.6.3 *[Part 1, Section 10-111(e)]* **Certification for other factors.**

Nothing in this section shall preclude any entity, whether associated with a *U-factor*, *SHGC* or *VT* certification program or not, from providing certification services relating to factors other than *U-factors*, *SHGCs* and *VTs* for *fenestration products* and exterior *doors*.

300.1.1.7 *[Section 110.6(a)6]* **Fenestration acceptance requirements.**

Before an occupancy permit is granted *site-built fenestration products* in other than *single-family buildings* shall be certified as meeting the *Acceptance Requirements for Code Compliance*, as specified in the Reference Nonresidential Appendix NA7 to ensure that *site-built fenestration* meets Standards requirements, including a matching label certificate for product(s) installed and be *readily accessible* at the project location. A certificate of acceptance certifying that the *fenestration product* meets the acceptance requirements shall be completed, signed and submitted to the *enforcement agency*.

300.1.2 *[Section 110.6(b)]* **Installation of field-fabricated fenestration and exterior doors.**

Field-fabricated fenestration and *field-fabricated* exterior *doors* may be installed only if the compliance documentation has demonstrated compliance for the installation using *U-factors* from Table 300.1-(1) *[Table 110.6-A]* and *SHGC* values from Table 300.1-(2) *[Table 110.6-B]*. *Field-fabricated fenestration* and *field-fabricated* exterior *doors* shall be caulked

between the *fenestration products* or exterior *door* and the *building*, and shall be weatherstripped.

Exception to Section 300.1.2: Unframed glass *doors* and fire *doors* need not be weatherstripped or caulked.

300.2 *[Section 110.7]* **Requirements to limit air leakage.**

All joints, penetrations and other openings in the *building envelope* that are potential sources of air leakage shall be caulked, gasketed, weather-stripped or otherwise sealed to limit *infiltration* and *exfiltration*.

300.3 *[Section 110.8]* **Insulation~~, roofing products and radiant barriers.~~**

300.3.1 *[Section 110.8(a)]* **Insulation certification by manufacturers.**

All insulation shall be certified by Department of Consumer Affairs, Bureau of Household Goods and Services that the insulation conductive thermal performance is approved pursuant to the California Code of Regulations, Title 24, Part 12, Chapters 12-13, Article 3, "Standards for Insulating Material."

300.3.2 *[Section 110.8(b)]* **Installation of urea formaldehyde foam insulation.**

Urea formaldehyde foam insulation may be applied or installed only if:

1. It is installed in exterior side walls; and
2. A 4-mil-thick plastic polyethylene vapor retarder or equivalent plastic sheathing vapor retarder is installed between the urea formaldehyde foam insulation and the interior space in all applications.

300.3.3 *[Section 110.8(c)]* **Flame spread rating of insulation**.

All insulating material shall be installed in compliance with the flame spread rating and smoke density requirements of the *CBC*.

300.3.4 *[Section 110.8(d)]* **Installation of insulation in existing buildings**.

Insulation installed in an existing *attic* shall comply with the applicable requirements below. If a contractor installs the insulation, the contractor shall certify to the customer, in writing, that the insulation meets the applicable requirements below.

1. ***Attics*.** If insulation is installed in the existing *attic* of a *single-family or multifamily, 3 stories or less, use designation* ~~*low-rise residential building*~~, the *R-value* of the total amount of insulation (after addition of insulation to the amount, if any, already in the *attic*) shall meet the requirements of Section 302.2.1 *[Section 150.0(a)]* for *single-family buildings* and Section 303.5.2.1.1 *[Section 180.2(a)1]* for *multifamily buildings* three *habitable stories* or less.

Exception to Section 300.3.4: Where the *accessible* space in the *attic* is not large enough to accommodate the required *R-value*, the entire *accessible* space shall be filled with insulation, provided such installation does not violate Section 1202.2 of Title 24, Part 2 or Section 806 of Title 24, Part 2.5.

300.3.5 *[Section 110.8(g)]* **Insulation requirements for heated slab floors.**

Heated slab floors shall be insulated according to the requirements in Table 300.3-(1) *[Table 110.8-A]*.

300.3.5.1 *[Section 110.8(g)1]* **Insulation materials in ground contact.**

Insulation materials in ground contact must:

1. Comply with the certification requirements of Section 300.3.1 *[Section 110.8(a)]*; and
2. Have a water absorption rate for the insulation material alone without facings that is no greater than 0.3 percent when tested in accordance with Test Method A – 24 Hour-Immersion of *ASTM C272*.
3. Water vapor permeance no greater than 2.0 perm/ inch when tested in accordance with *ASTM E96*.

300.3.5.2 *[Section 110.8(g)2]* **Insulation installation.**

Insulation installation must:

1. Be covered with a solid guard that protects against damage from ultraviolet radiation, moisture, landscaping operation, equipment maintenance and wind; and
2. Include a rigid plate, which penetrates the slab and blocks the insulation from acting as a conduit for insects from the ground to the structure above the foundation.

TABLE 300.3-(1) [TABLE 110.8-A] SLAB INSULATION REQUIREMENTS FOR HEATED SLAB FLOOR

INSULATION LOCATION	INSULATION ORIENTATION	INSTALLATION REQUIREMENTS	CLIMATE ZONE	INSULATION *R-VALUE*
Outside edge of heated slab, either inside or outside the foundation wall	Vertical	From the level of the top of the slab, down 16 inches or to the frost line, whichever is greater. Insulation may stop at the top of the footing where this is less than the required depth. For below grade slabs, vertical insulation shall be extended from the top of the foundation wall to the bottom of the foundation (or the top of the footing) or to the frost line, whichever is greater.	1 – 15 16	5 10
Between heated slab and outside foundation wall	Vertical and Horizontal	Vertical insulation from top of slab at inside edge of outside wall down to the top of the horizontal insulation. Horizontal insulation from the outside edge of the vertical insulation extending 4 feet toward the center of the slab in a direction normal to the outside of the *building* in plan view.	1 – 15 16	5 10 vertical and 7 horizontal

300.3.6 *[Section 110.8(h)]* **Wet insulation systems.**

When insulation is installed on *roofs* above the roofing membrane or layer used to seal the *roof* from water penetration, the effective *R-value* of the insulation shall be as specified in Reference Joint Appendix JA4.

300.4 *[Section 110.8]* **Roofing products**

300.~~3.7~~4.1 *[Section 110.8(i)]* **~~Roofing products s~~Solar reflectance and thermal emittance.**

300.~~3.7~~4.1.1 *[Section 110.8(i)1]* **Product certification and labeling.**

In order to meet the requirements of Section 102.5 *[Section 140.1]*, Section 102.4 *[Section 140.2]*, Section 301.3.1 *[Section 140.3(a)1]*, Sections 301.5.2.2.3 and 301.5.2.2.4 *[Section 141.0(b)2B]*, Section 302.3.7 *[Section 150.1(c)11]*, or Section 302.5.2.2.3 *[Section 150.2(b)1I]*, a *roofing product's thermal emittance* and an aged *solar reflectance* shall be certified and labeled according to the requirements of Sections 300.4.1.1.1 through 300.4.1.1.4 *[Section 10-113]*.

Exception to Section 300.~~3.7~~4.1.1: *Roofing products* that are not certified according to Sections 300.4.1.1.1 through 300.4.1.1.4 *[Section 10-113]* shall assume the following default aged *solar reflectance*/*thermal emittance* values:

1. For asphalt shingles: 0.08/0.75
2. For all other *roofing products*: 0.10/0.75

300.4.1.1.1 *[Part 1, Section 10-113(a)]* **Labeling requirements.**

Every *roofing product* installed in construction to take compliance credit or meet the prescriptive requirements for *reflectance* and emittance under Sections 102.5.2, 102.4, 301.3.1, 301.5.2.2.3, 302.3.7, 302.5.2.2.3, and 302.5.2.3 *[140.1, 140.2, 140.3(a)1, 141.0(b)2B, 150.1(c)11, 150.2(b)1I or 150.2(b)2]* shall have a clearly visible packaging label that lists the emittance and the initial and aged *solar reflectance*, or a CRRC Rapid Rating for *solar reflectance*, tested in accordance with *CRRC-1*.

Packaging for liquid-applied *roof* coatings shall state the product meets the requirements specified in Section 300.4.1.4 *[110.8(i)4]*.

300.4.1.1.2 *[Part 1, Section 10-113(b)]* **Certification requirements.**

Every *roofing product* installed in construction to take compliance credit or meet the prescriptive requirements for *reflectance* and emittance under Sections 102.5.2, 102.4, 301.3.1, 301.5.2.2.3, 302.3.7, 302.5.2.2.3, and 302.5.2.3 *[140.1, 140.2, 140.3(a)1, 141.0(b)2B, 150.1(c)11, 150.2(b)1I or 150.2(b)2]* shall be rated by CRRC or another supervisory entity approved by the *Energy Commission* pursuant to Section 300.4.1.1.3 *[Section 10-113(c)]*.

300.4.1.1.3 *[Part 1, Section 10-113(c)]* **Designation of Supervisory Entity.**

The CRRC shall be the supervisory entity to administer the rating program relating to *reflectance* and emittance ratings for *roofing products*, provided the *Energy Commission* determines that the CRRC meets the criteria in Section 300.4.1.1.4 *[Section 10-113(d)]*.

1. The *Energy Commission* may consider designating a supervisory entity other than CRRC if the *Energy Commission* determines that the CRRC is not meeting the criteria in Section 300.4.1.1.4 *[Section 10-113(d)]*. Such other supervisory entity shall meet the criteria in Section 300.4.1.1.4 *[Section 10-113(d)]* prior to being designated.

2. The *Energy Commission* shall periodically review, at least annually, the structure and operations of the supervisory entity to ensure continuing compliance with the criteria in Section 300.4.1.1.4 *[Section 10-113(d)]*. The supervisory entity shall provide an annual report to the *Energy Commission* explaining all of the measures it has taken to comply with the criteria in Section 300.4.1.1.4 *[Section 10-113(d)]*.

300.4.1.1.4 *[Part 1, Section 10-113(d)]* **Criteria for Supervisory Entity.**

1. Membership in the entity shall be open on a nondiscriminatory basis to any person or organization that has an interest in uniform performance ratings for *roofing products*, including, but not limited to, members of the roofing industry, *building* industry, design professionals, specifiers, utilities, government agencies, and public interest organizations. The membership shall be composed of a broad cross section of those interested in uniform thermal performance ratings for *roofing products*.
2. The governing body of the entity shall reflect a reasonable cross-section of the interests represented by the membership.
3. The entity shall maintain a program of oversight of product manufacturers, laboratories, and independent *certifying organizations* that ensures uniform application of the CRRC testing and rating procedures, labeling and rating, and such other rating procedures for other factors that improves the accuracy of properties of *roofing products* affecting energy performance as the CRRC and the *Energy Commission* may adopt.
4. The entity shall require manufacturers and independent *certifying organizations* within its program to use only laboratories accredited by the supervisory entity to perform tests in accordance with *CRRC-1*.
5. The entity shall maintain appropriate guidelines for testing laboratories and manufacturers, including requirements for adequate:
    5.1. Possession and calibration of equipment;
    5.2. Education, competence, and training of personnel;
    5.3. Quality control;
    5.4. Record keeping and reporting;

5.5. Periodic review including but not limited to, blind testing by laboratories; inspections of products; and inspections of laboratories and manufacturing facilities;

5.6. Challenges to ratings; and

5.7. Guidelines to maintain the integrity of the program, including, but not limited to, provisions to avoid conflicts of interest within the rating process.

6. The entity shall be a nonprofit organization and shall maintain reasonable, nondiscriminatory fee schedules for the services it provides, and shall make its fee schedules, the financial information on which fees are based, and financial statements available to its members for inspection.

7. The entity shall provide hearing processes that give laboratories, manufacturers and certifying agencies a fair review of decisions that adversely affect them.

8. The entity shall maintain a policy committee or similar body whose procedures are designed to avoid conflicts of interest in deciding appeals, resolving disputes, and setting policy for the *certifying organizations* in its program.

9. The entity shall publish at least annually a directory of rated products and products that are no longer rated by the CRRC.

10. The entity itself shall be free from conflict-of-interest ties or to undue influence from any particular *roofing product* manufacturing interest(s), testing or independent *certifying organization*(s).

11. The entity shall provide or authorize the use of labels that can be used to meet the requirements for showing compliance with the requirements of Sections 102.5.2, 102.4, 301.3.1, 301.5.2.2.3, 302.3.7, 302.5.2.2.3, and 302.5.2.3 *[140.1, 140.2, 140.3(a)1, 141.0(b)2B, 150.1(c)11, 150.2(b)1I and 150.2(b)2]*, and this section.

12. The entity's rating program shall allow for multiple participants in each aspect of the program to provide for competition between manufacturers and between testing labs.

300.~~3.7~~4.1.2 *[Section 110.8(i)2]* **Deriving aged solar reflectance from initial solar reflectance.**

If CRRC testing for an aged solar-reflectance is not available for a *roofing product*, the aged values shall be derived from the CRRC initial values using Equation 300.~~3~~4-A below:

ρ_{aged}=~~[~~0.2+β[$\rho_{initial}$-0.2] (Equation 300.~~3~~4-A)

where:

ρ_{aged} = the aged *solar reflectance*

$\rho_{initial}$ = the initial *solar reflectance*

β = soiling resistance listed by product type in Table 300. ~~3~~4-(1) *[Table 110.8-B]*.

TABLE 300.~~3~~4-(1) [TABLE 110.8-B] VALUES OF SOILING RESISTANCE B BY PRODUCT TYPE

PRODUCT TYPE	CRRC PRODUCT CATEGORY	β
Field-Applied Coating	Field-Applied Coating	0.65
Other	Not A Field-Applied Coating	0.70

300.~~3.7~~4.1.3 *[Section 110.8(i)3]* **Solar Reflectance Index (SRI).**

Solar Reflectance Index (SRI), calculated as specified by *ASTM E1980-11 (2019)*, may be used as an alternative to *thermal emittance* and an aged *solar reflectance* when complying with the requirements of Section 102.4 *[Section 140.2]*, Section 301.3.1 *[Section 140.3(a)1]*, Sections 301.5.2.2.3 and 301.5.2.2.4 *[Section 141.0(b)2B]*, Section 302.3.7 *[Section 150.1(c)11]*, Section 302.5.2.2.3 *[Section 150.2(b)1I]* or Section 102.5.4 *[Section 150.2(b)2]*.

SRI calculations shall be based on approach I from Section 6.1.1 of *ASTM E1980-11 (2019)* using only equation 1 and 3 and a moderate wind velocity of 2–6 meters per second. The *SRI* shall be calculated based on the aged *solar reflectance* value of the *roofing products*.

300.~~3.7~~4.1.4 *[Section 110.8(i)4A]* **Liquid applied roof coatings applied as top surface.**

Liquid applied *roof* coatings applied to *low-sloped roofs* in the field as the top surface of a *roof* covering shall be applied across the entire *roof* surface to meet the dry mil thickness or coverage recommended by the coating manufacturer, taking into consideration the substrate on which the coating is applied.

300.~~3.7~~4.1.4.1 *[Section 110.8(i)4B]* **Minimum performance requirements.**

Roof coatings shall meet the minimum performance requirements listed in Table 300.4-(2) *[Table 110.8-C]* or the minimum performance requirements of *ASTM C836*, D3468, D6083 or D6694, whichever are appropriate to the coating material.

Exception 1 to Section 300.~~3.7~~4.1.4.1: Aluminum- pigmented asphalt *roof* coatings shall meet the requirements of *ASTM D2824* and be installed as specified by *ASTM D3805*.

Exception 2 to Section 300.~~3.7~~4.1.4.1: Cement- based *roof* coatings shall contain a minimum of 20 percent cement and shall meet the requirements of *ASTM C1583*, *ASTM D822* and *ASTM D5870*.

TABLE 300.~~3~~4-(2) [TABLE 110.8-C] MINIMUM PERFORMANCE REQUIREMENTS FOR LIQUID APPLIED ROOF COATINGS

PHYSICAL PROPERTY	*ASTM* TEST PROCEDURE	REQUIREMENT
Initial percent elongation (break)	D2370	Minimum 200% @ 73° F (23° C)
Initial percent elongation (break) OR Initial Flexibility	D2370 D522, Test B	Minimum 60% @ 0° F (-18° C) Minimum pass 1" mandrel @ 0° F (-18° C)
Initial tensile strength (maximum stress)	D2370	Minimum 100 psi (1.38 Mpa) @ 73° F (23° C)
Initial tensile strength (maximum stress) OR Initial Flexibility	D2370 D522, Test B	Minimum 200 psi (2.76 Mpa) @ 0° F (-18° C) Minimum pass 1" mandrel @ 0° F (-18° C)
Final percent elongation (break) after accelerated weathering 1000 h	D2370	Minimum 100% @ 73° F (23° C)
Final percent elongation (break) after accelerated weathering 1000 h OR Flexibility after accelerated weathering 1000 h	D2370 D522, Test B	Minimum 40% @ 0° F (-18° C) Minimum pass 1" mandrel @ 0° F (-18° C)
Permeance	D1653	Maximum 50 perms
Accelerated weathering 1000 h	D4798	No cracking or ~~checking~~[1]checking[a]

Footnotes for Table 300.4-(2) *[Table 110.8-C]*:

a. Any cracking or checking visible to the eye fails the test procedure.

~~Footnotes for Table 300.34-CB(2) *[Table 110.8-C]*:~~

~~1. Any cracking or checking visible to the eye fails the test procedure.~~

300.~~3.8~~5 *[Section 110.8(j)]* **Radiant barrier.**

A *radiant barrier* shall have an emittance of 0.05 or less, tested in accordance with *ASTM C1371* or *ASTM E408*, and shall be certified to the Department of Consumer Affairs as required by Title 24, Part 12, Chapter 12-13, Standards for Insulating Material.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 301

NONRESIDENTIAL AND HOTEL/MOTEL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

301.1 *[Section 120.0]* **General.**

Section 301 establishes requirements for the design and installation of *building envelopes* in ~~*nonresidential* and *hotel/motel*~~ *buildings* *with nonresidential* and *hotel/motel use designations* that are within the scope of Section 100.3 *[Section 100.0(a)]*.

NOTE: The requirements of Sections 301.2 through 301.4 apply to *newly constructed buildings*. Sections 301.2 and 301.5 apply to *additions* or *alterations* to existing *buildings*.

301.2 *[Section 120.7]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

~~*Nonresidential* and *hotel/motel b*~~*Buildings* with *nonresidential* and *hotel/motel use designations* shall comply with the applicable requirements in Sections 301.2.1 through 301.2.5 *[Sections 120.7(a) through 120.7(e)]*.

Exception to Section 301.2: A dedicated *building* used solely as a *data center* that has a total *covered process load* exceeding 750 kW.

301.2.1 *[Section 120.7(a)]* **Roof/ceiling insulation.**

The opaque portions of the *roof*/ceiling that separates *conditioned spaces* from *unconditioned spaces* or ambient air shall not exceed ~~meet~~ the applicable requirements in Table 301.2-(1) ~~below~~:

TABLE 301.2-(1) WEIGHTED AVERAGE ROOF ASSEMBLY U-FACTOR

TYPE	*U-FACTOR*
Metal Building	0.098
Wood–Framed and others	0.075

~~1. **Metal building.** The weighted average *U-factor* of the *roof* assembly shall not exceed 0.098.~~

~~2. **Wood framed and others.** The weighted average *U-factor* of the *roof* assembly shall not exceed 0.075.~~

301.2.1.1 *[Section 120.7(a)3]* **Insulation placement.**

Insulation installed to limit heat loss and gain from *conditioned spaces* to *unconditioned spaces* shall comply with all of the following:

Insulation shall be installed in direct contact with a *roof* or ceiling that is sealed to limit *infiltration* and *exfiltration* as specified in Section 300.2 *[Section 110.7]*. This may include, but is not limited to, placing insulation either above or below the *roof* deck or on top of the finished ceiling.

1. When insulation is installed at the *roof* in *nonresidential buildings*, fixed vents or openings to the outdoors or to *unconditioned spaces* shall not be installed. When the space between the ceiling and the *roof* is either directly or *indirectly conditioned space*, it shall not be considered an *attic* for the purposes of complying with *CBC attic* ventilation requirements.

   ~~**NOTE:** Vents that do not penetrate the *roof* deck and are instead designed for wind resistance for *roof* membranes are not within the scope of this requirement.~~

2. Insulation placed on top of a suspended ceiling with removable ceiling panels shall not be used to meet the *Roof*/Ceiling requirement of Section 301.3 *[Section 140.3]* and Section 301.5 *[Section 141.0]*.

Exception 1 to Section 301.2.1.1: Vents that do not penetrate the *roof* deck and are instead designed for wind resistance for *roof* membranes are not within the scope of item 1.

Exception 2 to Section 301.2.1.1: When there are *conditioned spaces* with a combined floor area no greater than 2,000 square feet in an otherwise unconditioned *building*, and when the average height of the space between the ceiling and the *roof* over these spaces is greater than 12 feet, insulation placed in direct contact with a suspended ceiling with removable ceiling panels shall be an acceptable method of reducing heat loss from a *conditioned space* and shall be accounted for in heat loss calculations.

301.2.2 *[Section 120.7(b)]* **Wall insulation.**

The opaque portions of walls that separate *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the applicable requirements of Items 1 through 7 below:

1. ***Metal building*.** The weighted average *U-factor* of the wall assembly shall not exceed 0.113.
2. **Metal-framed.** The weighted average *U-factor* of the wall assembly shall not exceed 0.151.
3. **Light mass walls.** A 6-inch or greater hollow core concrete masonry unit shall have a *U-factor* not to exceed 0.440.
4. **Heavy mass walls.** An 8-inch or greater hollow core concrete masonry unit shall have a *U-factor* not to exceed 0.690.
5. **Wood-framed and others.** The weighted average *U-factor* of the wall assembly shall not exceed 0.110.
6. ***Spandrel* panels and *curtain wall*.** The weighted average *U-factor* of the *spandrel* panels and *curtain wall* assembly shall not exceed 0.280.

7. **Demising walls.** The opaque portions of framed demising walls shall meet the requirements below:

   7.1. Wood-framed walls shall be insulated to meet a *U-factor* not greater than 0.099.

   7.2. Metal-framed walls shall be insulated to meet a *U-factor* not greater than 0.151.

301.2.3 *[Section 120.7(c)]* **Floor and soffit insulation.**

The opaque portions of floors and soffits that separate *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the applicable requirements of Items 1 and 2 below:

1. **Raised mass floors.** Shall have a minimum of 3 inches of lightweight concrete over a metal deck, or the weighted average *U-factor* of the floor assembly shall not exceed 0.269.
2. **Other floors.** The weighted average *U-factor* of the floor assembly shall not exceed 0.071.
3. **Heated slab on grade floor.** A heated slab on grade floor shall be insulated to meet the requirements of Section 300.3.5 *[Section 110.8(g)]*.

301.2.4 *[Section 120.7(d)]* **Exterior Windows.**

Vertical fenestration assemblies shall have an area weighted average *U-factor* no greater than 0.47.

Exception to Section 301.2.4: *Fenestration* installed in *buildings* meeting Part 7 of the California *Building* Code, California Wildland-Urban Interface Code, and where the *building* is located in Fire Hazard Severity Zones or Wildland-Urban Interface (WUI) Fire Areas as designated by the local *enforcement agency*.

301.2.5 *[Section 120.7(e)]* **Vestibules.**

Public ~~entrances~~ access to a~~in~~ *newly constructed buildings*~~s~~ of *occupancy types* A, B, E, I, and M shall include an enclosed vestibule meeting that meets the applicable requirements of Items 1 and 2 below:

1. All *doors* ~~opening~~ providing access into and out of the vestibule shall be equipped with self-closing devices. Vestibules shall be designed so that ~~in passing~~passage through it does not require ~~the vestibule it is not necessary for~~ the interior and exterior *doors* to open ~~at the same time~~simultaneously. The installation of one or more revolving *doors* in the *building* entrance shall not eliminate the requirement that a vestibule be provided on any main entrance *doors* adjacent to revolving *doors*.
2. Where provided, the heating system for heated vestibules and air curtains with integral heating shall be provided with controls configured to shut off the source of heating when the *outdoor air* temperature is greater than 45°F. Vestibules heating and cooling systems shall be controlled by a *thermostat* located in the vestibule configured to limit heating to a temperature not greater than 60°F and cooling to a temperature not less than 85°F.

Exceptions to Section 301.2.5: Vestibules are not required for the following:

1. *Doors* not intended to be used by the public, such as *doors* to mechanical or electrical equipment rooms, or intended solely for employee use.
2. *Doors* opening directly from a sleeping unit or *dwelling unit*.
3. *Doors* that open directly from a space less than 3,000 square feet in area.
4. Revolving *doors* installed where a public entrance to a *newly constructed building* is required.
5. *Doors* used primarily to facilitate vehicular movement or material handling and adjacent personnel *doors*.
6. *Doors* that have an air curtain with a velocity of not less than 6.56 feet per second at the floor that have been tested in accordance with *ANSI/AMCA 220* and installed in accordance with the manufacturer's instructions. *Manual* or *automatic* controls shall be provided that operate the air curtain with the opening and closing of the *door*.
7. Public entrances in *buildings* that are located in *Climate Zones* 2 through 13 where the *building* is less than four stories above grade and with less than 10,000 square feet ~~in~~ of gross *conditioned floor area*.
8. *Buildings* with building plans that have been submitted to the local planning department before the effective date of the 2025 ~~Building Energy Efficiency Standards~~Energy Code, where compliance with the vestibules requirements of Section 301.2.5 *[Section 120.7(e)]* would require a resubmittal for approval.

301.3 *[Section 140.3]* **Prescriptive requirements (Newly Constructed).**

A *building* complies with this section by being designed with and constructed to meet all prescriptive requirements in Sections 301.3.1 through 301.3.9 *[Section 140.3(a)]* and the requirements of Sections 301.3.10 *[Section 140.3(c)]* and 301.3.11 *[Section 140.3(d)]* where they apply.

301.3.1 *[Section 140.3(a)1]* **~~Exterior roofs and ceilings~~Roofing products and roof/ceiling insulation.**

Exterior *roofs* and ceilings shall comply with ~~each of~~ the following applicable requirements~~ in this subsection.~~:

301.3.1.1 *[Section 140.3(a)1Ai]* **Roofing products for ~~nonresidential~~ buildings with *nonresidential use designations*.**

Shall meet the requirements of Section 300.3 *[Section 110.8]* and the applicable requirements of Sections 301.3.1.1.1 through 301.3.1.1.3.

Exception to Section 301.3.1.1: *Roof* area covered by *building* integrated photovoltaic panels and *building* integrated solar thermal panels are not required to meet the minimum requirements for *solar reflectance*, *thermal emittance*, or *SRI*.

301.3.1.1.1 *[Section 140.3(a)1Aia]* **Low-sloped roofs in C~~c~~limate Z~~z~~ones 1 through 16.**

Low-sloped roofs in *climate zones* 1 through 16 shall have:

1. A minimum aged *solar reflectance* of 0.63 and a minimum *thermal emittance* of 0.75; or
2. A minimum *solar reflectance index (SRI)* of 75.

Exception 1 to Section 301.3.1.1.1: Wood-framed *roofs* in ~~c~~*Climate* ~~z~~*Zones* 3 and 5 are not required to comply with Section 301.3.1.1.1 if the *roof* assembly has a *U-factor* of 0.034 or lower.

Exception 2 to Section 301.3.1.1.1: *Roof* constructions with a weight of at least 25 lb/ft^2 over the *roof* membrane are not required to comply with Section 301.3.1.1.1.

Exception 3 to Section 301.3.1.1.1: An aged *solar reflectance* less than 0.63 is allowed provided the maximum *roof*/ceiling *U-factor* in Table 301.3(1) *[Table 140.3]* is not exceeded.

301.3.1.1.2 *[Section 140.3(a)1Aib1]* **Steep-sloped roofs in Climate Zones 1 and 3.**

Steep-sloped roofs in *Climate Zones* 1 and 3 shall have:

1. A minimum aged *solar reflectance* of 0.20 and a minimum *thermal emittance* of 0.75, or
2. A minimum *SRI* of 16.

301.3.1.1.3 *[Section 140.3(a)1Aib2]* **Steep-sloped roofs in Climate Zones 2 and 4 through 16.**

Steep-sloped roofs in *Climate Zones* 2 and 4 through 16 shall have:

1. A minimum aged *solar reflectance* of 0.25 and a minimum *thermal emittance* of 0.80, or
2. A minimum *SRI* of 23.

TABLE 301.3(1) [TABLE 140.3] ROOF/CEILING INSULATION TRADE OFF FOR AGED SOLAR REFLECTANCE- NONRESIDENTIAL USE DESIGNATIONS~~BUILDINGS~~

AGED *SOLAR REFLECTANCE*	*METAL BUILDING* CLIMATE ZONE 1-16 *U-FACTOR*	WOOD-FRAMED AND OTHER CLIMATE ZONE 6 - 8 *U-FACTOR*	WOOD-FRAMED AND OTHER ALL OTHER *CLIMATE ZONES U-FACTOR*
0.62-0.56	0.038	0.045	0.032
0.55-0.46	0.035	0.042	0.030
0.45-0.36	0.033	0.039	0.029
0.35-0.25	0.031	0.037	0.028

301.3.1.2.2 *[Section 140.3(a)1Aii]* **Roofing products for guest rooms of buildings with *hotel/~~and~~ motel use designations~~buildings~~.**

Shall meet the requirements of Section 300.3 *[Section 110.8]* and the applicable requirements Sections 301.3.1.2.1 and 301.3.1.2.2.

301.3.1.2.1 *[Section 140.3(a)1Aiia]* **Low-sloped roofs in Climate Zones 9, 10, 11, 13, 14 and 15.**

Low-sloped roofs in *Climate Zones* 9, 10, 11, 13, 14 and 15 shall have:

1. A minimum aged *solar reflectance* of 0.55 and a minimum *thermal emittance* of 0.75, or
2. A minimum *SRI* of 64.

Exception to Section 301.3.1.2.1: *Roof* constructions with a weight of at least 25 lb/ft^2 over the *roof* membrane.

301.3.1.2.2 *[Section 140.3(a)1Aiib]* **Steep-sloped roofs in Climate Zones 2 through 15.**

Steep-sloped roofs in *Climate Zones* 2 through 15 shall have:

1. A minimum aged *solar reflectance* of 0.20 and a minimum *thermal emittance* of 0.75, or
2. A minimum *SRI* of 16.

Exception to Section 301.3.1.2.2: *Roof* area covered by *building* integrated photovoltaic panels and *building* integrated solar thermal panels are not required to meet the minimum requirements for *solar reflectance*, *thermal emittance*, or *SRI*.

301.3.1.3 *[Section 140.3(a)1B]* **Roof insulation.**

Roofs shall have an overall assembly *U-factor* no greater than the applicable value in Tables 301.3-(3), (3.1), (4)~~D~~ or (5)~~E~~ *[Tables 140.3-B, C or D]*, and where required by Section 300.3 *[Section 110.8]* and Section 301.2.1.1 *[Section 120.7(a)3]*, insulation shall be placed in direct contact with a *roof* or drywall ceiling.

301.3.2 *[Section 140.3(a)]* **Walls.**

301.3.2.1 *[Section 140.3(a)2]* **Exterior walls.**

Exterior walls shall have an overall assembly *U-factor* no greater than the applicable value in Tables 301.3-(3), (3.1), (4)~~D~~ or (5)~~E~~ *[Tables 140.3-B, C or D]*.

301.3.2.2 *[Section 140.3(a)3]* **Demising walls.**

Demising walls shall meet the demising wall requirements of Section 301.2.2 *[Section 120.7(b)7]*. Vertical *windows* in demising walls between conditioned and *unconditioned spaces* shall have an area-weighted average *U-factor* no greater than the applicable value in Tables 301.3-(3), (3.1), (4)~~D~~ or (5)~~E~~ *[Tables 140.3-B, C or D]*.

301.3.3 *[Section 140.3(a)4]* **Exterior floors and soffits.**

Exterior floors and soffits shall have an overall assembly *U-factor* no greater than the applicable value in Tables 301.3-(3), (3.1), (4)~~D~~ or (5)~~E~~ *[Tables 140.3-B, C or D]*.

301.3.4 *[Section 140.3(a)5]* **Vertical windows in exterior walls.**

Vertical *windows* in *exterior walls* shall comply with the applicable requirements in Sections 301.3.4.1 through 301.3.4.4 *[Sections 140.3(a)5A through 140.3(a)5D]*.

Exception 1 to Section 301.3.4: *Conditioned greenhouses*. The requirements of Section 908.1.3 *[Section 120.6(h)3]* apply.

Exception 2 to Section 301.3.4: For vertical *windows* containing chromogenic type *glazing*:

1. The lower-rated labeled *U-factor* and *RSHGC* shall be used with *automatic* controls to modulate the amount of heat flow into the space in multiple steps in response to daylight levels or solar intensity; and
2. The higher-rated labeled *VT* shall be used with *automatic* controls to modulate the amount of *light* transmitted into the space in multiple steps in response to daylight levels or solar intensity; and
3. *Chromogenic glazing* shall be considered separately from other *glazing* when complying with *U-factor*, *RSHGC*, and *VT* requirements; and
4. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted when complying with *U-factor*, *RSHGC*, and *VT* requirements.

301.3.4.1 *[Section 140.3(a)5A]* **Percent window area.**

Percent *window area* shall be limited in accordance with the applicable requirements of 1 and 2 below:

1. A *west-facing* area no greater than 40 percent of the gross *west-facing exterior wall area*, or 6 feet times the *west-facing display perimeter*, whichever is greater; and
2. A total area no greater than 40 percent of the *gross exterior wall area*, or 6 feet times the *display perimeter*, whichever is greater.

NOTE: Demising walls are not *exterior walls*, and therefore demising wall area is not part of the *gross exterior wall area* or *display perimeter* and *windows* in demising walls are not part of the *window area*.

301.3.4.2 *[Section 140.3(a)5B]* **U-factor.**

Vertical *windows* in *exterior walls* shall have an area-weighted average *U-factor* no greater than the applicable value in Tables 301.3-(3), (3.1), ~~D~~ (4), or ~~E~~ (5) *[Tables 140.3-B, C or D]*.

~~**Exception 1 to Section 301.3.4.2:** For vertical *windows* containing chromogenic type *glazing*:~~

~~The lower-rated labeled *U-factor* shall be used with *automatic* controls to modulate the amount of heat flow into the space in multiple steps in response to daylight levels or solar intensity; and~~

~~*Chromogenic glazing* shall be considered separately from other *glazing*; and~~

~~Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted.~~

301.3.4.3 *[Section 140.3(a)5C]* **Relative Solar Heat Gain Coefficient (RSHGC).**

Vertical *windows* in *exterior walls* shall have an area-weighted average *relative solar heat gain coefficient*, *RSHGC*, excluding the effects of interior *shading*, no greater than the applicable value in Tables 301.3-(3), (3.1), (4)~~D~~, or (5)~~E~~ *[Tables 140.3-B, C or D]*.

For purposes of this paragraph, the *relative solar heat gain coefficient*, *RSHGC*, of a vertical *window* is:

1. The *solar heat gain coefficient* of the *window*~~s~~; or
2. *Relative solar heat gain coefficient* is calculated using Equation 301.3-A *[Equation 140.3-A]*, if the *window* has an *overhang* or exterior *horizontal slats* that extend beyond each side of the *window* jamb by a distance equal to the *overhang's* horizontal projection.

Exception 1 to Section 301.3.4.3: An area-weighted average *relative solar heat gain coefficient* of 0.56 or less shall be used for *windows*:

1. That are in the first story of *exterior walls* that form a *display perimeter*; and
2. For which codes restrict the use of *overhangs* to shade the *windows*.

~~**Exception 2 to Section 301.3.4.3:** For vertical *glazing* containing chromogenic type *glazing*:~~

~~1. The lower-rated labeled *RSHGC* shall be used with *automatic* controls to modulate the amount of heat flow into the space in multiple steps in response to daylight levels or solar intensity; and~~

~~2. *Chromogenic glazing* shall be considered separately from other *glazing*; and~~

~~3. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted.~~

NOTE: Demising walls are not *exterior walls*, and therefore *windows* in demising walls are not subject to *SHGC* requirements.

EQUATION 301.3-A [EQUATION 140.3-A] RELATIVE SOLAR HEAT GAIN COEFFICIENT, RSHGC

$$RSHGC = SHGC \times [1 + a \times (2.72^{-PF} - 1) \times (\sin(b \times Az) + c]$$

where:

Feature	a	b	c
Overhang	0.150	0.008727	5.67
Exterior Horizonal Slat	0.144	0.008727	5.13

RSHGC = *Relative Solar Heat Gain Coefficient*.

SHGC = *Solar Heat Gain Coefficient* of the *vertical fenestration*.

Az = *Azimuth* of the *vertical fenestration* in degrees.

PF = Projection factor as calculated by Equation 301.3-C *[Equation 140.3-C]*.

301.3.4.4 *[Section 140.3(a)5D]* **Visible Transmittance (VT).**

Vertical *windows* in *exterior walls* shall have an area-weighted average *Visible Transmittance (VT)* no less than the applicable value in Tables 301.3-(3), (3.1), (4), and (5)~~D~~ *[Tables 140.3-B and C]*, or Equation 301.3-B *[Equation 140.3-B]*, as applicable.

Exception 1 to Section 301.3.4.4: When the *window*'*s* primary and *secondary sidelit daylit zones* are completely overlapped by one or more *skylit daylit zones*, then the *window* need not comply with Section 301.3.4.4 *[Section 140.3(a)5D]*.

Exception 2 to Section 301.3.4.4: If the *window*'*s VT* is not within the scope of *NFRC 200*, or *ASTM E972*, then the *VT* shall be calculated according to Reference Nonresidential Appendix NA6.

~~**Exception 3 to Section 301.3.4.4:** For vertical *windows* containing chromogenic type *glazing*:~~

~~1. The higher-rated labeled *VT* shall be used with *automatic* controls to modulate the amount of *light* transmitted into the space in multiple steps in response to daylight levels or solar intensity; and~~

~~2. *Chromogenic glazing* shall be considered separately from other *glazing*; and~~

~~3. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted.~~

NOTE: Demising walls are not *exterior walls*, and therefore *windows* in demising walls are not subject to *VT* requirements.

EQUATION 301.3-~~C~~ B [EQUATION 140.3-B] VERTICAL FENESTRATION MINIMUM VT

$VT \geq 0.11 / WWR$

where:

WWR = *Window Wall Ratio*, the ratio of (i) the total *window area* of the *entire building* to (ii) the total *gross exterior wall area* of the *entire building*. If the *WWR* is greater than 0.40, then 0.40 shall be used as the value for *WWR* in Equation 301.3-~~C~~ B *[EQUATION 140.3-B]*.

VT = *Visible Transmittance* of framed *window*.

301.3.5 *[Section 140.3(a)6]* **Skylights.**

Skylights shall comply with the applicable requirements in Sections 301.3.5.1 through 301.3.5.5 *[Sections 140.3(a)6A through 140.3(a)6E]*.

Exception 1 to Section 301.3.5: *Conditioned greenhouses*. The requirements of Section 908.1.3 *[Section 120.6(h)3]* apply.

Exception 2 to Section 301.3.5: For *skylights* containing chromogenic type *glazing*:

1. The lower-rated labeled *U-factor* shall be used with *automatic* controls to modulate the amount of heat flow into the space in multiple steps in response to daylight levels or solar intensity; and
2. The lower-rated labeled *SHGC* shall be used to demonstrate compliance with this section; and
3. The higher-rated labeled *VT* shall be used with *automatic* controls to modulate the amount of *light* transmitted into the space in multiple steps in response to daylight levels or solar intensity; and
4. *Chromogenic glazing* shall be considered separately from other *glazing* when complying with *U-factor*, *RSHGC*, and *VT* requirements; and
5. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted when complying with *U-factor*, *RSHGC*, and *VT* requirements.

301.3.5.1 *[Section 140.3(a)6A]* **Skylight Area.**

Skylights shall have an area no greater than 5 percent of the *gross exterior roof area Skylight Roof Ratio (SRR)*.

Exception to Section 301.3.5.1: *Buildings* with atria over 55 feet high shall have a *skylight area* no greater than 10 percent of the *gross exterior roof area*.

301.3.5.2 *[Section 140.3(a)6B]* **U-factor.**

Skylights shall have an area-weighted performance rating *U-factor* no greater than the applicable value in Tables 301.3(3), (3.1). ~~D~~(4), or ~~E~~(5) *[Tables 140.3-B, C or D]*.

Exception to Section 301.3.5.2: For *skylights* containing chromogenic type *glazing*:

1. The lower-rated labeled *U-factor* shall be used with *automatic* controls to modulate the amount of heat flow into the space in multiple steps in response to daylight levels or solar intensity; and
2. *Chromogenic glazing* shall be considered separately from other *glazing*; and
3. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted.

301.3.5.3 *[Section 140.3(a)6C]* **Solar Heat Gain Coefficient (SHGC).**

Skylights shall have an area-weighted performance rating *solar heat gain coefficient* no greater than the applicable value in Tables 301.3-(3), (3.1), (4)D, or (5)E *[Tables 140.3-B, C or D]*.

Exception to Section 301.3.5.3: For *skylights* containing chromogenic type *glazing*:

1. The lower-rated labeled *SHGC* shall be used to demonstrate compliance with this section; and
2. *Chromogenic glazing* shall be considered separately from other *glazing*; and
3. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted.

301.3.5.4 *[Section 140.3(a)6D]* **Visible Transmittance (VT).**

Skylights shall have an area-weighted performance rating *VT* no less than the applicable value in Tables 301.3-(3), (3.1), (4)D, or (5)E *[Tables 140.3-B, C or D]*.

Exception to Section 301.3.5.4: For *skylights* containing chromogenic type *glazing*:

1. The higher-rated labeled *VT* shall be used with *automatic* controls to modulate the amount of *light* transmitted into the space in multiple steps in response to daylight levels or solar intensity and;
2. *Chromogenic glazing* shall be considered separately from other *glazing*; and
3. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted.

301.3.5.5 *[Section 140.3(a)6E]* **Haze value.**

Skylights shall have a *glazing* material or diffuser that has a measured haze value greater than 90 percent, determined according to *ASTM D1003* or other test method approved by the *Energy Commission*.

Exception to Section 301.3.5.5: *Skylights* designed and installed to exclude direct sunlight entering the occupied space by the use of fixed or automated baffles or the geometry of the *skylight* and *light* well.

301.3.6 *[Section 140.3(a)7]* **Exterior doors.**

All exterior *doors* that separate *conditioned space* from *unconditioned space* or from ambient air shall have a *U-factor* not greater than the applicable value in Tables 301.3-C(3),

(3.1), (4)~~D~~, or (5)~~E~~ *[Tables 140.3-B, C or D]*. *Doors* that are more than one-quarter glass in area are considered *glazed doors*.

301.3.7 *[Section 140.3(a)9]* **Air barrier.**

To meet the requirement of Table 301.3 ~~C~~(3), (3.1), (4) or (5) in Section 301.3.9 *[Table 140.3-B]*, all *buildings* shall have a continuous *air barrier* that is designed and constructed to control air leakage into, and out of, the *building's conditioned space*.

Exception to Section 301.3.7: *Relocatable public school buildings*.

301.3.7.1 *[Section 140.3(a)9A]* **Design.**

Construction documents shall include *air barrier* boundaries, interconnections and penetrations, and associated square foot calculations for all sides of the *air barrier*.

301.3.7.2 *[Section 140.3(a)9B]* **Acceptable materials and assemblies.**

The *air barrier* shall be sealed at all joints for its entire length and shall meet either Section 301.3.7.2.1 or Section 301.3.7.2.2.

Exception to Section 301.3.7.2.~~2~~: The following materials shall be deemed to comply with Section 301.3.7.2 if all joints are sealed and all of the materials are installed as *air barriers* in accordance with the manufacturer's instructions:

1. Concrete masonry walls that have at least two coatings of paint or at least two coatings of sealer coating.
2. Concrete masonry walls with integral rigid board insulation.
3. Structurally insulated panels.
4. Portland cement or Portland sand parge, or stucco, or a gypsum plaster, each with a minimum 1/2 inch thickness.

301.3.7.2.1 *[Section 140.3(a)9Bi]* **Air permeance.**

Materials that have an air permeance not exceeding 0.004 cfm/ft^2, under a pressure differential of 0.3 in. of water (1.57 psf) (0.02 L/sec-m^2) at 75 Pa), when tested in accordance with *ASTM E2178*.

Exception to Section 301.3.7.2.1: Materials in Table 301.3 ~~B~~(2) *[Table 140.3-A]* shall be deemed to comply with Section 301.3.7.2 provided that all joints are sealed, and all of the materials are installed as *air barriers* in accordance with the manufacturer's instructions.

301.3.7.2.2 *[Section 140.3(a)9Bii]* **Average air leakage.**

Assemblies of materials and components that have an average air leakage not exceeding 0.04 cfm/ft^2, under a pressure differential of 0.3 in. of water (1.57 psf) (0.2 L/m^2 at 75 pa), when tested in accordance with *ASTM E2357*, *ASTM E1677*, *ASTM E1680* or *ASTM E283*.

~~**Exception to Section 301.3.7.2.2:** The following materials shall be deemed to comply with Section 301.3.7.2 if all joints are sealed and all of the materials are installed as *air barriers* in accordance with the manufacturer's instructions:~~

~~5. Concrete masonry walls that have at least two coatings of paint or at least two coatings of sealer coating.~~

~~6. Concrete masonry walls with integral rigid board insulation.~~

~~7. Structurally insulated panels.~~

~~8. Portland cement or Portland sand parge, or stucco, or a gypsum plaster, each with a minimum 1/2 inch thickness.~~

TABLE 301.3(2) ~~B~~ [TABLE 140.3-A] MATERIALS DEEMED TO COMPLY WITH SECTION 301.3.7.2 [SECTION 140.3(A)9B]

MATERIALS	MINIMUM THICKNESS
Plywood	Minimum 3/8 inches thickness
Oriented strand board	Minimum 3/8 inches thickness
Extruded polystyrene insulation board	Minimum 1/2 inches thickness
Foil-backed polyisocyanurate insulation board	Minimum 1/2 inches thickness
Closed cell spray foam with a minimum density of 2.0 pcf	Minimum 2 inches thickness
Open cell spray foam with a density no less than 0.4 pcf and no greater than 1.5 pcf	Minimum 5-1/2 inches thickness
Exterior and interior gypsum board	Minimum 1/2 inches thickness
Cement board	Minimum 1/2 inches thickness
Built up roofing membrane	No minimum thickness
Modified bituminous *roof* membrane	No minimum thickness
Fully adhered single-ply *roof* membrane	No minimum thickness
A Portland cement or Portland sand parge, or a gypsum plaster	Each with Minimum 5/8 inches thickness

(CONTINUED): TABLE 301.3 ~~B~~(2) [TABLE 140.3-A] MATERIALS DEEMED TO COMPLY WITH SECTION 301.3.7.2 [SECTION 140.3(a)9B]

MATERIALS	MINIMUM THICKNESS
Cast-in-place concrete, or precast concrete	No minimum thickness
Fully grouted concrete block masonry	No minimum thickness
Sheet steel or sheet aluminum	No minimum thickness

301.3.7.3 *[Section 140.3(a)9C]* **Verification.**

Verification of the installed *air barrier* may be performed. If verification is performed the *entire building* shall meet one of the air leakage requirements below. If the air leakage requirements are not met, a visual inspection and diagnostic evaluation shall be completed in accordance with NA5.7, all observed leaks shall be sealed where such sealing can be made without destruction of existing *building* components, and *buildings* where the tested leakage rate exceeded 0.6 cfm/ft^2 of *building* shell area at 75 Pa have been retested to confirm leakage is below 0.6 cfm/ft^2 of *building* shell at 75 Pa.

1. An air leakage rate not exceeding 0.40 cfm/ft^2 at a pressure differential of 0.3 in. of water (1.57 psf) (2.0 L/m^2 at 75 Pa). when the *entire building* is tested, after completion of construction, in accordance with NA 5, or another test method approved by the *Energy C~~c~~ommission*; or

2. For *buildings* that have more than 50,000 ft^2 of *conditioned floor area*, a sectional test method of co-pressurizing representative test floors and taking data from the specific floors to achieve the requirement when following the procedures in Sections NA5.2 to NA5.9. Representative test floors must meet the following conditions:

   2.1. The entire floor area of all stories that have any spaces directly under a *roof*.

   2.2. The entire floor area of all stories that have a *building* entrance or loading dock.

   2.3. Representative above grade wall sections of the *building* totaling at least 25 percent of the wall area enclosing the remaining *conditioned space*. Floor areas in Parts 2.1 and 2.2 above shall not be included in the 25 percent.

301.3.8 *[Section 140.3(a)8]* **Relocatable public school buildings.**

In complying with Sections 301.3.1 through 301.3.6 *[Sections 140.3(a)1 to 7] relocatable public school buildings* shall meet the following:

1. *Relocatable public school buildings* shall comply with Table 301.3-~~C~~(3) *[Table 140.3-B]* for a specific climate zone when the manufacturer or builder of the *relocatable public school building* certifies that the *building* is intended for use only in a specific *climate zone*; or
2. *Relocatable public school buildings* shall comply with Table 301.3(5) for specific *climate zone* groups when the manufacturer or builder of the *relocatable public school building* certifies that the *building* is intended for use only in a specific group of *climate zones* where a representative *climate zone* is used to demonstrate compliance in each climate zone group, as follows:

   2.1 Climate zone 16 representing Group A (CZ 1, 16)

   2.2 Climate zone 4 representing Group B (CZ 2, 3, 4, 5)

   2.3 Climate zone 10 representing Group C (CZ 6, 7, 8, 9, 10)

   2.4 Climate zone 14 representing Group D (CZ 11, 12, 13, 14)

   2.5 Climate zone 15 representing Group E (CZ 15); or
3. *Relocatable public school buildings* shall comply with Table 301.3-~~F~~(5) *[Table 140.3-D]* for any climate zone when the manufacturer or builder of the *relocatable public school building* certifies that the *building* is intended for use in any climate zone; and
4. The manufacturer or builder of a *relocatable public school building* shall certify that components of the *building* comply with requirements of this section in addition to Nonresidential Reference Appendix NA4 by:

   4.1. ~~3.1~~The placement of two (2) metal identification labels on the *building*, one mechanically fastened and visible from the exterior and the other mechanically fastened to the interior frame above the ceiling at the end of the module.~~,~~ ~~both~~ Both labels shall clearly list each certified *climate zone* ~~stating~~ (in addition to any other information by the Division of the State Architect or other law). ~~"Complies with Title 24, Part 6 for all climate zones"; and~~

4.2. Identification of the location of the two labels on the plans submitted to the *enforcing agency*.

301.3.9 *[Table 140.3-B, Table 140.3-C, Table 140.3-D]* **Nonresidential, hotel/motel and relocatable public school building prescriptive envelope criteria.**

TABLE 301.3(3)-C [TABLE 140.3-B] – PRESCRIPTIVE ENVELOPE CRITERIA FOR NONRESIDENTIAL ~~BUILDINGS~~ USE DESIGNATIONS INCLUDING RELOCATABLE PUBLIC SCHOOL BUILDINGS (WHERE MANUFACTURER CERTIFIES USE ONLY IN SPECIFIC CLIMATE ZONE; ~~NOT INCLUDING HIGH-RISE RESIDENTIAL BUILDINGS AND GUEST ROOMS OF HOTEL/MOTEL BUILDINGS~~)

***ENVELOPE* FEATURE**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Roofs and Ceilings - *Metal Building* Max *U-Factor*	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038
Roofs and Ceilings – Wood-Framed and Other Max *U-Factor*	0.028	0.028	0.028	0.028	0.028	0.047	0.047	0.047	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Walls - *Metal Building* Max *U-Factor*	0.098	0.053	0.098	0.053	0.053	0.098	0.098	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.050	0.053
Walls - Metal-framed Max *U-Factor*	0.060	0.055	0.071	0.055	0.055	0.060	0.060	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Walls - Mass, Light[a1] Max *U-Factor*	0.170	0.138	0.227	0.196	0.364	0.364	0.364	0.364	0.364	0.138	0.138	0.138	0.138	0.138	0.138	0.138
Walls - Mass, Heavy[a1] Max *U-Factor*	0.211	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	0.160	0.211	0.184	0.160	0.160	0.153
Walls - Wood-framed and Other Max *U-Factor*	0.078	0.053	0.102	0.053	0.095	0.102	0.102	0.095	0.053	0.053	0.042	0.053	0.053	0.053	0.038	0.053
Floors and Soffits - Raised Mass Max *U-Factor*	0.092	0.092	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.092	0.092	0.092	0.092	0.092	0.058
Floors and Soffits – Other Max *U-Factor*	0.048	0.039	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.039	0.071	0.071	0.039	0.039	0.039
Roofing Products - Low-Sloped Aged *Solar Reflectance*	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Roofing Products - Low-Sloped *Thermal Emittance*	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Roofing Products - Steep-Sloped Aged *Solar Reflectance*	0.20	0.25	0.20	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Roofing Products - Steep-Sloped *Thermal Emittance*	0.75	0.80	0.75	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80

(CONTINUED): TABLE 301.3(3) C [TABLE 140.3-B] – PRESCRIPTIVE ENVELOPE CRITERIA FOR NONRESIDENTIAL BUILDINGS USE DESIGNATIONS (INCLUDING DOORS FOR RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE MANUFACTURER CERTIFIES USE ONLY IN SPECIFIC CLIMATE ZONE; NOT INCLUDING HIGH-RISE RESIDENTIAL BUILDINGS AND GUEST ROOMS OF HOTEL/MOTEL BUILDINGS)

***Envelope* Feature**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Air Barrier	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
Exterior *Doors* - Non-Swinging Maximum *U-Factor*	0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50
Exterior *Doors* – Swinging Maximum *U-Factor*	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70

(CONTINUED): TABLE 301.3(3) [TABLE 140.3-B] PRESCRIPTIVE FENESTRATION CRITERIA FOR NONRESIDENTIAL USE DESIGNATIONS (INCLUDING RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE MANUFACTURER CERTIFIES USE ONLY IN SPECIFIC CLIMATE ZONE, NOT INCLUDING GROUP R OCCUPANCIES)

***FENESTRATION* – VERTICAL (ALL *CLIMATE ZONES*) (AREA-WEIGHTED PERFORMANCE RATING)**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Fixed Window (Max *U-Factor*)	0.34	0.34	0.34	0.34	0.36	0.36	0.36	0.36	0.34	0.36	0.34	0.34	0.34	0.34	0.34	0.34
Fixed Window (Max *RSHGC*)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.22	0.25	0.22	0.22	0.22	0.22	0.22	0.25
Fixed Window (Min *VT*)	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Curtain Wall or *Storefront* (Max *U-Factor*)	0.38	0.41	0.41	0.41	0.41	0.41	0.38	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Curtain Wall or *Storefront* (Max *RSHGC*)	0.25	0.26	0.26	0.26	0.26	0.26	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Curtain Wall or *Storefront* (Min *VT*)	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Operable *Window* (Max *U-Factor*)	0.43	0.43	0.43	0.43	0.43	0.46	0.46	0.46	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
Operable *Window* (Max *RSHGC*)	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Operable *Window* (Min *VT*)	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Glazed Doors (Max *U-Factor*)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Glazed Doors (Max *RSHGC*)	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Glazed Doors (Min *VT*)	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17

(CONTINUED): TABLE 301.3(3) [TABLE 140.3-B] – PRESCRIPTIVE ENVELOPE CRITERIA FOR NONRESIDENTIAL USE DESIGNATIONS (INCLUDING RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE MANUFACTURER CERTIFIES USE ONLY IN SPECIFIC CLIMATE ZONE; NOT INCLUDING GROUP R OCCUPANCIES)

***FENESTRATION – SKYLIGHTS* (ALL *CLIMATE ZONES*) (AREA-WEIGHTED PERFORMANCE RATING)**	**GLASS CURB MOUNTED**	**GLASS DECK MOUNTED**	**PLASTIC CURB MOUNTED**	**TUBULAR DAYLIGHTING DEVICES (TDDS)**
Max *U-factor*	0.58	0.46	0.88	0.88
Max *SHGC*	0.25	0.25	NR	NR
Min *VT* (Min VT_{annual} for TDDs)	0.49	0.49	0.64	0.38
Maximum SR_R%	5%	5%	5%	5%

Footnotes for Table 301.3-(3):

a. As defined in Section 201 *[Section 100.1]*, light mass walls are walls with a *heat capacity* of at least 7.0 Btu/ft^2-°F and less than 15.0 Btu/ft^2-°F. Heavy mass walls are walls with a *heat capacity* of at least 15.0 Btu/ft^2-°F.

TABLE 301.3(3.1) [TABLE 140.3-B] – PRESCRIPTIVE ENVELOPE CRITERIA FOR GROUP R OCCUPANCIES

***ENVELOPE* FEATURE**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Roofs and Ceilings - *Metal Building* Max *U-Factor*	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038
Roofs and Ceilings – Wood-Framed and Other Max *U-Factor*	0.028	0.028	0.028	0.028	0.028	0.047	0.047	0.047	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Walls - *Metal Building* Max *U-Factor*	0.098	0.053	0.098	0.053	0.053	0.098	0.098	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.050	0.053
Walls - Metal-framed Max *U-Factor*	0.060	0.055	0.071	0.055	0.055	0.060	0.060	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Walls - Mass, Light[a] Max *U-Factor*	0.170	0.138	0.227	0.196	0.364	0.364	0.364	0.364	0.364	0.138	0.138	0.138	0.138	0.138	0.138	0.138
Walls - Mass, Heavy[a] Max *U-Factor*	0.211	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	0.160	0.211	0.184	0.160	0.160	0.153
Walls - Wood-framed and Other Max *U-Factor*	0.078	0.053	0.102	0.053	0.095	0.102	0.102	0.095	0.053	0.053	0.042	0.053	0.053	0.053	0.038	0.053
Floors and Soffits - Raised Mass Max *U-Factor*	0.092	0.092	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.092	0.092	0.092	0.092	0.092	0.058
Floors and Soffits – Other Max *U-Factor*	0.048	0.039	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.039	0.071	0.071	0.039	0.039	0.039
Roofing Products - Low-Sloped Aged *Solar Reflectance*	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Roofing Products - Low-Sloped *Thermal Emittance*	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Roofing Products - Steep-Sloped Aged *Solar Reflectance*	0.20	0.25	0.20	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Roofing Products - Steep-Sloped *Thermal Emittance*	0.75	0.80	0.75	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80

(CONTINUED): TABLE 301.3(3.1) [TABLE 140.3-B] – PRESCRIPTIVE ENVELOPE CRITERIA FOR GROUP R OCCUPANCIES

***Envelope* Feature**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Air Barrier	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
Exterior *Doors* - Non-Swinging Maximum *U-Factor*	0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50
Exterior *Doors* – Swinging Maximum *U-Factor*	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70

(CONTINUED): ~~TABLE 301.3 (3.1) C [TABLE 140.3-B] – PRESCRIPTIVE ENVELOPE~~ CRITERIA FOR GROUP R OCCUPANCIES

***FENESTRATION* – VERTICAL (ALL *CLIMATE ZONES*) (AREA-WEIGHTED PERFORMANCE RATING)**	**CZ 1**	**CZ 2**	**CZ3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Fixed Window (Max *U-factor*)	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.34	0.36	0.34	0.34	0.34	0.34	0.34	0.36
Fixed Window (Max *RSHGC*)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.22	0.25	0.22	0.22	0.22	0.22	0.22	0.25
Fixed Window (Min *VT*)	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Curtain Wall or *Storefront* (Max *U-factor*)	0.38	0.41	0.41	0.41	0.41	0.41	0.38	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Curtain Wall or *Storefront* (Max *RSHGC*)	0.25	0.26	0.26	0.26	0.26	0.26	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Curtain Wall or *Storefront* (Min *VT*)	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Operable *Window* (Max *U-factor*)	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Operable *Window* (Max *RSHGC*)	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Operable *Window* (Min *VT*)	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Glazed Doors (Max *U-factor*)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Glazed Doors (Max *RSHGC*)	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Glazed Doors (Min *VT*)	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Fenestration (Max *WWR* %)	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%

(CONTINUED): TABLE 301.3(3.1)~~-C~~ [TABLE 140.3-B] – PRESCRIPTIVE ENVELOPE CRITERIA FOR GROUP R OCCUPANCIES~~PRESCRIPTIVE ENVELOPE CRITERIA FOR NONRESIDENTIAL BUILDINGS USE DESIGNATIONS (INCLUDING RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE MANUFACTURER CERTIFIES USE ONLY IN SPECIFIC CLIMATE ZONE; NOT INCLUDING HIGH-RISE RESIDENTIAL BUILDINGS AND GUEST ROOMS OF HOTEL/MOTEL BUILDINGS)

***FENESTRATION – SKYLIGHTS* (ALL *CLIMATE ZONES*) (AREA-WEIGHTED PERFORMANCE RATING)**	**GLASS CURB MOUNTED**	**GLASS DECK MOUNTED**	**PLASTIC CURB MOUNTED**	**TUBULAR DAYLIGHTING DEVICES (TDDS)**
Max *U-factor*	0.58	0.46	0.88	0.88
Max *SHGC*	0.25	0.25	NR	NR
Min *VT* (Min VT_{annual} for TDDs)	0.49	0.49	0.64	0.38
Maximum SR_R%	5%	5%	5%	5%

Footnotes for Table 301.3-(3.1):

a. As defined in Section 201 *[Section 100.1]*, light mass walls are walls with a *heat capacity* of at least 7.0 Btu/ft²-°F and less than 15.0 Btu/ft²-°F. Heavy mass walls are walls with a *heat capacity* of at least 15.0 Btu/ft²-°F.

~~Notes:~~

~~As defined in Section 201 *[Section 100.1]*, light mass walls are walls with a heat capacity of at least 7.0 Btu/ft²-°F and less than 15.0 Btu/ft²-°F. Heavy mass walls are walls with a heat capacity of at least 15.0 Btu/ft²-°F.~~

TABLE 301.3(4) ~~D~~ [TABLE 140.3-C] – PRESCRIPTIVE ENVELOPE CRITERIA FOR GUEST ROOMS OF HOTEL/MOTEL ~~BUILDINGS~~ USE DESIGNATIONS

***ENVELOPE* FEATURE**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Roofs and Ceilings - *Metal Building* Max *U-Factor*	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
Roofs and Ceilings – Wood-Framed and Other Max *U-Factor*	0.028	0.028	0.034	0.028	0.034	0.034	0.039	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Walls - *Metal Building* Max *U-Factor*	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.057	0.057	0.057	0.057	0.057
Walls - Metal-framed Max *U-Factor*	0.069	0.069	0.069	0.069	0.069	0.069	0.105	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.048	0.069
Walls - Mass, Light~~1~~[a] Max *U-Factor*	0.170	0.170	0.170	0.170	0.170	0.227	0.227	0.227	0.196	0.170	0.170	0.170	0.170	0.170	0.170	0.170
Walls - Mass, Heavy~~1~~[a] Max *U-Factor*	0.160	0.160	0.160	0.184	0.211	0.690	0.690	0.690	0.690	0.690	0.184	0.253	0.211	0.184	0.184	0.160
Walls - Wood-framed and Other Max *U-Factor*	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.042	0.059	0.059	0.042	0.042	0.042
Floors and Soffits - Raised Mass Max *U-Factor*	0.045	0.045	0.058	0.058	0.058	0.069	0.092	0.092	0.092	0.069	0.058	0.058	0.058	0.045	0.058	0.037
Floors and Soffits - Other Max *U-Factor*	0.034	0.034	0.039	0.039	0.039	0.039	0.071	0.039	0.039	0.039	0.039	0.039	0.039	0.034	0.039	0.034
Low Sloped *Roofing Products* Aged *Solar Reflectance*	NR	NR	NR	NR	NR	NR	NR	NR	0.55	0.55	0.55	NR	0.55	0.55	0.55	NR
Low Sloped *Roofing Products* *Thermal Emittance*	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	NR	0.75	0.75	0.75	NR
Steep Sloped *Roofing Products* Aged *Solar Reflectance*	NR	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	NR
Steep Sloped *Roofing Products* *Thermal Emittance*	NR	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0. 75	0.75	0.75	0.75	0.75	0.75	NR
Air Barrier	REQ	REQ	REQ	REQ	REQ	REQ	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
Non-Swinging Exterior *Doors* Max *U-Factor*	0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50
Swinging Exterior *Doors* Max *U-Factor*	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70

(CONTINUED): TABLE 301.3(4) ~~D~~ [TABLE 140.3-C] – PRESCRIPTIVE ENVELOPE CRITERIA FOR GUEST ROOMS OF HOTEL/MOTEL USE DESIGNATIONS ~~BUILDINGS~~

***FENESTRATION* – VERTICAL (ALL *CLIMATE ZONES*) (AREA-WEIGHTED PERFORMANCE RATING)**	***FIXED WINDOW***	**OPERABLE *WINDOW***	***CURTAIN WALL* AND *STOREFRONT***	**GLAZED DOORS[2]**
Max *U-factor*	0.36	0.46	0.41	0.45
Max *RSHGC*	0.25	0.22	0.26	0.23
Min *VT*	0.42	0.32	0.46	0.17
Maximum *WWR* %	40%	40%	40%	40%

(CONTINUED): TABLE 301.3(4) ~~D~~ [TABLE 140.3-C] – PRESCRIPTIVE ENVELOPE CRITERIA FOR GUEST ROOMS OF HOTEL/MOTEL USE DESIGNATIONS ~~BUILDINGS~~

***FENESTRATION – SKYLIGHTS* (ALL *CLIMATE ZONES*) (AREA-WEIGHTED PERFORMANCE RATING)**	**GLASS CURB MOUNTED**	**GLASS DECK MOUNTED**	**PLASTIC CURB MOUNTED**
Max *U-factor*	0.58	0.46	0.88
Max *SHGC*	0.25	0.25	NR
Min *VT*	0.49	0.49	0.64
Maximum *SRR* %	5%	5%	5%

Footnotes for Table 301.3(~~3~~4) and Table 301.3(4) *[Table 140.3-B and Table 140.3-C]*:

a. As defined in Section 201 *[Section 100.1]*, light mass walls are walls with a *heat capacity* of at least 7.0 Btu/ft²-°F and less than 15.0 Btu/ft²-°F. Heavy mass walls are walls with a *heat capacity* of at least 15.0 Btu/ft²-°F.

b. *Glazed doors* applies to both *site-built* and to factory-assembled *glazed doors*.

~~Footnotes for Table 301.3-C(3) and Table 301.3-D(4) *[Table 140.3-B and Table 140.3-C]*:~~

~~1. As defined in Section 201 *[Section 100.1]*, light mass walls are walls with a *heat capacity* of at least 7.0 Btu/ft²-°F and less than 15.0 Btu/ft²-°F. Heavy mass walls are walls with a *heat capacity* of at least 15.0 Btu/ft²-°F.~~

~~2. *Glazed doors* applies to both *site-built* and to factory-assembled *glazed doors*.~~

TABLE 301.3(5) [TABLE 140.3-D] – PRESCRIPTIVE- ENVELOPE CRITERIA FOR RELOCATABLE PUBLIC SCHOOL BUILDINGS (WHERE MANUFACTURER CERTIFIES USE IN- ALL CLIMATE ZONES OR IN A SPECIFIC CLIMATE ZONE GROUP)

***ENVELOPE* FEATURE**	**FOR USE IN ALL *CLIMATE ZONES***	**GROUP A** (CZ 1, **16**)	**GROUP B** (CZ 2, 3, **4**, 5)	**GROUP C** (CZ 6, 7, 8, 9, **10**)	**GROUP D** (11, 12, 13, **14**)	**GROUP E** (CZ 15)
Roofs and Ceilings - *Metal Building* Max *U-Factor*	0.038	0.038	0.038	0.038	0.038	0.038
Roofs and Ceilings - Wood Framed and Other Max *U-Factor*	0.028	0.028	0.028	0.028	0.028	0.028
Walls - *Metal Building* Max *U-Factor*	0.053	0.053	0.053	0.053	0.053	~~0.050~~
Walls - Metal-framed Max *U-Factor*	0.055	0.055	0.055	0.055	0.055	0.055
~~Walls - Mass, Light[1] Max U-Factor~~	~~0.138~~			~~0.364~~	~~0.364~~	
~~Walls - Mass, Heavy[1] Max U-Factor~~	~~0.153~~			~~0.690~~	~~0.690~~	
Walls - Wood-framed and Other Max *U-Factor*	0.038	0.053	0.053	0.053	0.053	0.038
~~Floors and Soffits - Raised Mass Max U-Factor~~	~~0.058~~			~~0.269~~	~~0.269~~	
Floors and Soffits – Other Max *U-Factor*	0.039	0.039	0.071	0.071	0.039	0.039
Roofing Products - Low-Sloped Aged *Solar Reflectance*	0.63	0.63	0.63	0.63	0.63	0.63
Roofing Products - Low-Sloped *Thermal Emittance*	0.75	0.75	0.75	0.75	0.75	0.75
Roofing Products - Steep-Sloped Aged *Solar Reflectance*	0.2~~75~~	0.25	0.25	0.25	0.25	0.25
Roofing Products - Steep-Sloped *Thermal Emittance*	0.80	0.80	0.80	0.80	0.80	0.80

(CONTINUED): TABLE 301.3(5)– PRESCRIPTIVE- ENVELOPE CRITERIA FOR RELOCATABLE PUBLIC SCHOOL BUILDINGS (WHERE MANUFACTURER CERTIFIES USE IN ALL CLIMATE ZONES OR IN A SPECIFIC CLIMATE ZONE GROUP)

***ENVELOPE* FEATURE**	**FOR USE IN ALL *CLIMATE ZONES***	**GROUP A (CZ 1, 16)~~CZ 2~~**	**GROUP B (CZ 2, 3, 4, 5)**	**GROUP C (CZ 6, 7, 8, 9, 10)**	**GROUP D (11, 12, 13, 14)**	**GROUP E** (15)
Air Barrier	NR	NR	NR	NR	NR	NR
Exterior *Doors* - Non-Swinging Maximum *U-Factor*	0.50	0.50	1.45	1.45	1.45	0.50
Exterior *Doors* – Swinging Maximum *U-Factor*	0.70	0.70	0.70	0.70	0.70	0.70

(CONTINUED): TABLE 301.3(5) – PRESCRIPTIVE ENVELOPE CRITERIA FOR RELOCATABLE PUBLIC SCHOOL BUILDINGS (WHERE MANUFACTURER CERTIFIES USE IN ALL CLIMATE ZONES OR IN A SPECIFIC CLIMATE ZONE-GROUP)

***FENESTRATION* – VERTICAL (ALL *CLIMATE ZONES*) (AREA-WEIGHTED PERFORMANCE RATING)**	**FOR USE IN ALL *CLIMATE ZONES***	**GROUP A** (CZ 1, **16**)	**GROUP B** (CZ 2, 3, **4**, 5)	**GROUP C** (CZ 6, 7, 8, 9, **10**)	**GROUP D** (11, 12, 13, **14**)	**GROUP E** (CZ **15**)
Fixed Window (Max *U-factor*)	0.34	0.36	0.36	0.36	0.34	0.34
Fixed Window (Max *RSHGC*)	0.22	0.25	0.25	0.25	0.22	0.22
Fixed Window (Min *VT*)	0.42	0.42	0.42	0.42	0.42	0.42
~~Curtain Wall or Storefront (Max U-factor)~~						
~~Curtain Wall or Storefront (Max RSHGC)~~						
~~Curtain Wall or Storefront (Min VT)~~						
Operable *Window* (Max *U-factor*)	0.46	0.46	0.46	0.46	0.46	0.43
Operable *Window* (Max *RSHGC*)	0.22	0.22	0.22	0.22	0.22	0.22
Operable *Window* (Min *VT*)	0.32	0.32	0.32	0.32	0.32	0.32
Glazed Doors (Max *U-factor*)	0.45	0.45	0.45	0.45	0.45	0.45
Glazed Doors (Max *RSHGC*)	0.23	0.23	0.23	0.23	0.23	0.23
Glazed Doors (Min *VT*)	0.17	0.17	0.17	0.17	0.17	0.17
Fenestration (Max *WWR* %)	40%	40%	40%	40%	40%	40%
Fenestration – Skylights (Max *U-Factor*)	See Table 301.3(3)					
Fenestration – Skylights (Max *RSHGC*)	See Table 301.3(3)					
Fenestration – Skylights (Min *VT*)	See Table 301.3(3)					
Fenestration – Skylights (Max *SRR*)	See Table 301.3(3)					

~~*TABLE 301.3-E [TABLE 140.3-D] PRESCRIPTIVE ENVELOPE CRITERIA FOR RELOCATABLE PUBLIC SCHOOL BUILDINGS FOR USE IN ALL CLIMATE ZONES*~~

ENVELOPE FEATURE	CRITERIA	VALUE
Roofs and Ceilings - Metal Buildings	Maximum U-factor	0.038
Roofs and Ceilings - Non-metal Buildings	Maximum U-factor	0.028
Walls – Wood-framed buildings	Maximum U-factor	0.038
Walls – Metal-framed buildings	Maximum U-factor	0.055
Walls - Metal buildings	Maximum U-factor	0.053
Walls - Mass/7.0 ≤ HC	Maximum U-factor	0.138
Walls - All Other Walls	Maximum U-factor	0.038
Floors and Soffits – Raised Mass	Maximum U-factor	0.058
Floors and Soffits – Raised Mass	Maximum U-factor	0.039
Roofing Products - Low-Sloped	Aged Solar Reflectance	0.63
Roofing Products - Low-Sloped	Thermal Emittance	0.75
Roofing Products - Steep-Sloped	Aged Solar Reflectance	0.25
Roofing Products - Steep-Sloped	Thermal Emittance	0.80
Fenestration – Fixed Windows	Maximum U-factor	0.34
Fenestration – Fixed Windows	Maximum RSHGC	0.22
Fenestration – Fixed Windows	Minimum VT	0.42
Fenestration – Operable Windows	Maximum U-factor	0.46
Fenestration – Operable Windows	Maximum RSHGC	0.22
Fenestration – Operable Windows	Minimum VT	0.32
Fenestration - Glazed Doors (Site-Built and Factory Assembled)	Maximum U-factor	0.45
Fenestration - Glazed Doors (Site-Built and Factory Assembled)	Maximum RSHGC	0.23
Fenestration - Glazed Doors (Site-Built and Factory Assembled)	Minimum VT	0.17
Fenestration - Skylights	Maximum U-factor	See Table 301.3-C *[Table 140.3-B]*
Fenestration - Skylights	Maximum RSHGC	See Table 301.3-C *[Table 140.3-B]*
Fenestration - Skylights	Minimum VT	See Table 301.3-C *[Table 140.3-B]*

~~ENVELOPE FEATURE~~	~~CRITERIA~~	~~VALUE~~
~~Fenestration -Skylights~~	~~Maximum SRR~~	~~5%~~
~~Exterior Doors - Non-Swinging doors~~	~~Maximum U-factor~~	~~0.50~~
~~Exterior Doors - Swinging doors~~	~~Maximum U-factor~~	~~0.70~~

301.3.10 *[Section 140.3(c)]* **Minimum daylighting requirement for large, enclosed spaces.**

In *Cclimate Zzones* 2 through 15, conditioned *enclosed spaces*, and unconditioned *enclosed spaces* that are greater than 5,000 square feet and that are directly under a *roof* with ceiling heights greater than 15 feet, shall meet the following requirements:

1. A combined total of at least 75 percent of the floor area, as determined in *building* floor plan (drawings) view, shall be within one or more of the following:
   1.1. *Primary sidelit daylit zone* in accordance with Section 601.2.2.4 *[Section 130.1(d)]*, or
   1.2. The total floor area in the space within a horizontal distance of 0.7 times the average ceiling height from the edge of rough opening of *skylights*.
2. All *skylit daylit zones* and *primary sidelit daylit zones* shall be shown on *building* plans.
3. *General lighting* in *daylit zones* shall be controlled in accordance with Section 601.2.2.4 *[Section 130.1(d)]*.
4. The total *skylight area* is at least 3 percent of the total floor area in the space within a horizontal distance of 0.7 times the average ceiling height from the edge of rough opening of *skylights*; or the product of the total *skylight area* and the average *skylight visible transmittance* is no less than 1.5 percent of the total floor area in the space within a horizontal distance of 0.7 times the average ceiling height from the edge of rough opening of *skylights*.
5. All *skylights* shall have a *glazing* material or diffuser that has a measured haze value greater than 90 percent, tested according to *ASTM D1003* (notwithstanding its scope) or other test method approved by the *Energy CCommission*.
6. *Skylights* for conditioned and *unconditioned spaces* shall have an area-weighted average *Visible Transmittance (VT)* no less than the applicable value required by Section 301.3.5.4 *[Section 140.3(a)6D]*.

Exception 1 to Section 301.3.10: Auditoriums, churches, movie theaters, *museums*, and *refrigerated warehouses*.

Exception 2 to Section 301.3.10: In *buildings* with unfinished interiors, future *enclosed spaces* for which there are plans to have:

1. A floor area of less than or equal to 5,000 square feet, or
2. Ceiling heights of less than or equal to 15 feet.

This exception shall not be used for S-1 or S-2 (storage), or for F-1 or F-2 (*factory*) *occupancies*.

Exception 3 to Section 301.3.10: *Enclosed spaces* having a designed *general lighting* system with a *lighting* power density less than 0.5 watts per square foot.

Exception 4 to Section 301.3.10: *Enclosed spaces* where it is documented that permanent architectural features of the *building*, existing structures or natural objects block direct beam sunlight on at least half of the *roof* over the *enclosed space* for more than 1500 daytime hours per year between 8 a.m. and 4 p.m.

301.3.11 *[Section 140.3(d)]* **Daylighting design Power Adjustment Factors (PAFs).**

To qualify for a Power Adjustment Factor (PAF) for *clerestory fenestration*, *horizontal slats*, or *light shelves* as specified in Section 601.3.1.1.2 *[Section 140.6(a)2L]*, daylighting devices shall meet the following requirements:

301.3.11.1 *[Section 140.3(d)1]* **Clerestory fenestration.**

To qualify for a PAF, *clerestory fenestration* shall meet the following requirements:

1. Shall be installed on east, west, or *south-facing* facades.
2. Shall have a head height that is at least 10 feet above the finished floor.
3. Shall have a *glazing* height that is greater than or equal to 10 percent of the head height.
4. If operable *shading* is installed on the *clerestory fenestration*, then the *clerestory fenestration shading* shall be controlled separately from *shading* serving other *vertical fenestration*.

301.3.11.2 *[Section 140.3(d)2]* **Interior and exterior horizontal slats.**

To qualify for a PAF, *horizontal slats* shall meet the following requirements and the requirements of Sections 301.3.11.2.1 through 301.3.11.2.3.

1. Shall be installed adjacent to *vertical fenestration* on east- or *west-facing* facades with *Window Wall Ratios* between 20 and 30 percent.
2. Exterior *horizontal slats* shall be level or sloped downwards from *fenestration*. Interior *horizontal slats* shall be level or sloped upwards from *fenestration*.
3. Shall have a projection factor as specified in Table 301.3-~~F~~(7~~6~~) *[Table 140.3-E]*. The projection factor is calculated using Equation 301.3-C *[Equation 140.3-C]*.
4. Shall have a minimum *Visible Reflectance* of 0.50 when tested as specified in *ASTM E903*.
5. Shall be permanently mounted and not adjustable.
6. Shall be shown on the plans with the dimensions for the slat projection and slat spacing as specified in Equation 301.3-C *[Equation 140.3-C]*.
7. Shall have a conspicuous factory installed label permanently affixed and prominently located on an attachment point of the device to the *building envelope*, stating the

following: “NOTICE: Removal of this device will require re-submittal of compliance documentation to the *enforcement agency* responsible for compliance with California Title 24, *Part 6*”.

301.3.11.2.1 *[Section 140.3(d)2D]* **Distance factor.**

Shall have a minimum distance factor of 0.3. The distance factor is calculated using Equation 301.3-C *[Equation 140.3-C]*.

Exception to Section 301.3.11.2.1: Where it is documented that existing adjacent structures or natural objects within view of the *vertical fenestration* block direct sunlight onto the *vertical fenestration* between 8 a.m. and 5 p.m. for less than 500 daytime hours per year.

301.3.11.2.2 *[Section 140.3(d)2F]* **Opacity.**

Shall be opaque.

Exception to Section 301.3.11.2.2: *Horizontal slats* with a *Visible Transmittance* of 0.03 or less when tested as specified in *ASTM E1175*.

301.3.11.2.3 *[Section 140.3(d)2H]* **Extension.**

Shall extend the entire height of the *vertical fenestration* and beyond each side of the *window* jamb by a distance equal to or greater than their horizontal projection.

Exception to Section 301.3.11.2.3: Where the slats are located entirely within the *vertical fenestration*’*s* rough opening, or a *fin* is located at the *window* jambs and extends vertically the entire height of the *window* jamb and extends horizontally the entire depth of the projection.

301.3.11.3 *[Section 140.3(d)3]* **Interior and exterior light shelves.**

To qualify for a PAF, *light shelves* shall meet the following requirements and the requirements of Sections 301.3.11.3.1 and 301.3.11.3.2.

1. Where there is *vertical fenestration area* below the *light shelf*, both interior and exterior *light shelves* shall be installed.
2. Shall be installed adjacent to *clerestory fenestration* on *south-facing* facades with *Window Wall Ratios* greater than 30 percent. The head height of the *light shelves* shall be no more than one foot below the finished ceiling. The *clerestory fenestration* shall meet the requirements of Section 301.3.11.1 *[Section 140.3(d)1]*.
3. Exterior *light shelves* shall be level or sloped downwards from *fenestration*. Interior *light shelves* shall be level or sloped upwards from *fenestration*.
4. Shall have a projection factor of the applicable value as specified in Table 301.3-~~F~~(7~~6~~) *[Table 140.3-E]*. The *light shelf* projection factor is calculated using Equation 301.3-C *[Equation 140.3-C]*.
5. Shall extend beyond each side of the *window* jamb by a distance equal to or greater than their horizontal projection.

6. Shall be shown on the plans with the dimensions for the *light shelf* projection and *light shelf* spacing as specified in Equation 301.3-C *[Equation 140.3-C]*.

301.3.11.3.1 *[Section 140.3(d)3E]* **Distance factor.**

Shall have a minimum Distance Factor of 0.3. The distance factor is calculated using Equation 301.3-C *[Equation 140.3-C]*.

Exception to Section 301.3.11.3.1: Where it is documented that existing adjacent structures or natural objects within view of the *vertical fenestration* block direct sunlight onto the *vertical fenestration* between 8 a.m. and 5 p.m. for less than 750 daytime hours per year.

301.3.11.3.2 *[Section 140.3(d)3F]* **Visible reflectance.**

Shall have a top surface with a minimum *Visible Reflectance* of 0.50 when tested as specified in *ASTM E903*.

Exception to Section 301.3.11.3.2: Where an exterior *light shelf* is installed greater than two feet below the clerestory sill.

TABLE 301.3(7) ~~F~~ [TABLE 140.3-E] DAYLIGHTING DEVICES

DAYLIGHTING DEVICE	ORIENTATION OF THE *VERTICAL FENESTRATION*	PROJECTION FACTOR
Horizontal Slats	East or West	2.0 to 3.0
Interior *Light Shelf*	South	1.0 to 2.0
Exterior *Light Shelf*	South	0.25 to 1.25

EQUATION 301.3-C [EQUATION 140.3-C] PROJECTION AND DISTANCE FACTOR CALCULATION

Projection Factor = Projection / Spacing

Distance Factor – D / (H_{AS} x Projection Factor)

where:

Projection = The horizontal distance between the base edge and the projected edge of the *overhang*, slat, or *light shelf*.

Spacing = For *overhangs*, the vertical distance between the projected edge of the *overhang* and sill of the *vertical fenestration* below it.
For *horizontal slats*, the vertical distance between the projected edge of a slat to the base edge of the slat below it.
For interior *light shelves*, the vertical distance between the projected edge of the *light shelf* and head of the *clerestory fenestration* above it.
For exterior *light shelves*, the vertical distance between the projected edge of the *light shelf* and sill of the *vertical fenestration* below it.

D = Distance between the existing structure or nature object and the *fenestration*

H_{AS} = Height difference between the top of the existing structure or nature object and the bottom of the *fenestration*

NOTE: The base edge is the edge of an *overhang*, slat, or *light shelf* that is adjacent to the *vertical fenestration*. The projected edge is the opposite edge from the base edge.

301.4 *[Section 100.2]* Performance requirements (Newly Constructed).

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

301.5 *[Section 141.0]* Additions and alterations to existing buildings.

301.5.1 *[Section 141.0]* Additions.

Additions to existing *nonresidential*, and *hotel/motel use designation* ~~*buildings*~~ shall meet the mandatory requirements of Section 301.5.1.1 that are applicable to the ~~*building*~~ project scope, and either the performance compliance approach (*energy budgets*) in Section 301.5.1.3 or the prescriptive compliance approach in Section 301.5.1.2 for the *Climate Zone* in which the *building* is located. *Climate zones* are shown in Figure 102.2-A *[FIGURE 100.1-A]*.

Covered process requirements for *additions*, *alterations*, and *repairs* to existing *nonresidential*, and *hotel/motel use designation* ~~*buildings*~~ are specified in Subchapter 9 *[Section 141.1]*.

301.5.1.1 *[Section 141.0(a)]* Mandatory requirements (Additions).

The *envelope* of the *addition* shall meet the applicable requirements of the sections listed below:

101 *[Section 110.0, 110.1, 110.5]* Systems and Equipment

300.1, 300.2, 300.3, 301.1, 301.2 *[Section 110.6, 110.7, 110.8, 120.0, 120.7]* Mandatory Requirements for *Envelopes*

301.5.1.2 *[Section 141.0(a)1]* Prescriptive requirements (Additions).

The *envelope* of the *addition* shall meet the applicable requirements of the sections listed below:

102.4 *[Section 140.2]* Prescriptive Requirements for *Newly Constructed Buildings*

301.3 *[Section 140.3]* Prescriptive Requirements for *Envelopes*

301.5.1.3 *[Section 141.0(a)2]* Performance requirements (Additions).

The *envelope* of the *addition* shall meet the applicable requirements of Section 102 and either the *addition* alone shall comply or the existing *building* plus *addition* plus *alteration* shall comply.

301.5.2 *[Section 141.0(b)]* **Alterations.**

Alterations to components of existing *nonresidential*, *hotel/motel use designations*, or *relocatable public school buildings*, including *alterations* made in conjunction with a change in *building occupancy* to a *nonresidential,* or *hotel/motel occupancy* shall meet mandatory requirements of Section 301.5.2.1, and either prescriptive requirements of Section 301.5.2.2 or performance requirements of Section 301.5.2.3.

~~**Exception to Section 301.5.2:** *Alterations* to *healthcare facilities* are not required to comply with this Section.~~

301.5.2.1 *[Section 141.0(b)1]* **Mandatory requirements (Alterations).**

Altered components in a *nonresidential*, or *hotel/motel use designations* ~~*building*~~ shall meet the requirements specified in the sections listed below that are applicable to the ~~*building*~~ project scope and the minimum requirements in Sections 301.5.2.1.1 through 301.5.2.1.4.

Covered process requirements for *alterations*, and *repairs* to existing *nonresidential*, and *hotel/motel use designations* ~~*buildings*~~ are specified in Subchapter 9 *[Section 141.1]*.

101 *[Section 100.0 (h), 110.0, 110.1, 110.5]* Systems and Equipment

300.1, 300.2, 300.3, 301.1, 301.2 *[Section 110.6, 110.7, 110.8, 120.0, 120.7]* Mandatory Requirements for *Envelopes*

301.5.2.1.1 *[Section 141.0(b)1A]* **Roof/Ceiling Insulation.**

The opaque portions of the *roof*/ceiling that separate *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the requirements of Section 301.5.2.2.4~~3~~ *[Section 141.0(b)2Bii]*.

Exception to Section 301.5.2.1.1: *Alterations* to *healthcare facilities* other than *HCAI facilities*.

301.5.2.1.2 *[Section 141.0(b)1B]* **Wall Insulation.**

For the altered opaque portion of walls separating *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the applicable requirements of Items 1 through 4 below:

1. ***Metal Building*.** A minimum of R-13 insulation between framing members, or the area-weighted average *U-factor* of the wall assembly shall not exceed U-0.113.
2. **Metal-Framed.** A minimum of R-13 insulation between framing members, or the area-weighted average *U-factor* of the wall assembly shall not exceed U-0.217.
3. **Wood-Framed and Others.** A minimum of R-11 insulation between framing members, or the area-weighted average *U-factor* of the wall assembly shall not exceed U-0.110.

4. ***Spandrel* Panels and Glass *Curtain Walls*.** A minimum of R-4, or the area-weighted average *U-factor* of the wall assembly shall not exceed U-0.280.

Exception 1 to Section 301.5.2.1.2: Light and heavy mass walls.

Exception 2 to Section 301.5.2.1.2: *Alterations* to *healthcare facilities*.

301.5.2.1.3 *[Section 141.0(b)1C]* **Floor Insulation.**

For the altered portion of *raised floors* that separate *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the applicable requirements of Items 1 through 3 below:

1. **Raised Framed Floors.** A minimum of R-11 insulation between framing members, or the area-weighted average *U-factor* of the floor assembly shall not exceed the *U-factor* of U-0.071.
2. **Raised Mass Floors in Hotel/Motel Guest Rooms.** A minimum of R-6 insulation, or the area-weighted average *U-factor* of the floor assembly shall not exceed the *U-factor* of U-0.111.
3. **Raised Mass Floors in Other *Occupancies*.** No minimum *U-factor* requirement.

Exception to Section 301.5.2.1.3: *Alterations* to *healthcare facilities*.

301.5.2.1.4 *[Section 141.0(b)1E]* **Exterior windows.**

Fenestration alterations other than *repairs* shall meet the following requirements:

1. ***Vertical fenestration alterations*.** Where over 150 square feet of the *entire building's vertical fenestration* is replaced, the maximum *U-factor* of the replaced units shall not exceed U-0.58.
2. **Added *vertical fenestration*.** Where over 50 square feet of *vertical fenestration* is added, it shall meet the requirements of Section 301.2.4 *[Section 120.7(d)]*. Where 50 square feet or less of *vertical fenestration* is added, this requirement shall not apply.

Exception to Section 301.5.2.1.4: *Alterations* to *healthcare facilities* other than *HCAI facilities*.

301.5.2.2 *[Section 141.0(b)2]* **Prescriptive requirements (Alterations).**

301.5.2.2.1 *[Section 141.0(b)2A]* **Group R Occupancy ~~Fenestration~~fenestration.**

Fenestration alterations in a Group R Occupancy, other than *repair* shall meet the requirements below:

301.5.2.2.1.1- *Vertical fenestration alterations* shall meet the requirements in Table 301.5-~~A~~(1) *[Table 141.0-A]*.

Exception to Section 301.5.2.2.1.1: In an *alteration*, where 150 square feet or less of the *entire building's vertical fenestration* is replaced, *RSHGC* and *VT* requirements of Table 301.5-~~A~~(1) *[Table 141.0-A]* shall not apply.

301.5.2.2.1.2- Added *vertical fenestration* shall meet the requirements of Table 301.3-~~C~~(3), ~~D~~ (4) or (5)~~E~~ in Section 301.3.9 *[TABLE 140.3-B, C, or D]*.

Exception to Section 301.5.2.2.1.2: In an *alteration*, where 50 square feet or less of *vertical fenestration* is added, *RSHGC* and *VT* requirements of Table 301.3-~~C~~(3), (4)~~D~~ or (5)~~E~~ in Section 301.3.9 *[TABLE 140.3-B, C, or D]* shall not apply.

301.5.2.2.1.3- All altered or newly installed *skylights* shall meet the requirements of Table 301.3-~~C~~(3), (4)~~D~~ or (5)~~E~~ in Section 301.3.9 *[TABLE 140.3-B, C, or D]*.

Exception to Section 301.5.2.2.1.3: In an *alteration*, where 50 square feet or less of *skylight* is added, *SHGC* and *VT* requirements of Table 301.3-~~C~~(3), (4)~~D~~ or (5)~~E~~ in Section 301.3.9 *[TABLE 140.3-B, C, or D]* shall not apply.

NOTE: Glass replaced in an existing sash and frame, or sashes replaced in an existing frame are considered *repairs*. In these cases, Section 100.4.4.1 *[Section 141.0(c)]* requires that the replacement be at least equivalent to the original in performance.

Exception to Section 301.5.2.2.1: *Alterations* to *healthcare facilities*.

TABLE 301.5(1) ~~A~~ [TABLE 141.0-A] ALTERED VERTICAL FENESTRATION MAXIMUM U-FACTOR AND MAXIMUM RSHGC

REQUIREMENT	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
U-factor	0.47	0.47	0.58	0.47	0.58	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
RSHGC	0.41	0.31	0.41	0.31	0.41	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.41

Footnote for Table 301.5(1) *[Table 141.0-A]*:

a. The required values for *VT* are located in Table 301.3(3), (4) or (5) in Section 301.3.9 *[TABLE 140.3-B, C, and D]* for all *Climate Zones*

~~Footnote for Table 301.5-A(1) *[Table 141.0-A]*:~~

~~1. The required values for *VT* are located in Table 301.3-C(3), (4)D or (5)E in Section 301.3.9 *[TABLE 140.3-B, C, and D]* for all *Climate Zones*~~

301.5.2.2.2 *[Section 141.0(b)2A]* **Nonresidential Fenestration.**

For nonresidential *use designations*, *fenestration alterations* other than *repairs* shall meet the requirements below:

301.5.2.2.2.1 One Hundred Percent Fenestration Alteration

Vertical fenestration alteration replacing one hundred percent of any single *fenestration* type (*fixed*, operable *windows*, *storefront*, curtainwall, *glazed doors*) shall meet the requirements of Sections 301.3.4.2. through 301.3.4.4 *[Sections 140.3(a)5B through 140.3(a)5D].*

Exception to Section 301.5.2.2.2.1: In an *alteration* where 150 square feet or less of the *entire building*'s *vertical fenestration* is replaced, *RSHGC* and *VT* requirements of Table 301.3(3) shall not apply.

301.5.2.2.2.2 All other Fenestration Alterations

All other *vertical fenestration alterations* shall meet the requirements in Table 301.5(2)

Exception to Section 301.5.2.2.2.2: In an *alteration* where 150 square feet or less of the *entire building*'s *vertical fenestration* is replaced, *RSHGC* and *VT* requirements of Table 301.5(2) shall not apply.

301.5.2.2.2.3 Added Fenestration

Added *vertical fenestration alterations* shall meet the requirements in Table 301.3(4) in Section 301.3.9.

Exception to Section 301.5.2.2.2.3: In an *alteration*, where 50 square feet or less of *vertical fenestration* is added, *RSHGC* and *VT* requirements of Table 301.3(3) shall not apply.

301.5.2.2.2.4 Skylights

All altered or newly installed *skylights* shall meet the requirements of Table 301.3(3), (3.1), (4) or (5) in Section 301.3.9.

Exception to Section 301.5.2.2.2.4: In an *alteration*, where 50 square feet or less of *skylight* is added, *SHGC* and *VT* requirements of Table 301.3(3), (3.1), (4) or (5),in Section 301.3.9 shall not apply.

TABLE 301.5(2) ALTERED VERTICAL FENESTRATION MAXIMUM U-FACTOR AND MAXIMUM RSHGC-NONRESIDENTIAL BUILDINGS (INCLUDING RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE MANUFACTURERS CERTIFY USE ONLY IN SPECIFIC CLIMATE ZONES

REQUIREMENT	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
***Fixed Window* (Max *U-Factor*)**	0.43	0.43	0.43	0.43	0.43	0.47	0.47	0.47	0.47	0.43	0.43	0.43	0.43	0.43	0.43	0.43
***Fixed Window* (Max *RSHGC*)**	0.41	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.41
***Fixed Window* (Min *VT*)**	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
***Curtain Wall* or *Storefront* (Max *U-Factor*)**	0.47	0.47	0.43	0.43	0.43	0.43	0.47	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
***Curtain Wall* or *Storefront* (Max *RSHGC*)**	0.41	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.41
***Curtain Wall* or *Storefront* (Min *VT*)**	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Operable *Window* (Max *U-Factor*)	0.47	0.47	0.58	0.47	0.58	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Operable *Window* (Max *RSHGC*)	0.41	0.31	0.41	0.31	0.41	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.41
Operable *Window* (Min *VT*)	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
***Glazed Doors* (Max *U-Factor*)**	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
***Glazed Doors* (Max *RSHGC*)**	0.41	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.41
***Glazed Doors* (Min *VT*)**	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17

Footnotes for Table 301.5(2):

a. Glass replaces in an existing sash, or frame, or sashes replaced in an existing frame are considered *repairs*. In these cases, Section 100.4.4.1 [Section 141.0(c)] requires that the replacement be at least equivalent to the original in performance.

~~**Note:** Glass replaces in an existing sash, or frame, or sashes replaced in an existing frame are considered repairs. In these cases, Section 100.4.4.1 [Section 141.0(c)] requires that the replacement be at least equivalent to the original in performance.~~

Exception to Section 301.5.2.2.2: *Alterations* to *healthcare facilities*.

301.5.2.2.3~~2~~ *[Section 141.0(b)2Bi]* **Roofing products.**

Existing *roofs* of a *nonresidential* or *hotel/motel* ~~*building*~~ *use designations* being replaced, recovered or recoated, as defined in Section 201 *[Section 100.1(b)]* and Title 24, Part 2, Chapter 2, shall meet the requirements of Section 300.3.7 *[Section 110.8(i)]*. When a *roof* with more than 50 percent of the *roof* area or more than 2,000 square feet of *roof*, whichever is less, is being altered, *roofing products* shall comply with requirements in Sections 301.3.1.1 and 301.3.1.2 *[Section 140.3(a)1A]*.

Exception 1 to Section 301.5.2.2.3~~2~~: An aged *solar reflectance* less than 0.63 is allowed for *low-sloped roofs* provided the maximum *roof*/ceiling *U-factor* in Table 301.5-~~B~~(3~~2~~) *[TABLE 141.0-B]* is not exceeded.

Exception 2 to Sections 301.5.2.2.3~~2~~: *Roof* area covered by *building* integrated photovoltaic panels and *building* integrated solar thermal panels are not required to meet the minimum requirements for *solar reflectance*, *thermal emittance*, or *SRI*.

Exception 3 to Sections 301.5.2.2.3~~2~~: *Roof* constructions with a weight of at least 25 lb/ft² are not required to meet the minimum requirements for *solar reflectance*, *thermal emittance*, or *SRI*.

Exception 4 to Section 301.5.2.2.3: Existing *roofs* being replaced, recovered or recoated on *healthcare facilities* other than *HCAI facilities*.

TABLE 301.5(3) ~~B~~ [TABLE 141.0-B] ROOF/CEILING INSULATION TRADEOFF FOR LOW-SLOPED AGED SOLAR REFLECTANCE

AGED *SOLAR REFLECTANCE*	*CLIMATE ZONES* 6, 7, 8 *U-FACTOR*	ALL OTHER *CLIMATE ZONES U-FACTOR*
0.62- 0.60	0.043	0.035
0.59-0.55	0.041	0.034
0.54-0.50	0.038	0.031
0.49-0.45	0.034	0.029
0.44-0.40	0.032	0.028
0.39-0.35	0.029	0.026
0.34-0.30	0.028	0.025
0.29-0.25	0.026	0.024

301.5.2.2.43 *[Section 141.0(b)2Bii]* **Roof/ceiling insulation.**

When a *low-sloped roof* with more than 50 percent of the *roof* area or more than 2,000 square feet of *roof*, whichever is less, is being altered, the area of the *roof recover* or *roof replacement* shall be insulated to the level specified in Table 301.5-C(43) *[Table 141.0-C]*.

Exception 1 to Section 301.5.2.2.43: *Roofs recovereds* with new R-10 insulation added above deck do not need to be insulated to the level specified in Table 301.5-C(43) *[Table 141.0-C]*.

Exception 2 to Section 301.5.2.2.43: When existing mechanical *equipment* located on the *roof* will not be disconnected and lifted, insulation added is the greater of R-10 or the maximum installed thickness that will allow the distance between the height of the *roof* membrane surface to the top of the base flashing to remain in accordance with the manufacturer's instructions.

Exception 3 to Section 301.5.2.2.43: At the drains and other low points, tapered insulation with a *thermal resistance* less than that prescribed in Table 301.5-C(43) *[Table 141.0-C]* may be used, provided that insulation thickness is increased at the high points of the *roof* so that the average *thermal resistance* equals or exceeds the value specified in Table 301.5-C(43) *[Table 141.0-C]*.

Exception 4 to Section 301.5.2.2.43: The area of the *roof* recoat is not required to be insulated.

Exception 5 to Section 301.5.2.2.4: *Roof alterations* on *healthcare facilities* other than *HCAI facilities*.

TABLE 301.5(~~43~~)-C [TABLE 141.0-C] INSULATION REQUIREMENTS FOR ROOF ALTERATIONS

CLIMATE ZONE	*CONTINUOUS INSULATION R-VALUE*	*U-FACTOR*
1-5, 9-16	R-23	0.037, with at least R-10 above deck
6-8	R-17	0.047, with at least R-10 above deck

301.5.2.2.5~~4~~ *[Section 141.0(b)2O]* **Minimum daylighting requirement for large enclosed spaces.**

A *building* shell for which interior walls or ceilings are installed for the first time shall meet the requirements of Section 301.3.10 *[Section 140.3(c)]*.

Exception to Section 301.5.2.2.5: *Alterations* to *healthcare facilities*.

301.5.2.2.6~~5~~ *[Section 141.0(b)2Q]* **Air barrier.**

Existing *building envelope* walls where at least 25% or more of the wall area is being altered must comply with Section 301.3.7 *[Section 140.3(a)9]*. Where the *building* is tested in accordance with the procedures for whole *building* air leakage in NA5.1 and the tested leakage rate exceeds 0.4 cfm/ft^2 of *building* shell at 75 pa., a Visual Inspection and Diagnostic Evaluation shall be done in accordance with NA5.7 and all observed leaks shall be sealed where such sealing can be made without destruction of existing *building* components.

Exception to Section 301.5.2.2.6~~5~~: *Alterations* to ~~*Healthcare*~~ *healthcare facilities*.

301.5.2.2.7~~6~~ *[Section 141.0(b)2R]* **Exterior doors.**

Alterations that add exterior *door area* shall meet the *U-factor* requirements of Section 301.3.6 *[Section 140.3(a)7]*.

301.5.2.3 *[Section 141.0(b)3]* **Performance requirements.**

The altered *envelope* shall meet the applicable requirements of Section 102.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 302

SINGLE-FAMILY ~~RESIDENTIAL~~ OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

302.1 *[Section 150.0]* **General.**

Single-family ~~*residential*~~ *use designations* ~~*building*~~ *envelopes* shall comply with the applicable requirements of Section 302.

NOTE: The requirements of Sections 302.2 through 302.4 apply to *newly constructed buildings*. Sections 302.2 and 302.5 apply to *additions* or *alterations*.

302.2 *[Section 150.0]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

302.2.1 *[Section 150.0(a)]* **Roof deck, ceiling and rafter roof insulation.**

The opaque portions of *roof* decks separating *attic* spaces from ambient air, and ceilings or rafter *roofs* separating *conditioned spaces* from *unconditioned spaces* or ambient air, shall meet the requirements below:

302.2.1.1 *[Section 150.0(a)1]* **Attics above conditioned space.**

In *Climate Zones* 4 and 8 through 16, *roof* decks in newly constructed *attics* that are above *conditioned space* shall be insulated to achieve an area-weighted average *U-factor* not exceeding U-0.184.

Exception 1 to Section 302.2.1.1: The *space-conditioning system air handler* and ducts are located entirely in *conditioned space* below the ceiling separating the *occupiable space* from the *attic*; or

The *space-conditioning system air handler* is located in *unconditioned space* and has 12 linear feet or less of supply duct, including the length of the *air handler* and the plenum, located in *unconditioned space*, with all other portions of the supply ducts located in *conditioned space* below the ceiling separating the *occupiable space* from the *attic*; or

The *space-conditioning system* is a ductless system.

Exception 2 to Section 302.2.1.1: Space-conditioning *duct systems* buried within insulation in an *attic* that complies using Sections 102.5.2 and 102.5.5 *[Section 150.1(b)]* and is verified according to RA 3.1.4.1.

302.2.1.2 *[Section 150.0(a)2]* **Ceilings and rafter roofs.**

Ceilings and rafter *roofs* shall be insulated to achieve an area-weighted average *U-factor* not exceeding U-0.043 or shall be insulated between wood-framing members with insulation resulting in an installed *thermal resistance* of R-22 or greater for the insulation alone. For

vented *attics*, the mandatory insulation shall be installed at the ceiling level; for unvented *attics*, the mandatory insulation shall be placed at either ceiling or *roof* level.

302.2.1.3 *[Section 150.0(a)3]* **Attic access doors.**

Attic access *doors* shall have permanently attached insulation using adhesive or mechanical fasteners. The *attic* access shall be gasketed to prevent air leakage.

302.2.1.4 *[Section 150.0(a)4]* **Insulation placement.**

Insulation shall be installed in direct contact with a *roof* or ceiling which is sealed to limit *infiltration* and *exfiltration* as specified in Section 300.2 *[Section 110.7]*, including but not limited to placing insulation either above or below the *roof* deck or on top of a drywall ceiling.

302.2.1.5 Attic Ventilation.

Attic Ventilation shall comply with the California Residential Code, Title 24, Part 2.5, Section R806 and Title 24 Part 7.

302.2.2 *[Section 150.0(b)]* **Loose-fill insulation.**

When loose-fill insulation is installed, the minimum installed weight per square foot shall conform with the insulation manufacturer's installed design weight per square foot at the manufacturer's labeled *R-value*.

302.2.3 *[Section 150.0(c)]* **Wall insulation.**

Opaque portions of above grade walls separating *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the requirements of this section.

In wood-framed assemblies, compliance with *U-factors* may be demonstrated by installing wall insulation with an *R-value* of R-15 in 2x4 assemblies and R-21 in 2x6 assemblies, with 16 inches on center spacing.

302.2.3.1 *[Section 150.0(c)1]* **2 x 4 inch framing.**

2 × 4 inch framing shall have an overall assembly *U-factor* not exceeding U-0.095.

302.2.3.2 *[Section 150.0(c)2]* **2 x 6 inch framing.**

2 × 6 inch or greater framing shall have an overall assembly *U-factor* not exceeding U-0.069.

302.2.3.3 *[Section 150.0(c)3]* **Opaque non-framed assemblies.**

Opaque non-framed assemblies shall have an overall assembly *U-factor* not exceeding U-0.102.

302.2.3.4 *[Section 150.0(c)4]* **Bay or bow window roofs and floors.**

Bay or bow *window roofs* and floors shall be insulated to meet the wall insulation requirements of Table 302.3-A(1) *[Table 150.1-A]*.

302.2.3.5 *[Section 150.0(c)5]* **Masonry/Mass walls.**

Masonry/Mass walls shall be insulated to meet the wall insulation requirements of Table 302.3-A(1) *[Table 150.1-A]*.

302.2.4 *[Section 150.0(d)]* **Raised-floor insulation.**

Raised floors separating *conditioned space* from *unconditioned space* or ambient air shall have an overall assembly *U-factor* not exceeding U-0.037. In a wood-framed assembly, compliance with the *U-factor* may be demonstrated by installing insulation with an *R-value* of 19 or greater.

Exception to Section 302.2.4: A *building* with a controlled ventilation or unvented crawlspace may omit *raised floor* insulation if all of the following are met:

1. The foundation walls are insulated to meet the wall insulation minimums requirements as shown in Table 302.3 A(1) *[Table 150.1-A]*; and
2. A Class I or Class II vapor retarder is placed over the entire floor of the *crawl space*; and
3. Vents between the *crawl space* and *outside air* are fitted with automatically operated louvers that are temperature actuated; and
4. The requirements in Reference Residential Appendix RA4.5.1.

302.2.5 *[Section 150.0(f)]* **Slab edge insulation.**

Material used for slab edge insulation shall meet the following minimum specifications:

1. Water absorption rate for the insulation material alone without facings no greater than 0.3 percent when tested in accordance with Test Method A – 24-Hour-Immersion of *ASTM C272*.
2. Water vapor permeance no greater than 2.0 perm/inch when tested in accordance with *ASTM E96*.
3. Concrete slab perimeter insulation shall be protected from physical damage and ultraviolet light deterioration.
4. Insulation for a *heated slab floor* shall meet the requirements of Section 300.3.5 *[Section 110.8(g)]*.

302.2.6 *[Section 150.0(g)]* **Vapor retarder.**

In *Climate Zones* 1–16, the earth floor of unvented *crawl space* shall be covered with a Class I or Class II vapor retarder. This requirement shall also apply to controlled ventilation *crawl space* for *buildings* complying with the Exception to Section 302.2.4 *[Section 150.0(d)]*.

In *Climate Zones* 14 and 16, a Class I or Class II vapor retarder shall be installed on the *conditioned space* side of all insulation in all *exterior walls*, vented *attics* and unvented *attics* with air-permeable insulation.

302.2.7 *[Section 150.0(q)]* **Fenestration products.**

Fenestration, including *skylight* products, separating *conditioned space* from *unconditioned space* or outdoors shall have a maximum weighted average *U-factor* of 0.40.

Exception 1 to Section 302.2.7: Up to 10 square feet of *fenestration area* or 0.5 percent of the *conditioned floor area*, whichever is greater, is not required to comply with the maximum *U-factor* requirement.

Exception 2 to Section 302.2.7: For dual-glazed *greenhouse or garden windows*, up to 30 square feet of *fenestration area* is not required to comply with the maximum *U-factor* requirement.

Exception 3 to Section 302.2.7: *Fenestration* installed in *buildings* meeting Part 7 of the California *Building* Code, California Wildland-Urban Interface Code, where the *building* is located in Fire

Hazard Severity Zones or Wildland-Urban Interface (WUI) Fire Areas as designated by the local *enforcement agency*.

302.3 *[Section 150.1]* **Prescriptive requirements (Newly Constructed).**

302.3.1 *[Section 150.1(c)1]* **Insulation.**

Installed components shall meet the applicable requirements of Sections 302.3.1.1 through 302.3.1.5.

Exception to Section 302.3.1: The insulation requirements of Table 302.3~~-A~~(1) *[Table 150.1-A]* may also be met by ceiling, *roof* deck, wall, or floor assemblies that meet the required maximum *U-factors* using a *U-factor* calculation method that considers the thermal effects of all elements of the assembly and is approved by the *Executive Director*.

302.3.1.1 *[Section 150.1(c)1A]* **Roof and ceiling insulation.**

Roof and ceiling insulation shall be installed with an *R-value* equal to or greater than that shown in Table 302.3~~-A~~(1) *[Table 150.1-A]* meeting options A, B, or C below.

302.3.1.1.1 *[Section 150.1(c)1Ai]* **Option A.**

Reserved.

302.3.1.1.2 *[Section 150.1(c)1Aii]* **Option B.**

A minimum *R-value* of insulation in a ventilated *attic* installed between the *roof* rafters in contact with the *roof* deck and an additional layer of ceiling insulation located between the *attic* and the *conditioned space* when meeting Section 402.3.3.1 *[Section 150.1(c)9A]*; or

302.3.1.1.3 *[Section 150.1(c)1Aiii]* **Option C.**

A minimum *R-value* of ceiling insulation located between a ventilated *attic* and the *conditioned space* or within a *cathedral ceiling* assembly shall comply with Section 402.3.3.2 *[Section 150.1(c)9B]*.

302.3.1.2 *[Section 150.1(c)1B]* **Wall insulation.**

1. **Framed *exterior walls*.** Framed *exterior walls* shall be insulated such that the *exterior wall* has an assembly *U-factor* equal to or less than that shown in Table 302.3~~-A~~(1) *[Table 150.1-A]*. The *U-factors* shown are maximum *U-factors* for the *exterior wall* assembly.
2. **Mass walls.** Mass walls above grade and below grade shall be insulated such that the wall has an assembly *U-factor* equal to or less than that shown in Table 302.3~~-A~~(1) *[Table 150.1-A]*, or walls shall be insulated with *continuous insulation* that has an *R-value* equal to or greater than that shown in Table 302.3~~-A~~(1) *[Table 150.1-A]*. ~~"Interior" denotes *continuous insulation* installed on the inside surface of the wall, and "exterior" denotes *continuous insulation* installed on the outside surface of the wall.~~
3. **Other unframed walls.** Other unframed *exterior walls*, excluding mass walls, shall meet the requirements for framed walls shown in Table 302.3~~-A~~(1) *[Table 150.1-A]*.

302.3.1.3 *[Section 150.1(c)1C]* **Raised-floor insulation.**

Raised-floors shall be insulated such that the floor assembly has an assembly *U-factor* equal to or less than shown in Table 302.3(1)~~-A~~ *[Table 150.1-A]*, or shall be insulated between wood framing with insulation having an *R-value* equal to or greater than that shown in Table 302.3~~-A~~(1) *[Table 150.1-A]*.

Exception to Section 302.3.1.3: Raised-floor insulation may be omitted if the foundation walls are insulated to meet the wall insulation minimum~~s~~ requirements shown in Table 302.3(1)~~-A~~ *[Table 150.1-A]*, and a vapor retarder is placed over the entire floor of the *crawl space*, and the vents are fitted with automatically operated louvers, and the requirements of Reference Residential Appendix RA4.5.1 are met.

302.3.1.4 *[Section 150.1(c)1D]* **Slab floor perimeter insulation.**

Slab floor perimeter insulation shall be installed with a *U-factor* equal to or less than, or *R-value* equal to or greater than shown in Table 302.3(1)~~-A~~ *[Table 150.1-A]*. The minimum depth of concrete-slab floor perimeter insulation shall be 16 inches or the depth of the footing of the *building*, whichever is less.

302.3.1.5 *[Section 150.1(c)1E]* **Quality Insulation Installation(QII).**

All *buildings* shall comply with the Quality Insulation Installation (QII) requirements shown in Table 302.3(1)~~-A~~ *[Table 150.1-A]*. When QII is required, insulation installation shall meet the criteria specified in Reference Appendix RA3.5.

302.3.2 *[Section 150.1(c)2]* **Radiant barrier.**

A *radiant barrier* required in Table 302.3(1)~~-A~~ *[Table 150.1-A]* shall meet the requirements specified in Section 300.~~3.8~~5 *[Section 110.8(j)]*, and shall meet the installation criteria specified in the Reference Residential Appendix RA4.

302.3.3 *[Section 150.1(c)3]* **Fenestration.**

302.3.3.1 *[Section 150.1(c)3A]* **U-Factor and Solar Heat Gain Coefficient (SHGC).**

Installed *fenestration products*, including *glazed doors*, shall have an area-weighted average *U-factor* and *Solar Heat Gain Coefficient (SHGC)* meeting the applicable *fenestration* value in Table 302.3(1)~~-A~~ *[Table 150.1-A]* and shall be determined in accordance with Sections 300.1.1.2 *[Section 110.6(a)2]* and 300.1.1.3 *[Section 110.6(a)3]*.

Exception 1 to Section 302.3.3.1: New *dwelling units* with a *conditioned floor area* of 500 square feet or less in Climate Zone 5 may comply with a maximum *U-factor* of 0.30.

Exception 2 to Section 302.3.3.1: For each *dwelling unit*, up to 3 square feet of *glazing* area installed in *doors* and up to 3 square feet of tubular *skylights* area with dual-pane diffusers shall not be required to meet the *U-factor* and *SHGC* requirements of Table 302.3(1)~~-A~~ *[Table 150.1-A]*.

Exception 3 to Section 302.3.3.1: In *Climate Zones* 2, 4, and 6 through 15, for each *dwelling unit* up to 16 square feet of *skylight area* with a maximum *U-factor* of 0.40 and a maximum *SHGC* of 0.30. In *Climate Zones* 1, 3, 5, and 16 there is no *SHGC* requirement.

Exception 4 to Section 302.3.3.1: For *fenestration* containing chromogenic type *glazing*:

1. The lower-rated labeled *U-factor* and *SHGC* shall be used with *automatic* controls to modulate the amount of solar gain and *light* transmitted into the space in multiple steps in response to daylight levels or solar intensity;
2. *Chromogenic glazing* shall be considered separately from other *fenestration*; and
3. Area-weighted averaging with other *fenestration* that is not chromatic shall not be permitted and shall be determined in accordance with Section 300.1.1 *[Section 110.6(a)]*.

Exception 5 to Section 302.3.3.1: For *dwelling units* containing unrated *site-built fenestration* that meets the maximum area restriction, the *U-factor* and *SHGC* can be determined in accordance with the Nonresidential Reference Appendix NA6 or use default values in Table 300.1 ~~A~~(1) *[Table 110.6-A]* and Table 300.1 ~~B~~(2) *[Table 110.6-B]*.

302.3.3.2 *[Section 150.1(c)3B]* **Maximum total fenestration area.**

The maximum total *fenestration area* shall not exceed the percentage of *conditioned floor area*, *CFA*, as indicated in Table 302.3 ~~A~~(1) *[Table 150.1-A]*. Total *fenestration* includes *skylights* and *west-facing glazing*.

302.3.3.3 *[Section 150.1(c)3C]* **Maximum West-facing fenestration area.**

The maximum *west-facing fenestration area* shall not exceed the percentage of *conditioned floor area* as indicated in Table 302.3 ~~A~~(1) *[Table 150.1-A]*. *West-facing fenestration area* includes *skylights* tilted in any direction when the pitch is less than 1:12.

302.3.4 *[Section 150.1(c)4]* **Shading.**

Where Table 302.3 ~~A~~(1) *[Table 150.1-A]* requires a maximum *SHGC*, the *shading* requirements shall be met by one of the following:

302.3.4.1 *[Section 150.1(c)4A]* **Maximum SHGC.**

Complying with the required maximum *SHGC* pursuant to Section 302.3.3.1 *[Section 150.1(c)3A]*; or

302.3.4.2 *[Section 150.1(c)4B]* **Exterior shading device.**

An exterior operable *shading* louver or other exterior *shading* device that meets the required maximum *SHGC*; or

302.3.4.2.1 *[Section 150.1(c)4E]* **Permanent installation.**

Exterior *shading* devices must be permanently secured with attachments or fasteners that are not intended for removal.

Exception to Section 302.3.4.2.1: Where the California *Building* Code (*CBC*) requires emergency egress or where compliance would conflict with health and safety regulations.

302.3.4.3 *[Section 150.1(c)4C]* **Combination SHGC and exterior shading device.**

A combination of Sections 302.3.4.1 and 302.3.4.2 to achieve the same performance as achieved in Section 302.3.3.1 *[Section 150.1(c)3A]*.

302.3.4.4 *[Section 150.1(c)4D]* **Overhangs for south-facing glazing.**

For *south-facing glazing* only, optimal *overhangs* shall be installed so that the *south-facing glazing* is fully shaded at solar noon on August 21 and substantially exposed to direct sunlight at solar noon on December 21.

302.3.5 *[Section 150.1(c)5]* **Doors.**

Installed swinging *door* products separating *conditioned space* from outside or adjacent *unconditioned space*, but not including *glazed door* products, shall have an area-weighted average *U-factor* no greater than the applicable *door* value in Table 302.3-A(1) *[Table 150.1-A]* and shall be determined in accordance with Section 300.1.1.2 *[Section 110.6(a)2]*. *Glazed door* products are treated as *fenestration products* in Section 302.3.3 *[Sections 150.1(c)3]* and Section 302.3.4 *[Section 150.1(c)4]*.

Exception to Section 302.3.5: Swinging *doors* between the *garage* and *conditioned space* that are required to have fire protection are not required to meet the applicable *door* value in Table 302.3-A(1) *[Table 150.1-A]*.

302.3.6 *[Table 150.1-A]* **Single-family standard building design.**

TABLE 302.3(1) A [TABLE 150.1-A] COMPONENT PACKAGE – SINGLE-FAMILY STANDARD BUILDING DESIGN

***BUILDING* COMPONENT *ROOFS* AND CEILINGS**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Option B[i,9] Below *Roof* Deck Insulation[1,2a,b] (With Air Space)	NR	NR	NR	R 19	NR	NR	NR	R 19	R 19	R 19	R 19	R 19	R 19	R 19	R 19	R 19
Option B[9i] Ceiling Insulation	R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
Option B[9i] *Radiant Barrier*	NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
Option C[10i] Ceiling Insulation for vented *attics*	R 38	R 30	R 30	R 30	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
Option C[10i] *Radiant Barrier* for vented *attics*	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
Option C *Roof* Deck Insulation for Cathedral Ceilings[1,4a,d]	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
Low-Sloped *Roofing Product* Aged *Solar Reflectance*	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR
Low-Sloped *Roofing Product* *Thermal Emittance*	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR
Steep-Sloped *Roofing Product* Aged *Solar Reflectance*	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	0.20	0.20	0.20	0.20	0.20	NR
Steep-Sloped *Roofing Product* *Thermal Emittance*	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	0.75	0.75	0.75	NR

(CONTINUED): TABLE 302.3 ~~A~~(1) [TABLE 150.1-A] COMPONENT PACKAGE – SINGLE-FAMILY STANDARD BUILDING DESIGN

***BUILDING* COMPONENT WALLS, FLOORS, *DOORS*, *FENESTRATIONS*, AND QII**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Above Grade Framed Walls[3c]	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.065	U 0.065	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048
Above Grade Masonry/ Mass Wall Interior[5,6e,f]	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.059 R 17
Above Grade Masonry/ Mass Wall Exterior[4,5,6e,f]	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.077 R 13
Below Grade Interior Walls[7g]	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.067 R 15
Below Grade ExteriorWalls[7g]	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.100 R 10	U 0.100 R 10	U 0.053 R 19
Slab Perimeter Floors	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	F-0.58 R 7.0
Raised Floors	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19
Concrete *Raised Floors*	U 0.092 R 8.0	U 0.092 R 8.0	U 0.269 R 0	U 0.269 R 0	U .269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0
Fenestration - Maximum U-factor[8h]	0.27	0.27	0.27	0.27	0.27	0.30	0.30	0.30	0.30	0.30	0.27	0.27	0.27	0.27	0.30	0.27
Fenestration - Maximum *SHGC*	NR	0.23	NR	0.23	NR	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.20	NR
Fenestration - Maximum Total Area	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Fenestration - Maximum West Facing Area	NR	5%	NR	5%	NR	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	NR
Door - Maximum *U-Factor*	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Quality Insulation Installation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Footnotes to Table 302.3(1) *[Table 150.1-A]*:

a. Install the specified *R-value* with an air space present between the roofing and the *roof* deck, such as standard installation of concrete or clay tile.

b. *R-values* shown for below *roof* deck insulation are for wood-frame construction with insulation installed between the framing members. Alternatives including insulation above rafters or above *roof* deck shall comply with the performance standards.

c. Assembly *U-factors* for exterior framed walls can be met with cavity insulation alone or with *continuous insulation* alone, or with both cavity and *continuous insulation* that results in an assembly *U-factor* equal to or less than the *U-factor* shown. Use Reference Joint Appendices JA4 Table 4.3.1, 4.3.1(a), or Table 4.3.4 to determine alternative insulation products to be less than or equal to the required maximum *U-factor*.

d. Assembly *U-factors* for *roofs* can be met with cavity insulation alone or with *continuous insulation* alone, or with both cavity and *continuous insulation* that results in an assembly *U-factor* equal to or less than the *U-factor* shown. Use Reference Joint Appendices JA4 Table 4.2.2 to determine alternative insulation products to be less than or equal to the required maximum *U-factor*. *R-values* shown represent the required insulation to meet the maximum *U-factor* with cavity insulation alone.

e. Mass wall has a *heat capacity* greater than or equal to 7.0 Btu/h-ft^2.

f. "Interior" denotes insulation installed on the inside surface of the wall. "Exterior" denotes insulation installed on the exterior surface of the wall.

g. Below grade "interior" denotes insulation installed on the inside surface of the wall, and below grade "exterior" denotes insulation installed on the outside surface of the wall.

h. New *dwelling units* with a *conditioned floor area* of 500 square feet or less in Climate Zone 5 may comply with a maximum *U-factor* of 0.30.

i. Option B meets Section 402.3.3.1 *[Section 150.1(c)9A]*

j. Option C meets Section 402.3.3.2 *[Section 150.1(c)9B]*

~~Footnotes to Table 302.3-A(1) *[Table 150.1-A]*:~~

~~1. Install the specified *R-value* with an air space present between the roofing and the *roof* deck, such as standard installation of concrete or clay tile.~~

~~2. *R-values* shown for below *roof* deck insulation are for wood-frame construction with insulation installed between the framing members. Alternatives including insulation above rafters or above *roof* deck shall comply with the performance standards.~~

~~3. Assembly *U-factors* for exterior framed walls can be met with cavity insulation alone or with *continuous insulation* alone, or with both cavity and *continuous insulation* that results in an assembly *U-factor* equal to or less than the *U-factor* shown. Use Reference Joint Appendices JA4 Table 4.3.1, 4.3.1(a), or Table 4.3.4 to determine alternative insulation products to be less than or equal to the required maximum *U-factor*.~~

~~4. Assembly *U-factors* for *roofs* can be met with cavity insulation alone or with *continuous insulation* alone, or with both cavity and *continuous insulation* that results in an assembly *U-factor* equal to or less than the *U-factor* shown. Use Reference Joint Appendices JA4 Table 4.2.2 to determine alternative insulation products to be less than or equal to the required maximum *U-factor*. *R-values* shown represent the required insulation to meet the maximum *U-factor* with cavity insulation alone.~~

~~5. Mass wall has a *heat capacity* greater than or equal to 7.0 Btu/h-ft^2.~~

~~6. "Interior" denotes insulation installed on the inside surface of the wall. "Exterior" denotes insulation installed on the exterior surface of the wall.~~

7. Below grade “interior” denotes insulation installed on the inside surface of the wall, and below grade “exterior” denotes insulation installed on the outside surface of the wall.
8. New *dwelling units* with a *conditioned floor area* of 500 square feet or less in Climate Zone 5 may comply with a maximum *U-factor* of 0.30.
9. Option B meets Section 402.3.3.1 *[Section 150.1(c)9A]*
10. Option C meets Section 402.3.3.2 *[Section 150.1(c)9B]*

302.3.7 *[Section 150.1(c)11]* **Roofing products.**

All *roofing products* shall meet the requirements of Section 300.3 *[Section 110.8]* and the applicable requirements of Section 302.3.7.1 or 302.3.7.2.

Exception 1 to Section 302.3.7: *Building* integrated photovoltaic panels and *building* integrated solar thermal panels are not required to comply with the minimum requirements for aged *solar reflectance* and *thermal emittance* or *SRI*.

Exception 2 to Section 302.3.7: *Roof* constructions with a weight of at least 25 lb/ft² are not required to comply with the minimum requirements for aged *solar reflectance* and *thermal emittance* or *SRI*.

302.3.7.1 *[Section 150.1(c)11A]* **Steep-sloped roofs in ~~c~~Climate ~~z~~Zones 10 through 15.**

Steep-sloped roofs in *~~C~~climate ~~z~~Zones* 10 through 15 shall have:

1. A minimum aged *solar reflectance* of 0.20 and a minimum *thermal emittance* of 0.75, or
2. A minimum *SRI* of 16.

302.3.7.2 *[Section 150.1(c)11B]* **Low-sloped roofs in C~~c~~limate ~~z~~Zones 13 and 15.**

Low-sloped roofs in *~~c~~Climate ~~z~~Zones* 13 and 15 shall have:

1. A minimum aged *solar reflectance* of 0.63 and a minimum *thermal emittance* of 0.75 or
2. A minimum *SRI* of 75.

302.4 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

302.5 *[Section 150.2]* **Additions and alterations to existing buildings.**

302.5.1 *[Section 150.2(a)]* **Additions.**

Additions to existing *single-family use designations~~residential buildings~~* shall meet the mandatory requirements of Section 302.5.1.1, and either prescriptive requirements of Section 302.5.1.2 or performance requirements of Section 302.5.1.3 *[Section 150.2(a)1 or 2]*.

302.5.1.1 *[Section 150.2(a)]* **Mandatory requirements (Additions).**

The *envelope* of the *addition* shall meet the requirements of the sections listed below:

101.2, 101.3, 101.4 *[Section 110.0, 110.1, 110.5]* Systems and Equipment

300.1, 300.2, 300.3, 302.2 *[Section 110.6, 110.7, 110.8, 150.0]* Mandatory Requirements for *Envelopes*

~~**Exception to Section 302.5.1.1:** Existing 2 x 4 inch framed walls already insulated to a *U-factor* not exceeding U-0.110 or already insulated between framing members with insulation having an installed *thermal resistance* of R-11 or greater do not need to comply with Section 302.2.3.1.~~

302.5.1.2 *[Section 150.2(a)1]* **Prescriptive requirements (Additions).**

302.5.1.2.1 *[Section 150.2(a)1A]* **Additions greater than 700 square feet.**

Additions that are greater than 700 square feet shall meet the requirements of Section 302.3 *[Section 150.1(c)]*, with the following modifications:

1. Extensions of existing wood-framed walls may retain the dimensions of the existing walls and shall install cavity insulation of R-15 in a 2x4 framing and R-21 in a 2x6 framing.
2. The maximum allowed *fenestration area* shall be the greater of 175 square feet or 20 percent of the *addition* floor area, and the maximum allowed *west-facing fenestration area* shall be the greater of 70 square feet or the requirements of Section 302.3 *[Section 150.1(c)]*.
3. *Alterations* that add *fenestration area* shall have a Maximum *SHGC* value of 0.23 in Climate Zone 15.
4. When existing siding of a wood-framed wall is not being removed or replaced, cavity insulation of R-15 in a 2x4 framing and R-21 in a 2x6 framing shall be installed and *continuous insulation* is not required.
5. *Additions* that consist of the conversion of existing spaces from unconditioned to *conditioned space* shall not be required to perform the following as part of QII:
    5.1. Existing *window* and *door* headers shall not be required to be insulated.
    5.2. Air sealing shall not be required when the existing *air barrier* is not being removed or replaced.

302.5.1.2.2 *[Section 150.2(a)1B]* **Additions 700 square feet or less.**

Additions that are 700 square feet or less shall meet the requirements of Section 302.3 *[Section 150.1(c)]*, with the following modifications:

1. *Roof* and ceiling insulation in a ventilated *attic* shall meet one of the following requirements:
    1.1. In *Climate Zones* 1, 2, 4, and 8 through 16, achieve an overall assembly *U-factor* not exceeding 0.025. In wood-framed assemblies, compliance with *U-factors* may be demonstrated by installing insulation with an *R-value* of R-38 or greater.
    1.2. In *Climate Zones* 3, and 5 through 7, achieve an overall assembly *U-factor* not exceeding 0.031. In wood-framed assemblies, compliance with *U-factors* may be demonstrated by installing insulation with an *R-value* of R-30 or greater.
2. *Radiant barriers* shall be installed in *Climate Zones* 2-15.

3. Extensions of existing wood-framed walls may retain the dimensions of the existing walls and shall install cavity insulation of R-15 in a 2×4 framing and R-21 in a 2×6 framing.
4. In *Climate Zones* 2, 4 and 6-15; the maximum allowed *west-facing fenestration area* shall not be greater than 60 square feet; and shall also comply with the requirements below:
   4.1. For *additions* that are 700 square feet or less but greater than 400 square feet, the maximum allowed *fenestration area* limit is the greater of 120 square feet or 25 percent of the *conditioned floor area* of the *addition*; or
   4.2. For *additions* that are 400 square feet or less, the maximum allowed *fenestration area* is the greater of 75 square feet or 30 percent of the *conditioned floor area* of the *addition*.
5. Quality Insulation Installation (QII) requirements of Section 302.3.1.5 *[Section 150.1(c)1E]* do not apply.
6. When existing siding of a wood-framed wall is not being removed or replaced, cavity insulation of R-15 in a 2×4 framing and R-21 in a 2×6 framing shall be installed, and *continuous insulation* is not required.

Exception 1 to Section 302.5.1.2.2: *Additions* of 300 square feet or less are not required to comply with the roofing requirements of Section 302.3.7 *[Section 150.1(c)11]*.

Exception 2 to Section 302.5.1.2.2: Insulation in an enclosed rafter ceiling shall meet the requirements of Section 302.2.1 *[Section 150.0]*.

302.5.1.3 *[Section 150.2(a)2]* **Performance requirements (Additions).**

Additions using the ~~P~~performance ~~calculations~~ compliance ~~shall~~approach shall meet the requirements of Section 102 for the *addition* alone or for the existing *building* plus *addition*.

302.5.2 *[Section 150.2(b)]* **Alterations.**

Alterations to existing *single-family use designations* ~~*residential buildings*~~ or *alterations* in conjunction with a change in *building occupancy* to a *single-family* ~~*residential*~~ *occupancy* shall meet mandatory requirements of Section 302.5.2.1, and either prescriptive requirements of Section 302.5.2.2 or performance requirements of Section 302.5.2.3.

Exception 1 to Section 302.5.2: Any dual-glazed *greenhouse or garden window* installed as part of an *alteration* complies with the *U-factor* requirements in Section 302.3.3 *[Section 150.1(c)3]*.

Exception 2 to Section 302.5.2: Where the space in the *attic* or rafter area is not large enough to accommodate the required *R-value*, the entire space shall be filled with insulation provided such installation does not violate Section 1203.2 of Title 24, Part 2.

302.5.2.1 *[Section 150.2(b)]* **Mandatory requirements (Alterations).**

The altered *envelope* component and any newly installed *equipment* serving the *alteration* shall meet the applicable requirements of the sections listed below:

101.2, 101.3, 101.4 *[Section 110.0, 110.1, 110.5]* Systems and Equipment

300.1, 300.2, 300.3, 302.2 *[Section 110.6, 110.7, 110.8, 150.0]* Mandatory Requirements for *Envelopes*

Exception 1 to Section 302.~~2.1.2~~5.2.1: Ceilings and rafter *roofs* in an *alteration* shall be insulated to achieve an area-weighted average *U-factor* not exceeding 0.054 or shall be insulated between wood-framing members with insulation resulting in an installed *thermal resistance* of R-19 or greater. For vented *attics*, the mandatory insulation shall be installed at the ceiling level; for unvented *attics*, the mandatory insulation shall be placed at either ceiling or *roof* level.

Exception 2 to Section 302.5.2.1: Existing 2 x 4 inch framed walls already insulated to a *U-factor* not exceeding U-0.110 or already insulated between framing members with insulation having an installed *thermal resistance* of R-11 or greater do not need to comply with Section 302.2.3.1.

302.5.2.2 *[Section 150.2(b)1]* **Prescriptive requirements (Alterations).**

302.5.2.2.1 *[Section 150.2(b)1A]* **Added fenestration.**

Alterations that add *vertical fenestration* and *skylight area* shall meet the total *fenestration area* and west facing *fenestration area*, *U-factor*, and *Solar Heat Gain Coefficient* requirements of Section 302.3.3.1 *[Section 150.1(c)3A]* and Table 302.3~~-A~~(1) *[TABLE 150.1-A]*.

Exception 1 to Section 302.5.2.2.1: *Alterations* that increases *fenestration area* shall have a Maximum *SHGC* value of 0.23 in Climate Zone 15.

Exception 2 to Section 302.5.2.2.1: *Alterations* that add up to 16 square feet of new *fenestration* or *skylight area* shall not be required to meet the total *fenestration area* and *west-facing fenestration area* requirements of Section 302.3.3.2 and 302.3.3.3 *[Sections 150.1(c)3B and C]*.

302.5.2.2.2 *[Section 150.2(b)1B]* **Replacement fenestration.**

New *manufactured fenestration products* installed to replace existing *fenestration products* of the same total area shall meet the *U-factor* and *Solar Heat Gain Coefficient* requirements of Section 302.3.3.1 *[Section 150.1(c)3A]*, and Section 302.3.4 *[Section 150.1(c)4]*.

Exception 1 to Section 302.5.2.2.2: Replacement of *vertical fenestration* no greater than 75 square feet with a *U-factor* no greater than 0.40 in *Climate Zones* 1-16, and a *SHGC* value no greater than 0.35 in *Climate Zones* 2, 4, and 6 through 15.

Exception 2 to Section 302.5.2.2.2: Replaced *skylights* must meet a *U-factor* no greater than 0.40, and a *SHGC* value no greater than 0.30.

Exception 3 to Section 302.5.2.2.2: Replacement of *vertical fenestration* greater than 75 square feet shall have a maximum *SHGC* value no greater than 0.23 in Climate Zone 15.

NOTE: Glass replaced in an existing sash and frame or sashes replaced in an existing frame are considered *repairs*, provided that the replacement is at least equivalent to the original in performance.

302.5.2.2.3 *[Section 150.2(b)1I]* **Roofing products and insulation.**

Replacements of more than 50 percent of the exterior surface of existing *roofs*, including adding a new surface layer on top of the existing exterior surface, shall meet the requirements of Section 300.3 *[Section 110.8]* and the applicable requirements below ~~where more than 50 percent of the *roof* is being replaced~~.

302.5.2.2.3.1- *Steep-sloped roofs – roofing products*. New *roofing products* on *steep-sloped roofs* in *Climate Zones* 4 and 8 through 15 shall have:

1. a minimum aged *solar reflectance* of 0.20 and a minimum *thermal emittance* of 0.75, or
2. a minimum *SRI* of 16.

Exception 1 to Section 302.5.2.2.3.1: The following shall be considered equivalent for compliance:

1. *Buildings* with ceiling assemblies with a *U-factor* lower than or equal to 0.025 or that are insulated with at least R-38 ceiling insulation; or
2. *Buildings* with a *radiant barrier* in the *attic*, where the *radiant barrier* is not installed directly above spaced sheathing, meeting the requirements of Section 302.3.2 *[Section 150.1(c)2]*; or
3. In *Climate Zones* 2, 4, 9, 10, 12 and 14, *buildings* that have no ducts in the *attic*; or
4. *Buildings* with R-2 or greater *continuous insulation* above or below the *roof* deck.

Exception 2 to Section 302.5.2.2.3.1: *Roof* area covered by *building* integrated photovoltaic panels or *building* integrated solar thermal panels is not required to meet minimum requirements for aged *solar reflectance*, *thermal emittance* or *SRI*.

Exception 3 to Section 302.5.2.2.3.1: *Roof* constructions with a weight of at least 25 lb/ft^2 are not required to comply with the minimum requirements for aged *solar reflectance* and *thermal emittance*, or *SRI*.

302.5.2.2.3.2- *Low-sloped roofs – roofing products*. New *roofing products* on *low-sloped roofs* in *Climate Zones* 4 and 6 through 15 shall have:

1. An aged *solar reflectance* equal to or greater than 0.63 and a *thermal emittance* equal or greater than 0.75, or
2. A minimum *SRI* of 75.

Exception 1 to Section 302.5.2.2.3.2: The aged *solar reflectance* can be met by using insulation at the *roof* deck specified in Table 302.5~~-A~~(1) *[Table 150.2-E]*.

TABLE 302.5(1) ~~A~~ [TABLE 150.2-E] AGED SOLAR REFLECTANCE INSULATION TRADE OFF TABLE

MINIMUM AGED *SOLAR REFLECTANCE*	***ROOF* DECK *CONTINUOUS INSULATION R-VALUE* (*CLIMATE ZONES* 6-7)**	***ROOF* DECK *CONTINUOUS INSULATION R-VALUE* (*CLIMATE ZONES* 2, 4, 8-15)**
0.60	2	16
0.55	4	18
0.50	6	20
0.45	8	22
No Requirement	10	24

Exception 2 to Section 302.5.2.2.3.2: *Roof* area covered by *building* integrated photovoltaic panels or *building* integrated solar thermal panels is not required to meet the minimum requirements for aged *solar reflectance*, *thermal emittance* or *SRI*.

Exception 3 to Section 302.5.2.2.3.2: *Roof* constructions with a weight of at least 25 lb/ft^2 are not required to comply with the minimum requirements for aged *solar reflectance* and *thermal emittance*, or *SRI*.

302.5.2.2.3.3- *Low-sloped roofs* – insulation. *Roofs* shall be insulated to the levels specified in Table 302.5~~-B~~(2) *[Table 150.2-F]*.

TABLE 302.5(2)~~-B~~ [TABLE 150.2-F] INSULATION REQUIREMENTS FOR LOW-SLOPED ROOF ALTERATIONS

CLIMATE ZONE	*CONTINUOUS INSULATION R-VALUE*	*ROOF* ASSEMBLY *U-FACTOR*
3, 5-7	NR	NR
1, 2, 4, 8-16	R-14	0.039

Exception 1 to Section 302.5.2.2.3.3: Existing *roofs* with R-10 or greater *continuous insulation* above or below the *roof* deck.

Exception 2 to Section 302.5.2.2.3.3: Existing *roofs* with an assembly *U-factor* of 0.056 or less or that are insulated with at least R-19 insulation between the *roof* rafters and in contact with the *roof* deck in *Climate Zones* 1, 2, 4, and 8 through 10.

Exception 3 to Section 302.5.2.2.3.3: The *continuous insulation* requirements of Table 302.5~~-B~~(2) *[Table 150.2-F]* may be reduced to R-4 where the following conditions are met:

1. Mechanical *equipment* is located on the *roof* and will not be temporarily disconnected and lifted as part of the *roof replacement* and the addition of insulation required by Table 302.5~~-B~~(2) *[Table 150.2-F]* would reduce the height from the *roof* surface to the top of the base flashing to less than that set forth in the manufacturer's installation instructions as per California Residential Code Section R900; or
2. Replaced roofing abuts sidewall or parapet walls and the addition of insulation required by Table 302.5~~-B~~(2) *[Table 150.2-F]* would reduce the height from the *roof* surface to the top of the base flashing to less than that set forth in the manufacturer's installation instructions as per the California Residential Code Section R900, provided that the following conditions apply:
    2.1. The sidewall or parapet walls are finished with an exterior cladding material other than the *roof* covering membrane material; and
    2.2. The sidewall or parapet walls have exterior cladding material that must be removed to install the new *roof* covering membrane to maintain the minimum base flashing height; and
    2.3. The ratio of the replaced *roof* area to the linear dimension of affected sidewall or parapet walls is less than 25 square feet per linear foot.

Exception 4 to Section 302.5.2.2.3.3: The *continuous insulation* requirements per Table 302.5~~-B~~(2) *[Table 150.2-F]* may be reduced where increasing the thickness of above deck insulation would reduce the flashing around an existing *exterior wall* opening below what is permitted by the *fenestration* or *door* manufacturer's installation instructions, or registered design professionals approved flashing design, as per the California Residential Code Section R703.4, or by California Residential Code Section R905.2.8.3.

Exception 5 to Section 302.5.2.2.3.3: Tapered insulation with *thermal resistance* less than prescribed at the drains and other low points may be used provided that the thickness of insulation is increased at the high points of the *roof* so that the average *thermal resistance* equals or exceeds the required value.

302.5.2.2.4 *[Section 150.2(b)1J]* **Vented attics.**

Vented *attics* shall meet the requirements of 302.5.2.2.4.1 through 302.5.2.2.4.4.

Exception 1 to Section 302.5.2.2.4: *Dwelling units* with at least R-38 existing insulation installed at the ceiling level.

Exception 2 to Section 302.5.2.2.4: *Dwelling units* where the *alteration* would directly cause the disturbance of asbestos.

Exception 3 to Section 302.5.2.2.4: *Dwelling units* with knob and tube wiring located in the vented *attic*.

Exception 4 to Section 302.5.2.2.4: Where the *accessible* space in the *attic* is not large enough to accommodate the required *R-value*, the entire *accessible* space shall be filled with insulation provided such installation does not violate Section 806.3 of Title 24, Part 2.5.

Exception 5 to Section 302.5.2.2.4: Where the *attic* space above the altered *dwelling unit* is shared with other *dwelling units* and the requirements of Section 302.5.2.2.4 *[Section 150.2(b)1J]* are not triggered for the other *dwelling units*.

302.5.2.2.4.1- In *Climate Zones* 1 through 4, 6, and 8 through 16, insulation shall be installed to achieve a weighted *U-factor* of 0.020 or insulation installed at the ceiling level shall result in an insulated *thermal resistance* of R-49 or greater for the insulation alone; and

Exception to Section 302.5.2.2.4.1: In *Climate Zones* 1, 3, and 6, *dwelling units* with at least R-19 existing insulation installed at the ceiling level.

302.5.2.2.4.2- In *Climate Zones* 2, 4, and 8 through 16 air seal all *accessible* areas of the ceiling plane between the *attic* and the *conditioned space* in accordance with Section 300.2 *[Section 110.7]*; and

Exception 1 to Section 302.5.2.2.4.2: *Dwelling units* with at least R-19 existing insulation installed at the ceiling level.

Exception 2 to Section 302.5.2.2.4.2: *Dwelling units* with atmospherically vented space heating or water heating combustion appliances located inside the *pressure boundary* of the *dwelling unit*.

302.5.2.2.4.3- In *Climate Zones* 1 through 4 and 8 through 16, recessed downlight *luminaires* in the ceiling shall be covered with insulation to the same depth as the rest of the ceiling. *Luminaires* not rated for insulation contact must be replaced or retrofitted with a fireproof cover that allows for insulation to be installed directly over the cover; and

Exception to Section 302.5.2.2.4.3: In *Climate Zones* 1 through 4 and 8 through 10, *dwelling units* with at least R-19 existing insulation installed at the ceiling level.

302.5.2.2.4.4- *Attic* ventilation shall comply with the California Residential Code, Title 24, Part 2.5, Section R806 and Title 24, Part 7.

302.5.2.2.5 *[Section 150.2(b)1N]* **Exterior doors.**

Alterations that add exterior *door area* shall meet the *U-factor* requirement of Section 302.3.5 *[Section 150.1(c)5]*.

302.5.2.3 *[Section 150.2(b)2]* **Performance requirements (Alterations).**

Alterations and any newly installed equipment using the performance compliance approach ~~The *altered component*(*s*) and any newly installed *equipment* serving the *alteration*~~ shall meet the applicable requirements of Section 102.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 303

MULTIFAMILY OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

303.1 *[Section 160.0]* **General.**

Multifamily building envelopes shall comply with the applicable requirements of Section 303. Section 303 applies to *dwelling units* and *common use areas* in *multifamily buildings*. Nonresidential *use designations*~~occupancies~~ in a mixed *occupancy building* shall comply with nonresidential requirements in Section 301.

NOTE: The requirements of Sections 303.2 through 303.4 apply to *newly constructed buildings*. Sections 303.2 and 303.5 apply to *additions* or *alterations*.

303.2 *[Section 160.1]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

303.2.1 *[Section 160.1(a)]* **Ceiling and roof insulation.**

The opaque portions of ceilings and *roofs* separating *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the requirements of Section 303.2.1.1 or 303.2.1.2, and Section 303.2.1.3 through Section 303.2.1.5.

303.2.1.1 *[Section 160.1(a)1]* **Attic roof.**

Roofs with an *attic* space shall be insulated to achieve an area-weighted average *U-factor* not exceeding U-0.043 or shall be insulated between wood-framing members with insulation resulting in an installed *thermal resistance* of R-22 or greater for the insulation alone. For vented *attics*, the mandatory insulation shall be installed at the ceiling level; for unvented *attics*, the mandatory insulation shall be placed at either ceiling or *roof* level~~meet the requirements of 1 through 3 below:~~

~~1. Shall be insulated to achieve an area-weighted average *U-factor* not exceeding U-0.043 or shall be insulated between wood-framing members with insulation resulting in an installed *thermal resistance* of R-22 or greater for the insulation alone. For vented *attics*, the mandatory insulation shall be installed at the ceiling level; for unvented *attics*, the mandatory insulation shall be placed at either ceiling or *roof* level;~~

~~2. Attic access doors shall have permanently attached insulation using adhesive or mechanical fasteners. The *attic* access shall be gasketed to prevent air leakage; and~~

~~3. When loose-fill insulation is installed, the minimum installed weight per square foot shall conform with the insulation manufacturer's installed design weight per square foot at the manufacturer's labeled *R-value*.~~

303.2.1.2 *[Section 160.1(a)2]* **Non-attic roof.**

Roofs without *attic* spaces shall meet the applicable requirements below:

1. ***Metal building*.** The area-weighted average *U-factor* of the *roof* assembly shall not exceed 0.098.
2. **Wood--framed and others.** The area-weighted average *U-factor* of the *roof* assembly shall not exceed 0.075.

303.2.1.2.1 *[Section 160.1(a)2C]* **Insulation placement.**

When insulation is installed at the *roof*, fixed vents or openings to the outdoors or to *unconditioned spaces* shall not be installed. When the space between the ceiling and the *roof* is either directly or *indirectly conditioned space*, it shall not be considered an *attic* for the purposes of complying with *CBC attic* ventilation requirements.

Exception to Section 303.2.1.2.1: Vents that do not penetrate the *roof* deck and are instead designed for wind resistance for *roof* membranes are not within the scope of Section 303.2.1.2.1.

303.2.1.3 *[Section 160.1(a)1B]* **Attic access doors.**

Attic access *doors* shall have permanently attached insulation using adhesive or mechanical fasteners. The *attic* access shall be gasketed to prevent air leakage.

303.2.1.43 *[Section 160.1(a)3]* **Insulation placement.**

Insulation shall be installed in direct contact with a *roof* or ceiling that is sealed to limit *infiltration* and *exfiltration* as specified in Section 300.2 *[Section 110.7]*, including but not limited to placing insulation either above or below the *roof* deck or on top of a drywall ceiling.

303.2.1.5 *[Section 160.1(a)1C]* **Loose-fill insulation.**

When loose-fill insulation is installed, the minimum installed weight per square foot shall conform with the insulation manufacturer's installed design weight per square foot at the manufacturer's labeled *R-value*.

303.2.2 *[Section 160.1(b)]* **Wall insulation.**

Opaque portions of above grade walls separating *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the following applicable requirements:

1. ***Metal building*.** The area-weighted average *U-factor* of the wall assembly shall not exceed 0.113.
2. **Metal--framed.** The area-weighted average *U-factor* of the wall assembly shall not exceed 0.151.
3. **Wood--framed and others.**
   3.1. Nominal 2x4 inch framing shall have an area-weighted average *U-factor* of the wall assembly not exceeding 0.095.
   3.2. Nominal 2x6 inch framing shall have an area-weighted average *U-factor* of the wall assembly not exceeding 0.069.

3.3. Other wall assemblies shall have an area-weighted average *U-factor* of the wall assembly not exceeding 0.102.

4. **Light mass walls.** A 6 inch or greater hollow core concrete masonry unit shall have a *U-factor* not to exceed 0.440.

5. **Heavy mass walls.** An 8 inch or greater hollow core concrete masonry unit shall have a *U-factor* not to exceed 0.690.

6. ***Spandrel* panels and *curtain wall*.** The area-weighted average *U-factor* of the *spandrel* panels and *curtain wall* assembly shall not exceed 0.280.

7. **Demising walls.** The opaque portions of framed demising walls shall meet the requirements below:

   7.1. Wood-framed walls shall be insulated to meet a *U-factor* not greater than 0.099.

   7.2. Metal-framed walls shall be insulated to meet a *U-factor* not greater than 0.151.

8. **Bay or Bow *windows*.** Bay or bow *window roofs* and floors shall be insulated to meet the wall insulation requirements of Table 303.3-A(1) *[Table 170.2-A]*.

303.2.3 *[Section 160.1(c)]* **Floor and soffit insulation.**

The opaque portions of floors and soffits that separate *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the applicable requirements below:

1. **Raised mass floors.** Raised mass floors shall have a minimum of 3 inches of lightweight concrete over a metal deck or the area-weighted average *U-factor* of the floor assembly shall not exceed 0.269.

2. **Raised wood floors.** Raised wood floors shall have an overall assembly *U-factor* not exceeding 0.037. In a wood-framed assembly, compliance with the *U-factor* may be demonstrated by installing insulation with an *R-value* of 19 or greater.

3. **Other floors.** The area-weighted average *U-factor* of the floor assembly shall not exceed 0.071.

4. **Heated slab on grade floor.** A heated slab on grade floor shall be insulated to meet the requirements of Section 300.3.5 *[Section 110.8(g)]*.

Exception to Section 303.2.3: A *building* with a controlled ventilation or unvented *crawl space* may omit *raised floor* insulation if all of the following are met:

1. The foundation walls are insulated to meet the wall insulation minimums requirements as shown in Table 303.3-A(1) *[Table 170.2-A]*; and

2. A Class I or Class II vapor retarder is placed over the entire floor of the *crawl space*; and

3. Vents between the *crawl space* and *outside air* are fitted with automatically operated louvers that are temperature actuated; and

4. The requirements in Reference Residential Appendix RA4.5.1.

303.2.4 *[Section 160.1(d)]* **Vapor retarder.**

In *Climate Zones* 1–16, the earth floor of unvented *crawl space* shall be covered with a Class I or Class II vapor retarder. This requirement shall also apply to controlled ventilation *crawl space* for *buildings* complying with the Exception to Section 303.2.3 *[Section 160.1(c)]*.

In *Climate Zones* 14 and 16, a Class I or Class II vapor retarder shall be installed on the *conditioned space* side of all insulation in all *exterior walls*, vented *attics* and unvented *attics* with air-permeable insulation.

303.2.5 *[Section 160.1(e)]* **Fenestration products.**

Fenestration separating *conditioned space* from *unconditioned space* or outdoors shall meet the requirements of either Section 303.2.5.1 or 303.2.5.2.

Exception to Section 303.2.5: *Fenestration* installed in *buildings* meeting Part 7 of the California *Building* Code, California Wildland-Urban Interface Code, where the *building* is located in Fire Hazard Severity Zones or Wildland-Urban Interface (WUI) Fire Areas as designated by the local *enforcement agency*.

303.2.5.1 *[Section 160.1(e)1]* **Maximum U-factor of fenestration products.**

Fenestration, including *skylight* products, must have a maximum *U-factor* of 0.58.

Exception 1 to Section 303.2.5.1: Up to 0.5 percent of the *conditioned floor area* is not required to comply with the maximum *U-factor* requirement.

Exception 2 to Section 303.2.5.1: For dual-glazed *greenhouse or garden windows*, up to 30 square feet of *fenestration area* per *dwelling unit* is not required to comply with the maximum *U-factor* requirement.

303.2.5.2 *[Section 160.1(e)2]* **Maximum area-weighted average U-factor.**

The area-weighted average *U-factor* of all *fenestration*, including *skylight* products, shall not exceed 0.58.

303.2.6 *[Section 160.1(g)]* **Slab edge Insulation.**

Slab edge insulation shall meet the following minimum specifications:

1. Insulation material alone without the facing shall have a water absorption rate no greater than 0.3 percent when tested in accordance with *ASTM C272*, Test Method A – 24-Hour-Immersion; and
2. Water vapor permeance no greater than 2.0 perm/inch when tested in accordance with *ASTM C272*; and
3. Concrete slab perimeter insulation shall be protected from physical damage and ultraviolet light deterioration; and
4. Insulation for a *heated slab floor* shall meet the requirements of Section 300.3.5 *[Section 110.8(g)]*.

303.3 *[Section 170.2]* **Prescriptive requirements (Newly Constructed)**

303.3.1 *[Section 170.2(a)]* **Envelope component requirements.**

Installed components shall meet the applicable requirements of Sections 303.3.1.1 through 303.3.1.8.

Exception to Section 303.3.1: The insulation requirements of Table 303.3~~-A~~(1) *[Table 170.2-A]* may be met by ceiling, *roof* deck, wall or floor assemblies that meet the required maximum *U-factors* using a *U-factor* calculation method that considers the thermal effects of all elements of the assembly and is approved by the *Executive Director*.

303.3.1.1 *[Section 170.2(a)1]* **Exterior roofs and ceilings.**

Exterior *roofs* and ceilings shall comply with each of the applicable requirements in this subsection:

303.3.1.1.1 *[Section 170.2(a)1A]* **Roofing products.**

All *roofing products* shall meet the requirements of Section 300.3 *[Section 110.8]* and the applicable minimum aged *solar reflectance* and *thermal emittance* requirements of Table 303.3~~-A~~(1) *[Table 170.2-A]*.

Exception 1 to Section 303.3.1.1.1: *Roof* area covered with *building* integrated photovoltaic panels and *building* integrated solar thermal panels are not required to comply with the minimum requirements for *solar reflectance* and *thermal emittance* or *SRI*.

Exception 2 to Section 303.3.1.1.1: *Roof* constructions with a weight of at least 25 lb/ft² are not required to comply with the minimum requirements for *solar reflectance* and *thermal emittance* or *SRI*.

303.3.1.1.2 *[Section 170.2(a)1B]* **Roof insulation.**

Roofs shall have an overall assembly *U-factor* no greater than the applicable value in Table 303.3~~-A~~(1) *[Table 170.2-A]*, meeting options A, B, C or D below. Where required by Section 300.3 *[Section 110.8]* and Section 303.2.1 *[Section160.1(a)]*, insulation shall be placed in direct contact with a continuous *roof* or drywall ceiling.

Option A: Reserved.

Option B: A minimum *R-value* of insulation installed between the *roof* rafters in contact with the *roof* deck and an additional layer of ceiling insulation located between the *attic* and the *conditioned space* when meeting Section 403.3.1.2.2.1 *[Section 170.2(c)3Biia]*; or

Option C: A minimum *R-value* of ceiling insulation located between the *attic* and the *conditioned space* when meeting Section 403.3.1.2.2.2 *[Section 170.2(c)3Biib]*.

Option D: A minimum *U-factor* for *roof* assemblies above *conditioned space* without *attic* space.

303.3.1.1.3 *[Section 170.2(a)1C]* **Radiant barrier.**

A *radiant barrier* required in Table 303.3~~-A~~(1) *[Table 170.2-A]* shall meet the requirements specified in Section 300.~~3.8~~5 *[Section 110.8(j)]* and shall meet the installation criteria specified in Reference Residential Appendix RA4.

303.3.1.1.4 Attic Ventilation.

Attic Ventilation shall comply with the California Residential Code, Title 24, Part 2.5, Section R806 and Title 24 Part 7.

303.3.1.2 *[Section 170.2(a)2]* **Wall insulation.**

***Exterior walls*.** *Exterior walls* shall have an overall assembly *U-factor* no greater than the applicable value in Table 303.3~~-A~~(1) *[Table 170.2-A]*.

Demising walls. Demising walls shall meet the requirements of Section 303.2.2 *[Section 160.1(b)7]*. Vertical *windows* in demising walls between conditioned and *unconditioned spaces* shall have an area-weighted average *U-factor* no greater than the applicable value in Table 303.3~~-A~~(1) *[Table 170.2-A]*.

303.3.1.3 *[Section 170.2(a)3A]* **Vertical fenestration and glazed doors in exterior walls.**

303.3.1.3.1 *[Section 170.2(a)3Ai]* **Percent fenestration area.**

Percent *fenestration area* shall be limited in accordance with the applicable requirements of 1 and 2 below:

1. A total *fenestration area* no greater than 20 percent of the *conditioned floor area*; and
2. A total *fenestration area* no greater than 40 percent of the *gross exterior wall area*.

NOTE: Demising walls are not *exterior walls*, and therefore demising wall area is not part of the *gross exterior wall area*, and *fenestration* in demising walls is not part of the *fenestration area* limitation.

303.3.1.3.2 *[Section 170.2(a)3Aii]* **Fenestration properties.**

Installed *fenestration products*, including *glazed doors*, shall have an area-weighted average *U-factor*, *Relative Solar Heat Gain Coefficient (RSHGC)*, and *Visible Transmittance (VT)* meeting the applicable *fenestration* values in Table 303.3~~-A~~(1) *[Table 170.2-A]*, or Equation 303.3-B for *VT [Equation 170.2-B]* ~~-~~and shall be determined in accordance with Section 300.1.1.2 *[Section 110.6(a)2]* and Section 300.1.1.3 *[Section 110.6(a)3]*.

Vertical fenestration in demising walls between conditioned and *unconditioned spaces* is only required to comply with the area-weighted average *U-factor* requirement in Table 303.3~~-A~~(1) *[Table 170.2-A]*.

Exception 1 to Section 303.3.1.3.2: For each *dwelling unit*, up to 3 square feet of new *glazing* area installed in *doors* shall not be required to meet the *U-factor* and *RSHGC* requirements of Table 303.3~~-A~~(1) *[Table 170.2-A]*.

Exception 2 to Section 303.3.1.3.2: For *fenestration* containing chromogenic type *glazing*:

1. The lower-rated labeled *U-factor* and *SHGC* shall be used with *automatic* controls to modulate the amount of solar gain and *light* transmitted into the space in multiple steps in response to daylight levels or solar intensity;
2. *Chromogenic glazing* shall be considered separately from other *fenestration*; and
3. Area-weighted averaging with other *fenestration* that is not chromatic shall not be permitted and shall be determined in accordance with Section 300.1.1 *[Section 110.6(a)]*.

Exception 3 to Section 303.3.1.3.2: For *dwelling units* containing unrated *site-built fenestration* that meets the maximum area restriction, the *U-factor* and *SHGC* can be determined in accordance with Nonresidential Reference Appendix NA6 or using default values in Table 300.1-~~A~~(1) *[Table 110.6-A]* and Table 300.1-~~B~~(2) *[Table 110.6-B]*.

Exception 4 to Section 303.3.1.3.2: *Fenestration* in *dwelling units* of *buildings* in *Climate Zones* 1, 3, 5 and 16 is not required to comply with the *RSHGC* requirements.

Exception 5 to Section 303.3.1.3.2: *Fenestration* in *dwelling units* is not required to comply with the *VT* requirements.

Exception 6 to Section 303.3.1.3.2: When the *window's* primary and *secondary sidelit daylit zones* are completely overlapped by one or more *skylit daylit zones*, then the *window* need not comply with Section 303.3.1.4 *[Section 170.2(a)3Aiv]*.

Exception 7 to Section 303.3.1.3.2: If the *window's VT* is not within the scope of *NFRC 200* or *ASTM E972*, then the *VT* shall be calculated according to Reference Nonresidential Appendix NA6.

Exception 8 to Section 303.3.1.3.2: For vertical *windows* containing chromogenic type *glazing*:

1. The higher rated labeled *VT* shall be used with *automatic* controls to modulate the amount of *light* transmitted into the space in multiple steps in response to daylight levels or solar intensity;
2. *Chromogenic glazing* shall be considered separately from other *glazing*; and
3. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted.

NOTE: Demising walls are not *exterior walls*, and therefore *windows* in demising walls are not subject to *VT* requirements.

$VT \geq 0.11/WWR$ (Equation 303.3-B *[Equation 170.2-B]*)

where:

WWR = *Window Wall Ratio*, the ratio of (i) the total *window area* of the *entire building* to (ii) the total *gross exterior wall area* of the *entire building*. If the *WWR* is greater than 0.40, then 0.40 shall be used as the value for *WWR* in Equation 303.3-B *[Equation 170.2-B]*.

VT = *Visible Transmittance* of framed *window*.

303.3.1.3.3 *[Section 170.2(a)3Aiii]* **Shading.**

Where Table 303.3-~~A~~(1) *[Table 170.2-A]* requires a maximum *RSHGC*, the requirements shall be met with an area-weighted average *RSHGC* excluding the effects of interior *shading*, no greater than the applicable value in Table 303.3-~~A~~(1) *[Table 170.2-A]*.

For the purposes of this paragraph, the *RSHGC* of a vertical *window* shall be determined according to Section 303.3.1.3.3.1 or 303.3.1.3.3.2.

303.3.1.3.3.1- The *solar heat gain coefficient* of the *window*.

303.3.1.3.3.2- *Relative solar heat gain coefficient* is calculated using Equation 303.3-A *[Equation 170.2-A]*, if the *window* has an *overhang* that extends beyond each side of the *window* jamb by a distance equal to the *overhang's* horizontal projection.

Exception 1 to Section 303.3.1.3.3.2: An area-weighted average *relative solar heat gain coefficient* of 0.56 or less shall be used for *windows*:

1. That are in the first story of *exterior walls* that form a *display perimeter*; and
2. For which codes restrict the use of *overhangs* to shade the *windows*.

Exception 2 to Section 303.3.1.3.3.2: For vertical *glazing* containing chromogenic type *glazing*:

1. The lower-rated labeled *RSHGC* shall be used with *automatic* controls to modulate the amount of heat flow into the space in multiple steps in response to daylight levels or solar intensity; and
2. *Chromogenic glazing* shall be considered separately from other *glazing*; and
3. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted.

NOTE: Demising walls are not *exterior walls*, and therefore *fenestration* in demising walls is not subject to *SHGC* requirements.

$RSHGC = SHGC \times [1 + a \times (2.72^{-PF} - 1) \times (\sin(b \times Az) + c)]$ (Equation 303.3-A *[Equation 170.2-A]*)

where:

Component	a	b	c
Overhang	0.150	0.008727	5.67
Exterior Horizontal Slat	0.144	0.008727	5.13

RSHGC = *Relative Solar Heat Gain Coefficient*.
SHGC = *Solar Heat Gain Coefficient* of the *vertical fenestration*.
Az = *Azimuth* of the *vertical fenestration* I degrees.
PF = Projection factor as calculated by Equation 301.3-C *[Equation 140.3-C]*.

~~**303.3.1.4 *[Section 170.2(a)3Aiv]* Vertical fenestration Visible Transmittance (VT).**~~

~~*Vertical fenestration* shall have an area-weighted average *Visible Transmittance (VT)* no less than the applicable value in Table 303.3-A *[Table 170.2-A]*, or Equation 303.3-B *[Equation 170.2-B]*, as applicable.~~

~~**Exception 1 to Section 303.3.1.4:** When the *window's* primary and *secondary sidelit daylit zones* are completely overlapped by one or more *skylit daylit zones*, then the *window* need not comply with Section 303.3.1.4 *[Section 170.2(a)3Aiv]*.~~

~~**Exception 2 to Section 303.3.1.4:** If the *window's VT* is not within the scope of *NFRC 200* or *ASTM E972*, then the *VT* shall be calculated according to Reference Nonresidential Appendix NA6.~~

Exception 3 to Section 303.3.1.4: For vertical *windows* containing chromogenic type *glazing*:

4. The higher rated labeled *VT* shall be used with *automatic* controls to modulate the amount of *light* transmitted into the space in multiple steps in response to daylight levels or solar intensity;

5. *Chromogenic glazing* shall be considered separately from other *glazing*; and

6. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted.

Exception 4 to Section 303.3.1.4: Fenestration in *dwelling units* is not required to comply with the *VT* requirements.

NOTE: Demising walls are not *exterior walls*, and therefore *windows* in demising walls are not subject to *VT* requirements.

VT ≥ 0.11/WWR (Equation 303.3-B *[Equation 170.2-B]*)

where:

WWR = *Window Wall Ratio*, the ratio of (i) the total *window area* of the *entire building* to (ii) the total *gross exterior wall area* of the *entire building*. If the *WWR* is greater than 0.40, then 0.40 shall be used as the value for *WWR* in Equation 303.3-B *[Equation 170.2-B]*.

VT = *Visible Transmittance* of framed *window*.

303.3.1.45 *[Section 170.2(a)3B]* **Skylights.**

303.3.1.45.1 *[Section 170.2(a)3Bi]* **Skylight area.**

The skylight roof ratio (SRR) *Skylights* shall have be an area no greater than 5 percent. of the *gross exterior roof area Skylight Roof Ratio (SRR)*.

Exception to Section 303.3.1.45.1: *Buildings* with an *atrium* over 55 feet high shall have a *skylight area* no greater than 10 percent of the *gross exterior roof area*.

303.3.1.45.2 *[Section 170.2(a)3Bii and Section 170.2(a)3Biii]* **U-factorFenestration Properties.**

Skylights shall have an area-weighted performance rating *U-factor* and *solar heat gain coefficient* no greater than the applicable value in Table 303.3-A(1) *[Table 170.2-A]*.

Exception 1 to Section 303.3.1.45.2: For each *dwelling unit* up to 16 square feet of new *skylight area* with a maximum *U-factor* of 0.55 and a maximum *SHGC* of 0.30.

Exception 2 to Section 303.3.1.45.2: For *skylights* containing chromogenic type *glazing*:

1. The lower-rated labeled *SHGC* shall be used with *automatic* controls to modulate the amount of heat flow into the space in multiple steps in response to daylight levels or solar intensity; and
2. *Chromogenic glazing* shall be considered separately from other *glazing*; and
3. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted.

303.3.1.5.3 *[Section 170.2(a)3Biii]* **Solar Heat Gain Coefficient (SHGC).**

~~*Skylights* shall have an area-weighted performance rating *solar heat gain coefficient* no greater than the applicable value in Table 303.3-A *[Table 170.2-A]*.~~

~~**Exception to Section 303.3.1.5.3:** For *skylights* containing chromogenic type *glazing*:~~

~~1. The lower rated labeled *SHGC* shall be used with *automatic* controls to modulate the amount of heat flow into the space in multiple steps in response to daylight levels or solar intensity; and~~

~~2. *Chromogenic glazing* shall be considered separately from other *glazing*; and~~

~~3. Area-weighted averaging with other *glazing* that is not chromogenic shall not be permitted.~~

303.3.1.4.3~~5.4 3~~ *[Section 170.2(a)3Biv]* **Haze value.**

Skylights shall have a *glazing* material or diffuser that has a measured haze value greater than 90 percent, determined according to *ASTM D1003* or other test method approved by the *Energy Commission*.

Exception to Section 303.3.1.~~5.4.~~3: *Skylights* designed and installed to exclude direct sunlight entering the occupied space by the use of *fixed* or automated baffles or the geometry of the *skylight* and *light* well.

303.3.1.5~~6~~ *[Section 170.2(a)4]* **Exterior doors, excluding Glazed Doors.**

All exterior *doors*, excluding *glazed doors*, that separate *conditioned space* from *unconditioned space* or from ambient air shall have a *U-factor* not greater than ~~the applicable value~~shown in Table 303.3~~-A~~(1) *[Table 170.2-A]*. *Glazed doors* must comply with the requirements of Section 303.3.1.3 *[Section 170.2(a)3A]*.

Exception to Section 303.3.1.6: Swinging *doors* that are required to have fire protection are not required to meet the ~~applicable~~ *door* value shown in Table 303.3~~-A~~(1) *[Table 170.2-A]*.

303.3.1.6~~7~~ *[Section 170.2(a)5]* **Floors.**

Floors shall meet the following requirements:

1. ***Raised floors*.** *Raised floors* shall be insulated such that the floor assembly has an assembly *U-factor* equal to or less than shown in Table 303.3~~-A~~(1) *[Table 170.2-A]*, or shall be insulated between wood framing with insulation having an *R-value* equal to or greater than shown in Table 303.3~~-A~~(1) *[Table 170.2-A]*.
2. **Slab floors.** Slab floors shall have perimeter insulation installed with an F-factor equal to or less than or *R-value* equal to or greater than shown in Table 303.3~~-A~~(1) *[Table 170.2-A]*. The minimum depth of concrete slab floor perimeter insulation shall be 16 inches or the depth of the footing of the *building*, whichever is less.

Exception to Section 303.3.1.6~~7~~: Raised-floor insulation may be omitted if the foundation walls are insulated to meet the wall insulation minimum~~s~~ requirements shown in Table 303.3~~-A~~(1) *[Table 170.2-A]*.

303.3.1.7~~8~~ *[Section 170.2(a)6]* **Quality Insulation Installation (QII).**

All *buildings* up to three *habitable stories* shall comply with the quality insulation installation (QII) requirements shown in Table 303.3~~-A~~(1) *[Table 170.2-A]*. When QII is required, insulation installation shall meet the criteria specified in Reference Appendix RA3.5.

303.3.2 *[Table 170.2-A]* **Multifamily standard building design.**

TABLE 303.3(1)~~-A~~ [TABLE 170.2-A] ENVELOPE COMPONENT PACKAGE – MULTIFAMILY STANDARD BUILDING DESIGN

***BUILDING* COMPONENT - *ROOFS* AND CEILINGS**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Option B[9i] Below *Roof* Deck Insulation [1,2a,b] (with air space)	NR	NR	NR	R19	NR	NR	NR	R19	R19	R13	R19	R19	R19	R19	R19	R13
Option B[9i] Ceiling Insulation	R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
Option B[9i] *Radiant Barrier*	NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
Option B[9i] Low-Sloped-Aged *Solar Reflectance*	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR
Option B[9i] Low-Sloped-Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR
Option B[9i] Low-Sloped-Solar *Reflectance* Index	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	75	NR	75	NR
Option B[9i] Steep-Sloped-Aged *Solar Reflectance*	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.25	0.25	0.20	0.25	0.20	0.25	NR
Option B[9i] Steep-Sloped-Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0. 75	0.75	0.75	0.75	0.75	0.75	NR
Option B[9i] Steep-Sloped-Solar *Reflectance* Index	NR	NR	NR	NR	NR	NR	NR	NR	NR	23	23	16	23	16	23	NR
Option C[10i] Ceiling Insulation	R 38	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38
Option C[10i] Radiant Barrier	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
Option C[10i] Low-Sloped-Aged *Solar Reflectance*	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR
Option C[10i] Low-Sloped-Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR

(CONTINUED): TABLE 303.3~~-A~~(1) [TABLE 170.2-A] ENVELOPE COMPONENT PACKAGE – MULTIFAMILY STANDARD BUILDING DESIGN

***BUILDING* COMPONENT - *ROOFS* AND CEILINGS**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Option C[~~10j~~] Low-Sloped-Solar *Reflectance* Index	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	75	NR	75	NR
Option C[~~10j~~] Steep-Sloped-Aged *Solar Reflectance*	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	0.20	0.20	0.20	0.20	0.20	NR
Option C[~~10j~~] Steep-Sloped-Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0. 75	0.75	0.75	0.75	0.75	0.75	NR
Option C[~~10j~~] Steep-Sloped-Solar *Reflectance* Index	NR	NR	NR	NR	NR	NR	NR	NR	NR	16	16	16	16	16	16	NR
Option D[~~11k~~]-Metal *Building U-factor*	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
Option D[~~11k~~]-Wood-Framed and Other *U-factor*	0.028	0.028	0.034	0.028	0.034	0.034	0.039	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Option D[~~11k~~] Low-Sloped-Aged *Solar Reflectance*	NR	0.63	NR	0.63	NR	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	NR
Option D[~~11k~~] Low-Sloped-Thermal Emittance	NR	0.75	NR	0.75	NR	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	NR
Option D[~~11k~~] Low-Sloped-Solar *Reflectance* Index	NR	75	NR	75	NR	75	75	75	75	75	75	75	75	75	75	NR
Option D[~~11k~~] Steep-Sloped-Aged *Solar Reflectance*	NR	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	NR
Option D[~~11k~~] Steep-Sloped-Thermal Emittance	NR	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	NR
Option D Steep-Sloped-Solar *Reflectance* Index	NR	16	16	16	16	16	16	16	16	16	16	16	16	16	16	NR

(CONTINUED): TABLE 303.3 ~~A~~(1) [TABLE 170.2-A] ENVELOPE COMPONENT PACKAGE – MULTIFAMILY STANDARD BUILDING DESIGN

***BUILDING* COMPONENT - WALLS, FLOORS, *DOORS*, AND QII**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Walls - *Metal Building* - Any Fire Rating	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.057	0.057	0.057	0.057	0.057
Walls - Framed (wood, metal) and other - >1hr fire rating	0.059	0.059	0.059	0.059	0.059	0.065	0.065	0.059	0.059	0.059	0.051	0.059	0.059	0.051	0.051	0.051
Walls - Framed (wood, metal) and other - ≤1hr fire rating[3c]	0.051	0.051	0.051	0.051	0.051	0.065	0.065	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051
Walls - Mass Light[4d]	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.059 R 17
Walls - Mass Heavy	0.253	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	0.184	0.253	0.211	0.184	0.184	0.160
Floors/Soffits - Slab Perimeter[8h]	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	F 0.58 R 7.0
Floors/Soffits – Wood-Framed	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19
Floors/Soffits - Raised Mass	U 0.092 R 8.0	U 0.092 R 8.0	U 0.269 R 0	U 0.269 R 0	U-0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0
Floors/Soffits - Other	0.048	0.039	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.039	0.071	0.071	0.039	0.039	0.039
Exterior Doors[6f] - Max *U-Factor Dwelling Unit* Entry	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

(CONTINUED): TABLE 303.3 ~~A~~ (1) [TABLE 170.2-A] ENVELOPE COMPONENT PACKAGE – MULTIFAMILY STANDARD BUILDING DESIGN

***BUILDING* COMPONENT - WALLS, FLOORS, *DOORS*, AND QII**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Exterior Doors[6f] - Max *U-Factor* Common Use Area Entry Non-Swinging	0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50
Exterior Doors[6f] - Max *U-Factor* Common Use Area Entry Swinging	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Quality Insulation Installation U~~u~~p T~~t~~o 3 *H~~h~~abitable S~~S~~tories*	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(CONTINUED): TABLE 303.3 ~~A~~ (1) [TABLE 170.2-A] ENVELOPE COMPONENT PACKAGE – MULTIFAMILY STANDARD BUILDING DESIGN

BUILDING* COMPONENT - *FENESTRATION	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Curtain Wall/ Storefront[7g] - Maximum *U-factor*	0.38	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.38
Curtain Wall/ Storefront[7g] - Maximum *RSHGC*	NR	0.26	NR	0.26	NR	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.26	NR
Curtain Wall/ Storefront[7g] - Minimum *VT*, ~~c~~Common ~~u~~Use ~~a~~Area	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
NAFS 2017 Performance Class AW[5e] - Maximum *U-factor*	0.38	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.38
NAFS 2017 Performance Class AW[5e] - Maximum *RSHGC*	NR	0.24	NR	0.24	NR	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	NR
NAFS 2017 Performance Class AW[5e] - Minimum *VT*, ~~c~~*Common* ~~u~~*Use* ~~a~~*Areas*	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
All Other *Fenestration* - Maximum *U-factor*	0.28	0.30	0.28	0.28	0.28	0.34	0.34	0.30	0.30	0.30	0.28	0.30	0.28	0.28	0.28	0.28
All Other *Fenestration* - Maximum *RSHGC*	NR	0.23	NR	0.23	NR	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	NR
Maximum *Window* to Floor Ratio	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Maximum *Window* to Wall Ratio	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Maximum *Skylight Roof Ratio*	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

Footnotes to Table 303.3(1) *[Table 170.2-A]*:

a. Install the specified *R-value* with an air space present between the roofing and the *roof* deck. ~~Such as standard installation of concrete or clay tile.~~

b. *R-values* shown for below *roof* deck insulation are for wood-frame construction with insulation installed between the framing members. Alternatives including insulation above rafters or above *roof* deck shall comply with the performance standards.

c. Assembly *U-factors* for exterior framed walls can be met with cavity insulation alone or with *continuous insulation* alone, or with both cavity and *continuous insulation* that results in an assembly *U-factor* equal to or less than the *U-factor* shown. Use Reference Joint Appendices JA4 Table 4.3.1, 4.3.1(a), or Table 4.3.4 to determine alternative insulation products ~~to be~~ with less than or equal to the required maximum *U-factor*.

d. Mass wall has a *heat capacity* greater than or equal to 7.0 Btu/h-ft^2.

e. Product must be certified to meet the North American *Fenestration* Standard/Specification for an Architectural *Window* (AW).

f. *Glazed doors* must meet the *fenestration* requirements.

g. Requirements apply to *doors* included in the Curtainwall/*Storefront* construction assembly.

h. If using F-factor to comply, use Reference Joint Appendices JA4, Table 4.4.7 to determine alternate depth and *R-value* to be less than or equal to the required maximum F-factor.

i. Option B per Section 303.3.1.1.2 *[Section 170.2(a)1Bii]*

j. Option C per Section 303.3.1.1.2 *[Section 170.2(a)1Bliii]*

k. Option D per Section 303.3.1.1.2 *[Section 170.2(a)1Biv]*

~~Footnotes to Table 303.3-A *[Table 170.2-A]*:~~

~~1. Install the specified *R-value* with an air space present between the roofing and the *roof* deck. Such as standard installation of concrete or clay tile.~~

~~2. *R-values* shown for below *roof* deck insulation are for wood-frame construction with insulation installed between the framing members. Alternatives including insulation above rafters or above *roof* deck shall comply with the performance standards.~~

~~3. Assembly *U-factors* for exterior framed walls can be met with cavity insulation alone or with *continuous insulation* alone, or with both cavity and *continuous insulation* that results in an assembly *U-factor* equal to or less than the *U-factor* shown. Use Reference Joint Appendices JA4 Table 4.3.1, 4.3.1(a), or Table 4.3.4 to determine alternative insulation products to be~~with less than or equal to the required maximum *U-factor*.~~

~~4. Mass wall has a *heat capacity* greater than or equal to 7.0 Btu/h-ft^2.~~

~~5. Product must be certified to meet the North American Fenestration Standard/Specification for an Architectural Window (AW).~~

~~6. *Glazed doors* must meet the fenestration requirements.~~

~~7. Requirements apply to *doors* included in the Curtainwall/Storefront construction assembly.~~

~~8. If using F-factor to comply, use Reference Joint Appendices JA4, Table 4.4.7 to determine alternate depth and *R-value* to be less than or equal to the required maximum F-factor.~~

~~9. Option B per Section 303.3.1.1.2 *[Section 170.2(a)1Bii]*~~

~~10. Option C per Section 303.3.1.1.2 *[Section 170.2(a)1Bliii]*~~

~~11. Option D per Section 303.3.1.1.2 *[Section 170.2(a)1Biv]*~~

303.3.3 *[Section 170.2(b)]* **Minimum daylighting requirement for large, enclosed spaces.**

In *Cclimate Zzones* 2 through 15, conditioned *enclosed spaces*, and unconditioned *enclosed spaces* that are greater than 5,000 square feet and that are directly under a *roof* with ceiling heights greater than 15 feet, shall meet the following requirements:

1. A combined total of at least 75 percent of the floor area, as determined in *building* floor plan (drawings) view, shall be within one or more of the following:
   1.1. *Primary sidelit daylit zone* in accordance with Section 603.2.2.2 *[Section 160.5(b)4Dib]*, or
   1.2. The total floor area in the space within a horizontal distance of 0.7 times the average ceiling height from the edge of rough opening of *skylights*.
2. All *skylit daylit zones* and *primary sidelit daylit zones* shall be shown on *building* plans.
3. *General lighting* in *daylit zones* shall be controlled in accordance with Section 603.2.2.2 *[Section 160.5(b)4D]*.
4. The total *skylight area* is at least 3 percent of the total floor area in the space within a horizontal distance of 0.7 times the average ceiling height from the edge of rough opening of *skylights*; or the product of the total *skylight area* and the average *skylight visible transmittance* is no less than 1.5 percent of the total floor area in the space within a horizontal distance of 0.7 times the average ceiling height from the edge of rough opening of *skylights*.
5. All *skylights* shall have a *glazing* material or diffuser that has a measured haze value greater than 90 percent, tested according to *ASTM D1003* (notwithstanding its scope) or other test method approved by the *Energy CCommission*.

Exception 1 to Section 303.3.3: In *buildings* with unfinished interiors, future *enclosed spaces* for which there are plans to have:

1. A floor area of less than or equal to 5,000 square feet, or
2. Ceiling heights of less than or equal to 15 feet.

This exception shall not be used for S-1 or S-2 (storage), or for F-1 or F-2 (*factory*) *occupancies*.

Exception 2 to Section 303.3.3: *Enclosed spaces* having a designed *general lighting* system with a *lighting* power density less than 0.5 watts per square foot.

Exception 3 to Section 303.3.3: *Enclosed spaces* where it is documented that permanent architectural features of the *building*, existing structures or natural objects block direct beam sunlight on at least half of the *roof* over the *enclosed space* for more than 1500 annual ~~daytime~~ hours ~~per year~~ between 8 a.m. and 4 p.m.

303.4 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

303.5 *[Sections 180.1, 180.2]* **Additions and alterations to existing buildings.**

303.5.1 *[Section 180.1]* **Additions.**

Additions to existing *multifamily use designations~~buildings~~* shall meet the mandatory requirements of Section 303.5.1.1, and either prescriptive requirements of Section 303.5.1.2 *[Section 180.1(a)]* or performance requirements of Section 303.5.1.3 *[Section 180.1(b)]*.

303.5.1.1 *[Section 180.1]* **Mandatory requirements (Additions).**

The *addition* shall meet the requirements of the sections listed below:

101 *[Section 100.0(h), 110.0, 110.1, 110.5]* Systems and Equipment

300.1, 300.2, 300.3, 303.1, 303.2 *[Section 110.6, 110.7, 110.8, 160.0, 160.1]* Mandatory Requirements for *Envelopes*

303.5.1.2 *[Section 180.1(a)1]* **Prescriptive requirements (Additions).**

The *envelope* of the *addition* shall meet the applicable requirements of the sections listed below:

303.3 *[Section 170.2(a and b)]* Prescriptive Requirements for *Envelope* Systems

303.5.1.2.1 *[Section 180.1(a)1A]* **Additions greater than 700 square feet.**

Additions that are greater than 700 square feet shall meet the requirements of Section 303.3.1 *[Section 170.2(a)]*, with the following modifications:

1. Extensions of existing wood-framed walls may retain the dimensions of the existing walls and shall install cavity insulation of R-15 in a 2x4 framing and R-21 in a 2x6 framing.
2. The maximum allowed *fenestration area* shall be the greater of 175 square feet or 20 percent of the *addition* floor area.
3. When existing siding of a wood-framed wall is not being removed or replaced, cavity insulation of R-15 in a 2x4 framing and R-21 in a 2x6 framing shall be installed and *continuous insulation* is not required.
4. *Additions* that consist of the conversion of existing spaces from unconditioned to *conditioned space* shall not be required to perform the air sealing part of QII when the existing *air barrier* is not being removed or replaced.

303.5.1.2.2 *[Section 180.1(a)1B]* **Additions 700 square feet or less.**

Additions that are 700 square feet or less shall meet the requirements of Section 303.3.1 *[Section 170.2(a)]*, with the following modifications:

1. *Roof* and ceiling insulation in a ventilated *attic* shall meet one of the following requirements:

   1.1. In *Climate Zones* 1, 2, 4, and 8 through 16, achieve an overall assembly *U-factor* not exceeding 0.025. In wood-framed assemblies, compliance with *U-factors* may be demonstrated by installing insulation with an *R-value* of R-38 or greater.

   1.2. In *Climate Zones* 3 and 5 through 7, achieve an overall assembly *U-factor* not exceeding 0.031. In wood-framed assemblies, compliance with *U-factors* may be demonstrated by installing insulation with an *R-value* of R-30 or greater.

2. For *buildings* three *habitable stories* or less in *Climate Zones* 2–15, *radiant barriers* shall be installed in *attics* with exposed *attic* deck undersides ~~in *Climate Zones* 2–15~~.

3. Extensions of existing wood-framed walls may retain the dimensions of the existing walls and shall install cavity insulation of R-15 in a 2x4 framing and R-21 in a 2x6 framing; and

4. *Fenestration products* must meet the *U-factor*, *RSGHC* and *VT* requirements of Table 303.5~~-B~~(2) *[Table 180.2-B]*.

5. Quality Insulation Installation (QII) requirements of ~~Section 303.3.1.8~~ Section 303.3.1.7 *[Section 170.2(a)6]* do not apply.

Exception 1 to Section 303.5.1.2.2: *Additions* of 300 square feet or less are not required to comply with the *roofing product* requirements of Section 303.3.1.1.1 *[Section 170.2(a)1A]*.

Exception 2 to Section 303.5.1.2.2: Insulation in an enclosed rafter ceiling shall meet the requirements of Section 303.2.1 *[Section 160.1(a)]*.

303.5.1.3 *[Section 180.1(b)]* **Performance requirements (Additions).**

Performance calculations shall meet the requirements of Section 102 for the *addition* alone or for the existing *building* plus *addition*.

Exception to Section 303.5.1.3: Existing structures with a minimum R-11 insulation in framed walls showing compliance with Section 303.5.1.3 *[Section 180.1(b)]* are not required to show compliance with Section 303.2.2 *[Section 160.1(b)]*.

303.5.2 *[Section 180.2]* **Alterations.**

Alterations to components of existing *multifamily use designations~~buildings~~*, including *alterations* made in conjunction with a change in *building occupancy* to a multifamily *occupancy*, shall meet mandatory requirements of Section 303.5.2.1, and either prescriptive requirements of Section 303.5.2.2 or performance requirements of Section 303.5.2.3.

303.5.2.1 *[Sections 180.0, 180.2(a)]* **Mandatory requirements (Alterations).**

Altered *envelope* components in a *multifamily* use designations~~building~~ shall meet the requirements specified in the sections listed below that are applicable to the *building* project and the minimum requirements in this section.

101 *[Section 100.0(h), 110.0, 110.1, 110.5]* Systems and Equipment

300.1, 300.2, 300.3, 303.1, 303.2 *[Section 110.6, 110.7, 110.8, 160.0, 160.1]* Mandatory Requirements for *Envelopes*

303.5.2.1.1 *[Section 180.2(a)1]* **Roof/ceiling insulation.**

The opaque portions of the *roof*/ceiling that separate *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the requirements of Section 303.5.2.2.2 *[Section 180.2(b)1B]*.

303.5.2.1.2 *[Section 180.2(a)2]* **Wall insulation.**

~~For t~~The altered opaque portion of walls separating *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the applicable requirements of Items 1 through 4 below:

1. ***Metal building*.** A minimum of R-13 insulation between framing members, or the area-weighted average *U-factor* of the wall assembly shall not exceed U-0.113.
2. **Metal--framed.** A minimum of R-13 insulation between framing members, or the area-weighted average *U-factor* of the wall assembly shall not exceed U-0.217.
3. **Wood--framed and others.** A minimum of R-11 insulation between framing members, or the area-weighted average *U-factor* of the wall assembly shall not exceed U-0.110.
4. ***Spandrel* panels and *curtain walls*.** A minimum of R-4 insulation, or the area-weighted average *U-factor* of the wall assembly shall not exceed U-0.280.

Exception to Section 303.5.2.1.2: Light and heavy mass walls.

303.5.2.1.3 *[Section 180.2(a)3]* **Floor insulation.**

~~For t~~The altered portion of *raised floors* that separate *conditioned spaces* from *unconditioned spaces* or ambient air shall meet the applicable requirements of Items 1 through 2 below:

1. **Raised framed floors.** A minimum of R-11 insulation between framing members, or the area-weighted average *U-factor* of the floor assembly shall not exceed U-0.071.
2. **Raised mass floors.** A minimum of R-6 insulation, or the area-weighted average *U-factor* of the floor assembly shall not exceed U-0.111.

303.5.2.2 *[Sections 180.2(b)]* **Prescriptive requirements (Alterations).**

303.5.2.2.1 *[Section 180.2(b)1A]* **Roofing products and insulation.**

Existing *roofs* being replaced, recovered or recoated ~~of a *multifamily building*~~ shall meet the requirements of Section 300.3.7 *[Section 110.8(i)]*. For *roofs* with more than 50 percent of the *roof* area or more than 2,000 square feet of *roof*, whichever is less, being altered, the requirements below apply:

303.5.2.2.1.1- *Steep-sloped roofs – roofing products*. *Steep-sloped roofs* in *Climate Zones* 4 and 8 through 15 shall have:

1. A minimum aged *solar reflectance* of 0.20 and a minimum *thermal emittance* of 0.75, or
2. A minimum *SRI* of 16.

Exception 1 to Section 303.5.2.2.1.1: The following shall be considered equivalent for compliance:

1. *Buildings* with ceiling assemblies with a *U-factor* lower than or equal to 0.025 or that are insulated with at least R-38 ceiling insulation in an *attic*; or
2. *Buildings* with a *radiant barrier* in the *attic*, where the *radiant barrier* is not installed directly above spaced sheathing, meeting the requirements of Section 303.3.1.1.3 *[Section 170.2(a)1C]*; or
3. *Buildings* that have no ducts in the *attic* in *Climate Zones* 2, 4, 9, 10, 12 and 14; or
4. *Buildings* with R-2 or greater *continuous insulation* above or below the *roof* deck.

Exception 2 to Sections 303.5.2.2.1.1: *Roof* area covered by *building* integrated photovoltaic panels and *building* integrated solar thermal panels is not required to meet the minimum requirements for *solar reflectance*, *thermal emittance* or *SRI*.

Exception 3 to Sections 303.5.2.2.1.1: *Roof* constructions with a weight of at least 25 lb/ft² are not required to meet the minimum requirements for *solar reflectance*, *thermal emittance* or *SRI*.

303.5.2.2.1.2- *Low-sloped roofs – roofing products*. *Low-sloped roofs* in *Climate Zones* 2, 4, and 6 through 15 shall have:

1. A minimum aged *solar reflectance* of 0.63 and a minimum *thermal emittance* of 0.75, or
2. A minimum *SRI* of 75.

Exception 1 to Section 303.5.2.2.1.2: The aged *solar reflectance* requirement can be met by using insulation at the *roof* deck specified in Table 303.5~~.A~~(1) *[Table 180.2-A]*.

TABLE 303.5 ~~A~~(1) [TABLE 180.2-A] ROOF/CEILING INSULATION TRADEOFF FOR LOW-SLOPED AGED SOLAR REFLECTANCE

MINIMUM AGED *SOLAR REFLECTANCE*	*ROOF* DECK *CONTINUOUS INSULATION R-VALUE* (*CLIMATE ZONES* 6-7)	*ROOF* DECK *CONTINUOUS INSULATION R-VALUE* (*CLIMATE ZONES* 2, 4, 8-15)
0.60	2	16
0.55	4	18
0.50	6	20
0.45	8	22
No requirement	10	24

Exception 2 to Sections 303.5.2.2.1.2: *Roof* area covered by *building* integrated photovoltaic panels and *building* integrated solar thermal panels is not required to meet the minimum requirements for *solar reflectance*, *thermal emittance* or *SRI*.

Exception 3 to Sections 303.5.2.2.1.2: *Roof* constructions with a weight of at least 25 lb/ft² are not required to meet the minimum requirements for *solar reflectance*, *thermal emittance* or *SRI*.

303.5.2.2.1.3- *Low-sloped roofs* – insulation. For *low-sloped roofs*, the area of the *roof recover* or *roof replacement* shall be insulated to R-14 *continuous insulation* or a *U-factor* of 0.039 in *Climate Zones* 1, 2, 4, and 8 through 16.

Exception 1 to Section 303.5.2.2.1.3: *Roof recovers* with new R-10 insulation added above deck ~~do not need to be insulated to meet R-14~~.

Exception 2 to Section 303.5.2.2.1.3: When existing mechanical *equipment* located on the *roof* will not be disconnected and lifted, insulation added may be limited to the greater of R-10 or the maximum installed thickness that will allow the distance between the height of the *roof* membrane surface to the top of the base flashing to remain in accordance with the manufacturer's instructions.

Exception 3 to Section 303.5.2.2.1.3: At the drains and other low points, tapered insulation with a *thermal resistance* less than R-14 may be used, provided that insulation thickness is increased at the high points of the *roof* so that the average *thermal resistance* equals or exceeds R-14.

Exception 4 to Section 303.5.2.2.1.3: The area of the *roof* recoat is not required to be insulated.

303.5.2.2.2 *[Section 180.2(b)1B]* **Roof/ceiling insulation for vented attics.**

Vented *attics* shall meet the requirements of 303.5.2.2.2.1 through 303.5.2.2.2.3~~4,~~ and shall comply with the California *Building* Code requirements for *attic* ventilation.

Exception 1 to Section 303.5.2.2.2: *Dwelling units* with at least R-38 existing insulation installed at the ceiling level.

Exception 2 to Section 303.5.2.2.2: *Dwelling units* where the *alteration* would directly cause the disturbance of asbestos unless the *alteration* is made in conjunction with asbestos abatement.

Exception 3 to Section 303.5.2.2.2: *Dwelling units* with knob and tube wiring located in the vented *attic*.

Exception 4 to Section 303.5.2.2.2: Where the *accessible* space in the *attic* is not large enough to accommodate the required *R-value*, the entire *accessible* space shall be filled with insulation, provided such installation does not violate Section 806.3 of Title 24, Part 2.5.

Exception 5 to Section 303.5.2.2.2: Where the *attic* space above the altered *dwelling unit* is shared with other *dwelling units* and the requirements of Section 303.5.2.2.2 *[Section 180.2(b)1Bi]* are not triggered for the other *dwelling units*.

303.5.2.2.2.1- In *Climate Zones* 1 through 4 and 8 through 16, insulation shall be installed to achieve a weighted *U-factor* of 0.020 or insulation installed at the ceiling level shall result in an installed *thermal resistance* of R-49 or greater for the insulation alone; and

Exception to Section 303.5.2.2.2.1: In *Climate Zones* 1, 3, 4 and 9, *dwelling units* with at least R-19 existing insulation installed at the ceiling level**.**

303.5.2.2.2.2- In *Climate Zones* 2 and 11 through 16, air seal all *accessible* areas of the ceiling plane between the *attic* and the *conditioned space* in accordance with Section 300.2 *[Section 110.7]*; and

Exception 1 to Section 303.5.2.2.2.2: *Dwelling units* with at least R-19 existing insulation installed at the ceiling level.

Exception 2 to Section 303.5.2.2.2.2: *Dwelling units* with atmospherically vented space heating or water-heating combustion appliances located inside the *pressure boundary* of the *dwelling unit*.

303.5.2.2.2.3- In *Climate Zones* 1 through 4 and 8 through 16, recessed downlight *luminaires* in the ceiling shall be covered with insulation to the same depth as the rest of the ceiling. *Luminaires* not rated for insulation contact must be replaced or fitted with a fireproof cover that allows for insulation to be installed directly over the cover; and

Exception to Section 303.5.2.2.2.3: In *Climate Zones* 1 through 4 and 8 through 10, *dwelling units* with at least R-19 existing insulation installed at the ceiling level.

~~**303.5.2.2.2.4-** *Attic* ventilation shall comply with the California Building Code requirements.~~

303.5.2.2.3 *[Section 180.2(b)1C]* **Fenestration.**

Fenestration alterations other than *repair* shall meet the requirements below:

NOTE: Glass replaced in an existing sash and frame or sashes replaced in an existing frame are considered *repairs*. In these cases, the replacement shall be at least equivalent to the original in performance.

303.5.2.2.3.1- *Fenestration* installed to replace existing *fenestration* of the same total area. Shall meet either:

1. The maximum *U-factor*, *RSHGC* and *VT* requirements of Table 303.5~~-B~~(2) *[Table 180.2-B]*, or
2. The area-weighted *U-factor* and *RSHGC* of Table 303.3~~-A~~(1) *[Table 170.2-A]*.

Exception to Section 303.5.2.2.3.1: In an *alteration*, where 150 square feet or less of the *entire building's vertical fenestration* is replaced, *RSHGC* and *VT* requirements of Table 303.5~~-B~~(2) *[Table 180.2-B]* shall not apply.

303.5.2.2.3.2- *Alterations* that add *vertical fenestration* and *skylight area*. Shall meet the total *fenestration area* requirements of Sections 303.3.1.3 and 303.3.1.5 *[Section 170.2(a)3]* and the *U-factor*, *RSHGC* and *VT* requirements of Table 303.5~~-B~~(2) *[Table 180.2-B]*.

Exception 1 to Section 303.5.2.2.3.2: *Alterations* that add *vertical fenestration area* of up to 50 square feet shall not be required to meet the total *fenestration area* requirements of Sections 303.3.1.3 *[Section 170.2(a)3]*, nor the *RSHGC* and *VT* requirements of Table 303.5~~-B~~(2) *[Table 180.2-B]*.

Exception 2 to Section 303.5.2.2.3.2: *Alterations* that add up to 16 square feet of new *skylight area* per *dwelling unit* with a maximum *U-factor* of 0.55 and a maximum *RSHGC* of 0.30 shall not be required to meet the total *fenestration area* requirements of Section 303.3.1.5 *[Section 170.2(a)3]*.

TABLE 303.5(2) ~~B~~ [TABLE 180.2-B] ALTERED FENESTRATION MAXIMUM U-FACTOR AND MAXIMUM SHGC AND RSHGC, MINIMUM VT

***BUILDING* TYPE**	**FEATURE**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Curtainwall / *Storefront* / *Window* Wall[4a]	*U-factor*	0.38	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.38
Curtainwall / *Storefront* / *Window* Wall[4a]	*RSHGC*	NR	0.26	NR	0.26	NR	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	NR
Curtainwall / *Storefront* / *Window* Wall[4a]	VT[2b]	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
NAFS 2017 Performance Class AW *Window* – *Fixed*	*U-factor*	0.38	0.38	0.38	0.38	0.38	0.47	0.47	0.41	0.41	0.38	0.38	0.38	0.38	0.38	0.38	0.38
NAFS 2017 Performance Class AW *Window* – *Fixed*	*RSHGC*	NR	0.25	NR	0.25	NR	0.31	0.31	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.25	NR
NAFS 2017 Performance Class AW *Window* – *Fixed*	VT[2b]	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
NAFS 2017 Performance Class AW *Window* – Operable	*U-factor*	0.43	0.43	0.43	0.43	0.43	0.47	0.47	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
NAFS 2017 Performance Class AW *Window* – Operable	*RSHGC*	NR	0.24	NR	0.24	NR	0.31	0.31	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	NR
NAFS 2017 Performance Class AW *Window* – Operable	VT[2b]	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
All Other *Windows* and *Glazed Doors*	*U-factor*	0.28	0.30	0.28	0.28	0.28	0.30	0.34	0.30	0.30	0.30	0.28	0.30	0.28	0.28	0.30	0.28
All Other *Windows* and *Glazed Doors*	*RSHGC*	NR	0.23	NR	0.23	NR	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	NR

(CONTINUED): TABLE 303.5~~-B~~(2) [Table 180.2-B] ALTERED *FENESTRATION* MAXIMUM *U-FACTOR* AND MAXIMUM *SHGC* AND *RSHGC*, MINIMUM *VT*

***Building* Type**	**Feature**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Skylights	*U-factor*	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Skylights	*SHGC*	NA	0.25	NA	0.25	NA	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	NA
Skylights, Serving Common Areas	VT[~~2~~b]	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49

Footnotes to Table 303.5(2) *[TABLE 180.2-B]*:

a. Requirements apply to *glazed doors* included in the Curtainwall/*Storefront* construction assembly.

b. Minimum *VT* requirements for *fenestration* other than *Skylights* do not apply to *multifamily, ~~buildings~~* 3 *habitable stories* or less *use designation*.

~~Footnotes to Table 303.5-B *[TABLE 180.2-B]*:~~

~~1. Requirements apply to *glazed doors* included in the Curtainwall/Storefront construction assembly.~~

~~2. Minimum *VT* requirements for fenestration other than *Skylights* do not apply to *multifamily buildings* 3 habitable stories or less.~~

303.5.2.2.4 *[Section 180.2(b)1D]* **Exterior doors.**

Alterations that add exterior *door area* shall meet the *U-factor* requirement of ~~Section 303.3.1.6~~ Section 303.3.1.5 *[Section 170.2(a)4]*.

303.5.2.3 *[Sections 180.2(c)]* **Performance requirements (Alterations).**

The *altered component*(*s*) and any newly installed *equipment* serving the *alteration* shall meet the applicable requirements of Section 102.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SUBCHAPTER 4
SPACE-CONDITIONING AND VENTILATION

SECTION 400

MANDATORY REQUIREMENTS FOR ALL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

400.1 *[Section 100.0(h)]* **Systems and equipment.**

Part 6 limits the installation of *manufactured equipment*, *products, and devices* to those that have been certified as specified by ~~s~~Sections 101.2 *[Section 110.0]* and 101.3 *[Section 110.1]*. Requirements for *manufactured equipment*, *products, and devices*, when not specified in Title 24 *Part 6*, are specified in California Code of Regulations, Title 20, Sections 1601-1609.

400.2 *[Section 110.2]* **Certification by manufacturers.**

Any space-conditioning *equipment* listed in this section may be installed only if the manufacturer has *certified to the Energy C~~c~~ommission* that the *equipment* complies with all the applicable requirements of this section.

400.3 *[Section 110.5]* **Natural gas central furnaces: pilot lights prohibited.**

Any natural gas system or *equipment* listed below may be installed only if it does not have a continuously burning pilot light:

1. Fan-type central furnaces.
2. Indoor and outdoor *fireplaces*

400.4 *[Section 110.8(a), (b), (c) and (d)]* **Insulation.**

400.4.1 *[Section 110.8(a)]* **Insulation certification by manufacturers.**

All insulation shall be certified by Department of Consumer Affairs, Bureau of Household Goods and Services that the insulation conductive thermal performance is approved pursuant to the California Code of Regulations, Title 24, Part 12, Chapters 12-13, Article 3, “Standards for Insulating Material.”

400.4.2 *[Section 110.8(b)]* **Installation of urea formaldehyde foam insulation.**

Urea formaldehyde foam insulation may be applied or installed only if:

1. It is installed in exterior side walls; and
2. A 4-mil-thick plastic polyethylene vapor retarder or equivalent plastic sheathing vapor retarder is installed between the urea formaldehyde foam insulation and the interior space in all applications.

400.4.3 *[Section 110.8(c)]* **Flame spread rating of insulation.**

All insulating material shall be installed in compliance with the flame spread rating and smoke density requirements of the *CBC*.

400.4.4 *[Section 110.8(d)]* **Installation of insulation in existing space-conditioning ducts ~~buildings~~.**

Insulation installed on an existing space-conditioning duct shall comply with Section 605.0 of the *CMC*. Where the insulation is installed by a contractor, the contractor shall provide written certification to the customer that the insulation complies with the requirements of Section 605.0 of the *CMC*.~~Insulation installed on an existing duct, shall comply with the applicable requirements below. If a contractor installs the insulation, the contractor shall certify to the customer, in writing, that the insulation meets the applicable requirements below.~~

~~1. **Ducts.** If insulation is installed on an existing space-conditioning duct, it shall comply with Section 605.0 of the CMC.~~

400.5 *[Section 110.2]* **Mandatory requirements for space-conditioning equipment.**

400.5.1 *[Section 110.2(a)]* **Efficiency.**

Equipment shall meet the applicable efficiency requirements in Tables 400.5-~~A~~(1) through 400.5-~~L~~(12) *[Tables 110.2-A through 110.2-L]*, subject to the following:

1. If more than one efficiency standard is listed for any *equipment* in Tables 400.5-~~A~~(1) through 400.5-~~L~~(12) *[Tables 110.2-A through 110.2-L]*, the *equipment* shall meet all the applicable standards that are listed; and
2. If more than one test method is listed in Tables 400.5-~~A~~(1) through 400.5-~~L~~(12) *[Tables 110.2-A through 110.2-L]*, the *equipment* shall comply with the applicable efficiency standard when tested ~~with~~ using each listed test method; and
3. Where *equipment* serves more than one function, it shall comply with the efficiency standards applicable to each function; and
4. Where a requirement is for *equipment* rated at its "maximum rated capacity" or "minimum rated capacity," the capacity shall be as provided for and allowed by the controls, during steady-state operation.

Exception 1 to Section 400.5.1: Water-cooled centrifugal water-chilling packages that are not designed for operation at *ANSI*/*AHRI* Standard 550/590 test conditions of 44°F leaving chilled water temperature and 85°F entering *condenser* water temperature with 3 gallons per minute per ton *condenser* water flow shall have a maximum full-load kW/ton and NPLV ratings adjusted using the following equation:

Adjusted maximum full-load kW/ton rating = (full- load kW/ton from Table 400.5-~~D~~(4))/Kadj

Adjusted maximum NPLV rating = (*IPLV* from Table 400.5-~~D~~(4))/Kadj

where:

Kadj = (A) × (B)

where:

$A = 0.00000014592 \times (LIFT)^4 - 0.0000346496 \times (LIFT)^3 + 0.00314196 \times (LIFT)^2 - 0.147199 \times (LIFT) + 3.9302$

~~LIFT = LvgCond – LvgEvap (°F)~~

~~LvgCond = Full-load leaving condenser fluid temperature (°F)~~

~~LvgEvap = Full-load leaving evaporator fluid temperature (°F)~~

$B = (0.0015 \times LvgEvap) + 0.934$

where:

LIFT = LvgCond – LvgEvap

LvgCond = Full-load leaving *condenser* fluid temperature (°F)

LvgEvap = Full-load leaving evaporator fluid temperature (°F)

The adjusted full-load and NPLV values are only applicable for centrifugal chillers meeting all of the following full-load design ranges:

1. Minimum Leaving Evaporator Fluid Temperature: 36°F
2. Maximum Leaving *Condenser* Fluid Temperature: 115°F
3. LIFT ≥ 20°F and ≤ 80°F

Centrifugal chillers designed to operate outside of these ranges are not covered by this exception.

Exception 2 to Section 400.5.1: Positive displacement (air-cooled and water-cooled) chillers with a leaving evaporator fluid temperature higher than 32°F shall show compliance with Table 400.5-~~D~~(4) *[Table 110.2-D]* when tested or certified with water at standard rating conditions, per the referenced test procedure.

Exception 3 to Section 400.5.1: *Equipment* primarily serving *refrigerated warehouses* or commercial refrigeration.

TABLE 400.5-A(1) [TABLE 110.2-A] AIR CONDITIONERS AND CONDENSING UNITS – MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	EFFICIENCY	TEST PROCEDURE[b]
Air Conditioners, air cooled both *split system* and single package	≥ 65,000 Btu/h and < 135,000 Btu/h	11.2 EER[a] Federal Minimum IEER[a]	*AHRI 340/360*
Air Conditioners, air cooled both *split system* and single package	≥ 135,000 Btu/h and < 240,000 Btu/h	11.0 EER[a] Federal Minimum IEER[a]	*AHRI 340/360*
Air Conditioners, air cooled both *split system* and single package	≥ 240,000 Btu/h and < 760,000 Btu/h	10.0 EER[a] Federal Minimum IEER[a]	*AHRI 340/360*
Air Conditioners, air cooled both *split system* and single package	≥ 760,000 Btu/h	9.7 EER[a] 12.5 IEER[a]	*AHRI 340/360*
Air Conditioners, water cooled	≥ 65,000 Btu/h and < 135,000 Btu/h	Federal Minimum EER[a] 13.9 IEER[a]	*AHRI 340/360*
Air Conditioners, water cooled	≥ 135,000 Btu/h and < 240,000 Btu/h	Federal Minimum EER[a] 13.9 IEER[a]	*AHRI 340/360*
Air Conditioners, water cooled	≥ 240,000 Btu/h and < 760,000 Btu/h	Federal Minimum EER[a] 13.6 IEER[a]	*AHRI 340/360*

(CONTINUED): TABLE 400.5 ~~-A~~(1) [TABLE 110.2-A] AIR CONDITIONERS AND CONDENSING UNITS – MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	EFFICIENCY	TEST PROCEDURE [b]
Air Cconditioners, water cooled	≥ 760,000 Btu/h	12.2EER[a] 13.5 IEER[a]	*AHRI 340/360*
Air Cconditioners, evaporatively cooled	≥ 65,000 Btu/h and < 135,000 Btu/h	Federal Minimum EER[a] 12.3 IEER[a]	*AHRI 340/360*
Air Cconditioners, evaporatively cooled	≥ 135,000 Btu/h and < 240,000 Btu/h	Federal Minimum EER[a] 12.2 IEER[a]	*AHRI 340/360*
Air Cconditioners, evaporatively cooled	≥ 240,000 Btu/h and < 760,000 Btu/h	Federal Minimum EER[a] 12.1 IEER[a]	*AHRI 340/360*
Air Cconditioners, evaporatively cooled	≥ 760,000 Btu/h	11.7 EER[a] 11.9 IEER[a]	*AHRI 340/360*
Condensing Uunits, air cooled	≥ 135,000 Btu/h	10.5 *EER* Federal Minimum *IEER*	*AHRI 365*
Condensing Uunits, water cooled	≥ 135,000 Btu/h	13.5 *EER* Federal Minimum *IEER*	*AHRI 365*
Condensing Uunits, evaporatively cooled	≥ 135,000 Btu/h	13.5 *EER* Federal Minimum *IEER*	*AHRI 365*

Footnotes to Table 400.5 ~~-A~~(1) *[Table 110.2-A]*:

a. Deduct 0.2 from the required *EERs* and *IEERs* for units with a heating section other than electric resistance heat.

b. Applicable test procedure and reference year are provided under the definitions.

~~Footnotes to Table 400.5-A *[Table 110.2-A]*:~~

~~Deduct 0.2 from the required *EERs* and *IEERs* for units with a heating section other than electric resistance heat.~~

~~Applicable test procedure and reference year are provided under the definitions.~~

TABLE 400.5 ~~B~~(2) [TABLE 110.2-B] HEAT PUMPS, MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	RATING CONDITION[c, d]	EFFICIENCY[a]	TEST PROCEDURE[b]
Air Cooled (Cooling Mode), both *split system* and single package	≥ 65,000 Btu/h and < 135,000 Btu/h		11.0 *EER* Federal Minimum *IEER*	*AHRI 340/360*
Air Cooled (Cooling Mode), both *split system* and single package	≥ 135,000 Btu/h and < 240,000 Btu/h		10.6 *EER* Federal Minimum *IEER*	*AHRI 340/360*
Air Cooled (Cooling Mode), both *split system* and single package	≥ 240,000 Btu/h		9.5 *EER* Federal Minimum *IEER*	*AHRI 340/360*
Water Ssource (Ccooling Mmode)	≥ 65,000 Btu/h and < 135,000 Btu/h	86ºF entering water	Federal Minimum *EER*	ISO-13256-1
Groundwater Ssource (Ccooling mMode)	< 135,000 Btu/h	59ºF entering water	18.0 *EER*	ISO-13256-1
Ground Ssource (Ccooling Mmode)	< 135,000 Btu/h	77ºF entering water	14.1 *EER*	ISO-13256-1
Water Ssource, water-to-water (Ccooling Mmode)	< 135,000 Btu/h	86ºF entering water	10.6 *EER*	ISO-13256-2
Groundwater sSource, water-to-water (Ccooling Mmode)	< 135,000 Btu/h	59ºF entering water	16.3 *EER*	ISO-13256-2
Ground Ssource, brine-to-water (Ccooling Mmode)	< 135,000 Btu/h	77ºF entering water	12.1 *EER*	ISO-13256-2
Air Cooled (Heating Mode) *Split Ssystem* and sSingle Ppackage	≥ 65,000 Btu/h and < 135,000 Btu/h (cooling capacity)	47° F dbDB/43° F wb WB *outdoor air*	Federal Minimum *COP*	*AHRI 340/360*
Air Cooled (Heating Mode) *Split Ssystem* and Ssingle Ppackage	≥ 65,000 Btu/h and < 135,000 Btu/h (cooling capacity)	17° FDB db/15° F wb WB *outdoor air*	2.25 *COP*	*AHRI 340/360*

(CONTINUED): TABLE 400.5~~-B~~(2) [TABLE 110.2-B] HEAT PUMPS, MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	RATING CONDITION[c, d]	EFFICIENCY [a]	TEST PROCEDURE [b]
Air Cooled (Heating Mode) *Split Ssystem* and Ssingle Ppackage	≥ 135,000 Btu/h and < 240,000 Btu/h (cooling capacity)	47° F ~~db~~DB/43° F ~~wb~~ WB *outdoor air*	Federal Minimum *COP*	*AHRI 340/360*
Air Cooled (Heating Mode) *Split Ssystem* and Ssingle Ppackage	≥ 240,000 Btu/h and < 760,000 Btu/h	47° F ~~db~~DB/43° F ~~wb~~ WB *outdoor air*	Federal Minimum *COP*	*AHRI 340/360*
Air Cooled (Heating Mode) *Split Ssystem* and ~~s~~Single Ppackage	≥ 135,000 Btu/h (cooling capacity)	17° F ~~db~~DB/15° F ~~wb~~ WB *outdoor air*	2.05 *COP*	*AHRI 340/360*
Water Ssource (Hheating Mmode)	< 135,000 Btu/h (cooling capacity)	68ºF entering water	Federal Minimum *COP*	ISO-13256-1
Water Ssource (Hheating Mmode)	≥ 135,000 Btu/h and < 240,000 Btu/h	68ºF entering water	Federal Minimum *COP*	ISO-13256-1
Groundwater Ssource (Hheating Mmode)	< 135,000 Btu/h (cooling capacity)	50ºF entering water	3.7 *COP*	ISO-13256-1
Ground Ssource (Hheating Mmode)	< 135,000 Btu/h (cooling capacity)	32ºF entering water	3.2 *COP*	ISO-13256-1
Water Ssource, water-to-water (Hheating Mmode)	< 135,000 Btu/h (cooling capacity)	68ºF entering water	3.7 *COP*	ISO-13256-2
Groundwater Ssource, water-to-water (Hheating Mmode)	< 135,000 Btu/h (cooling capacity)	50ºF entering water	3.1 *COP*	ISO-13256-2
Ground Ssource, brine-to-water (Hheating Mmode)	< 135,000 Btu/h (cooling capacity)	32ºF entering water	2.5 *COP*	ISO-13256-2

Footnotes to Table 400.5(2) *[Table 110.2-B]*:

a. Deduct 0.2 from the required *EERs* and *IEERs* for units with a heating section other than electric resistance heat.

b. Applicable test procedure and reference year are provided under the definitions.

c. DB = Dry-Bulb

d. WB = Wet-Bulb

~~Footnotes to Table 400.5-B *[Table 110.2-B]*:~~

~~Deduct 0.2 from the required *EERs* and *IEERs* for units with a heating section other than electric resistance heat.~~

~~Applicable test procedure and reference year are provided under the definitions.~~

TABLE 400.5~~-C~~(3) [TABLE 110.2-C] AIR-COOLED GAS-ENGINE HEAT PUMPS

EQUIPMENT TYPE	SIZE CATEGORY	SUBCATEGORY OR RATING CONDITION[b,c]	EFFICIENCY	TEST PROCEDURE[a]
Air-Cooled Gas-Engine *Heat Pump* (Cooling Mode)	All Capacities	95° F ~~db~~ DB *Outdoor Air*	0.60 *COP*	*ANSI Z21.40.4A*
Air-Cooled Gas-Engine *Heat Pump* (Heating Mode)	All Capacities	47° F DB~~db~~/43° F ~~wb~~ WB *Outdoor Air*	0.72 *COP*	*ANSI Z21.40.4A*

Footnotes to Table 400.5-~~C~~(3) *[Table 110.2-C]*:

a. Applicable test procedure and reference year are provided under the definitions.

b. DB = Dry-Bulb

c. WB = Wet-Bulb

~~Footnotes to Table 400.5-C *[Table 110.2-C]*:~~

~~Applicable test procedure and reference year are provided under the definitions.~~

TABLE 400.5 ~~C~~(4) [TABLE 110.2-D] WATER CHILLING PACKAGES – MINIMUM EFFICIENCY REQUIREMENTS [a,b]

EQUIPMENT TYPE	SIZE CATEGORY	PATH A EFFICIENCY[a, b]	PATH B EFFICIENCY[a, b]	TEST PROCEDURE[c]
Air Cooled, ~~W~~with *c~~C~~ondenser* ~~E~~electrically o~~O~~perated	< 150 Tons	≥ 10.100 *EER* ≥ 13.700 *IPLV*	≥ 9.700 *EER* ≥15.800 *IPLV*	*AHRI 550/590*
Air Cooled, w~~W~~ith *c~~C~~ondenser* e~~E~~lectrically o~~O~~perated	≥ 150 Tons	≥ 10.100 *EER* ≥ 14.000 *IPLV*	≥ 9.700 *EER* ≥16.100 *IPLV*	*AHRI 550/590*
Air Cooled, w~~W~~ithout *c~~C~~ondenser* e~~E~~lectrically o~~O~~perated	All Capacities	Air-cooled chillers without *condensers* must be rated with matching *condensers* and comply with the air-cooled chiller efficiency requirements.	Air-cooled chillers without *condensers* must be rated with matching *condensers* and comply with the air-cooled chiller efficiency requirements.	*AHRI 550/590*
Water Cooled, e~~E~~lectrically o~~O~~perated, r~~R~~eciprocating	All Capacities	Reciprocating units must comply with the water-cooled positive displacement efficiency requirements.	Reciprocating units must comply with the water-cooled positive displacement efficiency requirements.	*AHRI 550/590*
Water Cooled, e~~E~~lectrically o~~O~~perated p~~P~~ositive d~~D~~isplacement	< 75 Tons	≤0.750kW/ton ≤ 0.600 *IPLV*	≤ 0.780 kW/ton ≤ 0.500 *IPLV*	*AHRI 550/590*
Water Cooled, e~~E~~lectrically o~~O~~perated p~~P~~ositive d~~D~~isplacement	≥ 75 tons and < 150 tons	≤ 0.720 kW/ton ≤ 0.560 *IPLV*	≤ 0.750 kW/ton ≤ 0.490 *IPLV*	*AHRI 550/590*
Water Cooled, e~~E~~lectrically o~~O~~perated p~~P~~ositive d~~D~~isplacement	≥ 150 tons and < 300 tons	≤ 0.660 kW/ton ≤ 0.540 *IPLV*	≤ 0.680 kW/ton ≤ 0.440 *IPLV*	*AHRI 550/590*
Water Cooled, e~~E~~lectrically o~~O~~perated p~~P~~ositive d~~D~~isplacement,	≥ 300 Tons and < 600 tons	≤ 0.610kW/ton ≤ 0.520 *IPLV*	≤ 0.625 kW/ton ≤ 0.410 *IPLV*	*AHRI 550/590*
Water Cooled, ~~E~~electrically o~~O~~perated p~~P~~ositive d~~D~~isplacement	≥ 600 tons	≤ 0.560 kW/ton ≤ 0.500 *IPLV*	≤ 0.585 kW/ton ≤ 0.380 *IPLV*	*AHRI 550/590*

(CONTINUED): TABLE 400.5 ~~D~~(4) [TABLE 110.2-D] WATER CHILLING PACKAGES – MINIMUM EFFICIENCY REQUIREMENTS [A,B]

~~EQUIPMENT TYPE~~EQUIPMENT TYPE	~~SIZE CATEGORY~~SIZE CATEGORY	~~PATH A EFFICIENCY~~PATH A EFFICIENCY [a,b]	~~PATH B EFFICIENCY~~PATH B EFFICIENCY [a,b]	~~TEST PROCEDURE~~TEST PROCEDURE [c]
Water Cooled, ~~E~~electrically ~~O~~operated, ~~C~~centrifugal	< 150 Tons	≤ 0.610 kW/ton ≤ 0.550IPLV	≤ 0.695 kW/ton ≤ 0.440 *IPLV*	*AHRI 550/590*
Water Cooled, ~~E~~electrically ~~O~~operated, ~~C~~centrifugal	≥ 150 tons and < 300 tons	≤ 0.610 kW/ton ≤ 0.550 *IPLV*	≤ 0.635 kW/ton ≤ 0.400 *IPLV*	*AHRI 550/590*
Water Cooled, ~~E~~electrically ~~O~~operated, ~~C~~centrifugal	≥ 300 tons and < 400 tons	≤ 0.560 kW/ton ≤ 0.520 *IPLV*	≤ 0.595 kW/ton ≤ 0.390 *IPLV*	*AHRI 550/590*
Water Cooled, ~~E~~electrically ~~O~~operated, ~~C~~centrifugal	≥ 400 tons and < 600 tons	≤ 0.560 kW/ton ≤ 0.500 *IPLV*	≤ 0.585 kW/ton ≤ 0.380 *IPLV*	*AHRI 550/590*
Water Cooled, ~~E~~electrically ~~O~~operated, ~~C~~centrifugal	≥ 600 tons	≤ 0.560 kW/ton ≤ 0.500 *IPLV*	≤ 0.585 kW/ton ≤ 0.380 *IPLV*	*AHRI 550/590*
Air Cooled Absorption, ~~S~~single ~~E~~effect	All Capacities	≥0.600 *COP*	N.A. [d]	*AHRI 560*
Water Cooled Absorption, ~~S~~single ~~E~~effect	All Capacities	≥ 0.700 *COP*	N.A. [d]	*AHRI 560*
Absorption Double Effect, ~~I~~indirect-~~F~~fired	All Capacities	≥ 1.000 *COP* ≥ 1.050 *IPLV*	N.A. [d]	*AHRI 560*
Absorption Double Effect, ~~D~~direct-~~F~~fired	All Capacities	≥ 1.000 *COP* ≥1.000 *IPLV*	N.A. [d]	*AHRI 560*
Water Cooled Gas Engine Driven Chiller	All Capacities	≥ 1.2 *COP* ≥ 2.0 *IPLV*	N.A. [d]	*ANSI Z21.40.4A*

Footnotes to Table 400.5-~~D~~(4) *[Table 110.2-D]*:

a. No requirements for:

   1. Centrifugal chillers with design leaving evaporator temperature < 36°F; or

   2. Positive displacement chillers with design leaving fluid temperature ≤ 32°F; or

   3. Absorption chillers with design leaving fluid temperature < 40°F.

b. Must meet the minimum requirements of Path A for fixed speed chillers or Path B for variable speed chillers. ~~However, both the full load (*COP*) and *IPLV* must be met to fulfill the requirements of the applicable Path.~~For cooling operation, both the FL and *IPLV* must be met to fulfill the requirements of the applicable path.

c. See Section 201 *[Section 100.1]* for definitions.

d. N.A. means not applicable.

~~Footnotes to Table 400.5-D *[Table 110.2-D]*:~~

~~No requirements for:~~

~~Centrifugal chillers with design leaving evaporator temperature < 36°F; or~~

~~Positive displacement chillers with design leaving fluid temperature ≤ 32°F; or~~

~~Absorption chillers with design leaving fluid temperature < 40°F.~~

~~Must meet the minimum requirements of Path A or Path B. However, both the full load (*COP*) and *IPLV* must be met to fulfill the requirements of the applicable Path.~~

~~See Section 201 *[Section 100.1]* for definitions.~~

~~N.A. means not applicable.~~

TABLE 400.5-E(5) [TABLE 110.2-E] PERFORMANCE REQUIREMENTS FOR HEAT REJECTION EQUIPMENT

EQUIPMENT TYPE	TOTAL SYSTEM HEAT REJECTION CAPACITY AT RATED CONDITIONS	SUBCATEGORY OR RATING CONDITION[f, g]	PERFORMANCE REQUIRED [a, b, c, d]	TEST PROCEDURE[e]
Propeller or Aaxial Ffan *Open-circuit Ccooling Ttowers*	All	95°F entering water 85°F leaving water 75°F entering air wbWB	≥ 42.1 gpm/hp	*CTI ATC-105* and *CTI STD-201* RS
Centrifugal Ffan *Open-circuit Ccooling Ttowers*	All	95°F entering water 85°F leaving water 75°F entering air wbWB	≥ 20.0 gpm/hp	*CTI ATC-105* and *CTI STD-201* RS
Propeller or Aaxial Ffan *cClosed-circuit Ccooling Ttowers*	All	102°F entering water 90°F leaving water 75°F entering air wbWB	≥ 16.1 gpm/hp	*CTI ATC-105S* and *CTI STD-201* RS
Centrifugal Ffan *Cclosed-circuit Ccooling Ttowers*	All	102°F entering water 90°F leaving water 75°F entering air wbWB	≥ 7.0 gpm/hp	*CTI ATC-105S* and *CTI STD-201* RS
Propeller or aAxial Ffan Eevaporative *Ccondensers*	All	R-448A test fluid 165ºF entering gas temp 105ºF condensing temp 75ºF entering air wbWB	≥ 157,000 Btu/h • hp	*CTI ATC-106*
Propeller or Aaxial Ffan Eevaporative *Ccondensers*	All	Ammonia test fluid 140ºF entering gas temp 96.3ºF condensing temp 75ºF entering air wbWB	≥ 134,000 Btu/h • hp	*CTI ATC-106*
Centrifugal Ffan Eevaporative *Ccondensers*	All	R-448A test fluid 165ºF entering gas temp 105ºF condensing temp 75ºF entering air wbWB	≥ 135,000 Btu/h • hp	*CTI ATC-106*

(CONTINUED): TABLE 400.5 ~~E~~ E(5) [TABLE 110.2-E] PERFORMANCE REQUIREMENTS FOR HEAT REJECTION EQUIPMENT

EQUIPMENT TYPE	TOTAL SYSTEM HEAT REJECTION CAPACITY AT RATED CONDITIONS	SUBCATEGORY OR RATING CONDITIONS[f, g]	PERFORMANCE REQUIRED[a, b, c, d]	TEST PROCEDURE[e]
Centrifugal Ff~~f~~an ~~e~~Evaporative *Cc~~o~~ondensers*	All	Ammonia test fluid 140ºF entering gas temp 96.3ºF condensing temp 75ºF entering air ~~wb~~WB	≥ 110,000 Btu/h • hp	*CTI ATC-106*
Air Cc~~o~~ooled *Cc~~o~~ondensers*	All	125°F *condensing temperature* 190°F entering gas temperature 15°F subcooling 95°F entering ~~drybulb~~DB	≥ 176,000 Btu/h · hp	*AHRI 460*
Propeller or Aa~~a~~xial Ff~~f~~an *Dd~~r~~y Cc~~o~~olers* (air-cooled *fluid coolers*)	All	115°F entering water 105°F leaving water 95°F entering air ~~db~~DB	> 4.5 gpm/hp	*CTI ATC-105DS*

Footnotes to Table 400.5 ~~E~~(5) *[Table 110.2-E]*:

a. For purposes of this table, *open-circuit cooling tower* performance is defined as the water flow rating of the tower at the given rated conditions divided by the fan motor nameplate power.

b. For purposes of this table, *closed-circuit cooling tower* performance is defined as the *process* water flow rating of the tower at the given rated conditions divided by the sum of the fan motor nameplate rated power and the integral spray pump motor nameplate power.

c. For purposes of this table *dry cooler* performance is defined as the *process* water flow rating of the unit at the given thermal rating condition divided by the total fan motor nameplate power of the unit and air-cooled *condenser* performance is defined as the heat rejected from the refrigerant divided by the fan motor nameplate power of the unit.

d. *Open cooling towers* shall be tested using the test procedures in *CTI ATC-105*. Performance of factory assembled *open cooling towers* shall be either certified as base models as specified in *CTI STD-201* or verified by testing in the field by a *CTI* approved testing agency. Open *factory assembled cooling towers* with custom options added to a *CTI* certified base model for the purpose of safe maintenance or to reduce environmental or noise impact shall be rated at 90 percent of the *CTI* certified performance of the associated base model or at the manufacturer's stated performance, whichever is less. Base models of open *factory assembled cooling towers* are *open cooling towers* configured in exact accordance with the Data of Record submitted to *CTI* as specified by *CTI STD-201*. There are no certification requirements for *field erected cooling towers*.

e. Applicable test procedure and reference year are provided under the definitions. For *refrigerated warehouses* or commercial refrigeration applications, *condensers* shall comply with requirements specified by Section 901.1 *[Section 120.6(a)]* or Section 902.1 *[Section 120.6(b)]*.

f. DB = Dry-Bulb

g. WB = Wet-Bulb

~~Footnotes to Table 400.5-E *[Table 110.2-E]*:~~

~~For purposes of this table, *open-circuit cooling tower* performance is defined as the water flow rating of the tower at the given rated conditions divided by the fan motor nameplate power.~~

~~For purposes of this table, *closed-circuit cooling tower* performance is defined as the *process* water flow rating of the tower at the given rated conditions divided by the sum of the fan motor nameplate rated power and the integral spray pump motor nameplate power.~~

~~For purposes of this table *dry cooler* performance is defined as the *process* water flow rating of the unit at the given thermal rating condition divided by the total fan motor nameplate power of the unit and air-cooled *condenser* performance is defined as the heat rejected from the refrigerant divided by the fan motor nameplate power of the unit.~~

~~*Open cooling towers* shall be tested using the test procedures in *CTI ATC-105*. Performance of factory assembled *open cooling towers* shall be either certified as base models as specified in *CTI STD-201* or verified by testing in the field by a *CTI* approved testing agency. Open *factory assembled cooling towers* with custom options added to a *CTI* certified base model for the purpose of safe maintenance or to reduce environmental or noise impact shall be rated at 90 percent of the *CTI* certified performance of the associated base model or at the manufacturer's stated performance, whichever is less. Base models of open *factory assembled cooling towers* are *open cooling towers* configured in exact accordance with the Data of Record submitted to *CTI* as specified by *CTI STD-201*. There are no certification requirements for *field erected cooling towers*.~~

~~Applicable test procedure and reference year are provided under the definitions. For *refrigerated warehouses* or commercial refrigeration applications, *condensers* shall comply with requirements specified by Section 901.1 *[Section 120.6(a)]* or Section 902.1 *[Section 120.6(b)]*.~~

TABLE 400.5 ~~F~~(6) [TABLE 110.2-F] ELECTRICALLY OPERATED VARIABLE REFRIGERANT FLOW (VRF) AIR CONDITIONERS - MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUB-CATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE[a]
VRF *Air Conditioners*, a~~A~~ir c~~C~~ooled	<65,000 Btu/h	All	VRF Multi-split System	~~13.0 SEER Before 1/1/2023~~ Federal Minimum *SEER2* ~~On or After 1/1/2023~~	~~AHRI 1230 Before 1/1/2023~~ *AHRI 210/240* ~~On or After 1/1/2023~~
VRF *Air Conditioners*, a~~A~~ir c~~C~~ooled	≥65,000 Btu/h and <135,000 Btu/h	Electric Resistance (or none)	VRF Multi-split System	10.5 *EER* Federal Minimum *IEER* [b]	*AHRI 1230*
VRF *Air Conditioners*, a~~A~~ir c~~C~~ooled	≥135,000 Btu/h and <240,000 Btu/h	Electric Resistance (or none)	VRF Multi-split System	10.3 *EER* Federal Minimum *IEER* [b]	*AHRI 1230*
VRF *Air Conditioners*, a~~A~~ir c~~C~~ooled	≥240,000 Btu/h	Electric Resistance (or none)	VRF Multi-split System	9.5 *EER* Federal Minimum *IEER* [b]	*AHRI 1230*

Footnotes to Table 400.5(6) *[Table 110.2-F]*:

a. Applicable test procedure and reference year are provided under the definitions.

b. *IEERs* are only applicable to *equipment* with capacity control as specified by *AHRI 1230* test procedures.

~~Footnotes to Table 400.5 F *[Table 110.2-F]*:~~

~~a. Applicable test procedure and reference year are provided under the definitions.~~

~~b. *IEERs* are only applicable to *equipment* with capacity control as specified by *AHRI 1230* test procedures.~~

TABLE 400.5 ~~G~~(7) [TABLE 110.2-G] ELECTRICALLY OPERATED VARIABLE REFRIGERANT FLOW AIR-TO-AIR AND APPLIED HEAT PUMPS – MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUB-CATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE[b]
VRF Air Cooled, (~~c~~Cooling M~~m~~ode)	<65,000 Btu/h	All	VRF Multi-split System	~~13.0 SEER Before 1/1/2023~~ Federal Minimum =*SEER2* ~~On or after 1/1/2023~~	~~AHRI 1230 Before 1/1/2023~~ *AHRI 210/240* ~~On or After 1/1/2023~~
VRF Air Cooled, (C~~c~~ooling M~~m~~ode)	≥65,000 Btu/h and <135,000 Btu/h	Electric Resistance (or none)	VRF Multi-split System [a]	10.3 *EER* Federal Minimum *IEER* [c]	*AHRI 1230*
VRF Air Cooled, (C~~c~~ooling M~~m~~ode)	≥135,000 Btu/h and <240,000 Btu/h	Electric Resistance (or none)	VRF Multi-split System [a]	9.9 *EER* Federal Minimum *IEER* [c]	*AHRI 1230*
VRF Air Cooled, (C~~c~~ooling M~~m~~ode)	≥240,000 Btu/h	Electric Resistance (or none)	VRF Multi-split System [a]	9.1 *EER* Federal Minimum *IEER* [c]	*AHRI 1230*
VRF Water S~~s~~ource (C~~c~~ooling M~~m~~ode)	<65,000 Btu/h	All	VRF Multi-split systems [a] 86ºF entering water	12.0 *EER* Federal Minimum *IEER* [c]	*AHRI 1230*
VRF Water S~~s~~ource (C~~c~~ooling M~~m~~ode)	≥65,000 Btu/h and <135,000 Btu/h	All	VRF Multi-split System [a] 86ºF entering water	12.0 *EER* Federal Minimum *IEER* [c]	*AHRI 1230*
VRF Water S~~s~~ource (C~~c~~ooling M~~m~~ode)	≥135,000 Btu/h and < 240,000	All	VRF Multi-split System [a] 86ºF entering water	10.0 *EER* Federal Minimum *IEER* [c]	*AHRI 1230*
VRF Water S~~s~~ource (C~~c~~ooling M~~m~~ode)	≥ 240,000 Btu/h	All	VRF Multi-split System[a] 86ºF entering water	10.0 *EER* Federal Minimum *IEER*	*AHRI 1230*

(CONTINUED): TABLE 400.5~~-G~~(7) [TABLE 110.2-G] ELECTRICALLY OPERATED VARIABLE REFRIGERANT FLOW AIR-TO-AIR AND APPLIED HEAT PUMPS – MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUB-CATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE [B]
VRF Groundwater Ssource (Ccooling Mmode)	<135,000 Btu/h	All	VRF Multi-split System [a] 59ºF entering water	16.2 *EER*	*AHRI 1230*
VRF Groundwater Ssource (Ccooling Mmode)	≥135,000 Btu/h	All	VRF Multi-split System [a] 59ºF entering water	13.8 *EER*	*AHRI 1230*
VRF Ground Ssource (cCooling Mmode)	<135,000 Btu/h	All	VRF Multi-split System [a] 77ºF entering water	13.4 *EER*	*AHRI 1230*
VRF Ground Ssource (Ccooling Mmode)	≥135,000 Btu/h	All	VRF Multi-split System [a] 77ºF entering water	11.0 *EER*	*AHRI 1230*
VRF Air Cooled (Hheating Mmode)	<65,000 Btu/h (cooling capacity)	---	VRF Multi-split System	~~7.7 HSPF Before 1/1/2025~~ 7.5 *HSPF2* ~~On or after 1/1/2025~~	~~AHRI 1230 Before 1/1/2025~~ *AHRI 210/240* ~~On or After 1/1/2025~~
VRF Air Cooled (Hheating Mmode)	≥65,000 Btu/h and <135,000 Btu/h (cooling capacity)	---	VRF Multi-split system 47ºF ~~db~~DB/ 43ºF ~~wb~~ WB *outdoor air*	Federal Minimum *COP*	*AHRI 1230*
VRF Air Cooled (Hheating Mmode)	≥65,000 Btu/h and <135,000 Btu/h (cooling capacity)	---	VRF Multi-split Ssystem 17ºF db/15ºF wb *outdoor air*	2.25 *COP*	*AHRI 1230*
VRF Air Cooled (Hheating Mmode)	≥135,000 Btu/h (cooling capacity)	---	VRF Multi-split Ssystem 47ºF ~~db~~DB/ 43ºF ~~wb~~ WB *outdoor air*	Federal Minimum *COP*	*AHRI 1230*

(CONTINUED): TABLE 400.5~~-G~~(7) [TABLE 110.2-G] ELECTRICALLY OPERATED VARIABLE REFRIGERANT FLOW AIR-TO-AIR AND APPLIED HEAT PUMPS – MINIMUM EFFICIENCY REQUIREMENTS

~~EQUIPMENT TYPE~~EQUIPMENT TYPE	~~SIZE CATEGORY~~SIZE CATEGORY	~~HEATING SECTION TYPE~~HEATING SECTION TYPE	~~SUB-CATEGORY OR RATING CONDITION~~SUB-CATEGORY OR RATING CONDITION[d,e]	~~MINIMUM EFFICIENCY~~MINIMUM EFFICIENCY	~~TEST PROCEDURE~~ TEST PROCEDURE [b]
VRF Air Cooled (H~~h~~eating M~~m~~ode)	≥135,000 Btu/h (cooling capacity)	---	VRF Multi-split system 17ºF ~~db~~DB/15ºF ~~wb~~ WB *outdoor air*	2.05 *COP*	*AHRI 1230*
VRF Water S~~s~~ource (H~~h~~eating M~~m~~ode)	< 65,000 Btu/h (cooling capacity)	---	VRF Multi-split System 68ºF entering water	Federal Minimum *COP*	*AHRI 1230*
VRF Water ~~s~~Source (H~~h~~eating M~~m~~ode)	≥65,000 Btu/h and <135,000 Btu/h (cooling capacity)	---	VRF Multi-split System 68ºF entering water	Federal Minimum *COP*	*AHRI 1230*
VRF Water S~~s~~ource (H~~h~~eating M~~m~~ode)	≥135,000 Btu/h and < 240,000 Btu/h (cooling capacity)	---	VRF Multi-split System 68ºF entering water	Federal Minimum *COP*	*AHRI 1230*
VRF Water S~~s~~ource (H~~h~~eating M~~m~~ode)	≥ 240,000 Btu/h (cooling capacity)	---	VRF Multi-split System 68ºF entering water	Federal Minimum *COP*	*AHRI 1230*
VRF Groundwater S~~s~~ource (H~~h~~eating M~~m~~ode)	<135,000 Btu/h (cooling capacity)	---	VRF Multi-split System 50ºF entering water	3.6 *COP*	*AHRI 1230*
VRF Groundwater source (H~~h~~eating M~~m~~ode)	≥135,000 Btu/h (cooling capacity)	---	VRF Multi-split System 50ºF entering water	3.3 *COP*	*AHRI 1230*
VRF Ground S~~s~~ource (H~~h~~eating M~~m~~ode)	<135,000 Btu/h (cooling capacity)	---	VRF Multi-split System 32ºF entering water	3.1 *COP*	*AHRI 1230*
VRF Ground S~~s~~ource (H~~h~~eating M~~m~~ode)	≥135,000 Btu/h (cooling capacity)	---	VRF Multi-split System 32ºF entering water	2.8 *COP*	*AHRI 1230*

Footnotes to Table 400.5(7) *[Table 110.2-G]*:

a. Deduct 0.2 from the required *EERs* and *IEERs* for Variable Refrigerant Flow (VRF) Multi-split system units with a heating recovery section.

b. Applicable test procedure and reference year are provided under the definitions.

c. *IEERs* are only applicable to *equipment* with capacity control as specified by *AHRI 1230* test procedures.

d. DB = Dry-Bulb

e. WB = Wet-Bulb

~~Footnotes to Table 400.5-G *[Table 110.2-G]*:~~

~~a. Deduct 0.2 from the required *EERs* and *IEERs* for Variable Refrigerant Flow (VRF) Multi-split system units with a heating recovery section.~~

~~b. Applicable test procedure and reference year are provided under the definitions.~~

~~c. *IEERs* are only applicable to *equipment* with capacity control as specified by *AHRI 1230* test procedures.~~

TABLE 400.5 ~~H~~(8) [TABLE 110.2-H] DX-DOAS UNITS, SINGLE-PACKAGE AND REMOTE CONDENSER – MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	ENERGY RECOVERY	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE[a]
Air C~~c~~ooled (D~~d~~ehumidification M~~m~~ode)	Without energy recovery	NA	3.8 ISMRE2	*AHRI 920*
Air S~~s~~ource *H~~h~~eat P~~p~~umps* (D~~d~~ehumidification M~~m~~ode)	Without energy recovery	NA	3.8 ISMRE2	*AHRI 920*
Water C~~c~~ooled (D~~d~~ehumidification M~~m~~ode)	Without energy recovery	Cooling Tower *Condenser* Water	4.7 ISMRE2	*AHRI 920*
Water S~~s~~ource *H~~h~~eat P~~p~~ump* (D~~d~~ehumidification M~~m~~ode)	Without energy recovery	Ground S~~s~~ource, closed and open loop	4.6 ISMRE2	*AHRI 920*
Water S~~s~~ource *H~~h~~eat P~~p~~ump* (dehumidification mode)	Without energy recovery	Water S~~s~~ource	3.8 ISMRE2	*AHRI 920*
Air source *heat pumps* (heating mode)	Without energy recovery	NA	2.05 ISCOP2	*AHRI 920*
Water source *heat pump* (heating mode)	Without energy recovery	Ground S~~s~~ource, closed and open loop	2.13 ISCOP2	*AHRI 920*
Water source *heat pump* (heating mode)	Without energy recovery	Water S~~s~~ource	2.13 ISCOP2	*AHRI 920*
Air cooled (dehumidification mode)	With energy recovery	NA	5.0 ISMRE2	*AHRI 920*
Air source *heat pumps* (dehumidification mode)	With energy recovery	NA	5.0 ISMRE2	*AHRI 920*

(CONTINUED): TABLE 400.5 ~~H~~(8) [TABLE 110.2-H] DX-DOAS UNITS, SINGLE-PACKAGE AND REMOTE CONDENSER – MINIMUM EFFICIENCY REQUIREMENTS

~~EQUIPMENT TYPE~~EQUIPMENT TYPE	~~ENERGY RECOVERY~~ENERGY RECOVERY	~~SUBCATEGORY OR RATING CONDITION~~SUB-CATEGORY OR RATING CONDITIONS	~~MINIMUM EFFICIENCY~~MINIMUM EFFICIENCY	~~TEST~~ TEST PROCEDURE~~PROCEDURE~~[a]
Water C~~c~~ooled (D~~d~~ehumidification ~~m~~Mode)	With energy recovery	Cooling T~~t~~ower *C~~c~~ondenser* W~~w~~ater	5.1 ISMRE2	*AHRI 920*
Water S~~s~~ource *H~~h~~eat P~~p~~ump* (D~~d~~ehumidification M~~m~~ode)	With energy recovery	Ground ~~s~~Source, closed and open loop	5.0 ISMRE2	*AHRI 920*
Water S~~s~~ource *H~~h~~eat P~~p~~ump* (D~~d~~ehumidification M~~m~~ode)	With energy recovery	Water S~~s~~ource	4.6 ISMRE2	*AHRI 920*
Air S~~s~~ource *H~~h~~eat P~~p~~umps* (H~~h~~eating M~~m~~ode)	With energy recovery		3.2 ISCOP2	*AHRI 920*
Water S~~s~~ource *H~~h~~eat P~~p~~ump* (H~~h~~eating M~~m~~ode)	With energy recovery	Ground S~~s~~ource, closed and open loop	3.5 ISCOP2	*AHRI 920*
Water S~~s~~ource *H~~h~~eat P~~p~~ump* (H~~h~~eating M~~m~~ode)	With energy recovery	Water S~~s~~ource	4.04 ISCOP2	*AHRI 920*

Footnotes to Table 400.5 ~~H~~(8) *[Table 110.2-H]*:

a. Applicable test procedure and reference year are provided under the definitions.

~~Footnotes to Table 400.5 H *[Table 110.2-H]*:~~

~~Applicable test procedure and reference year are provided under the definitions.~~

TABLE 400.5 ~~I~~(9) [TABLE 110.2-I] HEAT PUMP AND HEAT RECOVERY CHILLER PACKAGES, COOLING OPERATION – MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY REFRIGERATING CAPACITY[a], TON_R	PATH A COOLING OPERATION EFFICIENCY[b, c, d, e], AIR SOURCE *EER* (FL/*IPLV*), BTU/WH, LIQUID SOURCE POWER INPUT PER CAPACITY (FL/*IPLV*), KW/TON_R ~~PATH A~~	PATH B COOLING OPERATION EFFICIENCY[b, c, d, e], AIR SOURCE *EER* (FL/*IPLV*), BTU/WH, LIQUID SOURCE POWER INPUT PER CAPACITY (FL/*IPLV*), KW/TON_R ~~PATH B~~	TEST PROCEDURE
Air Source	< 150	> 5.595 FL > 13.02 *IPLV*.IP	> 9.215 FL > 15.01 *IPLV*.IP	*AHRI 550/590*
Air Source	> 150	> 5.595 FL > 13.30 *IPLV*.IP	> 9.215 FL > 15.30 *IPLV*.IP	*AHRI 550/590*
Liquid ~~s~~Source Eelectrically Ooperated Ppositive Ddisplacement	> 11.25[f] and < 150	< 0.7895 FL < 0.6316 *IPLV*.IP	< 0.8211 FL < 0.5263 *IPLV*.IP	*AHRI 550/590*
Liquid Source Electrically Operated Positive Displacement~~Liquid source electrically operated positive displacement~~	> 150 and < 300	< 0.7579 FL < 0.5895 *IPLV*.IP	< 0.7895 FL < 0.5158 *IPLV*.IP	*AHRI 550/590*
Liquid Source Electrically Operated Positive Displacement~~Liquid source electrically operated positive displacement~~	> 300 and < 400	< 0.6947 FL < 0.5684 *IPLV*.IP	< 0.7158 FL < 0.4632 *IPLV*.IP	*AHRI 550/590*
Liquid Source Electrically Operated Positive Displacement~~Liquid source electrically operated positive displacement~~	> 400 and < 600	< 0.6421 FL < 0.5474 *IPLV*.IP	< 0.6579 FL < 0.4316 *IPLV*.IP	*AHRI 550/590*
Liquid Source Electrically Operated Positive Displacement~~Liquid source electrically operated positive displacement~~	> 600	< 0.5895 FL < 0.5263 *IPLV*.IP	< 0.6158 FL < 0.4000 *IPLV*.IP	*AHRI 550/590*
Liquid Source Electrically Operated Positive Displacement~~Liquid source electrically operated centrifugal~~	> 11.25[f] and < 150	< 0.6421 FL < 0.5789 *IPLV*.IP	< 0.7316 FL < 0.4632 *IPLV*.IP	*AHRI 550/590*

Liquid Source Electrically Operated Positive Displacement~~Liquid source electrically operated centrifugal~~	> 150 and < 300	< 0.6190 FL < 0.5748 *IPLV*.IP	< 0.6684 FL < 0.4211 *IPLV*.IP	*AHRI ~~/~~550/590*
Liquid Source Electrically Operated Positive Displacement~~Liquid source electrically operated centrifugal~~	> 300 and < 400	< 0.5895 FL < 0.5526 *IPLV*.IP	< 0.6263 FL < 0.4105 *IPLV*.IP	*AHRI ~~/~~550/590*
Liquid Source Electrically Operated Positive Displacement~~Liquid source electrically operated centrifugal~~	> 400 and < 600	< 0.5895 FL < 0.5263 *IPLV*.IP	< 0.6158 FL < 0.4000 *IPLV*.IP	*AHRI ~~/~~550/590*
Liquid Source Electrically Operated Positive Displacement~~Liquid source electrically operated centrifugal~~	> 600	< 0.5895 FL < 0.5263 *IPLV*.IP	< 0.6158 FL < 0.4000 *IPLV*.IP	*AHRI ~~/~~550/590*

Footnotes to Table 400.5~~.I~~(9) *[Table 110.2-I]*:

a. The size category is the full-load net refrigeration cooling mode capacity, which is the capacity of the evaporator available for cooling of the thermal load external to the chilling package.

b. Cooling rating conditions are standard rating conditions defined in *AHRI 550/590* (I-P), Table 4, except for liquid cooled centrifugal chilling packages which can adjust cooling efficiency for nonstandard rating conditions using K_{adj} procedure in accordance with Section 400.5.1 *[Section 110.2(a)]*.

c. ~~For cooling operation, compliance with both the FL and *IPLV* is required, but only~~ Must meet the minimum requirements of ~~compliance with~~ Path A for fixed speed chillers or Path B for variable speed chillers ~~or Path B cooling efficiency is required~~. For cooling operation, both the FL and *IPLV* must be met to fulfill the requirements of the applicable path.

d. For units that operate in both cooling and heating, compliance with both the cooling and heating efficiency is required.

e. For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recover COP_{HR} is only required at one of the four heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, Hot-Water 1 or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes b and c.

f. Water to water *heat pumps* with capacity less than 135,000 Btu/h are included in Table 400.5~~.B~~(2) *[Table 110.2-B] Heat Pumps*, Minimum Efficiency Requirements.

~~Footnotes to Table 400.5.I *[Table 110.2-I]*:~~

~~The size category is the full-load net refrigeration cooling mode capacity, which is the capacity of the evaporator available for cooling of the thermal load external to the chilling package.~~

~~Cooling rating conditions are standard rating conditions defined in *AHRI 550/590* (I-P), Table 4, except for liquid cooled centrifugal chilling packages which can adjust cooling efficiency for nonstandard rating conditions using K_{adj} procedure in accordance with Section 400.5.1 *[Section 110.2(a)]*.~~

~~For cooling operation, compliance with both the FL and *IPLV* is required, but only compliance with Path A or Path B cooling efficiency is required.~~

~~For units that operate in both cooling and heating, compliance with both the cooling and heating efficiency is required.~~

~~For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recover COP_{HR} is only required at one of the four heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, Hot-Water 1 or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes b and c.~~

~~Water to water *heat pumps* with capacity less than 135,000 Btu/h are included in Table 400.5-B *[Table 110.2-B]* Heat Pumps, Minimum Efficiency Requirements.~~

TABLE 400.5 ~~J~~(10) [TABLE 110.2-J] HEAT PUMP AND HEAT RECOVERY CHILLER PACKAGES, HEAT PUMP, HEATING OPERATION – MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type: Air Source

SIZE CATEGORY REFRIGERATING CAPACITY[a], TON_R	HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR OAT (DB/WB)[b, k, l], F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H)[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, LOW, 95 F/105 F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H)[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, MEDIUM, 105 F/120 F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H)[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, HIGH, 120 F/140 F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H)[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, BOOST, 120 F/140 F	TEST PROCEDURE
< 150	47 ~~db~~DB 43 ~~wb~~WB	> 3.29	> 2.77	> 2.31	NAj	*AHRI 550/590*
< 150	17 ~~db~~DB 15 ~~wb~~WB	> 2.029	> 1.775	> 1.483	NAj	*AHRI 550/590*
> 150	47 ~~db~~DB 43 ~~wb~~WB	> 3.29	> 2.77	> 2.31	NAj	*AHRI 550/590*
> 150	17 ~~db~~DB 15 ~~wb~~WB	> 2.029	> 1.775	> 1.483	NAj	*AHRI 550/590*

(CONTINUED): TABLE 400.5~~J~~(10) [TABLE 110.2-J] HEAT PUMP AND HEAT RECOVERY CHILLER PACKAGES, HEAT PUMP, HEATING OPERATION – MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type: Liquid source electrically operated positive displacement

SIZE CATEGORY REFRIGERATING CAPACITY[a], TONR	HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR OAT (DB/WB)[b, k, l], F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H) [c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, LOW, 95 F/105 F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H) [c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, MEDIUM, 105 F/120 F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H) [c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, HIGH, 120 F/140 F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H) [c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, BOOST, 120 F/140 F	TEST PROCEDURE
> 11.25[h] and < 150	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	*AHRI 550/590*
> 11.25 [h] and < 150	65 [i]	NA[j]	NA[j]	NA[j]	> 3.55	*AHRI 550/590*
> 150 and < 300	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	*AHRI 550/590*
> 150 and < 300	65 [i]	NA[j]	NA[j]	NA[j]	> 3.55	*AHRI 550/590*
> 300 and < 400	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	*AHRI 550/590*
> 300 and < 400	65 [i]	NA[j]	NA[j]	NA[j]	> 3.55	*AHRI 550/590*
> 400 and < 600	44[i]	> 4.93	> 3.96	> 2.97	NA[j]	*AHRI 550/590*
> 400 and < 600	65 [i]	NA[j]	NA[j]	NA[j]	> 3.9	*AHRI 550/590*
> 600	44[i]	> 4.93	> 3.96	> 2.97	NA[g]	*AHRI 550/590*
> 600	65 [i]	NA[j]	NA[j]	NA[j]	> 3.9	*AHRI 550/590*

(CONTINUED): TABLE 400.5~~J~~(10) [TABLE 110.2-J] HEAT PUMP AND HEAT RECOVERY CHILLER PACKAGES, HEAT PUMP, HEATING OPERATION – MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type: Liquid source electrically operated centrifugal

SIZE CATEGORY REFRIGERATING CAPACITY[a], TON_R	HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR OAT (DB/WB)[b,k,l], F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H)[c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, LOW, 95 F/105 F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H)[c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, MEDIUM, 105 F/120 F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H)[c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, HIGH, 120 F/140 F	*HEAT PUMP* HEATING FULL LOAD HEATING EFFICIENCY (COP_H)[c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, BOOST, 120 F/140 F	TEST PROCEDURE
> 11.25[h] and < 150	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	*AHRI 550/590*
> 11.25[h] and < 150	65[i]	NA[j]	NA[j]	NA[j]	> 3.55	*AHRI 550/590*
> 150 and < 300	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	*AHRI 550/590*
> 150 and < 300	65[i]	NA[j]	NA[j]	NA[j]	> 3.55	*AHRI 550/590*
> 300 and < 400	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	*AHRI 550/590*
> 300 and < 400	65[i]	NA[g]	NA[g]	NA[g]	> 3.55	*AHRI 550/590*
> 400 and < 600	44[i]	> 4.93	> 3.96	> 2.97	NA[j]	*AHRI 550/590*
> 400 and < 600	65[i]	NA[j]	NA[j]	NA[j]	> 3.9	*AHRI 550/590*
> 600	44[i]	> 4.93	> 3.96	> 2.97	NA[j]	*AHRI 550/590*
> 600	65[i]	NA[j]	NA[j]	NA[j]	> 3.9	*AHRI 550/590*

Footnotes to Table 400.5 ~~J~~(10) *[Table 110.2-J]*:

a. The size category is the full-load net refrigeration cooling mode capacity, which is the capacity of the evaporator available for cooling of the thermal load external to the chilling package.

b. For air source *heat pumps*, compliance with both the 47 F and 17 F heating source *outdoor air* temperature (OAT) rating efficiency is required for heating.

c. Heating full load rating conditions are at standard rating conditions defined in *AHRI 550/590* (I-P), Table 4, includes the impact of defrost for air source heating ratings.

d. For units that operate in both cooling and heating, compliance with both the cooling and heating efficiency is required.

e. For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recover COP_{HR} is only required at one of the four heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, Hot-Water 1 or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes b and c of Table 400.5 ~~I~~(9) *[Table 110.2-I]*.

f. For applications where the chilling package is installed to operate only in heating, compliance only with the heating performance COP_H is required at only one of the heating *AHRI 550/590* (I-P) standard rating conditions of Low, Medium, High, or Boost. Compliance with cooling performance is not required.

g. For *heat pump* chilling package applications where the cooling capacity is not being used for conditioning, compliance with the heating performance COP_H is only required at one of the heating *AHRI 550/590* (I-P) standard rating conditions of Low, Medium, High, or Boost. Compliance with the cooling performance is required as defined in footnotes b and c of Table 400.5 ~~I~~(9) *[Table 110.2-I]*, except as noted in footnote f.

h. Water to water *heat pumps* with capacity less than 135,000 Btu/h are included in Table 400.5 ~~B~~(2) *[Table 110.2-B] Heat Pumps*, Minimum Efficiency Requirements.

i. Source leaving liquid temperature.

   1. The cooling evaporator liquid flow rate used for the heating rating for a reverse cycle air to water *heat pump* shall be the flow rate determined during the full load cooling rating.

   2. The cooling evaporator liquid flow rate for the simultaneous cooling and heating and heat recovery liquid cooled chilling packages rating shall be the liquid flow rates from the cooling operation full load rating.

   3. For heating only fluid to fluid chiller packages, the evaporator flow rate obtained with an entering liquid temperature of 54 F and a leaving liquid temperature of 44 F shall be used.

j. NA means the requirements are not applicable.

k. DB = Dry-Bulb

l. WB = Wet-Bulb

~~Footnotes to Table 400.5 J *[Table 110.2-J]*:~~

~~The size category is the full-load net refrigeration cooling mode capacity, which is the capacity of the evaporator available for cooling of the thermal load external to the chilling package.~~

~~For air source *heat pumps*, compliance with both the 47 F and 17 F heating source *outdoor air* temperature (OAT) rating efficiency is required for heating.~~

~~Heating full load rating conditions are at standard rating conditions defined in *AHRI 550/590* (I-P), Table 4, includes the impact of defrost for air source heating ratings.~~

~~For units that operate in both cooling and heating, compliance with both the cooling and heating efficiency is required.~~

~~For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recover COP_{HR} is only required at one of the four heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, Hot-Water 1 or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes b and c of Table 400.5-I *[Table 110.2-I]*.~~

~~For applications where the chilling package is installed to operate only in heating, compliance only with the heating performance COP_H is required at only one of the heating *AHRI 550/590* (I-P) standard rating conditions of Low, Medium, High, or Boost. Compliance with cooling performance is not required.~~

~~For *heat pump* chilling package applications where the cooling capacity is not being used for conditioning, compliance with the heating performance COP_H is only required at one of the heating *AHRI 550/590* (I-P) standard rating conditions of Low, Medium, High, or Boost. Compliance with the cooling performance is required as defined in footnotes b and c of Table 400.5-I *[Table 110.2-I]*, except as noted in footnote f.~~

~~Water to water *heat pumps* with capacity less than 135,000 Btu/h are included in Table 400.5-B *[Table 110.2-B] Heat Pumps*, Minimum Efficiency Requirements.~~

~~Source leaving liquid temperature.~~

~~The cooling evaporator liquid flow rate used for the heating rating for a reverse cycle air to water *heat pump* shall be the flow rate determined during the full load cooling rating.~~

~~The cooling evaporator liquid flow rate for the simultaneous cooling and heating and heat recovery liquid cooled chilling packages rating shall be the liquid flow rates from the cooling operation full load rating.~~

~~For heating only fluid to fluid chiller packages, the evaporator flow rate obtained with an entering liquid temperature of 54 F and a leaving liquid temperature of 44 F shall be used.~~

~~NA means the requirements are not applicable.~~

TABLE 400.5 ~~K~~(11) [TABLE 110.2-K] HEAT PUMP AND HEAT RECOVERY CHILLER PACKAGES, SIMULTANEOUS COOLING AND HEATING, HEATING OPERATION – MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type: Air Source

SIZE CATEGORY REFRIGERATING CAPACITY[a], TON_R	HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR OAT (DB/WB)[b, k, l], F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, LOW, 95 F/105 F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, MEDIUM, 105 F/120 F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, HIGH, 120 F/140 F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, BOOST, 120 F/140 F	TEST PROCEDURE
< 150	47 ~~db~~DB 43 ~~wb~~WB	NAj	NAj	NAj	NAj	*AHRI 550/590*
< 150	17 ~~db~~DB 15 ~~wb~~WB	NAj	NAj	NAj	NAj	*AHRI 550/590*
> 150	47 ~~db~~DB 43 ~~wb~~WB	NAj	NAj	NAj	NAj	*AHRI 550/590*
> 150	17 ~~db~~DB 15 ~~wb~~WB	NAj	NAj	NAj	NAj	*AHRI 550/590*

(CONTINUED): TABLE 400.5 ~~K~~(11) [TABLE 110.2-K] HEAT PUMP AND HEAT RECOVERY CHILLER PACKAGES, SIMULTANEOUS COOLING AND HEATING, HEATING OPERATION– MINMUM EFFICIENCY REQUIREMENTS

Equipment Type: Liquid source electrically operated positive displacement

~~SIZE CATEGORY REFRIGERATING CAPACITY~~[A] SIZE CATEGORY REFRIGERATION CAPACITY[A], TON~~TON~~$_R$	~~HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR~~HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR OAT (~~DB~~DB/~~WB~~WB)[b, k, l], F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY ~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY~~ (COP_{SHC})[c,d,e,f,g], W/W, ~~ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~ENTERING/LEAVING HEATING LIQUID TEMPERATURE, ~~LOW~~LOW, 95 F/105 F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY ~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY~~ (COP_{SHC})[c,d,e,f,g], W/W, ~~ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~, ~~MEDIUM~~MEDIUM, 105 F/120 F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY ~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY~~ (COP_{SHC})[c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~, ~~HIGH~~HIGH, 120 F/140 F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY ~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY~~ (COP_{SHC})[c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~, ~~BOOST~~BOOST, 120 F/140 F	~~TEST PROCEDURE~~TEST PROCEDURE
> 11.25[h] and < 150	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	*AHRI 550/590*
> 11.25 [h] and < 150	65 [i]	NA[j]	NA[j]	NA[j]	> 6.150	*AHRI 550/590*
> 150 and < 300	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	*AHRI 550/590*
> 150 and < 300	65 [i]	NA[j]	NA[j]	NA[j]	> 6.150	*AHRI 550/590*
> 300 and < 400	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	*AHRI 550/590*
> 300 and < 400	65 [i]	NA[j]	NA[j]	NA[j]	> 6.150	*AHRI 550/590*
> 400 and < 600	44[i]	> 8.9	> 6.98	> 5	NA[j]	*AHRI 550/590*
> 400 and < 600	65 [i]	NA[j]	NA[j]	NA[j]	> 6.85	*AHRI 550/590*

~~SIZE CATEGORY REFRIGERATING CAPACITY~~[A] SIZE CATEGORY REFRIGERATION CAPACITY[A], ~~TON~~TON~~R~~	~~HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR~~HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR OAT (~~DB~~DB/~~WB~~WB)[b, ~~k~~, l], F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY ~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY~~ (COP_{SHC}) [c,d,e,f,g], W/W, ~~ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~ENTERING/LEAVING HEATING LIQUID TEMPERATURE, ~~LOW~~LOW, 95 F/105 F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY ~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY~~ (COP_{SHC}) [c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, ~~ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~, ~~MEDIUM~~MEDIUM, 105 F/120 F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY ~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY~~ (COP_{SHC}) [c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~, ~~HIGH~~HIGH, 120 F/140 F	SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY ~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY~~ (COP_{SHC}) [c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~ENTERING/LEAVING HEATING LIQUID TEMPERATURE~~, ~~BOOST~~BOOST, 120 F/140 F	~~TEST PROCEDURE~~TEST PROCEDURE
> 600	44[i]	> 8.9	> 6.98	> 5	NA[j]	*AHRI 550/590*
> 600	65 [i]	NA[j]	NA[j]	NA[j]	> 6.85	*AHRI 550/590*

(CONTINUED): TABLE 400.5 ~~K~~(11) [TABLE 110.2-K] HEAT PUMP AND HEAT RECOVERY CHILLER PACKAGES, SIMULTANEOUS COOLING AND HEATING, HEATING OPERATION – MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type: Liquid source electrically operated centrifugal

~~SIZE CATEGORY REFRIGERATING CAPACITY[A], TON$_R$~~ SIZE CATEGORY REFRIGERATION CAPACITY[a], TON$_R$	~~HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR OAT (DB/WB)[B], F~~ HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR OAT (DB/WB)[b, k, l], F	~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP$_{SHC}$)[C,D,E,F,G], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, LOW, 95 F/105 F~~ SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP$_{SHC}$)[c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, LOW, 95 F/105 F	~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP$_{SHC}$)[C,D,E,F,G], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, MEDIUM, 105 F/120 F~~ SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP$_{SHC}$)[c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, MEDIUM, 105 F/120 F	~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP$_{SHC}$)[C,D,E,F,G], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, HIGH, 120 F/140 F~~ SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP$_{SHC}$)[c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, HIGH, 120 F/140 F	~~SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP$_{SHC}$)[C,D,E,F,G], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, BOOST, 120 F/140 F~~ SIMULTANEOUS COOLING AND HEATING FULL LOAD EFFICIENCY (COP$_{SHC}$)[c,d,e,f,g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, BOOST, 120 F/140 F	~~TEST PROCEDURE~~ TEST PROCEDURE
> 11.25[h] and < 150	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	*AHRI 550/590*
> 11.25[h] and < 150	65[i]	NA[j]	NA[j]	NA[j]	> 6.150	*AHRI 550/590*
> 150 and < 300	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	*AHRI 550/590*
> 150 and < 300	65[i]	NA[j]	NA[j]	NA[j]	> 6.150	*AHRI 550/590*
> 300 and < 400	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	*AHRI 550/590*
> 300 and < 400	65[i]	NA[j]	NA[j]	NA[j]	> 6.150	*AHRI 550/590*
> 400 and < 600	44[i]	> 8.9	> 6.98	> 5	NA[j]	*AHRI 550/590*
> 400 and < 600	65[i]	NA[j]	NA[j]	NA[j]	> 6.85	*AHRI 550/590*
> 600	44[i]	> 8.9	> 6.98	> 5	NA[j]	*AHRI 550/590*
> 600	65[i]	NA[j]	NA[j]	NA[j]	> 6.85	*AHRI 550/590*

Footnotes to Table 400.5 ~~K~~(11) *[Table 110.2-K]*:

a. The size category is the full-load net refrigeration cooling mode capacity, which is the capacity of the evaporator available for cooling of the thermal load external to the chilling package.

b. For air source *heat pumps*, compliance with both the 47 F and 17 F heating source *outdoor air* temperature (OAT) rating efficiency is required for heating.

c. Heating full load rating conditions are at standard rating conditions defined in *AHRI 550/590* (I-P), Table 4, includes the impact of defrost for air source heating ratings.

d. For units that operate in both cooling and heating, compliance with both the cooling and heating efficiency is required.

e. For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recover COP_{HR} is only required at one of the four heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, Hot-Water 1 or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes b and c of Table 400.5 ~~I~~(9) *[Table 110.2-I]*.

f. Heating full load rating conditions are at standard rating conditions defined in *AHRI 550/590* (I-P), Table 4, includes the impact of defrost for air *source* heating ratings.

g. For simultaneous cooling and heating chillers applications where there is simultaneous cooling and heating, compliance with the simultaneous cooling performance heat recovery COP_{SHC} is only required at one of the heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, High, or Boost. Compliance with cooling performance is required as defined in footnotes b and c of Table 400.5 ~~I~~(9) *[Table 110.2-I]*.

h. Water to water *heat pumps* with capacity less than 135,000 Btu/h are included in Table 400.5 ~~B~~(2) *[Table 110.2-B] Heat Pumps*, Minimum Efficiency Requirements.

i. Source leaving liquid temperature.

   1. The cooling evaporator liquid flow rate used for the heating rating for a reverse cycle air to water *heat pump* shall be the flow rate determined during the full load cooling rating.

   2. The cooling evaporator liquid flow rate for the simultaneous cooling and heating and heat recovery liquid cooled chilling packages rating shall be the liquid flow rates from the cooling operation full load rating.

   3. For heating only fluid to fluid chiller packages, the evaporator flow rate obtained with an entering liquid temperature of 54 F and a leaving liquid temperature of 44 F shall be used.

j. NA means the requirements are not applicable.

k. DB = Dry-Bulb

l. WB = Wet-Bulb

~~Footnotes to Table 400.5-K *[Table 110.2-K]*:~~

~~The size category is the full-load net refrigeration cooling mode capacity, which is the capacity of the evaporator available for cooling of the thermal load external to the chilling package.~~

~~For air source *heat pumps*, compliance with both the 47 F and 17 F heating source *outdoor air* temperature (OAT) rating efficiency is required for heating.~~

~~Heating full load rating conditions are at standard rating conditions defined in *AHRI 550/590* (I-P), Table 4, includes the impact of defrost for air source heating ratings.~~

~~For units that operate in both cooling and heating, compliance with both the cooling and heating efficiency is required.~~

~~For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recover COP_{HR} is only required at one of the four heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, Hot-Water 1 or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes b and c of Table 400.5-I *[Table 110.2-I]*.~~

~~Heating full load rating conditions are at standard rating conditions defined in *AHRI 550/590* (I-P), Table 4, includes the impact of defrost for air *source* heating ratings.~~

~~For simultaneous cooling and heating chillers applications where there is simultaneous cooling and heating, compliance with the simultaneous cooling performance heat recovery COP_{SHC} is only required at one of the heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, High, or Boost. Compliance with cooling performance is required as defined in footnotes b and c of Table 400.5-I *[Table 110.2-I]*.~~

~~Water to water *heat pumps* with capacity less than 135,000 Btu/h are included in Table 400.5-B *[Table 110.2-B] Heat Pumps*, Minimum Efficiency Requirements.~~

~~Source leaving liquid temperature.~~

~~The cooling evaporator liquid flow rate used for the heating rating for a reverse cycle air to water *heat pump* shall be the flow rate determined during the full load cooling rating.~~

~~The cooling evaporator liquid flow rate for the simultaneous cooling and heating and heat recovery liquid cooled chilling packages rating shall be the liquid flow rates from the cooling operation full load rating.~~

~~For heating only fluid to fluid chiller packages, the evaporator flow rate obtained with an entering liquid temperature of 54 F and a leaving liquid temperature of 44 F shall be used.~~

~~NA means the requirements are not applicable.~~

TABLE 400.5 ~~L~~(12) [TABLE 110.2-L] HEAT PUMP AND HEAT RECOVERY CHILLER PACKAGES, HEAT RECOVERY, HEATING OPERATION – MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type: Air Source

SIZE CATEGORY REFRIGERATING CAPACITY[a], TON_R	HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR OAT (DB/WB)[b, k, l], F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, LOW, 95 F/105 F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, MEDIUM, 105 F/120 F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, HIGH, 120 F/140 F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, BOOST, 120 F/140 F	TEST PROCEDURE
< 150	47 ~~db~~DB 43 ~~wb~~WB	NAj	NAj	NAj	NAj	*AHRI 550/590*
< 150	17 ~~db~~DB 15 ~~wb~~WB	NAj	NAj	NAj	NAj	*AHRI 550/590*
> 150	47 ~~db~~DB 43 ~~wb~~WB	NAj	NAj	NAj	NAj	*AHRI 550/590*
> 150	17 ~~db~~DB 15 ~~wb~~WB	NAj	NAj	NAj	NAj	*AHRI 550/590*

(CONTINUED): TABLE 400.5 ~~L~~ (12) [TABLE 110.2-L] HEAT PUMP AND HEAT RECOVERY CHILLER PACKAGES, HEAT RECOVERY, HEATING OPERATION – MINMUM EFFICIENCY REQUIREMENTS

Equipment Type: Liquid source electrically operated positive displacement

SIZE CATEGORY REFRIGERATING CAPACITY[a], TON_R	HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR OAT (DB/WB)[b, k, l], F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, LOW, 95 F/105 F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, MEDIUM, 105 F/120 F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, HIGH, 120 F/140 F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, BOOST, 120 F/140 F	TEST PROCEDURE
> 11.25[h] and < 150	44[i]	> 8.33	> 6.41	> 4.862	> 4.42	*AHRI 550/590*
> 11.25 [h] and < 150	65 [i]	NA[j]	NA[j]	NA[j]	NA[j]	*AHRI 550/590*
> 150 and < 300	44[i]	> 8.33	> 6.41	> 4.862	> 4.42	*AHRI 550/590*
> 150 and < 300	65 [i]	NA[j]	NA[j]	NA[j]	NA[j]	*AHRI 550/590*
> 300 and < 400	44[i]	> 8.33	> 6.41	> 4.862	> 4.42	*AHRI 550/590*
> 300 and < 400	65 [i]	NA[j]	NA[j]	NA[j]	NA[j]	*AHRI 550/590*
> 400 and < 600	44[i]	> 8.9	> 6.98	> 5.5	> 5	*AHRI 550/590*
> 400 and < 600	65 [i]	NA[j]	NA[j]	NA[j]	NA[j]	*AHRI 550/590*
> 600	44[i]	> 8.9	> 6.98	> 5.5	> 5	*AHRI 550/590*
> 600	65 [i]	NA[j]	NA[j]	NA[j]	NA[j]	*AHRI 550/590*

(CONTINUED): TABLE 400.5 ~~L~~ (12) [TABLE 110.2-L] HEAT PUMP AND HEAT RECOVERY CHILLER PACKAGES, HEAT RECOVERY, HEATING OPERATION –MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type: Liquid source electrically operated centrifugal

SIZE CATEGORY REFRIGERATING CAPACITY[a], TON_R	HEATING SOURCE CONDITIONS (LEAVING LIQUID) OR OAT (DB/WB)[b, k, l], F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, LOW, 95 F/105 F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, MEDIUM, 105 F/120 F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, HIGH, 120 F/140 F	HEAT RECOVERY HEATING FULL LOAD EFFICIENCY (COP_{SHC})[c, d, e, f, g], W/W, ENTERING/LEAVING HEATING LIQUID TEMPERATURE, BOOST, 120 F/140 F	TEST PROCEDURE
> 11.25[h] and < 150	44[i]	> 8.33	> 6.41	> 4.862	> 4.42	*AHRI 550/590*
> 11.25[h] and < 150	65[i]	NA[j]	NA[j]	NA[j]	NA[j]	*AHRI 550/590*
> 150 and < 300	44[i]	> 8.33	> 6.41	> 4.862	> 4.42	*AHRI 550/590*
> 150 and < 300	65[i]	NA[j]	NA[j]	NA[j]	NA[j]	*AHRI 550/590*
> 300 and < 400	44[i]	> 8.33	> 6.41	> 4.862	> 4.42	*AHRI 550/590*
> 300 and < 400	65[i]	NA[j]	NA[j]	NA[j]	NA[j]	*AHRI 550/590*
> 400 and < 600	44[i]	> 8.9	> 6.98	> 5.5	> 5	*AHRI 550/590*
> 400 and < 600	65[i]	NA[j]	NA[j]	NA[j]	NA[j]	*AHRI 550/590*
> 600	44[i]	> 8.9	> 6.98	> 5.5	> 5	*AHRI 550/590*
> 600	65[i]	NA[j]	NA[j]	NA[j]	NA[j]	*AHRI 550/590*

Footnotes to Table 400.5(12) *[Table 110.2-L]*:

a. The size category is the full-load net refrigeration cooling mode capacity, which is the capacity of the evaporator available for cooling of the thermal load external to the chilling package.

b. For air source *heat pumps*, compliance with both the 47 F and 17 F heating source *outdoor air* temperature (OAT) rating efficiency is required for heating.

c. Heating full load rating conditions are at standard rating conditions defined in *AHRI 550/590* (I-P), Table 4, includes the impact of defrost for air source heating ratings.

d. For units that operate in both cooling and heating, compliance with both the cooling and heating efficiency is required.

e. For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recover COP_{HR} is only required at one of the four heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, Hot-Water 1 or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes b and c of Table 400.5(9) *[Table 110.2-I]*.

f. For liquid source heat recovery chilling packages that have capabilities for heat rejection to a heat recovery *condenser* and a tower *condenser* the COP_{HR} applies to operation at full load with 100 percent heat recovery (no tower rejection). Units that only have capabilities for partial heat recovery shall meet the requirements of Table 400.5(4) *[Table 110.2-D]* Water Chilling Packages Minimum Efficiency.

g. For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recover COP_{HR} is only required at one of the four heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, Hot-Water 1 or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes b and c of Table 400.5(9) *[Table 110.2-I]*.

h. Water to water *heat pumps* with capacity less than 135,000 Btu/h are included in Table 400.5(2) *[Table 110.2-B] Heat Pumps*, Minimum Efficiency Requirements.

i. Source leaving liquid temperature.

   1. The cooling evaporator liquid flow rate used for the heating rating for a reverse cycle air to water *heat pump* shall be the flow rate determined during the full load cooling rating.

   2. The cooling evaporator liquid flow rate for the simultaneous cooling and heating and heat recovery liquid cooled chilling packages rating shall be the liquid flow rates from the cooling operation full load rating.

   3. For heating only fluid to fluid chiller packages, the evaporator flow rate obtained with an entering liquid temperature of 54 F and a leaving liquid temperature of 44 F shall be used.

j. NA means the requirements are not applicable

k. DB = Dry-Bulb

l. WB = Wet-Bulb

Footnotes to Table 400.5-L *[Table 110.2-L]*:

a. The size category is the full-load net refrigeration cooling mode capacity, which is the capacity of the evaporator available for cooling of the thermal load external to the chilling package.

b. For air source *heat pumps*, compliance with both the 47 F and 17 F heating source *outdoor air* temperature (OAT) rating efficiency is required for heating.

c. Heating full load rating conditions are at standard rating conditions defined in *AHRI 550/590* (I-P), Table 4, includes the impact of defrost for air source heating ratings.

d. For units that operate in both cooling and heating, compliance with both the cooling and heating efficiency is required.

e. For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recover COP_{HR} is only required at one of the four heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, Hot-Water 1 or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes b and c of Table 400.5-I *[Table 110.2-I]*.

f. For liquid source heat recovery chilling packages that have capabilities for heat rejection to a heat recovery *condenser* and a tower *condenser* the COP_{HR} applies to operation at full load with 100 percent heat recovery (no tower rejection). Units that only have capabilities for partial heat recovery shall meet the requirements of Table 400.5-D *[Table 110.2-D]* Water Chilling Packages Minimum Efficiency.

g. For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recover COP_{HR} is only required at one of the four heating *AHRI 550/590* (I-P) standard ratings conditions of Low, Medium, Hot-Water 1 or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes b and c of Table 400.5-I *[Table 110.2-I]*.

h. Water to water *heat pumps* with capacity less than 135,000 Btu/h are included in Table 400.5-B *[Table 110.2-B]* Heat Pumps, Minimum Efficiency Requirements.

i. Source leaving liquid temperature.

1. The cooling evaporator liquid flow rate used for the heating rating for a reverse cycle air to water *heat pump* shall be the flow rate determined during the full load cooling rating.

2. The cooling evaporator liquid flow rate for the simultaneous cooling and heating and heat recovery liquid cooled chilling packages rating shall be the liquid flow rates from the cooling operation full load rating.

3. For heating only fluid to fluid chiller packages, the evaporator flow rate obtained with an entering liquid temperature of 54 F and a leaving liquid temperature of 44 F shall be used.

4.

j. NA means the requirements are not applicable.

400.5.2 *[Section 110.2(b)]* **Controls for heat pumps with supplementary heaters.**

Control requirements for *heat pumps* with supplementary heaters in *single-family residential buildings* are specified in Section 402.2.2.7 *[Section 150.0(h)7]* and Section 402.2.4.2 *[Section 150.0(i)2]*. *Heat pumps* with supplementary heaters in *nonresidential* and *multifamily buildings* shall have controls:

1. That prevent supplementary heater operation when the heating load can be met by the *heat pump* alone; and
2. In which the cut-on temperature for *heat pump* heating is higher than the cut-on temperature for supplementary heating, and the cut-off temperature for *heat pump* heating is higher than the cut-off temperature for supplementary heating.

Exception 1 to Section 400.5.2: The controls may allow supplementary heater operation during:

1. Defrost; and
2. *Transient* periods such as start-ups and following room *thermostat* setpoint advance, if the controls provide preferential rate control, intelligent recovery, staging, ramping or another control mechanism designed to preclude the unnecessary operation of supplementary heating.

Exception 2 to Section 400.5.2: Room air-conditioner *heat pumps*.

400.5.3 *[Section 110.2(c)]* **Thermostats.**

All heating or cooling systems not controlled by a central *energy management control system (EMCS)* shall have a setback *thermostat*.

Setback capabilities. All *thermostats* shall have a clock mechanism that allows the *building* occupant to program the temperature setpoints for at least four periods within 24 hours. *Thermostats* for *heat pumps* shall meet the requirements of Section 400.5.2 *[Section 110.2(b)]*.

Exception to Section 400.5.3: Gravity gas wall heaters, gravity floor heaters, gravity room heaters, noncentral electric heaters, *fireplaces* or *decorative gas appliances*, *wood stoves*, room *air conditioners* and room air-conditioner *heat pumps*.

400.5.4 *[Section 110.2(d)]* **Gas-fired, ~~and~~ oil-fired, and electric furnace standby loss controls.**

All furnaces with input ratings ≥ 225,000 Btu/hr~~, including electric furnaces,~~ that are not located within the *conditioned space* shall have jacket losses not exceeding 0.75 percent of the input rating.

Gas-fired and oil-fired forced-air furnaces with input ratings ≥ 225,000 Btu/hr shall also have an intermittent ignition or interrupted device (IID), and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for furnaces where combustion air is drawn from the *conditioned space*.

400.5.5 *[Section (110.2(e)]* **Open and closed-circuit cooling towers.**

All open and *closed-circuit cooling tower* ~~with rated capacity ≥ 150 tons~~ installations with rated capacity ≥ 150 tons shall comply with the following:

~~**Exception to Section 400.5.5:** Open and *closed-circuit cooling towers* with rated capacity < 150 tons.~~

1. **Conductivity controls.** Be equipped with conductivity controls that maximize *cycles of concentration* based on local water quality conditions. Controls shall:

   1.1. -Aautomate system bleed and chemical feed based on conductivity. ~~Conductivity controllers shall~~

   1.2. ~~b~~Be installed in accordance with manufacturer's specifications in order to maximize accuracy.

2. **Documentation of maximum achievable *cycles of concentration*.** *Building* owners shall document the *cycles of concentration* achievable based on local water supply conditions as reported annually by the local water supplier, and using the calculations below. The calculations are intended to determine maximum achievable *cycles of concentration* based on the parameters identified in Table 400.5-~~M~~(13) *[Table 110.2-A-1]*. *Building* owner shall document maximum achievable *cycles of concentration* on the mechanical compliance form which shall be reviewed and signed by the Professional Engineer (P.E.) of Record.

   The maximum achievable *cycles of concentrations* are based on the local water supply quality as reported by the local water supplier, and shall be the minimum of:

   2970 divided by the conductivity of the entering make-up water

   1845 divided by the total dissolved solids of the entering make-up water

   540 divided by the M-alkalinity excluding galvanized steel of the entering make-up water

   450 divided by the M-alkalinity including galvanized steel of the entering make-up water

   540 divided by the calcium hardness of the entering make-up water

   270 divided by the chlorides of the entering make-up water

   225 divided by the sulfates of the entering make-up water

   135 divided by the silica of the entering make-up water

   $$Langelier\ Saturation\ Index = 10^{\left(\frac{-1}{2.038895}*[Log(M*0.9*1.219)-0.061105*Log(C*0.8)+0.55*Log(H*M)+0.0050325*T-5.95]\right)}$$

   where:

   C = Conductivity of the entering make-up water.

   H = Calcium hardness of the entering make-up water.

   M = M-alkalinity excluding galvanized steel of the entering make-up water.

T = Max skin temperature

3. **Cooling tower blowdown.** Cooling towers shall not allow blowdown until one or more of the parameters in Table 400.5~~-M~~(13) *[Table 110.2-A-1]* reaches the maximum value specified.

TABLE 400.5~~-M~~(13) [TABLE 110.2-A-1] RECIRCULATING WATER PROPERTIES

RECIRCULATING WATER PARAMETERS	MAXIMUM VALUES
Conductivity (micro-siemens/cm)	2970 micro-siemens/cm
Total dissolved solids (ppm)	1845 ppm
Total alkalinity as CaCO3 (ppm) excluding galvanized steel	540 ppm
Total alkalinity as CaCO3 (ppm) galvanized steel (passivated)	450 ppm
Calcium hardness as CACO3 (ppm)	540 ppm
Chlorides as Cl (ppm)	270 ppm
Sulfates (ppm)	225 ppm
Silica (ppm)	135 ppm
Langelier saturation index (LSI)	2.5 (LSI)

4. **Flow meter.** Be equipped with a flow meter with an analog output for flow either hardwired or available through a gateway on the makeup water line.
5. **Overflow alarm.** Be equipped with an overflow alarm to prevent overflow of the sump in case of makeup water valve failure. Overflow alarm shall send an audible signal or provide an alert via the *energy management control system* to the tower operator in case of sump overflow.
6. **Drift eliminators.** Be equipped with ~~efficient~~ drift eliminators that achieve drift reduction to 0.002 percent of the circulated water volume for counter-flow towers and 0.005 percent for cross-flow towers.
7. **Field verification.** Conductivity controls and overflow alarm shall be verified according to Reference Nonresidential Appendix NA 7.5.18.

400.5.6 *[Section 110.2(f)]* **Low leakage air-handling units.**

To qualify ~~as a low leakage air-handling unit for use for meeting the requirements for applicable~~ for the low leakage *air-handling unit* compliance credit(s) available in the performance standards set forth in Sections 102.5.1, 102.5.2, and 102.5.5 *[Sections 150.1(b) and 140.1]*, the manufacturer shall certify to the *Energy Commission* that the *air-handling unit* meets the specifications in Reference Joint Appendix JA9.

400.6 *[Section 110.12]* **Mandatory requirements for demand management.**

Buildings, other than *healthcare facilities*, that install or are required to install *demand responsive controls* shall comply with the applicable *demand responsive control* requirements of Sections 400.6.1 and 400.6.2 *[Sections 110.12(a) and 110.12(b)]*.

400.6.1 *[Section 110.12(a)]* **Demand responsive controls.**

1. All *demand responsive controls* shall be either:

   1.1. A certified *OpenADR 2.0a* or *OpenADR 2.0b Virtual End Node* (*VEN*), as specified under Clause 11, Conformance, in the applicable OpenADR 2.0 Specification; or a certified Baseline Profile OpenADR 3.0 *Virtual End Node*; or

   1.2. *Certified to the Energy Commission* as being capable of responding to a *demand response signal* from a certified *OpenADR 2.0b* or a certified Baseline Profile OpenADR 3.0 *Virtual End Node* by automatically implementing the control functions requested by the *Virtual End Node* for the equipment it controls.

2. All *demand responsive controls* shall be capable of communicating with the *VEN* using a wired or wireless bidirectional communication protocol.

3. When the *demand response signal* is disabled or unavailable, all *demand responsive controls* shall continue to perform all other control functions provided by the control.

4. *Demand responsive control thermostats* shall comply with Reference Joint Appendix ~~5~~ ~~(~~JA5~~)~~, Technical Specifications for Occupant Controlled Smart *Thermostats*.

400.6.2 *[Section 110.12(b)]* **Demand responsive zonal HVAC controls.**

Nonresidential *HVAC systems* with *DDC* to the Zone level shall be programmed to allow centralized demand shed for *noncritical zones* as follows:

400.6.2.1 *[Section 110.12(b)1]* **Operating cooling temperature setpoint.**

The controls shall have a capability to remotely increase the operating cooling temperature set points by 4 degrees or more in all *noncritical zones* on signal from a centralized contact or software point within an *Energy Management Control System (EMCS)*.

400.6.2.2 *[Section 110.12(b)2]* **Operating heating temperature setpoint.**

The controls shall have a capability to remotely decrease the operating heating temperature set points by 4 degrees or more in all *noncritical zones* on signal from a centralized contact or software point within an *EMCS*.

400.6.2.3 *[Section 110.12(b)3]* **Remote temperature reset.**

The controls shall have capabilities to remotely reset the temperatures in all *noncritical zones* to original operating levels on signal from a centralized contact or software point within an *EMCS*.

400.6.2.4 *[Section 110.12(b)4]* **Adjustable rate of change.**

The controls shall be programmed to provide an adjustable rate of change for the temperature increase, decrease, and reset.

400.6.2.5 *[Section 110.12(b)5]* **Required features.**

The controls shall have the following features:

1. **Disabled.** Disabled by authorized facility operators; and

2. ***Manual* control.** *Manual* control by authorized facility operators to allow adjustment of heating and cooling set points globally from a single point in the *EMCS*; and
3. ***Automatic* Demand Shed Control.** Upon receipt of a *demand response signal*, the *space-conditioning systems* shall conduct a centralized demand shed, as specified in Section 400.6.2.1 and 400.6.2.2 *[Sections 110.12(b)1 and 110.12(b)2]*, for *noncritical zones* during the *demand response period*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code;* Section 18930, *Health and Safety Code.*

SECTION 401

NONRESIDENTIAL AND HOTEL/MOTEL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

401.1 *[Section 120.0]* **General.**

Section 401 establishes requirements for the design and installation of *building* ventilation and *space-conditioning systems* and *equipment* in *nonresidential* and *hotel/motel* ~~*buildings*~~ *use designations* that are within the scope of Section 100.3 *[Section 100.0(a)]*.

NOTE: The requirements of Sections 401.2 through 401.4 apply to *newly constructed buildings*. Sections 401.2 and 401.5 apply to *additions* or *alterations* to existing *buildings*.

401.2 Mandatory requirements (Newly Constructed, Additions, Alterations).

401.2.1 *[Section 120.1]* **Ventilation and indoor air quality.**

All *occupiable spaces* in *hotel/motel* ~~*buildings*~~, and *nonresidential* *use designations*~~*buildings other than*~~not including~~n~~ *healthcare facilities*, shall comply with the applicable requirements of Section 401.2.1.1 through 401.2.1.5 *[Section 120.1(a) through 120.1(g)]*. *Healthcare facilities* shall be ventilated in accordance with Chapter 4 of the California Mechanical Code.

The required *outdoor air*-ventilation rate and the air-distribution system design shall be clearly identified on the plans in accordance with Section 100.5 *[Section 10-103 of Title 24, Part 1]*.

401.2.1.1 *[Section 120.1(c)]* **Occupiable spaces.**

All *occupiable spaces* shall meet the requirements of Section 401.2.1.1.1 *[Section 120.1(c)1]* and shall also comply with either Section 401.2.1.1.2 *[Section 120.1(c)2]* or Section 401.2.1.1.3 *[Section 120.1(c)3]*.

401.2.1.1.1 *[Section 120.1(c)1]* **Air filtration.**

Mechanical system types specified below shall be designed to ensure that all recirculated air and all *outdoor air* supplied to the *occupiable space* is filtered before passing through any system thermal conditioning components. *Air filters* shall conform to the requirements of this section.

1. Mechanical *space-conditioning systems* that *supply air* to an *occupiable space* through ductwork exceeding 10 ft (3 m) in length.
2. Mechanical supply-only ventilation systems and *makeup air* systems that provide *outside air* to an *occupiable space*.

3. The supply side of mechanical *balanced ventilation systems*, including *heat recovery ventilation systems* and *energy recovery ventilation systems* that provide *outside air* to an *occupiable space*.

***Air filter* efficiency.** The filters shall have a designated efficiency equal to or greater than *MERV* 13 when tested in accordance with *ASHRAE Standard 52.2*, or a *particle size efficiency* rating equal to or greater than 50 percent in the 0.30–1.0 µm range, and equal to or greater than 85 percent in the 1.0–3.0 µm range when tested in accordance with *AHRI* Standard 680; and

Systems shall be equipped with *air filters* that meet either:

1. Nominal 2-inch minimum depth filter(s); or
2. Nominal one inch minimum depth filter(s) shall be allowed if the filter(s) are sized according to Equation 401.2-A *[Equation 120.1-A]*, based on a maximum face velocity of 150 feet per minute.

$$A_{face} = Q_{filter} / V_{face}$$ (Equation 401.2-A *[Equation 120.1-A]*)

where:

A_{face} = *air filter* face area, the product of *air filter* nominal length × nominal width, ft^2

Q_{filter} = design airflow rate for the *air filter*, ft^3/min

V_{face} = *air filter* face velocity ≤ 150, ft/min

Air bypass prevention. Filter racks or grilles shall use gaskets, sealing or other means to close gaps around inserted filters and prevent air from bypassing the filter.

Exception 1 to Section 401.2.1.1.1: Evaporative coolers are not subject to the air filtration requirements of Section 401.2.1.1.1 *[Section 120.1(c)1]*.

Exception 2 to Section 401.2.1.1.1: For heat recovery ventilators and energy recovery ventilators, the location of the filters required by Section 401.2.1.1.1 *[Section 120.1(c)1A]* may be downstream of a system thermal conditioning component, provided the system is equipped with ancillary filtration upstream of the system's thermal conditioning component.

401.2.1.1.2 *[Section 120.1(c)2]* **Natural ventilation.**

Naturally ventilated spaces shall be designed in accordance with the following:

1. **Floor area to be ventilated.** Spaces or portions of spaces to be naturally ventilated shall be located within a distance based on the ceiling height, as specified below.

   The ceiling height (H) to be used shall be the minimum ceiling height in the space, or for ceilings that are increasing in height as distance from the operable openings is increased, the ceiling height shall be determined as the average height of the ceiling within 20 feet from the operable opening. [*ASHRAE* 62.1:6.4.1.1]

1.1. **Single side opening.** For spaces with operable opening on one side of the zone, the naturally ventilated area shall extend to a distance not greater than two times the height (H) of the ceiling from the openings. [*ASHRAE* 62.1:6.4.1.3]

1.2. **Double side opening.** For zones with openings on two opposite sides of the zone, the naturally ventilated area shall extend between the openings separated by a distance not greater than five times the height of the ceiling. [*ASHRAE* 62.1:6.4.1.4]

1.3. **Corner opening.** For zones with operable openings on two adjacent sides of a zone, the naturally ventilated area shall extend to a distance not greater than five times the height of the ceiling along a line drawn between the outside edges of the two openings that are the farthest apart. The remaining area of the zone that is not bounded by the walls that have the openings and the line drawn between the openings shall comply with the requirements for Single side opening as having openings on only one side of the zone. [*ASHRAE* 62.1:6.4.1.5]

2. **Location and size of openings.** Zones or portions of zones to be naturally ventilated shall have a permanently open airflow path to openings directly connected to the outdoors. The openable area shall be not less than 4 percent of the net occupiable floor area. Where openings are covered with louvers or otherwise obstructed, the openable area shall be based on the net free unobstructed area through the opening. Where interior rooms, or portions of rooms, without direct openings to the outdoors are ventilated through adjoining rooms, the opening between rooms shall be permanently unobstructed and have a free area of not less than 8 percent of the area of the interior room or less than 25 square feet. [*ASHRAE* 62.1:6.4.1.6]

3. **Control and accessibility.** The means to open the required operable opening shall be *readily accessible* to *building* occupants whenever the space is occupied. Controls shall be designed to coordinate operation of the natural and mechanical ventilation systems. [*ASHRAE* 62.1:6.4.3]

401.2.1.1.2.1- Mechanical ventilation system for naturally ventilated spaces. Naturally ventilated spaces shall also include a mechanical ventilation system designed in accordance with Section 401.2.1.1.3 *[Section 120.1(c)3]*.

Exception 1 to Section 401.2.1.1.2.1: Spaces not served by a *space-conditioning system*.

Exception 2 to Section 401.2.1.1.2.1: Spaces where natural ventilation openings complying with Section 401.2.1.1.2 *[Section 120.1(c)2]* are either permanently open or have controls that prevent the openings from being closed during periods of expected occupancy.

401.2.1.1.3 *[Section 120.1(c)3]* **Mechanical ventilation.**

Occupiable spaces shall be ventilated with a mechanical ventilation system capable of providing an outdoor airflow rate to the zone (V_z) no less than Equation 401.2-B *[Equation 120.1-F]* as described below:

V_z = The larger of $R_p \times P_z$ or $R_a \times A_z$ (Equation 401.2-B *[Equation 120.1-F]*)

where:

R_p = 15 cubic feet per minute of outdoor airflow per person

P_z = The expected number of occupants. For spaces without fixed seating, the expected number of occupants shall be the expected number specified by the *building* designer or the default occupancy density in Table 401.2~~-A~~(1) *[Table 120.1-A]* times the occupiable floor area of the zone, whichever is greater. For spaces with fixed seating, the expected number of occupants shall be determined in accordance with the California *Building* Code Section 1004.6.

R_a = The area-based minimum ventilation airflow rate in Table 401.2~~-A~~(1) *[Table 120.1-A]*.

A_z = The net occupiable floor area of the ventilation zone in square feet.

Exception to Section 401.2.1.1.3: The rate of *outdoor air* required by Section 401.2.1.1.3 *[Section 120.1(c)3]* may be provided with air transferred from other ventilated spaces if:

1. Use of *transfer air* is in accordance with Section 401.2.1.5 *[Section 120.1(g)]*; and
2. The *outdoor air* that is supplied to all spaces combined, is sufficient to meet the requirements of Section 401.2.1.1.3 *[Section 120.1(c)3]* for each space individually.

TABLE 401.2~~-A~~(1) [TABLE 120.1-A]– MINIMUM VENTILATION RATES

***OCCUPANCY* CATEGORY – EDUCATIONAL FACILITIES**	**MINIMUM OCCUPANT LOAD DENSITY (PERSONS / 1000 FT^2)**	**AREA-BASED MINIMUM VENTILATION R_A (CFM/FT^2)**	**AIR CLASS**	**NOTES**
Daycare (through age 4)	14	0.15	2	--
Daycare sickroom	5	0.15	3	--
Classrooms (ages 5-8)	25	0.15	1	--
Classrooms (age 9 -18)	25	0.15	1	--
Lecture/postsecondary *classroom*	25	0.15	1	F
Lecture hall (fixed seats)	71	0.15	1	F
Art *classroom*	25	0.15	2	--
Science *laboratories*	25	0.15	2	--
University/college *laboratories*	25	0.15	2	--
Wood/metal shop	10	0.15	2	--
Information technology equipment facilities (occupiable) ~~Computer lab~~	25	0.15	1	--
Media center	25	0.15	1	A
Music/theater/dance	33	0.15	1	F
Multiuse assembly	33	0.15	1	F

(CONTINUED): TABLE 401.2 ~~A~~(1) [TABLE 120.1-A]– MINIMUM VENTILATION RATES

OCCUPANCY* CATEGORY - *FOOD AND BEVERAGE SERVICE	**MINIMUM OCCUPANT LOAD DENSITY (PERSONS / 1000 FT²)**	**AREA-BASED MINIMUM VENTILATION R_A (CFM/FT²)**	**AIR CLASS**	**NOTES**
Restaurant dining rooms	33	0.15	2	--
Cafeteria/fast-food dining	33	0.15	2	--
Bars, cocktail lounges	33	0.2	2	--
Kitchen (cooking)	3	0.15	2	--

(CONTINUED): TABLE 401.2 ~~A~~(1) [TABLE 120.1-A]– MINIMUM VENTILATION RATES

OCCUPANCY* CATEGORY - *GENERAL	**MINIMUM OCCUPANT LOAD DENSITY (PERSONS / 1000 FT²)**	**AREA-BASED MINIMUM VENTILATION R_A (CFM/FT²)**	**AIR CLASS**	**NOTES**
Break rooms	33	0.15	1	F
Coffee Stations	33	0.15	1	F
Conference/meeting	33	0.15	1	F
Corridors	5	0.15	1	F
Occupiable storage rooms for liquids or gels	2	0.15	2	B

(CONTINUED): TABLE 401.2 ~~A~~(1) [TABLE 120.1-A]– MINIMUM VENTILATION RATES

OCCUPANCY* CATEGORY - *HOTELS, MOTELS, RESORTS, DORMITORIES	**MINIMUM OCCUPANT LOAD DENSITY (PERSONS / 1000 FT²)**	**AREA-BASED MINIMUM VENTILATION R_A (CFM/FT²)**	**AIR CLASS**	**NOTES**
Bedroom/living room	3	0.15	1	F
Barracks sleeping areas	5	0.15	1	F
Laundry rooms, central	5	0.15	2	--
Laundry rooms within *dwelling units*	5	0.15	1	--
Lobbies/pre-function	33	0.15	1	F
Multipurpose assembly	33	0.15	1	F

(CONTINUED): TABLE 401.2~~-A~~(1) [TABLE 120.1-A]– MINIMUM VENTILATION RATES

OCCUPANCY* CATEGORY - *OFFICE BUILDINGS	**MINIMUM OCCUPANT LOAD DENSITY (PERSONS / 1000 FT²)**	**AREA-BASED MINIMUM VENTILATION R_A (CFM/FT²)**	**AIR CLASS**	**NOTES**
~~Breakrooms~~	~~33~~	~~0.15~~	~~1~~	~~--~~
Main entry lobbies	33	0.15	1	F
Occupiable storage rooms for dry materials	2	0.15	1	--
Office space	5	0.15	1	F
Reception areas	5	0.15	1	F
Telephone/data entry	33	0.15	1	F

(CONTINUED): TABLE 401.2~~-A~~(1) [TABLE 120.1-A]– MINIMUM VENTILATION RATES

COOCCUPANCY CATEGORY - ***MISCELLANEOUS SPACES***	**MINIMUM OCCUPANT LOAD DENSITY (PERSONS / 1000 FT²)**	**AREA-BASED MINIMUM VENTILATION R_A (CFM/FT²)**	**AIR CLASS**	**NOTES**
Bank vaults/safe deposit	5	0.15	2	F
Banks or bank lobbies	5	0.15	1	F
~~Computer (not printing)~~ *Information technology equipment facilities* (occupiable)	5	0.15	1	F
Controlled Environment Horticulture spaces with *Carbon Dioxide Enrichment*	0	0	2	I
Controlled Environment Horticulture spaces without *Carbon Dioxide Enrichment*	5	0.15	2	--
Freezer and *refrigerated spaces* (<50°F)	0	*0*	2	E
General manufacturing (excludes heavy industrial and *process* using chemicals)	5	0.15	3	
Pharmacy (prep. Area)	5	0.15	2	--
Photo studios	5	0.15	1	--
Shipping/receiving	2	0.15	2	B
Sorting, packing, light assembly	2	0.15	2	--
Telephone closets	5	0.15	1	--
Transportation waiting	33	0.15	1	F
Warehouses	1	0.15	2	B
All others	5	0.15	2	--

~~*(CONTINUED): TABLE 401.2-A(1) [TABLE 120.1-A]– MINIMUM VENTILATION RATES*~~

~~OCCUPANCY CATEGORY -~~	~~MINIMUM OCCUPANT LOAD DENSITY (PERSONS / 1000 FT^2)~~		~~AIR CLASS~~	~~NOTES~~
~~General manufacturing (excludes heavy industrial and process using chemicals~~	~~5~~	~~0.15~~	~~3~~	
~~Pharmacy (prep. Area)~~	~~5~~	~~0.15~~	~~2~~	~~--~~
~~Photo studios~~	~~5~~	~~0.15~~	~~1~~	~~--~~
~~Shipping/receiving~~	~~2~~	~~0.15~~	~~2~~	~~B~~
~~Sorting, packing, light assembly~~	~~2~~	~~0.15~~	~~2~~	~~--~~
~~Telephone closets~~	~~5~~	~~0.15~~	~~1~~	~~--~~
~~Transportation waiting~~	~~33~~	~~0.15~~	~~1~~	~~F~~
~~Warehouses~~	~~1~~	~~0.15~~	~~2~~	~~B~~
~~All others~~	~~5~~	~~0.15~~	~~2~~	~~--~~

(CONTINUED): TABLE 401.2~~-A~~(1) [TABLE 120.1-A]– MINIMUM VENTILATION RATES

OCCUPANCY* CATEGORY - *PUBLIC ASSEMBLY SPACES	**MINIMUM OCCUPANT LOAD DENSITY (PERSONS / 1000 FT^2)**	**AREA-BASED MINIMUM VENTILATION R_A (CFM/FT^2)**	**AIR CLASS**	**NOTES**
Auditorium seating area	71	0.15	1	F
Places of religious worship	71	0.15	1	F
Courtrooms	13	0.15	1	F
Legislative chambers	13	0.15	1	F
Libraries (reading rooms and *stack areas*)	10	0.15	1	--
Lobbies	33	0.15	1	F
Museums (children's)	17	0.15	1	--
Museums/galleries	17	0.15	1	F

(CONTINUED): TABLE 401.2~~-A~~(1) [TABLE 120.1-A]– MINIMUM VENTILATION RATES

OCCUPANCY* CATEGORY - *RESIDENTIAL	**MINIMUM OCCUPANT LOAD DENSITY (PERSONS / 1000 FT^2)**	**AREA-BASED MINIMUM VENTILATION R_A (CFM/FT^2)**	**AIR CLASS**	**NOTES**
Common corridors	5	0.15	1	F

(CONTINUED): TABLE 401.2 ~~A~~(1) [TABLE 120.1-A]– MINIMUM VENTILATION RATES

OCCUPANCY* CATEGORY - *RETAIL	**MINIMUM OCCUPANT LOAD DENSITY (PERSONS / 1000 FT²)**	**AREA-BASED MINIMUM VENTILATION R_A (CFM/FT²)**	**AIR CLASS**	**NOTES**
Sales (except as below)	17	0.2	2	--
Mall common areas	17	0.15	1	F
Barbershop	17	0.4	2	--
Beauty and nail salons	17	0.4	2	--
Pet shops (animal areas)	17	0.2	2	--
Supermarket	17	0.2	1	F
Coin-operated *laundries*	17	0.3	2	--

(CONTINUED): TABLE 401.2~~-A~~(1) [TABLE 120.1-A]– MINIMUM VENTILATION RATES

OCCUPANCY* CATEGORY - *SPORTS AND ENTERTAINMENT	**MINIMUM OCCUPANT LOAD DENSITY (PERSONS / 1000 FT^2)**	**AREA-BASED MINIMUM VENTILATION R_A (CFM/FT^2)**	**AIR CLASS**	**NOTES**
Gym, sports arena (play area)	10	0.15	2	E
Spectator areas	33	0.15	1	F
Swimming (pool)	10	0.15	2	C
Swimming (deck)	33	0.15	2	C
Disco/dance floors	100	0.15	2	F
Health club/aerobics room	10	0.15	2	
Health club/weight rooms	10	0.15	2	
Bowling alley (seating)	7	0.15	1	
Gambling casinos	45	0.15	1	
Game arcades	45	0.15	1	
Stages, studios	33	0.15	1	D, F

Footnotes for Table 401.2~~-A~~(1) *[Table 120.1-A]*:

a. The minimum occupant density is one half of the maximum occupant load assumed for egress purposes in the *CBC*.

Specific Notes:

A. For high-school and college libraries, the values shown for "Public Assembly Spaces – Libraries" shall be used.

B. Rate may not be sufficient where stored materials include those having potentially harmful emissions.

C. Rate does not allow for humidity control. "Deck area" refers to the area surrounding the *pool* that is capable of being wetted during *pool* use or when the *pool* is occupied. Deck area that is not expected to be wetted shall be designated as an *occupancy* category.

D. Rate does not include special exhaust for stage effects such as dry ice vapors and smoke.

E. Where combustion *equipment* is intended to be used on the playing surface or in the space, additional dilution ventilation, source control, or both shall be provided.

F. Ventilation air for this *occupancy* category shall be permitted to be reduced to zero when the space is in occupied-standby mode.

G. See California Fire Code Section 5307.4 for carbon dioxide monitoring and purge ventilation requirements.

~~Footnotes for Table 401.2-A *[Table 120.1-A]*:~~

TABLE 401.2(2)~~)~~ [NEW TABLE] – SPACE TYPES WITH REQUIRED OCCUPIED STANDBY CONTROLS

***OCCUPANCY* CATEGORY**	**SPACE TYPE**
Educational Facilities	Lecture/postsecondary classroom
Educational Facilities	Lecture hall (fixed seats)
Educational Facilities	Multiuse assembly (less than 1,000 square feet)
General	Break rooms
General	Conference/meeting
General	Corridors
Office Buildings	Main entry lobbies
Office Buildings	Office space
Miscellaneous Spaces	Bank vaults/safe deposit
Miscellaneous Spaces	Banks or bank lobbies
Miscellaneous Spaces	Information technology equipment facilities (occupiable)
Miscellaneous Spaces	Transportation waiting
Public Assembly Spaces	Lobbies

~~The minimum occupant density is one half of the maximum occupant load assumed for egress purposes in the CBC.~~

Footnotes for Table 401.2(2) *[NEW TABLE]*:

Space types listed in this table are those space types of Table 401.2(1) *[Table 120.1-A]* noted as F, which permits ventilation air to be reduced to zero in occupied-standby mode and for which *occupant sensing controls* are required.

~~Specific Notes:~~

~~A. For high-school and college libraries, the values shown for "Public Assembly Spaces – Libraries" shall be used.~~

~~B. Rate may not be sufficient where stored materials include those having potentially harmful emissions.~~

~~C. Rate does not allow for humidity control. "Deck area" refers to the area surrounding the *pool* that is capable of being wetted during *pool* use or when the *pool* is occupied. Deck area that is not expected to be wetted shall be designated as an *occupancy* category.~~

~~D. Rate does not include special exhaust for stage effects such as dry ice vapors and smoke.~~

~~E. Where combustion *equipment* is intended to be used on the playing surface or in the space, additional dilution ventilation, source control, or both shall be provided.~~

~~Ventilation air for this *occupancy* category shall be permitted to be reduced to zero when the space is in occupied-standby mode.~~

401.2.1.1.4 *[Section 120.1(c)4]* **Exhaust ventilation.**

The design exhaust airflow shall be determined in accordance with the requirements in Table 401.2~~-B~~(2) *[Table 120.1-B]*. Exhaust *makeup air* shall be permitted to be any combination of *outdoor air*, recirculated air, or *transfer air*. [*ASHRAE* 62.1:6.5.1]

TABLE 401.2-~~B~~(32) [TABLE 120.1-B] – MINIMUM EXHAUST RATES [ASHRAE 62.1: TABLE 6.-25]

OCCUPANCY CATEGORY	EXHAUST RATE, CFM/UNIT	EXHAUST RATE, CFM/FT^2	AIR CLASS	NOTES
Animal imaging(MRI/CT/PET)	-	0.9	3	-
Animal *operating rooms*	-	3.00	3	-
Animal postoperative *recovery room*	-	1.5	3	-
Animal preparation rooms	-	1.5	3	-
Animal procedure room	-	2.25	3	-
Animal surgery scrub	-	1.50	3	-
Large-animal holding room	-	2.25	3	-
Animal Necropsy	-	2.25	3	-
Small-animal-cage room (static cages)	-	2.25	3	-
Small-animal-cage room (ventilated cages)	-	1.50	3	-
Arenas	-	0.50	1	B
Art *classrooms*	-	0.70	2	-
Auto repair rooms	-	1.5	2	A
Barber shops	-	0.50	2	-
Beauty and nail salons	-	0.60	2	-
Cells with toilet	-	1.00	2	-
Copy, printing rooms	-	0.50	2	-
Darkrooms	-	1.00	2	-
Educational science *laboratories*	-	1.00	2	-
Janitor closets, trash rooms, recycling	-	1.00	3	-
Kitchenettes	-	0.30	2	-
Kitchens – commercial	-	0.70	2	-
Locker rooms for athletic or industrial facilities	-	0.50	2	-
All other *locker rooms*	-	0.25	2	-
Shower rooms	20/50	-	2	G,H
Paint spray booths	-	-	4	F
Parking garages	-	0.75	2	C
Pet shops (animal areas)	-	0.90	2	-
Refrigerating machinery rooms	-	-	3	F
Soiled laundry storage rooms	-	1.00	3	F
Storage rooms, chemical	-	1.50	4	F
Toilets – private	25/50	-	2	E
Toilets – public	50/70	-	2	D
Woodwork shop/*classrooms*	-	0.50	2	-

Footnotes for Table 401.2(32) *[Table 120.1-B]*:

a. Stands where engines are run shall have exhaust systems that directly connect to the engine exhaust and prevent escape of fumes.

b. Where combustion *equipment* is intended to be used on the playing surface, additional dilution ventilation, source control, or both shall be provided.

c. Exhaust shall not be required where two or more sides comprise walls that are at least 50% open to the outside.

d. Rate is per water closet, urinal, or both. Provide tThe higher rate shall be used wheren periods of heavy use]areintermittent use is expected to occur. Otherwise Tthe lower rate shall be permitted to be used otherwise.

e. Rate is for a toilet room intended to be occupied by one person at a time. For continuous ~~systems~~ operation during hours of use, the lower rate shall be permitted to be used. Otherwise the higher rate shall be used.

f. See other applicable standards for exhaust rate.

g. For continuous system operation, the lower rate shall be permitted to be used. Otherwise the higher rate shall be used.

h. Rate is per showerhead.

~~Footnotes for Table 401.2-B *[Table 120.1-B]*:~~

~~A. Stands where engines are run shall have exhaust systems that directly connect to the engine exhaust and prevent escape of fumes.~~

~~B. Where combustion *equipment* is intended to be used on the playing surface, additional dilution ventilation, source control, or both shall be provided.~~

~~C. Exhaust shall not be required where two or more sides comprise walls that are at least 50% open to the outside.~~

~~D. Rate is per water closet, urinal, or both. Provide the higher rate where periods of heavy use are expected to occur. The lower rate shall be permitted to be used otherwise.~~

~~E. Rate is for a toilet room intended to be occupied by one person at a time. For continuous systems operation during hours of use, the lower rate shall be permitted to be used. Otherwise the higher rate shall be used.~~

~~F. See other applicable standards for exhaust rate.~~

~~G. For continuous system operation, the lower rate shall be permitted to be used. Otherwise the higher rate shall be used.~~

~~H. Rate is per showerhead~~

401.2.1.2 *[Section 120.1(d)]* Operation and control requirements for minimum quantities of outdoor air.

401.2.1.2.1 *[Section 120.1(d)1]* Times of occupancy.

The minimum rate of *outdoor air* required by Section 401.2.1.1 *[Section 120.1(c)]* shall be supplied to each space at all times when the space is usually occupied.

Exception 1 to Section 401.2.1.2.1: In intermittently occupied spaces that do not have *processes* or operations that generate dusts, fumes, mists, vapors or gasses and are not provided with local exhaust ventilation (such as indoor operation of internal combustion engines or areas designated for unvented food service preparation), the rate of *outdoor air* may be reduced if the ventilation system serving the space is controlled by a *demand*

control ventilation device complying with Section 401.2.1.2.4 *[Section 120.1(d)4]* or by an occupant sensor ventilation control device complying with Section 401.2.1.2.4.4~~5~~ *[Section 120.1(d)5]*.

Exception 2 to Section 401.2.1.2.1: The rate of *outdoor air* provided to a space may be reduced below the level required by Section 401.2.1.1 *[Section 120.1(c)]* for up to 30 minutes at a time if the average rate for each hour is equal to or greater than the required ventilation rate.

401.2.1.2.2 *[Section 120.1(d)2]* **Pre-occupancy.**

The lesser of the minimum rate of *outdoor air* required by Section 401.2.1.1 *[Section 120.1(c)]* or three complete air changes shall be supplied to the *entire building* during the one-hour period immediately before the *building* is ~~normally~~ scheduled to be occupied.

401.2.1.2.3 Demand control ventilation and occupied standby (Nonresidential buildings other than Group R occupancies).

Nonresidential buildings other than *Group R occupancies* shall comply with the following sections:

Section 401.2.1.2.3.1 *[New Section]* Required *demand control ventilation*

Section 401.2.1.2.3.2 *[New Section] Demand control ventilation* devices

Section 401.2.1.2.3.3 *[New Section]* CO_2 concentrations.

Section 401.2.1.2.3.4 *[New Section]* Occupied standby zone controls

Section 401.2.1.2.3.5 *[New Section]* Control functionality.

401.2.1.2.3.1 *[Section 120.1(d)3]* **Required demand control ventilation**

Demand ventilation controls complying with Section 401.2.1.2.5 *[Section 120.1(d)4]* are required as follows:

1. ~~for~~ For ~~a~~ each space with a design occupant density, or a maximum occupant load factor for egress purposes in the Section 1004 of Title 24, Part 2~~CBC~~, greater than or equal to 25 people per 1,000 square feet (40 square feet or less per person) and where ~~if~~ the ventilation system serving that ~~the~~ space has one or more of the following characteristics:
   1.1. ~~an~~ An *air economizer*; or
   1.2. ~~modulating~~ Modulating *outdoor*~~outside~~ *air* control with recirculating *return air*; or
   1.3. A design outdoor airflow rate > 3,000 cfm
2. For each ventilation system serving one or more spaces identified in Section 401.2.1.2.3.1 Item1.

Exception 1 to Section 401.2.1.2.3.1: Where space exhaust is greater than the design ventilation rate specified in Section 401.2.1.1.3 *[Section 120.1(c)3]* minus 0.2 cfm per square foot of conditioned area.

Exception 2 to Section 401.2.1.2.3.1: Spaces that have *processes* or operations that generate dusts, fumes, mists, vapors or gases and are not provided with local exhaust ventilation, such as indoor operation of internal combustion engines or areas designated for unvented food service preparation, daycare sickrooms, science labs, *barber* shops or beauty and nail salons shall not install *demand control ventilation*.

Exception 3 to Section 401.2.1.2.3.1: Spaces with an area of less than 150 square feet, or a design occupancy of less than 10 people as specified by Section 401.2.1.1.3 *[Section 120.1(c)3]*.

401.2.1.2.3.2 *[Section 120.1(d)4]* **Demand control ventilation devices.**

1. Ventilation systems, including *DOAS*, serving space(s) where *demand control ventilation* (*DCV*) is required shall be provided with continuously variable supply and exhaust fan speed control, such as a variable frequency drive or an electronically commutated motor, and shall be capable of modulating the outdoor airflow rate from the design outdoor airflow rate down to the greater of the following:

   1.1 The minimum system *outdoor air* ventilation rate determined in accordance with Equation 401.2-D.

   1.2 The lowest outdoor airflow rate the system can deliver without operating below any minimum supply airflow rate or minimum outdoor airflow rate published in the manufacturer's equipment submittal for the ventilation unit.

2. For each system with *demand control ventilation* (*DCV*), CO2 sensors shall be installed in each ~~room~~ space that meets the criteria of Section 401.2.1.2.3 [Section 120.1(d)3] with no less than one sensor per 10,000 square feet of floor space. When ~~a zone or~~ a space is served by more than one sensor, a signal from any sensor indicating that CO2 is near or at the setpoint within the ~~zone or~~ space, shall trigger an increase in ventilation.

3. CO2 sensors shall be located in the ~~room~~ space between 3 feet and 6 feet above the floor ~~or at the anticipated height of the occupants' heads~~.

4. ~~3~~When the system is operating during hours of expected occupancy, the controls shall maintain the system *outdoor air* ventilation rate no less than ~~Ra x Az per Equation 401.2-B [Equation 120.1-F] in Section 401.2.1.1.3 for each space with a CO2 sensor(s), plus the greater of either th exhaust air rate or the rate required by Section 401.2.1.1.3 [Section 120.1(c)3] for other spaces served by the system.~~ the minimum system *outdoor air* ventilation rate determined in accordance with Equation 401.2-D.

   Vsys-min = Σ (Ra × Az)*DCV* + Σ [the larger of Vex or Vz]other *(Equation 401.2-D [New Equation])*

   where:

Vsys-min = The minimum system *outdoor air* ventilation rate, cfm.

Ra = The area-based minimum ventilation airflow rate in Table 401.2-(1) *[Table 120.1-A]*, cfm/ft2.

Az = The net occupiable floor area of the ventilation zone, ft2.

Vex = The design exhaust airflow rate of the space, cfm.

Vz = The zone outdoor airflow rate required by Equation 401.2-B *[Equation 120.1-F]* in Section 401.2.1.1.3 *[Section 120.1(c)3]*, cfm.

The first summation applies to each space served by the system that has one or more CO2 sensors. The second summation applies to all other spaces served by the system.

5. ~~4~~CO2 sensors shall be certified by the manufacturer to be accurate within plus or minus 75 ppm at a 600 and 1000 ppm concentration when measured at sea level and 25°C, factory calibrated and certified by the manufacturer to require calibration no more frequently than once every 5 years. Upon detection of sensor failure, the system shall provide a signal which resets to supply the minimum quantity of *outside air* to levels required by Section 401.2.1.1.3 *[Section 120.1(c)3]* to the zone serviced by the sensor at all times that the zone is occupied.
6. The CO2 sensor(s) reading for each ~~zone~~ space shall be displayed continuously, and shall be recorded on systems with *DDC* to the zone level.

401.2.1.2.~~4.1~~3.3 CO2 concentrations.

Demand ventilation controls shall maintain CO_2 concentrations less than or equal to 600 ppm plus the *outdoor air* CO_2 concentration in all ~~rooms~~ spaces with CO_2 sensors.

Outdoor air CO_2 concentration shall be determined by one of the following:

1. CO_2 concentration shall be assumed to be 400 ppm without any direct measurement; or
2. CO_2 concentration shall be dynamically measured using a CO_2 sensor located within 4 feet of the *outdoor air* intake.

Exception to Section 401.2.1.2.~~4.1~~3.3: The *outdoor air* ventilation rate is not required to be larger than the design *outdoor air* ventilation rate required by Section 401.2.1.1.3 *[Section 120.1(c)3]* regardless of CO_2 concentration.

401.2.1.2.~~5~~3.4 *[Section 120.1(d)5]* **Occupied standby zone controls.**

Space conditioning zones shall include occupied standby controls complying with this section when all of the following are true:

1. All rooms served by the zone are permitted to have their ventilation air reduced to zero while in occupied-standby mode per Table 401.2(1) ~~A~~ [*Table 120.1-A*].

Space types for which occupied standby controls are required are listed in Table 401.2(2); and

~~2. Occupant sensors are required by Sections 601.2.2.3.5 and 601.2.2.3.6 *[Section 130.1(c)5 and 6]*; and~~

2. ~~3~~The zone and ventilation system is not served by pneumatic controls.

401.2.1.2.~~5.1~~3.5 *[Section 120.1(d)5B]* **Control functionality.**

Occupied-standby zone controls shall comply with the following:

1. Occupant sensors shall have suitable coverage and placement to detect occupants in the entire space. In 20 minutes or less after no occupancy is detected by any sensors covering the room, occupant sensing controls shall indicate a room is vacant.

2. When occupant sensors controlling lighting are also used for ventilation, the ventilation signal shall be independent of daylighting, manual lighting overrides or manual control of lighting.

3. When a single zone serves multiple spaces, there shall be an occupant sensor in each space and the zone shall not be considered vacant until all spaces in the zone are vacant.

4. One hour prior to normal scheduled occupancy, the occupant sensor ventilation control shall allow pre-occupancy purge as described in Section 401.2.1.2.2 *[Section 120.1(d)2]*.

5. When the zone is scheduled to be occupied and occupant sensing controls in all spaces served by the zone indicate the spaces are unoccupied, the zone shall be placed in occupied-standby mode.

6. Where the ventilation system serving the zone is capable of shutting off outdoor air to that zone independently of the other zones it serves, ~~In~~in 5 minutes or less after entering occupied-standby mode, mechanical ventilation to the zone shall be shut off until the space becomes occupied or until ventilation is needed to provide space heating or conditioning. When mechanical ventilation is shut off to the zone, the ventilation system serving the zone shall reduce the system ~~outside~~ outdoor air rate by the amount of ~~outside~~ outdoor air required for the zone.

7. Where the system providing space conditioning also provides ventilation to the zone, in 5 minutes or less after entering occupied-standby mode, space-conditioning zone setpoints shall be reset in accordance with Section 401.2.2.5.3 *[Section 120.2(e)3]*.

401.2.1.2.**4** *[New Section]* **Demand control ventilation and occupied standby (Group R occupancies)**

Group R occupancies shall comply with:

Section 401.2.1.2.4.1 *[Section 120.1(d)3]* Required *demand control ventilation*

Section 401.2.1.2.4.2 *[Section 120.1(d)4] Demand control ventilation* devices

Section 401.2.1.2.4.3 *[Section 120.1(d)4C and D]* CO_2 concentrations.

Section 401.2.1.2.4.4 *[Section 120.1(d)5]* Occupied standby zone controls

Section 401.2.1.2.4.5 *[Section 120.1(d)5b]* Control functionality.

401.2.1.2.4.1~~401.2.1.2.3~~ *[Section 120.1(d)3]* **Required demand control ventilation.**

Demand ventilation controls complying with Section 401.2.1.2.4 *[Section 120.1(d)4]* are required for a space with a design occupant density, or a maximum occupant load factor for egress purposes in the *CBC*, greater than or equal to 25 people per 1,000 square feet (40 square feet or less per person) if the ventilation system serving the space has one or more of the following:

1. ~~an~~ An *air economizer*; or
2. ~~modulating~~ Modulating ~~*outside*~~ *outdoor air* control; or
3. ~~a~~A design outdoor airflow rate > 3,000 cfm

Exception 1 to Section 401.2.1.2.4.1~~3~~: Where space exhaust is greater than the design ventilation rate specified in Section 401.2.1.1.3 *[Section 120.1(c)3]* minus 0.2 cfm per square foot of conditioned area.

Exception 2 to Section 401.2.1.2.4.1~~3~~: Spaces that have *processes* or operations that generate dusts, fumes, mists, vapors or gases and are not provided with local exhaust ventilation, such as indoor operation of internal combustion engines or areas designated for unvented food service preparation, daycare sickrooms, science labs, *barber* shops or beauty and nail salons shall not install *demand control ventilation*.

Exception 3 to Section 401.2.1.2.4.1~~3~~: Spaces with an area of less than 150 square feet, or a design occupancy of less than 10 people as specified by Section 401.2.1.1.3 *[Section 120.1(c)3]*.

401.2.1.2.4.2 *[Section 120.1(d)4]* **Demand control ventilation (DCV) devices.**

1. For each system with *demand control ventilation* (*DCV*, CO_2 sensors shall be installed in each room that meets the criteria of Section 401.2.1.2.3 *[Section 120.1(d)3]* with no less than one sensor per 10,000 square feet of floor space. When a zone or a space is served by more than one sensor, a signal from any sensor indicating that CO_2 is near or at the setpoint within the zone or space, shall trigger an increase in ventilation.
2. CO_2 sensors shall be located in the room between 3 feet and 6 feet above the floor or at the anticipated height of the occupants' heads.
3. When the system is operating during hours of expected occupancy, the controls shall maintain system *outdoor air* ventilation rates no less than Ra × Az per Equation 401.2-B *[Equation 120.1-F]* in Section 401.2.1.1.3 for each space with a

CO_2 sensor(s), plus the greater of either the exhaust air rate or the rate required by Section 401.2.1.1.3 *[Section 120.1(c)3]* for other spaces served by the system.

4. CO_2 sensors shall be certified by the manufacturer to be accurate within plus or minus 75 ppm at a 600 and 1000 ppm concentration when measured at sea level and 25°C, factory calibrated and certified by the manufacturer to require calibration no more frequently than once every 5 years. Upon detection of sensor failure, the system shall provide a signal which resets to supply the minimum quantity of *outside air* to levels required by Section 401.2.1.1.3 *[Section 120.1(c)3]* to the zone serviced by the sensor at all times that the zone is occupied.
5. The CO_2 sensor(s) reading for each zone shall be displayed continuously, and shall be recorded on systems with *DDC* to the zone level.

401.2.1.2.4.3 *[Section 120.1(d)4C and D]* **CO_2 concentrations.**

Demand ventilation controls shall maintain CO_2 concentrations less than or equal to 600 ppm plus the *outdoor air* CO_2 concentration in all rooms with CO_2 sensors.

Outdoor air CO_2 concentration shall be determined by one of the following:

1. CO_2 concentration shall be assumed to be 400 ppm without any direct measurement; or
2. CO_2 concentration shall be dynamically measured using a CO_2 sensor located within 4 feet of the *outdoor air* intake.

Exception to Section 401.2.1.2.4.3: The *outdoor air* ventilation rate is not required to be larger than the design *outdoor air* ventilation rate required by Section 401.2.1.1.3 *[Section 120.1(c)3]* regardless of CO_2 concentration.

401.2.1.2.4.4 *[Section 120.1(d)5]* **Occupied standby zone controls.**

Space conditioning zones shall include occupied standby controls complying with this section when all of the following are true:

1. All rooms served by the zone are permitted to have their ventilation air reduced to zero while in occupied-standby mode per Table 401.2~~-A~~(1) *[Table 120.1-A]*; and
2. Occupant sensors are required by Sections 601.2.2.3.5 and 601.2.2.3.6 *[Section 130.1(c)5 and 6]*; and
3. The zone and ventilation system is not served by pneumatic controls.

401.2.1.2.4.5 [Section 120.1(d)5B] Control functionality.

Occupied-standby zone controls shall comply with the following:

1. Occupant sensors shall have suitable coverage and placement to detect occupants in the entire space. In 20 minutes or less after no occupancy is detected by any sensors covering the room, *occupant sensing controls* shall indicate a room is vacant.

2. When occupant sensors controlling *lighting* are also used for ventilation, the ventilation signal shall be independent of daylighting, *manual lighting* overrides or *manual* control of *lighting*.
3. When a single zone serves multiple spaces, there shall be an occupant sensor in each space and the zone shall not be considered vacant until all spaces in the zone are vacant.
4. One hour prior to normal scheduled occupancy, the occupant sensor ventilation control shall allow pre-*occupancy* purge as described in Section 401.2.1.2.2 *[Section 120.1(d)2]*.
5. When the zone is scheduled to be occupied and *occupant sensing controls* in all spaces served by the zone indicate the spaces are unoccupied, the zone shall be placed in occupied-standby mode.
6. In 5 minutes or less after entering occupied-standby mode, mechanical ventilation to the zone shall be shut off until the space becomes occupied or until ventilation is needed to provide space heating or conditioning. When mechanical ventilation is shut off to the zone, the ventilation system serving the zone shall reduce the system *outside air* rate by the amount of *outside air* required for the zone.
7. Where the system providing space conditioning also provides ventilation to the zone, in 5 minutes or less after entering occupied-standby mode, *space-conditioning zone* setpoints shall be reset in accordance with Section 401.2.2.5.3 *[Section 120.2(e)3]*.

401.2.1.3 *[Section 120.1(e)]* **Ducting for zonal heating and cooling units.**

Where a return plenum is used to distribute *outdoor air* to a *zonal* heating or cooling unit, which then supplies the air to a space in order to meet the requirements of Section 401.2.1.1.3 *[Section 120.1(c)3]*, the *outdoor air* shall be ducted to discharge either:

1. Within 5 feet of the unit; or
2. Within 15 feet of the unit, substantially toward the unit, and at a velocity not less than 500 feet per minute.

401.2.1.4 *[Section 120.1(f)]* **Design and control requirements for quantities of outdoor air.**

1. All mechanical ventilation and *space-conditioning systems*, including ductwork, dampers and controls, shall be designed and installed to allow design minimum *outside air* rates that are no less than the larger of:~~All mechanical ventilation and space-conditioning systems shall be designed with and have installed ductwork, dampers and controls that allow design minimum outside air rates to be operated at no less than the larger of~~:
   1.1. the minimum levels specified in Section 401.2.1.1.3 *[Section 120.1(c)3]*; or
   1.2. the rate required for make-up of exhaust systems that are required for a covered or *non-covered process*, for control of odors, or for the removal of contaminants within the space.

2. All variable air volume mechanical ventilation and *space-conditioning systems* shall include dynamic controls that are capable of maintaining measured *outside air* ventilation rates within 10 percent of the design minimum *outside air* ventilation rate at both full and reduced supply airflow conditions. Fixed minimum damper position is not considered to be dynamic and is not an allowed control strategy.
3. All mechanical ventilation and *space-conditioning systems* shall be tested to confirm their ability to operate within 10 percent of the design minimum *outside air* rate.

401.2.1.5 *[Section 120.1(g)]* **Air classification and recirculation limitations.**

Air classification and recirculation limitations of air shall be based on the air classification as listed in Table 401.2-A(1) *[Table 120.1-A]* or Table 401.2-C(3) *[Table 120.1-C]*, and in accordance with the requirements of Sections 401.2.1.5.1 through 401.2.1.5.4 *[Sections 120.1(g)1 through 4]*.

Ancillary spaces. Redesignation of Class 1 air to Class 2 air shall be permitted for Class 1 spaces that are ancillary to Class 2 spaces. [*ASHRAE* 62.1:5.13.2.3]

Transfer. A mixture of air that has been transferred through or returned from spaces or locations with different air classes shall be redesignated with the highest classification among the air classes mixed. [*ASHRAE* 62.1:5.13.2.2]

Classification. Air leaving each space or location shall be designated at an expected air-quality classification not less than that shown in Tables 401.2-~~A~~(1), 401.2-~~B~~(2) or 401.2-~~C~~(3) *[Tables 120.1-A, 120.1-B or 120.1-C]*. Air leaving spaces or locations that are not listed in Tables 401.2-~~A~~(1), 401.2-~~B~~(2) or 401.2-~~C~~(3) *[Tables 120.1-A, 120.1-B or 120.1-C]* shall be designated with the same classification as air from the most similar space or location listed in terms of occupant activities and *building* construction.

NOTE: Air class definitions are taken directly from *ASHRAE* 62.1 and are duplicated here for convenience.

401.2.1.5.1- Class 1 Air is air with low contaminant concentration, low sensory-irritation intensity or inoffensive odor. Recirculation or transfer of Class 1 air to any space shall be permitted; [*ASHRAE* 62.1:5.13.3.1]

401.2.1.5.2- Class 2 Air is air with moderate contaminant concentration, mild sensory-irritation intensity or mildly offensive odors (Class 2 air also includes air that is not necessarily harmful or objectionable but that is inappropriate for transfer or recirculation to spaces used for different purposes). Recirculation or transfer of Class 2 air shall be permitted in accordance with the following:

401.2.1.5.2.1- Recirculation of Class 2 air within the space of origin shall be permitted [*ASHRAE* 62.1:5.13.3.2.1];

401.2.1.5.2.2- Recirculation or transfer of Class 2 to other Class 2 or Class 3 spaces shall be permitted, provided that the other spaces are used for the same or similar purpose or task and involve the same or similar pollutant sources as the Class 2 space [*ASHRAE* 62.1:5.13.3.2.2]; or

401.2.1.5.2.3- Transfer of Class 2 air to toilet rooms [*ASHRAE* 62.1:5.13.3.2.3]; or

401.2.1.5.2.4- Recirculation or transfer of Class 2 air to Class 4 spaces [*ASHRAE* 62.1:5.13.3.2.4]; or

401.2.1.5.2.5- Class 2 air shall not be recirculated or transferred to Class 1 spaces. [*ASHRAE* 62.1:5.13.3.2.5]

Exception to Section 401.2.1.5.2.5: When using any energy recovery device, recirculation from leakage, carryover, or transfer from the exhaust side of the energy recovery device is permitted. Recirculated Class 2 air shall not exceed 10 percent of the *outdoor air* intake flow.

401.2.1.5.3- Class 3 Air is air with significant contaminant concentration, significant sensory-irritation intensity or offensive odor. Recirculation or transfer of Class 3 air shall be permitted in accordance with the following:

401.2.1.5.3.1- Recirculation of Class 3 air within the space of origin shall be permitted. [*ASHRAE* 62.1:5.13.3.3.1]

401.2.1.5.3.2- Class 3 air shall not be recirculated or transferred to any other space. [*ASHRAE* 62.1:5.13.3.3.2].

Exception to Section 401.2.1.5.3.2: When using any energy recovery device, recirculation from leakage, carryover, or transfer from the exhaust side of the energy recovery device is permitted. Recirculated Class 3 air shall not exceed 5 percent of the *outdoor air* intake flow.

401.2.1.5.4- Class 4 Air is air with highly objectionable fumes or gases or with potentially dangerous particles, bioaerosols, or gases at concentrations high enough to be considered as harmful. Class 4 air shall not be recirculated or transferred to any space or recirculated within the space of origin. [*ASHRAE* 62.1:5.13.3.4]

TABLE 401.2~~-C~~(4) [TABLE 120.1-C] – AIRSTREAMS OR SOURCES [ASHRAE 62.1:TABLE 5.16.16-3]

DESCRIPTION	AIR CLASS
Commercial *kitchen* grease hoods	4
Commercial *kitchen* hoods other than grease	3
Diazo printing equipment discharge	4
Hydraulic elevator machine room	2
Laboratory hoods	4[a]
Paint spray booths	4
Refrigerating machinery rooms	3

Footnotes for Table 401.2~~-C~~(4) *[Table 120.1-C]*:

a. Air Class 4 unless determined otherwise by the Environmental Health and Safety professional responsible to the owner or to the owner's designee.

~~Footnotes for Table 401.2-C *[Table 120.1-C]*:~~

~~Air Class 4 unless determined otherwise by the Environmental Health and Safety professional responsible to the owner or to the owner's designee.~~

401.2.1.6 *[Section 120.1(h)]* **Ventilation only mechanical systems.**

HVAC systems without *mechanical cooling* or *mechanical heating* shall meet the requirements of Section 401.2.2.6 *[Section 120.2(f)]*.

401.2.2 *[Section 120.2]* **Controls for space-conditioning systems.**

Nonresidential and *hotel/motel buildings* shall comply with the applicable requirements of Section 401.2.2.1 through 401.2.2.1~~2~~3 *[Sections 120.2(a) through 120.2(l)]*.

401.2.2.1 *[Section 120.2(a)]* **Thermostatic controls for each zone.**

The supply of heating and cooling energy to each *space-conditioning zone* shall be controlled by an individual thermostatic control that responds to temperature within the zone and that meets the applicable requirements of Section 401.2.2.2 *[Section 120.2(b)]*. An *Energy Management Control System (EMCS)* may be installed to comply with the requirements of one or more thermostatic controls if it complies with all applicable requirements for each thermostatic control.

Exception to Section 401.2.2.1: An independent perimeter heating or cooling system may serve more than one zone without individual thermostatic controls if:

1. All zones are also served by an interior cooling system; and
2. The perimeter system is designed solely to offset *envelope* heat losses or gains; and
3. The perimeter system has at least one thermostatic control for each *building* orientation of 50 feet or more; and
4. The perimeter system is controlled by at least one *thermostat* located in one of the zones served by the system.

401.2.2.2 *[Section 120.2(b)]* **Criteria for zonal thermostatic controls.**

The individual thermostatic controls required by Section 401.2.2.1 *[Section 120.2(a)]* shall meet the following requirements as applicable:

401.2.2.2.1- Where used to control comfort heating, the thermostatic controls shall be capable of being set, locally or remotely, down to 55°F or lower.

401.2.2.2.2- Where used to control comfort cooling, the thermostatic controls shall be capable of being set, locally or remotely, up to 85°F or higher.

401.2.2.2.3- Where used to control both comfort heating and comfort cooling, the thermostatic controls shall meet Sections 401.2.2.2.1 and 401.2.2.2.2 and shall be capable of providing a temperature range or dead band of at least 5°F within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.

Exception 1 to Section 401.2.2.2.3: Systems with *thermostats* that require *manual* changeover between heating and cooling modes.

Exception 2 to Section 401.2.2.2.3: Systems serving *healthcare facilities*.

401.2.2.2.4- Thermostatic controls for all single zone, *air conditioners* and *heat pumps* shall comply with the requirements of Section 400.5.3 *[Sections 110.2(c)]* and Section 400.6.1 *[Section 110.12(a)]* and, if equipped with *DDC* to the Zone level, with the *Automatic* Demand Shed Controls of Section 400.6.2 *[Section 110.12(b)]*.

Exception 1 to Section 401.2.2.2.4: Systems serving *non-covered process loads* that must have constant temperatures to prevent degradation of materials, a *process*, plants or animals.

Exception 2 to Section 401.2.2.2.4: Package terminal *air conditioners*, package terminal *heat pumps*, room *air conditioners* and room *air conditioner heat pumps*.

Exception 3 to Section 401.2.2.2.4: Systems serving *healthcare facilities*.

401.2.2.3 *[Section 120.2(c)]* **Hotel/motel guest room thermostats.**

Hotel/motel guest room *thermostats* shall:

401.2.2.3.1- Have numeric temperature setpoints in °F and °C; and

Exception to Section 401.2.2.3.1: *Thermostats* that are integrated into the room heating and *cooling equipment*.

401.2.2.3.2- Have setpoint stops, which are *accessible* only to authorized personnel, such that guest room occupants cannot adjust the setpoint more than ±5°F (±3°C); and

401.2.2.3.3- Meet the requirements of Section 400.5.3 *[Section 110.2(c)]*.

401.2.2.4 *[Section 120.2(d)]* **Heat pump controls.**

All *heat pumps* with supplementary electric resistance heaters shall be installed with controls that comply with Section 400.5.2 *[Section 110.2(b)]*.

401.2.2.5 *[Section 120.2(e)]* **Shut-off and reset controls for space-conditioning and ventilation systems.**

Each *space-conditioning system* shall be installed with controls that comply with ~~the following~~Sections 401.2.2.5.1 through 401.2.2.5.4.

Each ventilation system serving *nonresidential buildings* other than *Group R occupancies* shall be installed with controls that comply with Sections 401.2.2.5.1 through 401.2.2.5.4.

For *HCAI facilities*, space-conditioning and ventilation systems shall be installed with controls that comply with Section 401.2.2.5.5.

Exception to Section 401.2.2.5: Systems serving *healthcare facilities other than HCAI facilities*.

401.2.2.5.1 *[Section 120.2(e)1]* **Automatic shut-off.**

The control shall be capable of automatically shutting off the system during periods of nonuse and shall have:

1. An *automatic time switch control* device complying with Section 600.2 *[Section 110.9]* with an *accessible manual* override that allows operation of the system for up to 4 hours; or
2. An occupancy sensor; or
3. A 4-hour timer that can be manually operated.

Exception 1 to Section 401.2.2.5.1: Mechanical systems serving retail stores and associated *malls*, restaurants, grocery stores, churches and theaters equipped with 7-day programmable timers.

Exception 2 to Section 401.2.2.5.1: Systems serving *hotel/motel* guest rooms, if they have a *readily accessible manual* shut-off switch.

Exception 3 to Section 401.2.2.5.1: Where it can be demonstrated to the satisfaction of the enforcing agency that the system serves an area that must operate continuously.

Exception 4 to Section 401.2.2.5.1 Systems with full load demands of 2 kW (6,800 Btu/hr or less, if they have a *readily accessible manual* shut-off switch.

401.2.2.5.2 *[Section 120.2(e)2]* **Automatic restart.**

The control shall automatically restart and temporarily operate the system as required to maintain:

401.2.2.5.2.1- A setback heating *thermostat* setpoint if the system provides *mechanical heating*; and

Exception to Section 401.2.2.5.2.1: *Thermostat* setback controls are not required in *nonresidential buildings* in areas where the Winter Median of Extremes *outdoor air* temperature determined in accordance with outdoor *design conditions* of Section 401.3.4.3 *[Section 140.4(b)3]* is greater than 32°F.

401.2.2.5.2.2- A setup cooling *thermostat* setpoint if the system provides *mechanical cooling*.

Exception to Section 401.2.2.5.2.2: *Thermostat* setup controls are not required in *nonresidential buildings* in areas where the Summer Design Dry-Bulb 0.5 percent

temperature determined in accordance with outdoor *design conditions* of Section 401.3.4.3 *[Section 140.4(b)3]* is less than 100°F.

Exception 1 to Section 401.2.2.5.2: Systems serving *hotel/motel* guest rooms, if they have a *readily accessible manual* shut-off switch.

Exception 2 to Section 401.2.2.5.2: Where it can be demonstrated to the satisfaction of the enforcing agency that the system serves an area that must operate continuously.

Exception 3 to Section 401.2.2.5.2: Systems with full load demands of 2 kW or less, if they have a *readily accessible manual* shut-off switch.

401.2.2.5.3 *[Section 120.2(e)3]* **Occupant sensing zone controls.**

Where the system providing space conditioning also provides the ventilation required by Section 401.2.1 *[Section 120.1]* and includes occupant sensor ventilation control as specified in Section 401.2.1.2.4.4~~5~~ *[Section 120.1(d)5]*, the occupant sensing zone controls shall additionally comply with the following:

1. In 5 minutes or less after entering occupied-standby mode as described in Section 401.2.1.2 *[Section 120.1(d)]*:
    1.1. Automatically set up the operating cooling temperature set point by 2°F or more and set back the operating heating temperature set point by 2°F or more; or
    1.2. For *multiple zone systems* with *Direct Digital Controls* (*DDC*) to the zone level, setup the operating cooling temperature setpoint by 0.5°F or more and setback the operating heating temperature setpoint by 0.5°F or more.
2. In 5 minutes or less after entering occupied-standby mode, mechanical ventilation to the zone shall remain off whenever the space temperature is between the active heating and cooling setpoints.

Exception 1 to Section 401.2.2.5.3: Where it can be demonstrated to the satisfaction of the enforcing agency that the system serves an area that must operate continuously.

Exception 2 to Section 401.2.2.5.3: Systems with full load demands of 2 kW or less, if they have a *readily accessible manual* shut-off switch.

401.2.2.5.4 *[Section 120.2(e)4]* **Hotel and motel guest rooms.**

Hotel and motel guest rooms shall have captive card key controls, occupancy sensing controls or *automatic* controls such that, no longer than 30 minutes after the guest room has been vacated, setpoints are set up at least +5°F (+3°C) in cooling mode and set down at least -5°F (-3°C) in heating mode.

401.2.2.5.5 *[New Section]* **Turndown controls in HCAI facilities.**

HCAI facility spaces included in Table 401.2-(5) or Section 401.2.1.2.4.4 *[Section 120.1(d)5]* shall have controls to turn down airflow where permitted. Space-conditioning and ventilation systems shall have controls that:

1. Reset zone or terminal supply airflow to no less than the minimum allowed for that space as stated in Table 4-A of the California Mechanical Code or Section 401.2.1.2.4.4 *[Section 120.1(d)5]*, based on occupied and unoccupied status. Where a zone or system serves multiple spaces, airflow shall not be reduced below the largest applicable minimum airflow rate allowed for any space served.
2. Have a delay of no less than 20 minutes and no more than 60 minutes to confirm unoccupied status prior to switching to unoccupied status.

Exception to Section 401.2.2.5.5: Spaces individually designated as emergency operation spaces, which are clinical spaces required for emergency operation where an airflow setback would interfere with clinical functions.

TABLE 401.2(5) [NEW TABLE]: HCAI FACILITY SPACE REQUIRED TO HAVE TURNDOWN CONTROLS

***CMC* TABLE 4-A SPACE GROUPING**	**SPACE TYPE[a]**
Diagnostic and Treatment	Bronchoscopy, sputum collection, and pentamidine administration; cancer treatment area; Call 1 *imaging room* (CT Scan, fluoroscopy room, MRI room, negative-pressure s-ray room); Class 2 *imaging room* (angiography room, cardiac catheterization lab, electroconvulsive therapy procedure room, interventional imaging procedure room); Class 3 *imaging room* (hybrid *operating room*); Dental treatment; Dialysis treatment area; Dialyzer reprocessing room; Gastrointestinal endoscopy procedure room; General examination room; Hydrotherapy; Medication preparation room; Nuclear medicine hot lab; Speech therapy room; Physical therapy; Occupational therapy; Special examination room; Ultrasound.
Nursing Units and Other Patient Care Areas	Cesarean delivery room; Delivery room; Labor/delivery/recovery (LDR) room; Labor/delivery/recovery/postpartum (LDRP) room; Lactation room; *Operating room*; Cystoscopy room; *Patient room*; Patient bedroom, behavioral room; Pediatric playroom; Post-anesthesia care unit (PACU) and recovery; Procedure room; Recreation/activity room; Seclusion room; Seclusion room; Sterile processing room; *Treatment room*.
Support Services	Blood bank/tissue storage; Blood draw/phlebotomy; *Food preparation areas*; *Laboratory* work area, bacteriology; *Laboratory* work area, biochemistry; *Laboratory* work area, cytology; *Laboratory* work area, general; *Laboratory* work area, glasswashing; *Laboratory* work area, histology; *Laboratory* work area media transfer; *Laboratory* work area microbiology; *Laboratory* work area, nuclear medicine; *Laboratory* work area, serology; *Laboratory* work area, sterilizing; Pharmacy services: *Pharmacy areas* (Drug room); Toilet room; Warewashing.

Footnotes for Table 401.2(5):

a. Space types listed in this table may or may not have additional energy efficiency requirements.

401.2.2.6 *[Section 120.2(f)]* **Dampers for air supply and exhaust equipment.**

Outdoor air supply and exhaust *equipment* shall be installed with dampers that automatically close upon fan shutdown.

Exception 1 to Section 401.2.2.6: *Equipment* that serves an area that must operate continuously.

Exception 2 to Section 401.2.2.6: Gravity and other nonelectrical *equipment* that has *readily accessible manual* damper controls.

Exception 3 to Section 401.2.2.6: At combustion air intakes and shaft vents.

~~**Exception 4 to Section 401.2.2.6:** Where prohibited by other provisions of law.~~

401.2.2.7 *[Section 120.2(g)]* **Isolation area devices.**

401.2.2.7.1- Nonresidential buildings other than Group R occupancies shall comply with the following:

1. Each *space-conditioning and ventilation system* serving multiple zones with a combined *conditioned floor area* of more than 25,000 square feet shall be designed, installed, and controlled to serve isolation areas.
2. Each zone, or any combination of zones not exceeding 25,000 square feet, shall be a separate isolation area.
3. Each isolation area shall be provided with isolation devices, such as valves or dampers, that allow the supply of heating, ~~or~~ cooling, or *outdoor air* to be reduced or shut off independently of other isolation areas.
4. The system shall be capable of continuous operation while serving only the smallest isolation area served by that system.
5. Where the isolation devices required by this section reduce or shut off the supply of *outdoor air* to an isolation area, and exhaust air is removed from that isolation area by a system that continues to operate, the exhaust airflow from that isolation area shall be reduced correspondingly, or the isolation area shall be provided with make-up air.
6. Each isolation area shall be controlled by a device meeting the requirements of Section 401.2.2.5.1 *[Section 120.2(e)1]*.

401.2.2.7.2- Group R occupancies shall comply with the following:

1. Each *space-conditioning system* serving multiple zones with a combined *conditioned floor area* of more than 25,000 square feet shall be designed, installed, and controlled to serve isolation areas.
2. Each zone, or any combination of zones not exceeding 25,000 square feet, shall be a separate isolation area.
3. Each isolation area shall be provided with isolation devices, such as valves or dampers, that allow the supply of heating or cooling to be reduced or shut off independently of other isolation areas.

4. Each isolation area shall be controlled by a device meeting the requirements of Section 401.2.2.5.1 *[Section 120.2(e)1]*.

Exception to Section 401.2.2.7: Zones designed to be conditioned continuously.

401.2.2.8 *[Section 120.2(h)]* **Automatic demand shed controls.**

See Section 400.6 *[Section 110.12]* for requirements for *automatic* demand shed controls.

401.2.2.9 *[Section 120.2(i)]* **Economizer fault detection and diagnostics (FDD).**

All newly installed *air handlers* with a *mechanical cooling* capacity over 33,000 Btu/hr and an installed *air economizer* shall include a stand-alone or integrated *Fault Detection and Diagnostics* (FDD) system in accordance with the following:

401.2.2.9.1- Temperature sensors. The following temperature sensors shall be permanently installed to monitor system operation:

1. *outside air*;
2. *supply air*; and
3. when required for differential economizer operation a *return air* sensor.

Temperature sensors shall have an accuracy of ±2°F over the range of 40°F to 80°F.

401.2.2.9.2- Controller capabilities. The controller shall have the capability of displaying the value of each sensor and shall provide system status by indicating the following conditions:

1. Free cooling available;
2. Economizer enabled;
3. Compressor enabled;
4. Heating enabled, if the system is capable of heating; and
5. Mixed-air low limit cycle active.

The unit controller shall allow *manual* initiation of each operating mode so that the operation of cooling systems, economizers, fans and heating system can be independently tested and verified.

401.2.2.9.3- *Fault* reporting. *Faults* shall be reported in one of the following ways:

1. Reported to an *Energy Management Control System* regularly monitored by facility personnel.
2. *Annunciated* locally on one or more zone *thermostats*, or a device within five (5) feet of zone *thermostat*(s), clearly visible, at eye level, and meeting the following requirements:

    2.1. On the *thermostat*, device, or an adjacent written *sign*, display instructions to contact appropriate *building* personnel or an HVAC technician; and

2.2. In *buildings* with multiple tenants, the annunciation shall either be within property management offices or in a common space *accessible* by the property or *building* manager.

3. Reported to a *fault* management application which automatically provides notification of the *fault* to a remote HVAC service provider.

401.2.2.9.4- *Fault* detection. The FDD system shall detect the following *faults*:

1. Air temperature sensor failure/*fault*;
2. Not economizing when it should;
3. Economizing when it should not;
4. Damper not modulating; and
5. Excess *outdoor air*.

401.2.2.9.5- Certification to *Energy Commission*. The FDD System shall be *certified to the Energy Commission* as meeting requirements of Sections 401.2.2.9.1 through 401.2.2.9.4 *[Sections 120.2(i)1 through 120.2(i)7]* in accordance with Section 101.2 *[Section 110.0]* and Reference Joint Appendix JA6.3.

Exception to Section 401.2.2.9.5: FDD algorithms based in *direct digital control* systems are not required to be *certified to the Energy Commission*.

401.2.2.10 *[New Section]* HVAC Fault Detection and Diagnostics (FDD).

A stand-alone or integrated FDD system shall be provided as specified by Table 401.2 (5)[New table]. The provided FDD system shall perform all of the functions below:

1. Monitor HVAC equipment and system(s),
2. Automatically detect the following faults:
   2.1. HVAC operating outside of scheduled hours and outside of permitted user override
   2.2. Leaking or inoperable cooling coil valves on Air Handling Units
   2.3. Leaking or inoperable heating coil valves on Air Handling Units
   2.4. Inoperable terminal unit dampers
   2.5. Zone temperature sensor failure/fault
   2.6. Building HVAC control fan motor command at 100% or placed in manual override
3. Automatically diagnose faults with:
   3.1. The specific fault detected
   3.2. The affected equipment or system by name or identifier
   3.3. Recommended corrective actions
4. Communicate faults and diagnoses in at least one of the following ways:
   4.1. Report to an energy management control system regularly monitored by facility personnel

4.2. Report to a fault management application, which automatically provides notification of the fault to a remote HVAC service provider

5. Display the fault, diagnosis status, and the value of each sensor being monitored in an energy management control system or a fault management application; and

6. Trend system performance data at least once every 15 minutes or as event based and store data for a minimum of six months.

Exception to 401.2.2.10: Systems serving Group R occupancies.

TABLE 401.2(6~~5~~) [NEW TABLE] HVAC FDD APPLICATIONS AND QUALIFICATIONS

BUILDING STATUS	APPLICATIONS	QUALIFICATIONS
Newly constructed buildings with 100,000 ft2 of conditioned floor area or larger	Air-handling system and all zones served by the system	Individual systems supplying more than three zones with design heating or cooling capacity of 300 kBtu/h and larger
Additions or alterations in buildings with 100,000 ft2 of conditioned floor area or larger	Zone terminal unit such as a VAV box	Where existing zones served by the same air-handling systems have FDD
Additions or alterations where additions, alterations, and replacements of space conditioning system serve a total combined floor area of 100,000 ft2	New or replacement air-handling units and new zones served by the system	Individual air handling units with design heating or cooling capacity of 300 kBtu/h and larger, and supply more than three zones, and more than 75% of zones are new

401.2.2.11~~0~~ *[Section 120.2(j)]* **Direct Digital Controls (DDC).**

Direct Digital Controls to the zone shall be provided as specified by Table 401.2-~~D~~(6~~5~~4) *[Table 120.2-A]*. The provided *DDC* system shall meet the control logic requirements of Section 401.2.1.2 and Section 400.6 *[Sections 120.1(d), 110.12(a) and 110.12(b)]*, and be capable of the following:

1. Monitoring zone and system demand for fan pressure, pump pressure, heating and cooling;
2. Transferring zone and system demand information from zones to air distribution system controllers and from air distribution systems to heating and cooling plant controllers;
3. Automatically detecting the zones and systems that may be excessively driving the reset logic and generate an alarm or other indication to the system operator;
4. Readily allow operator removal of zone(s) from the reset algorithm;
5. For new *buildings*, trending and graphically displaying input and output points; and
6. Resetting heating and cooling setpoints in all *noncritical zones* upon receipt of a signal from a centralized contact or software point as described in Section 400.6.2 *[Section 110.12(b)]*.

TABLE 401.2 ~~D~~(7) [TABLE 120.2-A] DDC APPLICATIONS AND QUALIFICATIONS

BUILDING STATUS	APPLICATIONS	QUALIFICATIONS
Newly Constructed Buildings	Air-handling system and all zones served by the system	Individual systems supplying more than three zones and with design heating or cooling capacity of 300 kBtu/h and larger
Newly Constructed Buildings	Chilled water plant and all coils and terminal units served by the system	Individual plants supplying more than three zones and with design cooling capacity of 300 kBtu/h (87.9 kW) and larger
Newly Constructed Buildings	Hot water plant and all coils and terminal units served by the system	Individual plants supplying more than three zones and with design heating capacity of 300 kBtu/h (87.9 kW) and larger
Additions or *Alterations*	Zone terminal unit such as *VAV* box	*Healthcare facilities* and *Group R Occupancies*: Where existing zones served by the same air-handling, chilled water, or hot water systems that have *DDC* All other nonresidential *occupancies*: Any new or replacement zone terminal unit
Additions or *Alterations*	Air-handling system or fan coil	*Healthcare facilities* and *Group R Occupancies*: Where existing air-handling system(s) and fan coil(s) served by the same chilled or hot water plant have *DDC* All other nonresidential *occupancies*: New air-handling system(s) with design cooling capacity of 150 kBtu/h and larger, or New air-handling systems(s) or fan coil(s) of any size where existing air-handling system(s) and fan coil(s) served by the same chilled or hot water plant have *DDC*, or New air-handling system(s) of any size where greater than 50% of the existing downstream zone terminal units served by the air-handling system have *DDC*
Additions or *Alterations*	New air-handling system and all new zones served by the system	*Healthcare facilities* and *Group R Occupancies*: Individual systems with design heating or cooling capacity of 300 kBtu/h and larger and supplying more than three zones and more than 75 percent of zones are new All other nonresidential *occupancies*: Individual systems with design heating or cooling capacity of 150 kBtu/h and larger and supplying more than three zones and more than 75 percent of zones are new New air-handling system(s) and more than 85 percent of zone terminal units are new, then all existing terminal units served by the new air-handling system shall be upgraded to *DDC*

BUILDING STATUS	APPLICATIONS	QUALIFICATIONS
Additions or *Alterations*	New or upgraded chilled water plant	*Healthcare facilities* and *Group R Occupancies*: Where all chillers are new and plant design cooling capacity is 300 kBtu/h (87.9 kW) and larger All other nonresidential *occupancies*: Where more than 50 percent of plant design cooling capacity is new and plant design cooling capacity is 300 kBtu/h (87.9 kW) and larger, chilled water plant shall be commissioned per Section 1001.5.2.
Additions or *Alterations*	New or upgraded hot water plant	*Healthcare facilities* and *Group R Occupancies*: Where all boilers are new and plant design heating capacity is 300 kBtu/h (87.9 kW) and larger All other nonresidential *occupancies*: Where more than 50 percent of plant design heating capacity is new and plant design heating capacity is 300 kBtu/h (87.9 kW) and larger, hot water plant shall be commissioned per Section 1001.5.2.

401.2.2.121 ~~1~~ *[Section 120.2(k)]* **Optimum start/stop controls.**

Space conditioning systems with *DDC* to the zone level shall have optimum start/stop controls. The control algorithm shall, as a minimum, be a function of the difference between space temperature and occupied setpoint, the *outdoor air* temperature, and the amount of time prior to scheduled occupancy. Mass radiant floor slab systems shall incorporate floor temperature onto the optimum start algorithm.

Exception to Section 401.2.2.121 ~~1~~**:** Systems that must operate continuously.

401.2.2.132 ~~2~~ *[Section 120.2(l)]* **HVAC hot water temperature.**

Zones that use hot water for space heating shall be designed for a hot water supply temperature of no greater than 130 °F. New or replacement terminal units in *alterations* shall be designed to operate at the existing hot water system supply temperature and shall also be capable of operation with a supply temperature no greater than 130°F.

401.2.3 *[Section 120.3]* **Pipe insulation.**

Nonresidential and *hotel/motel* *use designations*~~*buildings*~~ shall comply with the applicable requirements of Section 401.2.3.1 through 401.2.3.3 *[Sections 120.3(a) through 120.3(c)]*.

Exception 1 to Section 401.2.3: Factory-installed piping within space-conditioning *equipment* certified under Section 101.3 *[Section 110.1]* or Section 400.2 *[Section 110.2]*.

Exception 2 to Section 401.2.3: Piping that conveys fluids with a design operating temperature range between 60°F and 105°F.

Exception 3 to Section 401.2.3: Where the heat gain or heat loss to or from piping without insulation will not increase *building Ssource Eenergy* use.

Exception 4 to Section 401.2.3: Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration. Metal piping that penetrates metal framing shall use grommets, plugs, wrapping or other insulating material to assure that no contact is made with the metal framing.

401.2.3.1 *[Section 120.3(a)]* **General requirements.**

Insulation conductivity shall be determined in accordance with *ASTM* C335 at the mean temperature listed in Table 401.2(8) or Table 401.2(9) *[Table 120.3-A1 or Table 120.3-A2]*, and shall be rounded to the nearest 1/100 Btu-inch per hour per square foot per °F.

Fluid distribution systems include all elements that are in series with the fluid flow, such as pipes, fittings, pumps, valves, strainers, coil u-bends, and air separators, but not including elements that are not in series with the fluid flow, such as expansion tanks, fill lines, chemical feeders, and drains.

The piping conditions listed below for *space-conditioning systems* piping with fluid normal operating temperatures listed in Table 401.2~~-E~~(8) or Table 401.2~~-F~~(9) *[Table 120.3-A1 or Table 120.3-A2]*, the fluid distribution system shall have at least the amount of insulation specified in Section 401.2.3.3 *[Section 120.3(c)]*:~~.~~

~~Insulation conductivity shall be determined in accordance with *ASTM* C335 at the mean temperature listed in Table 401.2-E(65) or Table 401.2-F(76) *[Table 120.3-A1 or Table 120.3-A2]*, and shall be rounded to the nearest 1/100 Btu-inch per hour per square foot per °F. Fluid distribution systems include all elements that are in series with the fluid flow, such as pipes, fittings, pumps, valves, strainers, coil u-bends, and air separators, but not including elements that are not in series with the fluid flow, such as expansion tanks, fill lines, chemical feeders, and drains.~~

401.2.3.1.1- Space cooling systems. All refrigerant suction, chilled water, and brine fluid distribution systems.

401.2.3.1.2- Space heating systems. All refrigerant suction, steam, steam condensate and hot water fluid distribution systems.

Exception to Section 401.2.3.1.2: *Heat pump* refrigerant vapor line shall be installed with a minimum of 0.5 inch thick or R-3.0 insulation for *nonresidential buildings* and 0.75 inch thick or R-6.0 insulation for *residential buildings*. No insulation is required on the refrigerant liquid line.

401.2.3.2 *[Section 120.3(b)]* **Insulation protection.**

Pipe insulation shall be protected from damage due to sunlight, moisture, *equipment* maintenance and wind. Protection shall, at minimum, include the following:

1. Pipe insulation exposed to weather shall be protected by a cover suitable for outdoor service. The cover shall be water retardant and provides shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be used to provide this protection.

2. Pipe insulation covering chilled water piping and refrigerant suction piping located outside the *conditioned space* shall include, or be protected by, a Class I or Class II vapor retarder. All penetrations and joints shall be sealed.

3. Pipe insulation buried below grade must be installed in a water proof and non-crushable casing or sleeve.

401.2.3.3 *[Section 120.3(c)]* **Insulation thickness.**

1. For insulation with a conductivity in the range shown in Table 401.2-~~E~~(7) or Table 401.2-~~F~~(8) *[Table 120.3-A1 or Table 120.3-A2]* for the applicable fluid temperature range, the insulation shall have the applicable minimum thickness or *R-value* shown in Table 401.2-~~E~~(7) or Table 401.2-~~F~~(8) *[Table 120.3-A1 or Table 120.3-A2]*.

2. For insulation with a conductivity outside the range shown in Table 401.2-~~E~~(7) or Table 401.2-~~F~~(8) *[Table 120.3-A1 or Table 120.3-A2]* for the applicable fluid temperature range, the insulation shall have a minimum *R-value* shown in Table 401.2-~~E~~(7) or Table 401.2-~~F~~(8) *[Table 120.3-A1 or Table 120.3-A2]* or thickness as calculated:

MINIMUM INSULATION THICKNESS EQUATION *(Equation 401.2-C)*

$$T = PR\left[\left(1 + \frac{t}{PR}\right)^{\frac{K}{k}} - 1\right]$$

where:

T = insulation thickness for material with conductivity K, inches.

PR = actual outside radius, inches.

t = Insulation thickness from Table 401.2-~~E~~(7) or Table 401.2-~~F~~(8) *[Table 120.3-A-1 or Table 120.3-A-2]*, inches.

K = Conductivity of alternate material at the mean rating temperature indicated in Table 401.2-~~E~~(7) or Table 401.2-~~F~~(8) *[Table 120.3-A-1 or Table 120.3-A-2]* for the applicable fluid temperature range, in Btu-inch per hour per square foot per °F.

k = The lower value of the conductivity range listed in Table 401.2-~~E~~(7) or Table 401.2-~~F~~(8) *[Table 120.3-A-1 or Table 120.3-A-2]* for the applicable fluid temperature range, Btu-inch per hour per square foot per °F.

TABLE 401.2~~-E~~(8) [TABLE 120.3-A-1] SPACE HEATING SYSTEMS (STEAM, STEAM CONDENSATE, REFRIGERANT, SPACE HEATING) PIPE INSULATION THICKNESS

FLUID OPERATING TEMPERATURE RANGE (°F)	INSULATION CONDUCTIVITY (IN BTU·IN/H·FT^{2}·°F)	INSULATION MEAN RATING TEMPERATURE (°F)	NOMINAL PIPE DIAMETER < 1 INCH	NOMINAL PIPE DIAMETER 1 TO < 1.5 INCHES	NOMINAL PIPE DIAMETER 1.5 TO < 4 INCHES	NOMINAL PIPE DIAMETER 4 TO < 8 INCHES	NOMINAL PIPE DIAMETER 8 INCHES AND LARGER
Above 350	0.32-0.34	250	4.5 inches	5.0 inches	5.0 inches	5.0 inches	5.0 inches
Above 350	0.32-0.34	250	R 37	R 41	R 37	R 27	R 23
251-350	0.29-0.32	200	3.0 inches	4.0 inches	4.5 inches	4.5 inches	4.5 inches
251-350	0.29-0.32	200	R 24	R 34	R 35	R 26	R 22
201-250	0.27-0.30	150	2.5 inches	2.5 inches	2.5 inches	3.0 inches	3.0 inches
201-250	0.27-0.30	150	R 21	R 20	R 17.5	R 17	R 14.5
141-200	0.25-0.29	125	1.5 inches	1.5 inches	2.0 inches	2.0 inches	2.0 inches
141-200	0.25-0.29	125	R 11.5	R 11	R 14	R 11	R 10
105-140	0.22-0.28	100	1.0 inch	1.5 inches	1.5 inches	1.5 inches	1.5 inches
105-140	0.22-0.28	100	R 7.7	R 12.5	R 11	R 9	R 8

TABLE 401.2~~-F~~(9) [TABLE 120.3-A-2] SPACE COOLING SYSTEMS (CHILLED WATER, REFRIGERANT AND BRINE) PIPE INSULATION THICKNESS

FLUID OPERATING TEMPERATURE RANGE (°F)	INSULATION CONDUCTIVITY (IN BTU·IN/H·FT^{2}·°F)	INSULATION MEAN RATING TEMPERATURE (°F)	NOMINAL PIPE DIAMETER < 1 INCH	NOMINAL PIPE DIAMETER 1 TO < 1.5 INCHES	NOMINAL PIPE DIAMETER 1.5 TO < 4 INCHES	NOMINAL PIPE DIAMETER 4 TO < 8 INCHES	NOMINAL PIPE DIAMETER 8 INCHES AND LARGER
Residential 40-60	0.21-0.27	75	0.75 inch	0.75 inch	1.0 inch	1.0 inch	1.0 inch
Residential 40-60	0.21-0.27	75	R 6	R 5	R 7	R 6	R 5
Nonresidential 40-60	0.21-0.27	75	0.5 inch	0.5 inch	1.0 inch	1.0 inch	1.0 inch
Nonresidential 40-60	0.21-0.27	75	R 3	R 3	R 7	R 6	R 5
Below 40	0.20-0.26	50	1.0 inch	1.5 inches	1.5 inches	1.5 inches	1.5 inches
Below 40	0.20-0.26	50	R 8.5	R 14	R 12	R 10	R 9

Footnote to Table 401.2(8) and Table 401.2(9) *[Table 120.3-A-1 and Table 120.3-A-2]*:

a. These thicknesses are based on energy efficiency considerations only. Issues such as water vapor permeability or surface condensation sometimes require vapor retarders or additional insulation.

~~Footnote to Table 401.2-E and Table 401.2-F *[Table 120.3-A-1 and Table 120.3-A-2]*:~~

~~1. These thicknesses are based on energy efficiency considerations only. Issues such as water vapor permeability or surface condensation sometimes require vapor retarders or additional insulation.~~

401.2.4 *[Section 120.4]* **Requirements for air distribution system ducts and plenums.**

Nonresidential and *hotel/motel* *use designations*~~*buildings*~~ shall comply with the applicable requirements of Section 401.2.4.1 through Section 401.2.4.7 *[Sections 120.4(a) through 120.4(g)]*.

Exception to Section 401.2.4: Systems serving *healthcare facilities* shall comply with the applicable requirements of the California Mechanical Code.

401.2.4.1 *[Section 120.4(a)]* **CMC compliance.**

All air distribution system ducts and plenums, including but not limited to *building* cavities, mechanical closets, air-handler boxes and support platforms used as ducts or plenums, shall meet the requirements of the *CMC* Sections 601.0, 602.0, 603.0, 604.0, and 605.0, and *ANSI*/*SMACNA*-006-2006 HVAC Duct Construction Standards Metal and Flexible, 3rd Edition incorporated herein by reference. Connections of metal ducts and the inner core of flexible ducts shall be mechanically fastened. Openings shall be sealed with mastic, tape, aerosol sealant or other duct-closure system that meets the applicable requirements of *UL 181*, *UL 181A*, or *UL 181B*. If mastic or tape is used to seal openings greater than 1/4 inch, the combination of mastic and either mesh or tape shall be used.

Portions of supply-air and return-air ducts conveying heated or cooled air located in one or more of the following spaces shall be insulated to a minimum installed level of R-8:

1. Outdoors; or
2. In a space between the *roof* and an insulated ceiling; or
3. In a space directly under a *roof* with fixed vents or openings to the outside or *unconditioned spaces*; or
4. In an unconditioned crawlspace; or
5. In other *unconditioned spaces*.

Portions of supply-air ducts that are not in one of these spaces, including ducts buried in concrete slab, shall be insulated to a minimum installed level of R-4.2 or be enclosed in *directly conditioned space*.

401.2.4.2 *[Section 120.4(b)]* **Duct and plenum materials.**

401.2.4.2.1 *[Section 120.4(b)1]* **Factory-fabricated duct systems.**

All factory-fabricated *duct systems* shall comply with *UL 181* for ducts and closure systems, including collars, connections and splices, and be labeled as complying with *UL 181*. *UL 181* testing may be performed by *UL* laboratories or a *laboratory* approved by the *Executive Director*.

401.2.4.2.1.1- Tapes and mastics in rigid fiberglass ducts. All pressure-sensitive tapes, heat-activated tapes, and mastics used in the manufacture of rigid fiberglass ducts shall comply with *UL 181* and *UL 181A*.

401.2.4.2.1.2- Tapes and mastics in flexible ducts. All pressure-sensitive tapes and mastics used with flexible ducts shall comply with *UL 181* and *UL 181B*.

401.2.4.2.1.3- Seal class rating. All ductwork and plenums with pressure class ratings shall be constructed to *Seal Class A*. Joints and seams of *duct systems* and their components shall not be sealed with cloth-back rubber adhesive duct tapes unless such tape is used in combination with mastic and drawbands.

Exception to Section 401.2.4.2.1.3: Ductwork located in occupied space and exposed to view is not required to meet *Seal Class A*.

401.2.4.2.2 *[Section 120.4(b)2]* **Field-fabricated duct systems.**

Factory-made rigid fiberglass and flexible ducts for *field-fabricated duct systems* shall comply with *UL 181*. All pressure-sensitive tapes, mastics, aerosol sealants or other closure systems used for installing *field-fabricated duct systems* shall meet the applicable requirements of *UL 181*, *UL 181A* and *UL 181B*.

401.2.4.2.2.1- Mastic sealants and mesh.

1. Sealants shall comply with the applicable requirements of *UL 181*, *UL 181A* and *UL 181B*, and be nontoxic and water resistant.
2. Sealants for interior applications shall pass *ASTM C731* (extrudability after aging) and D2202 (slump test on vertical surfaces), incorporated herein by reference.
3. Sealants for exterior applications shall pass *ASTM* tests C731, C732 (artificial weathering test), and D2202, incorporated herein by reference.
4. Sealants and meshes shall be rated for exterior use.

401.2.4.2.2.2- Pressure-sensitive tape. Pressure-sensitive tapes shall comply with the applicable requirements of *UL 181*, *UL 181A* and *UL 181B*.

401.2.4.2.2.3- Seal class rating. All ductwork and plenums with pressure class ratings shall be constructed to *Seal Class A*. Joints and seams of *duct systems* and their components shall not be sealed with cloth-back rubber adhesive duct tapes unless such tape is used in combination with mastic and drawbands.

Exception to Section 401.2.4.2.2.3: Ductwork located in occupied space and exposed to view is not required to meet *Seal Class A*.

401.2.4.2.2.4- Drawbands used with flexible duct.

1. Drawbands shall be either stainless-steel worm-drive hose clamps or UV-resistant nylon duct ties.
2. Drawbands shall have a minimum tensile strength rating of 150 pounds.
3. Drawbands shall be tightened as recommended by the manufacturer with an adjustable tensioning tool.

401.2.4.2.2.5- Aerosol-sealant closures.

1. Aerosol sealants shall meet the requirements of *UL 723* and be applied according to manufacturer specifications.
2. Tapes or mastics used in combination with aerosol sealing shall meet the requirements of this section.

401.2.4.3 *[Section 120.4(c)]* **Product R-values.**

All duct insulation product *R-values* shall be based on insulation only (excluding air films, vapor retarders or other duct components) and tested *C-values* at 75°F mean temperature at the installed thickness, in accordance with *ASTM C518* or *ASTM C177*, incorporated herein by reference, and certified pursuant to Section 300.3 *[Section 110.8]*.

401.2.4.4 *[Section 120.4(d)]* **Installed thickness.**

The installed thickness of duct insulation used to determine its *R-value* shall be determined as follows:

1. For duct board, duct liner and factory-made rigid ducts not normally subjected to compression, the nominal insulation thickness shall be used.
2. For duct wrap, installed thickness shall be assumed to be 75 percent (25 percent compression) of nominal thickness.
3. For factory-made flexible air ducts, the installed thickness shall be determined by dividing the difference between the actual outside diameter and nominal inside diameter by two.

401.2.4.5 *[Section 120.4(e)]* **Insulated flexible duct labels.**

Insulated flexible duct products installed to meet this requirement must include labels, in maximum intervals of 3 feet, showing the thermal performance *R-value* for the duct insulation itself (excluding air films, vapor retarder or other duct components), based on the tests in Section 401.2.4.3 *[Section 120.4(c)]* and the installed thickness determined by Section 401.2.4.4 *[Section 120.4(d)3]*.

401.2.4.6 *[Section 120.4(f)]* **Protection of insulation.**

Insulation shall be protected from damage, including that due to sunlight, moisture, equipment maintenance and wind, but not limited to the following:

1. Insulation exposed to weather shall be suitable for outdoor service, e.g., protected by aluminum, sheet metal, painted canvas or plastic cover. Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation that can cause degradation of the material.

401.2.4.7 *[Section 120.4(g)]* **Duct sealing.**

Duct systems shall comply with the requirements below:

401.2.4.7.1 *[Section 120.4(g)1]* **Duct leakage rate per NA7.**

New *duct systems* that meet the criteria below shall be sealed to a leakage rate not to exceed 6 percent of the nominal *air handler* airflow rate as confirmed through acceptance testing, in accordance with Reference Nonresidential Appendix NA7.5.3.

1. The *duct system* does not serve a *healthcare facility*; and
2. The *duct system* provides conditioned air to an *occupiable space* for a constant volume, single zone, *space-conditioning system*; and

3. The *space-conditioning system* serves less than 5,000 square feet of *conditioned floor area*; and
4. The combined surface area of the ducts located outdoors or in *unconditioned space* is more than 25 percent of the total surface area of the entire *duct system*.

401.2.4.7.2 *[Section 120.4(g)2]* **Duct leakage rate per CMC.**

New *duct systems* that are not subject to testing under Section 401.2.4.7.1 *[Section 120.4(g)1]* shall instead meet the duct leakage testing requirements of *CMC* Section 603.10.1.

401.2.5 *[Section 120.9]* **Commercial boilers.**

401.2.5.1 *[Section 120.9(a)]* **Combustion air positive shut-off.**

Combustion air positive shut-off shall be provided on all newly installed boilers as follows:

1. All boilers with an input capacity of 2.5 MMBtu/h (2,500,000 Btu/h) and above, in which the boiler is designed to operate with a nonpositive vent static pressure.
2. All boilers where one stack serves two or more boilers with a total combined input capacity per stack of 2.5 MMBtu/h (2,500,000 Btu/h).

401.2.5.2 *[Section 120.9(b)]* **Combustion air fans.**

Boiler combustion air fans with motors 10 horsepower or larger in newly installed boilers shall meet one of the following ~~for newly installed boilers~~:

1. The fan motor shall be driven by a variable speed drive, or
2. The fan motor shall include controls that limit the fan motor demand to no more than 30 percent of the total design wattage at 50 percent of design air volume.

401.2.5.3 *[Section 120.9(c)]* **Combustion air volume and stack-gas oxygen concentration.**

Newly installed boilers with an input capacity 5 MMBtu/h (5,000,000 Btu/h) and greater shall maintain stack-gas oxygen concentrations at less than or equal to 5.0 percent by volume on a dry basis over firing rates of 20 to 100 percent. Combustion air volume shall be controlled with respect to firing rate or flue gas oxygen concentration. Use of a common gas and combustion air control linkage or jack shaft is prohibited.

Exception to Section 401.2.5.3: Boilers with steady state full-load *combustion efficiency* 90 percent or higher.

401.2.6 *[Section 120.10]* **Fans.**

Each fan or fan array with a combined motor nameplate horsepower greater than 1.00 hp or with a combined *fan nameplate electrical input power* greater than 0.89 kW shall have a *fan energy index (FEI)* of 1.00 or higher at *fan system design conditions*. Each fan and fan array used for a variable-air-volume system that meets the requirements of Section 401.3.5.2 *[Section 140.4(c)2]* shall have an *FEI* of 0.95 or higher at *fan system design conditions*.

The *FEI* for *fan arrays* shall be calculated in accordance with *ANSI/AMCA 208-18 Annex C*.

Exception 1 to Section 401.2.6: *Embedded fans* that are part of the *equipment* listed under Section 101.3 *[Section 110.1]* or Section 400.2 *[Section 110.2]*, *computer room air conditioners* (CRACs) as defined in 10 *CFR* 431, and *DX-DOAS* units.

Exception 2 to Section 401.2.6: *Embedded fans* and *embedded fan arrays* with a combined motor nameplate horsepower of 5 hp or less or with a *fan system electrical input power* of 4.1 kW or less.

Exception 3 to Section 401.2.6: Circulation fans, *ceiling fans* and air curtains.

Exception 4 to Section 401.2.6: Fans that are intended to operate only during emergency conditions.

401.2.6.1- All *FEI* values shall be provided by a manufacturer, where fan selection software and/or fan catalogs display third party verified *FEI* values in accordance with Appendix A to Subpart J of Part 10 *CFR* 431.

Exception to Section 401.2.6.1: *FEI* values for *embedded fans* do not need to be third-party verified.

401.2.7 *[Section 120.5]* **Mechanical system acceptance.**

Nonresidential and *hotel/motel* *use designations*~~*buildings*~~ shall comply with the applicable requirements of Sections 401.2.7.1 through 401.2.7.19.

Before an occupancy permit is granted, the following *equipment* and systems shall be certified as meeting the *Acceptance Requirements for Code Compliance*, as specified by the Reference Nonresidential Appendix NA7. A Certificate of Acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements.

When certification is required by Section 103.2 *[Title 24, Part 1, Section 10-103.2]*, the acceptance testing specified by Section 401.2.7 *[Section 120.5(a)]* shall be performed by a certified mechanical acceptance test technician (CMATT). If the CMATT is operating as an employee, the CMATT shall be employed by a certified mechanical acceptance test employer. The CMATT shall disclose on the certificate of acceptance a valid CMATT certification identification number issued by an approved acceptance test technician certification provider. The CMATT shall complete all certificate of acceptance documentation in accordance with the applicable requirements in Section 100.5.1.3 *[Section 10-103(a)4]*.

Exception to Section 401.2.7: Systems serving *healthcare facilities*.

401.2.7.1- *Outdoor air* ventilation systems shall be tested in accordance with NA7.5.1.

401.2.7.2- Constant volume, single zone air conditioning and *heat pump* unit controls shall be tested in accordance with NA7.5.2.

401.2.7.3- *Duct systems* that are subject to testing under Section 401.2.4.7.1 *[Section 120.4(g)1]*, Section 401.5.2.2.3 *[Section 141.0(b)2Di]* or Section 401.5.2.2.4 *[Section 141.0(b)2Dii]* shall be tested in accordance with NA7.5.3.

401.2.7.4- *Air economizers*, *DOAS*, *HRV* or *ERV* systems shall be tested in accordance with NA7.5.4.

Exception 1 to Section 401.2.7.4: *Air economizers* installed by the *HVAC system* manufacturer and *certified to the Energy C~~C~~ommission* as being factory calibrated and tested are not required to comply with the Functional Testing section of the *air economizer* controls acceptance test as described in NA7.5.4.2.

Exception 2 to Section 401.2.7.4: The *DOAS*, *HRV*, or *ERV* unit that does not meet the exhaust air heat recovery ratio as specified in Section 401.3.18.1 *[Section 140.4(q)1]* or does not include bypass or control to disable energy recovery as specified in Section 401.3.18.2 *[Section 140.4(q)2]*.

401.2.7.5- *Demand control ventilation* systems required by Section 401.2.1.1.3 *[Section 120.1(c)3]* shall be tested in accordance with NA7.5.5.

401.2.7.6- Supply fan variable flow controls shall be tested in accordance with NA7.5.6.

401.2.7.7- Hydronic system variable flow controls shall be tested in accordance with NA7.5.7 and NA7.5.9.

401.2.7.8- Boiler~~, or~~ chiller~~s~~, *air-to--water heat pump*, or *water-to--water heat pump* that require ~~isolation controls~~stage off of flow as specified by Section 401.3.13.2 *[Section 140.4(k)2]* or Section 401.3.13.3 *[Section 140.4(k)3]* shall be tested in accordance with NA7.5.7.

Exception to 401.2.7.8: *Air-to-water heat pumps* and *water-to-water heat pumps* in *Group R occupancies*.

401.2.7.9- Hydronic systems with supply water temperature reset controls shall be tested in accordance with NA7.5.8.

401.2.7.10- *Automatic* demand shed controls shall be tested in accordance with NA7.5.10.

401.2.7.11- *Fault Detection and Diagnostics* (FDD) for Packaged Direct-Expansion Units shall be tested in accordance with NA7.5.11.

401.2.7.12- *Automatic fault detection and diagnostics* (FDD) for air handling units and zone terminal units shall be tested in accordance with NA7.5.12.

401.2.7.13- Distributed Energy Storage DX AC Systems shall be tested in accordance with NA7.5.13.

401.2.7.14- Thermal Energy Storage (TES) Systems shall be tested in accordance with NA7.5.14.

401.2.7.15- *Supply air* temperature reset controls shall be tested in accordance with NA7.5.15.

401.2.7.16- Water-cooled chillers served by cooling towers with *condenser* water reset controls shall be tested in accordance with NA7.5.16.

401.2.7.17- When an *energy management control system* is installed, it shall functionally meet all of the applicable requirements of *Part 6*.

401.2.7.18- Occupant sensing zone controls shall be tested in accordance with NA7.5.17.

401.2.7.19- Conductivity controls and overflow alarms for open and *closed-circuit cooling towers* shall be tested according to NA7.5.18.

401.3 *[Section 140.4]* **Prescriptive requirements (Newly Constructed).**

A *use designations*~~*building*~~ complies with this section by being designed with and having constructed and installed a *space-conditioning system* that meets the applicable prescriptive requirements of Section 401.3.1 through 401.3.20.

401.3.1 *[Section 140.4(a)1]* **Sizing and equipment selection.**

~~1. *Mechanical heating* and *mechanical cooling equipment* serving *healthcare facilities* shall be sized to meet the design heating and cooling loads as calculated according to Section 401.3.4 *[Section 140.4(b)].*~~

2. *Mechanical heating* and *mechanical cooling equipment* serving *hotel/motel* ~~*buildings*~~ *or* and *nonresidential use designations,*~~*buildings*~~ ~~other than~~not including *healthcare facilities* shall be the smallest size, within the available options of the desired equipment line, necessary to meet the design heating and cooling loads of the ~~*building*~~*zone*, as calculated according to Section 401.3.4 *[Section 140.4(b)]*.

3. *Mechanical heating* and *mechanical cooling equipment* serving *healthcare facilities* shall be sized to meet the design heating and cooling loads as calculated according to Section 401.3.4 *[Section 140.4(b)].*

Exception 1 to Section 401.3.1: Where it can be demonstrated to the satisfaction of the enforcing agency that oversizing will not increase *building LSC*.

Exception 2 to Section 401.3.1: Standby *equipment* with controls that allow the standby *equipment* to operate only when the primary *equipment* is not operating.

Exception 3 to Section 401.3.1: Multiple units of the same equipment type, such as multiple chillers and boilers, having combined capacities exceeding the design load, if they have controls, that sequence or otherwise optimally control the operation of each unit based on load.

401.3.2 *[Section 140.4(a)2]* **Single zone space-conditioning system type.**

Single zone *space-conditioning systems* with direct expansion cooling with rated cooling capacity 240,000 Btu/hr or less serving the following ~~spaces~~ *use designations* shall meet the applicable requirements below, or shall meet the performance compliance requirements of Section 401.4 *[Section 140.1]*.

1. **Retail and grocery *use designations*~~building spaces~~ in *Climate Zones* 2 through 15.** The *space-conditioning system* shall be a *heat pump*.

2. **Retail and grocery *use designations*~~building spaces~~ in *Climate Zones* 1 and 16 with cooling capacity less than 65,000 Btu/hr.** The *space-conditioning system* shall be an *air conditioner* with furnace.

3. **Retail and grocery *use designations*~~building spaces~~ in *Climate Zones* 1 and 16 with cooling capacity 65,000 Btu/hr or greater.** The *space-conditioning system* shall be a *dual-fuel heat pump*.
4. **School *use designations*~~building spaces~~.** For *Climate Zones* 2 through 15, the *space-conditioning system* shall be a *heat pump*. For *Climate Zones* 1 and 16, the *space-conditioning system* shall be a *dual-fuel heat pump*.
5. **Office, financial institution, and *library use designations*~~building spaces~~ in *Climate Zones* 1 through 15.** The *space-conditioning system* shall be a *heat pump*.
6. **Office, financial institution, and *library use designations*~~building spaces~~ in Climate Zone 16 with cooling capacity less than 65,000 Btu/hr.** The *space-conditioning system* shall be an *air conditioner* with furnace.
7. **Office, financial institution, and *library use designations* ~~building spaces~~ in Climate Zone 16 with cooling capacity 65,000 Btu/hr or greater.** The *space-conditioning system* shall be a *dual-fuel heat pump*.
8. **Office spaces in *warehouses use designations*.** The *space-conditioning system* shall be a *heat pump* in all *climate zones*.

401.3.3 *[Section 140.4(a)3]* **Multi-zone space-conditioning system types.**

Space-conditioning systems in *office* ~~*buildings*~~ and *school use designations*~~*buildings*~~ not covered by Section 401.3.2 *[Section 140.4(a)2]* shall meet the requirements in Sections 401.3.3.1 through 401.3.3.~~5~~6

Exception 1 to Section 401.3.3: *Buildings* greater than 150,000 square feet or greater than five (5) *habitable stories*.

Exception 2 to Section 401.3.3: *School use designations*~~*buildings*~~ in *Climate Zones* 6 and 7.

401.3.3.1 *[Section 140.4(a)3A]* **Space-conditioning system type.**

Space-conditioning systems shall comply with one of the following:

401.3.3.1.1 *[Section 140.4(a)3Ai]* **Variable Refrigerant Flow (VRF).**

The *space-conditioning system* shall be a variable refrigerant flow (VRF) *heat pump* system that incorporates refrigerant-loop heat recovery and a *dedicated outdoor air system (DOAS)* providing ventilation to all zones served by the *space-conditioning system*. Indoor fans shall meet the requirements of Section 401.3.3.3 *[Section 140.4(a)3D]*. The *DOAS* shall comply with Section 401.3.3.4 *[Section 140.4(a)3E]*.

401.3.3.1.2 *[Section 140.4(a)3Aii]* **Four-pipe Fan Coil (FPFC).**

The *space-conditioning system* shall be four-pipe fan coil (FPFC) terminal units with a *DOAS* providing ventilation to all zones served by the *space-conditioning system*. The FPFC hot water coils shall be supplied by an *air-to-water heat pump (AWHP)* space-heating hot water loop that complies with Section 401.3.3.2 *[Section 140.4(a)3C]*. Indoor fans shall meet the requirements of Section 401.3.3.3 *[Section 140.4(a)3D]*. The *DOAS* shall comply with Section 401.3.3.4 *[Section 140.4(a)3E]*.

401.3.3.1.3 *[Section 140.4(a)3Aiii]* **Variable Air Volume (VAV).**

For *office* *use designations*~~*buildings*~~ in all *Climate Zones* and *school* *use designations*~~*buildings*~~ in *climate zones* 2, 4 and 8 through 16, the *space-conditioning system* shall be a *variable air volume (VAV) system* that utilizes heating supplied through a hot water loop served by an *AWHP* that complies with Section 401.3.3.2 *[Section 140.4(a)3C]* and the following:

For *office* *use designations*~~buildings~~:

1. The portion of *perimeter zone* terminal unit heating capacity utilizing parallel fanpowered boxes complying with Section 401.3.3.4 *[Section 140.4(a)3E]* shall be:
   1.1. One hundred percent in *Climate Zones* 1 through 6 and 16.
   1.2. Twenty-five percent in *Climate Zones* 7 through 15.
2. Ventilation systems in *Climate Zones* 1, 3, and 5 shall be equipped with a heat recovery system in compliance with Section 401.3.18 *[Section 140.4(q)]*.
3. The maximum allowed fan power in *Climate Zones* 3 and 5 shall be 15 percent lower than specified by Section 401.3.5.1 *[Section 140.4(c)1]*.

For school *use designations*~~buildings~~:

1. All *perimeter zone* terminal units shall be parallel fan powered boxes complying with Section 401.3.3.4 *[Section 140.4(a)3E]*.
2. Ventilation systems in *Climate Zones* 2, 4, and 11 through 16 shall be equipped with a heat recovery system in compliance with Section 401.3.18 *[Section 140.4(q)]*.
3. The maximum allowed fan power in Climate Zone 2 shall be 15 percent lower than specified by Section 401.3.5.1 *[Section 140.4(c)1]*.
4. The design leaving water temperature of the heating loop shall be no greater than 120°F in climate zone 2.

401.3.3.1.4 *[Section 140.4(a)3Aiv]* **Dual Fan, Dual Duct.**

1. The *space-conditioning system* shall be a dual fan, dual duct (DFDD) system with hot and cold decks each served by separate *fan systems*, and:
   1.1. When required by Section 401.3.7 *[Section 140.4(e)]*, economizers shall be located on the cold deck,
   1.2. The hot deck shall supply 100 percent *return air*, except *outdoor air* may be supplied as required to supplement the cold deck to maintain the design minimum *outdoor air* rate,
   1.3. The hot deck heating source shall be a *heat pump*, and
   1.4. The DFDD and DFDD terminal unit control sequence shall comply with *ASHRAE Guideline 36*.

401.3.3.1.5 *[Section 140.4(a)3Av]* **All other systems.**

A *space-conditioning system* determined by the *Executive Director* to use no more energy than the systems specified in Section 401.3.3 *[Section 140.4(a)3]*.

401.3.3.2 *[Section 140.4(a)3C]* **Air-to-water Heat Pump (AWHP) space-heating hot water loop.**

AWHPs used to comply with the requirements of Sections 401.3.3.1.2 or 401.3.3.1.3 *[Section 140.4(a)3Aii, 140.4(a)3Aiii, or 140.4(a)3B]*, when used for space-heating hot water shall meet the following requirements:

1. The minimum efficiency requirements specified in Table 400.5~~J~~(10) *[Table 110.2-J]*, and
2. If chilled water produced by an *AWHP* is used for space cooling, then the heat recovery system shall comply with Section 401.3.19 *[Section 140.4(s)]*, and
3. Supplemental heating shall be provided by an electric resistance boiler with a capacity of not greater than 50 percent of the design space-heating hot water loop heating capacity.

401.3.3.3 *[Section 140.4(a)3D]* **Indoor fans.**

Indoor fans used to comply with the requirements of Section 401.3.3.1.1 *[Section 140.4(a)3Ai]* or Section 401.3.3.1.2 *[Section 140.4(a)3Aii]* shall have a maximum fan power of 0.35 W/cfm at design airflow, shall have not less than three speeds and shall turn off when there is no demand for heating or cooling in the space. At 66 percent air-flow the power draw shall be no more than 51 percent of the fan power at full fan speed, and at 33 percent air flow the power draw shall be no more than 12 percent of the fan power at full fan speed.

401.3.3.4 *[Section 140.4(a)3E]* **Dedicated Outdoor Air System (DOAS).**

DOAS used to comply with the requirements of Section 401.3.3.1.1 *[Section 140.4(a)3Ai]* or Section 401.3.3.1.2 *[Section 140.4(a)3Aii]* shall comply with Section 401.3.17 *[Section 140.4(p)]*, be equipped with a heat recovery system in compliance with Section 401.3.18 *[Section 140.4(q)]* and have a maximum fan power of 0.77 W/cfm at design airflow. *DOAS* units that provide active heating or cooling shall meet one of the following requirements:

1. For hydronic heating or cooling:
   1.1. *DOAS* heating coils shall be hydronic heating coils utilizing the *AWHP* space-heating hot water loop.
   1.2. *DOAS* cooling coils shall be hydronic cooling coils utilizing space-cooling chilled water loop.
2. Other heating or cooling shall be provided by a *heat pump*. Electric resistance heating shall not be used.

401.3.3.5 Dedicated Outdoor Air System with Water Loop Heat Pump (WLHP) system.

The *DOAS* with WLHP *space-conditioning system* shall comply with the following requirements:

1. The *space-conditioning system* shall be a WLHP system.

1.1. The common *heat pump* water loop shall utilize cooling towers for heat rejection and air-to water *heat pumps* (*AWHPs*) for heat addition. *AWHPs* shall not be used for heat rejection.

1.2. Supplemental heating shall be provided either by an electric boiler not exceeding 50% of the *heat pump* loop design heating capacity, or airside electric resistance heating where the heating capacity of the *heat pump* is more than 75 percent of the design heating load calculated in accordance with Section 140.4(a) *[Section 401.3]* at the design outdoor temperature specified in Section 140.4(b)4 *[Section 401.3.4.4]*.

2. Indoor fans shall meet the requirements of Section 401.3.3.3 *[Section 140.4(a)3D]*.

3. Ventilation to all zones served by the *space-conditioning system* shall be provided by a *DOAS*. The *DOAS* shall comply with Section 401.3.3.4 *[Section 140.4(a)3E]*.

401.3.3.~~5~~6 *[Section 140.4(a)3F]* **Parallel fan-powered boxes.**

Parallel fan-powered boxes used to comply with Section 401.3.3.1.3 *[Section 140.4(a)3Aiii]* shall use recirculated zone or plenum air shall be used in heating mode. Fans shall cycle on only when there is a demand for heating and shall have a maximum fan power of 0.3 W/cfm at design airflow. Terminal units providing ventilation air shall be set to no greater than the minimum ventilation rate when the zone is in *deadband* or in heating mode.

401.3.4 *[Section 140.4(b)]* **Calculations.**

In making *equipment* sizing calculations under Sections 401.3.1 through 401.3.3, all of the following rules shall apply:

401.3.4.1 *[Section 140.4(b)1]* **Heating and cooling loads.**

Heating and cooling system design loads shall be determined in accordance with the procedures described below:

1. For systems serving *hotel/motel* ~~*buildings*~~ and *nonresidential* *use designations*,~~*buildings*~~ not including ~~other than~~ *healthcare facilities*, the method in the ~~2017~~ *ASHRAE* Handbook, Fundamentals shall be used or as specified in a method approved by the *Energy C*~~c~~*ommission*.

2. When sizing new or replacement *space-conditioning* equipment in a *nonresidential building alteration*, other than in *healthcare facilities* and *Group R Occupancies*, existing submetered *HVAC* energy use data or system operating trend data from a central *EMCS* shall be used to support heating and cooling load calculations in Section 401.3.4.1.1. If these data are not trended or available, only heating and cooling load calculations in accordance with Section 401.3.4.1.1 shall be required.

3. For system serving *healthcare facilities* the method in the California Mechanical Code shall be used.

401.3.4.2 *[Section 140.4(b)2]* **Indoor design conditions.**

Indoor design temperature and humidity conditions for comfort applications shall be determined in accordance with the procedures described below:

1. For systems serving *hotel/motel* ~~*buildings*~~ and *nonresidential* *use designations,* ~~*buildings other than*~~not including *healthcare facilities*, *ASHRAE Standard 55* or the ~~2017~~ *ASHRAE Handbook, Fundamentals Volume*, except that winter humidification and summer dehumidification shall not be required.
2. For systems serving *healthcare facilities* the method in the California Mechanical Code shall be used.

401.3.4.3 *[Section 140.4(b)3]* **Outdoor design conditions.**

Outdoor *design conditions* shall be selected in accordance with the procedures described below:

1. For systems serving *hotel/motel* ~~*buildings*~~ and *nonresidential* *use designations,* ~~*buildings other than*~~not including *healthcare facilities* the *design conditions* shall meet the following:
   1.1. Outdoor *design conditions* shall be selected from Reference Joint Appendix JA2, which is based on data from the *ASHRAE Climatic Data for Region X* or the *ASHRAE Handbook, Fundamentals Volume*.
   1.2. Heating design temperatures shall be no lower than the 99.0 percent Heating Dry-Bulb or the Heating Winter Median of Extremes values.
   1.3. Cooling design temperatures shall be no greater than the 0.5 percent Cooling Dry-Bulb and Mean Coincident Wet-Bulb values.
2. For system serving *healthcare facilities* the method in Section 320.0 of the California Mechanical Code shall be used.

Exception to Section 401.3.4.3: Cooling design temperatures for cooling towers shall be no greater than the 0.5 percent cooling design wet-bulb values.

401.3.4.4 *[Section 140.4(b)4]* **Ventilation.**

Outdoor air ventilation loads shall be calculated using the ventilation rates required in Section 401.2.1.1.3 *[Section 120.1(c)3]*.

401.3.4.5 *[Section 140.4(b)5]* **Envelope.**

Envelope heating and cooling loads shall be calculated using *envelope* characteristics, including square footage, thermal conductance, *Solar Heat Gain Coefficient* or *shading coefficient*, and air leakage, consistent with the proposed design.

401.3.4.6 *[Section 140.4(b)6]* **Lighting.**

Lighting heating and cooling loads shall be based on actual design *lighting* levels or power densities as specified in Section 601.3.1 *[Section 140.6]*.

401.3.4.7 *[Section 140.4(b)7]* **People.**

Occupant density shall be based on the expected occupancy of the *building* and shall be the same as determined under Section 401.2.1.1.3 *[Section 120.1(c)3A]*, if used. Sensible and

latent heat gains shall be as listed in the ~~2017~~ *ASHRAE* Handbook, Fundamentals, Chapter 18.

401.3.4.8 *[Section 140.4(b)8]* **Process loads.**

Loads caused by a *process* shall be based upon actual information on the intended use of the *building*.

401.3.4.9 *[Section 140.4(b)9]* **Miscellaneous equipment.**

Equipment loads other than *process loads* shall be calculated using design data compiled from one or more of the following sources:

1. Actual information based on the intended use of the *building*; or
2. Published data from manufacturer's technical publications or from technical societies, such as the *ASHRAE Handbook, Applications Volume*; or
3. Other data based on the designer's experience of expected loads and occupancy patterns.

401.3.4.10 *[Section 140.4(b)10]* **Internal heat gains.**

Internal heat gains may be ignored for heating load calculations.

401.3.4.11 *[Section 140.4(b)11]* **Safety factor.**

Calculated design loads based on Sections 401.3.4.1 through 401.3.4.10 may be increased by up to 10 percent to account for unexpected loads or changes in space usage.

401.3.4.12 *[Section 140.4(b)12]* **Other loads.**

Loads such as warm-up or cool-down shall be calculated from principles based on the thermal capacity of the *building* and its contents, the degree of setback, and desired recovery time; or may be assumed to be no more than 30 percent for heating and 10 percent for cooling of the steady-state design loads. In addition, the steady-state load may include a safety factor in accordance with Section 401.3.4.11.

401.3.5 *[Section 140.4(c)]* **Fan systems.**

Each *fan system* moving air into, out of or between *conditioned spaces* or circulating air for the purpose of conditioning air within a space shall meet the requirements below.

Exception to Section 401.3.5: *Fan system* power caused solely by *process loads*.

401.3.5.1 *[Section 140.4(c)1]* **Fan power budget.**

For each *fan system* that includes at least one fan or fan array with *fan electrical input power* ≥ 1 kW, *fan system electrical input power (Fan* $kW_{design,system}$*)* determined per Section 401.3.5.1.2 *[Section 140.4(c)1B]* at the *fan system* design airflow shall not exceed Fan kW_{budget} as calculated per Section 401.3.5.1.1 *[Section 140.4(c)1A]*.

Exception to Section 401.3.5.1: Systems whose fan power is specified in Section 401.3.3 *[Section 140.4(a)3]*.

401.3.5.1.1 *[Section 140.4(c)1A]* **Calculation of fan power budget – Fan system (Fan kW budget).**

1. For each *fan system*, determine the *fan system airflow* and choose the appropriate table(s) for fan power allowance:

   1.1. For *single-cabinet fan systems*, use the *fan system airflow* and the power allowances in both Table 401.3~~-A~~(1) *[Table 140.4-A]* and Table 401.3~~-B~~(2) *[Table 140.4-B]*.

   1.2. For *supply-only fan systems*, use the *fan system airflow* and power allowances in Table 401.3~~-A~~(1) *[Table 140.4-A]*.

   1.3. For relief *fan systems*, use the design relief airflow and the power allowances in Table 401.3~~-B~~(2) *[Table 140.4-B]*.

   1.4. For exhaust, return and *transfer fan systems*, use the *fan system airflow* and the power allowances in Table 401.3~~-B~~(2) *[Table 140.4-B]*.

   ~~1.5.~~ For *complex fan systems*, separately calculate the fan power allowance for the supply and return/exhaust systems and sum them. For the *supply air*flow, use *supply air*flow at the *fan system design conditions*, and the power allowances in Table 401.3~~-A~~(1) *[Table 140.4-A]*. For the return exhaust airflow, use return/exhaust airflow at the *fan system design conditions*, and the power allowances in Table 401.3~~-B~~(2) *[Table 140.4-B]*.

2. For each *fan system* determine the components included in the *fan system* and sum the fan power allowances of those components. All *fan systems* shall include the system base allowance. If, for a given component, only a portion of the *fan system airflow* passes through the component, calculate the fan power allowance for that component per Equation 401.3-A *[Equation 140.4-A]*:

   Equation 401.3-A [EQUATION 140.4-A] FAN POWER ALLOWANCE

   $$FPA_{adj} = \frac{Q_{comp}}{Q_{sys}} \text{ X } FPA_{comp}$$

   where:

   FPA_{adj} = The corrected fan power allowance for the component in w/cfm

   Q_{comp} = The airflow through component in cfm

   Q_{sys} = The *fan system airflow* in cfm

   FPA_{comp} = The fan power allowance of the component from Table 401.3(1) *[Table 140.4-A]* or Table 401.3(2) *[Table 140.4-B]*

   3. Multiply the *fan system airflow* by the sum of the fan power allowances for the *fan system*.

   4. Divide by 1000 to convert to Fan kW_{budget}.

   5. For *building* sites at elevations greater than 3,000 feet, multiply Fan kW_{budget} by the correction factor in Table 401.3(3) *[Table 140.4-C]*.

TABLE 401.3 ~~A~~(1) [TABLE 140.4-A] – SUPPLY FAN POWER ALLOWANCES (WATTS/ CFM)

AIRFLOW	MULTI-ZONE *VAV* SYSTEMS ≤ 5,000 CFM[a]	MULTI-ZONE *VAV* SYSTEMS > 5,000 AND ≤ 10,000 CFM[a]	MULTI-ZONE *VAV* SYSTEMS > 10,000 CFM[a]	ALL OTHER *FAN SYSTEMS* ≤ 5,000 CFM	ALL OTHER *FAN SYSTEMS* > 5,000 AND ≤ 10,000 CFM	ALL OTHER *FAN SYSTEMS* > 10,000 CFM
Supply System Base Allowance for AHU serving spaces ≤ 6 floors away.	0.395	0.453	0.413	0.232	0.256	0.236
Supply system base allowance for AHU serving spaces > 6 floors away	0.508	0.548	0.501	0.349	0.356	0.325
MERV 13 to *MERV* 16 Filter upstream of thermal conditioning equipment (two times the clean filter pressure drop)[b]	0.136	0.114	0.105	0.139	0.120	0.107
MERV 13 to *MERV* 16 Final filter downstream of thermal conditioning equipment. (two times the clean filter pressure drop)[b]	0.225	0.188	0.176	0.231	0.197	0.177
Filtration allowance for > *MERV* 16 or HEPA Filter (two times the clean filter pressure drop) [b]	0.335	0.280	0.265	0.342	0.292	0.264
Central Hydronic heating coil allowance	0.046	0.048	0.052	0.046	0.050	0.054
Electric heat allowance	0.046	0.038	0.035	0.046	0.040	0.036
Gas heat allowance	0.069	0.057	0.070	0.058	0.060	0.072
Hydronic/DX cooling coil or *heat pump* coil (wet) allowance[c]	0.135	0.114	0.105	0.139	0.120	0.107
Solid or liquid Desiccant system allowance	0.157	0.132	0.123	0.163	0.139	0.124
Reheat Coil for Dehumidification Allowance	0.045	0.038	0.035	0.046	0.040	0.036

(CONTINUED): TABLE 401.3 ~~A~~(1) [TABLE 140.4-A] – SUPPLY FAN POWER ALLOWANCES (WATTS/ CFM)

AIRFLOW	MULTI-ZONE *VAV* SYSTEMS ≤ 5,000 CFM[a1]	MULTI-ZONE *VAV* SYSTEMS > 5,000 AND ≤ 10,000 CFM[a1]	MULTI-ZONE *VAV* SYSTEMS > 10,000 CFM[a1]	ALL OTHER *FAN SYSTEMS* ≤ 5,000 CFM	ALL OTHER *FAN SYSTEMS* > 5,000 AND ≤ 10,000 CFM	ALL OTHER *FAN SYSTEMS* > 10,000 CFM
Allowance for Evaporative humidifier/cooler in series with a cooling coil. Value shown is allowed watts/cfm per 1.0 Inches of water gauge (in.w.g.) Determine pressure loss (in.w.g.) at 400 fpm or maximum velocity allowed by the manufacturer, whichever is less. *[Calculation required, see note d4]*	0.224	0.188	0.176	0.231	0.197	0.177
Allowance for 100% *Outdoor air* system[e5].	0.000	0.000	0.000	0.070	0.100	0.107
Energy recovery allowance for 0.50 ≤ *ERR* <0.55 [f6]	0.135	0.114	0.105	0.139	0.120	0.107
Energy recovery allowance for 0.55 ≤ *ERR* <0.60 [f6]	0.160	0.134	0.124	0.165	0.141	0.126
Energy recovery allowance for 0.60 ≤ *ERR* <0.65 [f6]	0.184	0.155	0.144	0.190	0.163	0.146
Energy recovery allowance for 0.65 ≤ *ERR* <0.70 [6f]	0.208	0.175	0.163	0.215	0.184	0.165
Energy recovery allowance for 0.70 ≤ *ERR* <0.75 [6f]	0.232	0.196	0.183	0.240	0.205	0.184
Energy recovery allowance for 0.75 ≤ *ERR* <0.80 [6f]	0.257	0.216	0.202	0.264	0.226	0.203
Energy recovery allowance for *ERR* ≥ 0.80 [6f]	0.281	0.236	0.222	0.289	0.247	0.222
Coil Runaround Loop	0.135	0.114	0.105	0.139	0.120	0.107
Allowance for Gas phase filtration. Value shown is allowed w/cfm per 1.0 in. wg air	0.224	0.188	0.176	0.231	0.197	0.177

AIRFLOW	MULTI-ZONE *VAV* SYSTEMS ≤ 5,000 CFM[a1]	MULTI-ZONE *VAV* SYSTEMS > 5,000 AND ≤ 10,000 CFM[a1]	MULTI-ZONE *VAV* SYSTEMS > 10,000 CFM[a1]	ALL OTHER *FAN SYSTEMS* ≤ 5,000 CFM	ALL OTHER *FAN SYSTEMS* > 5,000 AND ≤ 10,000 CFM	ALL OTHER *FAN SYSTEMS* > 10,000 CFM
pressure drop. [Calculation required, see note 4d]						
Economizer Return Damper	0.045	0.038	0.035	0.046	0.040	0.036
Air blender allowance	0.045	0.038	0.035	0.046	0.040	0.036
Sound attenuation section [fans serving spaces with design background noise goals below NC35]	0.034	0.029	0.026	0.035	0.030	0.027
Deduction for systems that feed a terminal unit with a fan with electrical input power < 1kW	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100
Low-turndown single-zone *VAV fan systems* meeting the requirements in note g.	0.000	0.000	0.000	0.070	0.100	0.089

Footnotes to Table 401.3(1) *[Table 140.4-A]:*

a. See Section 201 *[Section 100.1]* for the definition of *FAN SYSTEM, MULTI-ZONE VARIABLE AIR VOLUME (VAV)* .

b. Filter fan power allowance can only be counted once per *fan system*, except *fan systems* in *healthcare facilities*, which can claim one of the *MERV* 13 to 16 filter allowances and the HEPA filter allowance if both are included in the *fan system*.

c. *Healthcare facilities* can claim this fan power allowance twice per *fan system* where coil design leaving air temperature is less than 44 ^{o}F.

d. Power allowance requires further calculation by multiplying the actual inches of water gauge (in.w.g.) of the device/ component by the watts/ cfm in Table 401.3(1) *[Table 140.4-A]*.

e. The 100% *outdoor air* system must serve 3 or more HVAC zones and airflow during non-economizer operating periods must not exceed 135% of minimum requirements in Section 401.2.1.1.3 *[Section 120.1(c)3]*.

f. *Enthalpy Recovery Ratio (ERR)* calculated per *ANSI/ASHRAE 84-2020*.

g. A low-turndown single-zone *VAV fan system* must be capable of and configured to reduce airflow to 50 percent of design airflow and use no more than 30 percent of the design wattage at that airflow. No more than 10 percent of the design load served by the *equipment* shall have fixed loads.

~~Footnotes to Table 401.3-A *[Table 140.4-A]:*~~

~~1. See Section 201 *[Section 100.1]* for the definition of *FAN SYSTEM, MULTI-ZONE VARIABLE AIR VOLUME (VAV)* .~~

~~2. Filter fan power allowance can only be counted once per *fan system*, except *fan systems* in *healthcare facilities*, which can claim one of the *MERV* 13 to 16 filter allowances and the HEPA filter allowance if both are included in the *fan system*.~~

~~3. *Healthcare facilities* can claim this fan power allowance twice per *fan system* where coil design leaving air temperature is less than 44 ^{o}F.~~

~~4. Power allowance requires further calculation by multiplying the actual inches of water gauge (in.w.g.) of the device/ component by the watts/ cfm in Table 401.3-A *[Table 140.4-A]*.~~

~~5. The 100% *outdoor air* system must serve 3 or more HVAC zones and airflow during non-economizer operating periods must not exceed 135% of minimum requirements in Section 401.2.1.1.3 *[Section 120.1(c)3]*.~~

~~6. *Enthalpy Recovery Ratio (ERR)* calculated per *ANSI/ASHRAE 84-2020*.~~

~~7. A low-turndown single-zone *VAV fan system* must be capable of and configured to reduce airflow to 50 percent of design airflow and use no more than 30 percent of the design wattage at that airflow. No more than 10 percent of the design load served by the *equipment* shall have fixed loads.~~

TABLE 401.3 ~~B~~(2) [TABLE 140.4-B] - EXHAUST, RETURN, RELIEF, TRANSFER FAN POWER ALLOWANCES (WATTS/ CFM)

AIRFLOW	MULTI-ZONE VAV SYSTEMS~~aa~~[1] ≤ 5,000 CFM	MULTI-ZONE VAV SYSTEMS~~a~~[1] > 5,000 AND ≤ 10,000 CFM	MULTI-ZONE VAV SYSTEMS~~a~~[1] > 10,000 CFM	ALL OTHER FAN SYSTEMS ≤ 5,000 CFM	ALL OTHER FAN SYSTEMS > 5,000 AND ≤ 10,000 CFM	ALL OTHER FAN SYSTEMS > 10,000 CFM
Exhaust System Base Allowance	0.221	0.246	0.236	0.186	0.184	0.190
Filter (any *MERV* value)[b][2]	0.046	0.041	0.036	0.046	0.041	0.035
Energy Recovery Allowance For 0.50 ≤ *ERR* <0.55 [c][3]	0.139	0.120	0.107	0.139	0.123	0.109
Energy Recovery Allowance For 0.55 ≤ *ERR* <0.60 [c][3]	0.165	0.142	0.126	0.165	0.144	0.128
Energy Recovery Allowance For 0.60 ≤ *ERR* <0.65 [c][3]	0.190	0.163	0.146	0.191	0.166	0.148
Energy Recovery Allowance For 0.65 ≤ *ERR* <0.70 [c][3]	0.215	0.184	0.165	0.216	0.188	0.167
Energy Recovery Allowance For 0.70 ≤ *ERR* <0.75 [c][3]	0.240	0.206	0.184	0.241	0.209	0.186
Energy Recovery Allowance For 0.75 ≤ *ERR* <0.80 [c][3]	0.265	0.227	0.203	0.266	0.231	0.205
Energy Recovery Allowance For *ERR* ≥ 0.80 [c][3]	0.289	0.248	0.222	0.291	0.252	0.225
Coil Runaround Loop	0.139	0.120	0.107	0.139	0.123	0.109
Return or exhaust systems required by code or accreditation standards to be fully ducted, or systems required to maintain air pressure differentials between adjacent rooms	0.116	0.100	0.089	0.116	0.102	0.091
Return and/or exhaust airflow control devices required for space pressurization control	0.116	0.100	0.089	0.116	0.102	0.091

(CONTINUED): TABLE 401.3~~-B~~(2) [TABLE 140.4-B] - EXHAUST, RETURN, RELIEF, TRANSFER FAN POWER ALLOWANCES (WATTS/ CFM)

AIRFLOW	MULTI-ZONE VAV SYSTEMS[a1] ≤ 5,000 CFM	MULTI-ZONE VAV SYSTEMS[a1] > 5,000 AND ≤ 10,000 CFM	MULTI-ZONE VAV SYSTEMS[a1] > 10,000 CFM	ALL OTHER FAN SYSTEMS ≤ 5,000 CFM	ALL OTHER FAN SYSTEMS > 5,000 AND ≤ 10,000 CFM	ALL OTHER FAN SYSTEMS > 10,000 CFM
Laboratory and vivarium exhaust systems in high-rise *buildings* for vertical duct exceeding 75 ft. Value shown is allowed w/cfm per 0.25 in. wg for each 100 feet exceeding 75 feet. [Calculation required, see note d4]	0.058	0.051	0.045	0.058	0.052	0.046
Biosafety cabinet. Value shown is allowed w/cfm per 1.0 in. wg air pressure drop. [Calculation required, see note d4]	0.231	0.198	0.177	0.232	0.202	0.179
Exhaust filters, scrubbers, or other exhaust treatment required by code or standard. Value shown is allowed w/cfm per 1.0 in. wg air pressure drop. [Calculation required, see note d4]	0.231	0.198	0.177	0.232	0.202	0.179
Healthcare facility allowance[e5]	0.231	0.198	0.177	0.232	0.202	0.179
Sound attenuation section [Fans serving spaces with design background noise goals below NC35.]	0.035	0.030	0.027	0.035	0.031	0.028

Footnotes to Table 401.3(2) *[Table 140.4-B]*:

a. See *FAN SYSTEM, MULTI-ZONE VARIABLE AIR VOLUME (VAV)* in definitions for Multizone to be classified as a Multi-Zone *VAV* System.

b. Filter pressure loss can only be counted once per *fan system*.

c. *Enthalpy Recovery Ratio (ERR)* calculated per *ANSI/ASHRAE* 84-2020.

d. Power allowance requires further calculation, multiplying the actual pressure drop (in. wg.) of the device/component by the watts/cfm in the Table 401.3(2) *[Table 140.4-B]*.

e. This allowance can only be taken for *healthcare facilities.*

~~Footnotes to Table 401.3-B *[Table 140.4-B]*:~~

~~1. See *FAN SYSTEM, MULTI-ZONE VARIABLE AIR VOLUME (VAV)* in definitions for Multizone to be classified as a Multi-Zone VAV System.~~

~~2. Filter pressure loss can only be counted once per *fan system*.~~

~~3. *Enthalpy Recovery Ratio (ERR)* calculated per *ANSI/ASHRAE* 84-2020.~~

~~4. Power allowance requires further calculation, multiplying the actual pressure drop (in. wg.) of the device/component by the watts/cfm in the Table 401.3-B *[Table 140.4-B]*.~~

~~5. This allowance can only be taken for *healthcare facilities*.~~

~~For each *fan system* determine the components included in the *fan system* and sum the fan power allowances of those components. All *fan systems* shall include the system base allowance. If, for a given component, only a portion of the *fan system airflow* passes through the component, calculate the fan power allowance for that component per Equation 401.3-A *[Equation 140.4-A]*:~~

~~*Equation 401.3-A [EQUATION 140.4-A] FAN POWER ALLOWANCE*~~

$$FPA_{adj} = \frac{Q_{comp}}{Q_{sys}} \text{ X } FPA_{comp}$$

~~where:~~

~~FPA_{adj} = The corrected fan power allowance for the component in w/cfm~~

~~Q_{comp} = The airflow through component in cfm~~

~~Q_{sys} = The *fan system airflow* in cfm~~

~~FPA_{comp} = The fan power allowance of the component from Table 401.3-A(1) *[Table 140.4-A]* or Table 401.3-B(2) *[Table 140.4-B]*~~

~~Multiply the *fan system airflow* by the sum of the fan power allowances for the *fan system*.~~

~~Divide by 1000 to convert to Fan kW_{budget}.~~

~~For building sites at elevations greater than 3,000 feet, multiply Fan kW_{budget} by the correction factor in Table 401.3-C(3) *[Table 140.4-C]*.~~

TABLE 401.3-C(3) [TABLE 140.4-C] - AIR DENSITY CORRECTION FACTORS

ALTITUDE (FT)	CORRECTION FACTOR
< 3,000	1.000
≥ 3,000 and < 4,000	0.896
≥ 4,000 and < 5,000	0.864
≥ 5,000 and < 6,000	0.832
≥ 6,000	0.801

401.3.5.1.2 *[Section 140.4(c)1B]* **Determining fan system electrical input power (Fan kWdesign, system).**

Fan $kW_{design,system}$ is the sum of Fan kW_{design} for each fan or fan array included in the *fan system* with Fan kW_{design} ≥ 1 kW. If variable speed drives are used, their efficiency losses shall be included. Fan input power shall be calculated with two times the clean filter pressure drop, which is the mean of the clean filter pressure drop and design final filter pressure drop. The Fan kW_{design} for each fan or fan array shall be determined using one of the following methods. There is no requirement to use the same method for all fans in a *fan system*:

1. Use the default Fan kW_{design} in Table 401.3-D(4) *[Table 140.4-D]* for one or more of the fans. This method cannot be used for *complex fan systems*.

2. Use the Fan kW_{design} at *fan system design conditions* provided by the manufacturer of the fan, fan array, or *equipment* that includes the fan or fan array calculated per a test procedure included in USDOE 10 *CFR* Part 430, USDOE 10 *CFR* Part 431, *ANSI*/*AMCA* Standard 208-2018, *ANSI*/*AMCA* Standard 210-2016, *AHRI* Standard 430-2020, *AHRI* Standard 440-2019 or *ISO 5801-2017*.
3. Use the Fan kW_{design} provided by the manufacturer, calculated at *fan system design conditions* per one of the methods listed in Section 5.3 of *ANSI/AMCA 208-2018*.
4. Determine the Fan kW_{design} by using the maximum electrical input power provided on the motor nameplate.

TABLE 401.3 ~~D~~(4) [TABLE 140.4-D] - DEFAULT VALUES FOR FAN KWDESIGN BASED ON MOTOR NAMEPLATE HP

MOTOR NAMEPLATE HP	DEFAULT FAN KW_{DESIGN} WITH VARIABLE SPEED DRIVE (FAN KW_{DESIGN})	DEFAULT FAN KW_{DESIGN} WITHOUT VARIABLE SPEED DRIVE(FAN KW_{DESIGN})
< 1	0.96	0.89
≥ 1 and < 1.5	1.38	1.29
≥ 1.5 and < 2	1.84	1.72
≥ 2 and < 3	2.73	2.57
≥ 3 and < 5	4.38	4.17
≥ 5 and < 7.5	6.43	6.15
≥ 7.5 and < 10	8.46	8.13
≥ 10 and < 15	12.47	12.03
≥ 15 and < 20	16.55	16.04
≥ 20 and < 25	20.58	19.92
≥ 25 and < 30	24.59	23.77
≥ 30 and < 40	32.74	31.70
≥ 40 and < 50	40.71	39.46
≥ 50 and < 60	48.50	47.10
≥ 60 and < 75	60.45	58.87
≥ 75 and ≤ 100	80.40	78.17

Footnotes to Table 401.3(4) *[TABLE 140.4-D]*:

a. This table cannot be used for Motor Nameplate Horsepower values greater than 100.

b. This table is to be used only with motors with a service factor ≤ 1.15. If the service factor is not provided, this table may not be used.

~~Footnotes to Table 401.3 D *[TABLE 140.4-D]*:~~

~~1. This table cannot be used for Motor Nameplate Horsepower values greater than 100.~~

~~2. This table is to be used only with motors with a service factor ≤ 1.15. If the service factor is not provided, this table may not be used.~~

401.3.5.2 *[Section 140.4(c)2]* **Variable air volume (VAV) systems.**

Static pressure sensor location. Static pressure sensors used to control variable air volume fans shall be placed in a position such that the controller set-point is no greater than one-third the total design fan static pressure, except for systems with zone reset control complying with setpoint reset requirements below. If this results in the sensor being located downstream of any major duct split, multiple sensors shall be installed in each major branch with fan capacity controlled to satisfy the sensor furthest below its setpoint; and

Setpoint reset. For systems with *direct digital control* of individual zone boxes reporting to the central control panel:

1. Static pressure setpoints shall be reset based on the zone requiring the most pressure.
2. Control sequences of operation for static pressure setpoint reset shall be in accordance with *ASHRAE Guideline 36*.

401.3.5.3 *[Section 140.4(c)3]* **Fractional HVAC motors for fans.**

HVAC motors for fans that are less than 1 hp and 1/12 hp or greater shall be *electronically-commutated motors* or shall have a minimum motor efficiency of 70 percent when rated in accordance with NEMA Standard MG 1-2006 at full load rating conditions. These motors shall also have the means to adjust motor speed for either balancing or remote control. Belt-driven fans may use sheave adjustments for airflow balancing in lieu of a varying motor speed.

Exception 1 to Section 401.3.5.3: Motors in fan-coils and terminal units that operate only when providing heating to the space served.

Exception 2 to Section 401.3.5.3: Motors in space conditioning *equipment* certified under Section 101.3 *[Section 110.1]* or Section 400.2 *[Section 110.2]*.

401.3.6 *[Section 140.4(d)]* **Space-conditioning zone controls.**

Each *space-conditioning zone* in nonresidential and hotel/motel *buildings* shall have controls designed in accordance with Section 401.3.6.1 or Section 401.3.6.2.

For *HCAI facilities*, each *space-conditioning zone* shall have controls designed in accordance with Section 401.3.6.3.

Exception 1 to Section 401.3.6: Zones with special pressurization relationships or cross-contamination control needs.

Exception 2 to Section 401.3.6: Zones served by *space-conditioning systems* in which at least 75 percent of the energy for reheating, or providing warm air in mixing systems, is provided from a site-recovered or site-solar energy source.

Exception 3 to Section 401.3.6: Zones in which specific humidity levels are required to satisfy *non-covered process loads*. *Computer rooms* or other spaces where the only *process load* is from IT *equipment* may not use this exception.

Exception 4 to Section 401.3.6: Zones with a peak supply-air quantity of 300 cfm or less.

Exception 5 to Section 401.3.6: Systems serving *healthcare facilities* other than *HCAI facilities*.

401.3.6.1 *[Section 140.4(d)1]* **Reheating, recooling, simultaneous heating and cooling.**

Each *space-conditioning zone* shall have controls that prevent:

1. Reheating; and
2. Recooling; and
3. Simultaneous provisions of heating and cooling to the same zone, such as mixing or simultaneous supply of air that has been previously mechanically heated and air that has been previously cooled, either by *cooling equipment* or by economizer systems.

401.3.6.2 *[Section 140.4(d)2]* **Zones served by VAV Systems.**

Zones served by variable air-volume systems that are designed and controlled to reduce, to a minimum, the volume of reheated, recooled, or mixed air are allowed only if the controls meet all of the following requirements:

For each zone with *direct digital controls* (*DDC*):

1. The volume of primary air that is reheated, recooled, or mixed air supply shall not exceed the larger of:
   1.1. 50 percent of the peak *primary airflow*; or
   1.2. The design zone outdoor airflow rate as specified by Section 401.2.1.1.3 *[Section 120.1(c)3]*.
2. The volume of primary air in the *deadband* shall not exceed the design zone outdoor airflow rate as specified by Section 401.2.1.1.3 *[Section 120.1(c)3]*.
3. The first stage of heating consists of modulating the zone *supply air* temperature setpoint up to a maximum setpoint no higher than 95ºF while the airflow is maintained at the dead band flow rate.
4. The second stage of heating consists of modulating the airflow rate from the dead band flow rate up to the heating maximum flow rate.
5. Control sequences of operation for *reheat* zones shall be in accordance with *ASHRAE Guideline 36*.

For each zone without *DDC*:

1. The volume of primary air that is reheated, re-cooled, or mixed air supply shall not exceed the larger of the following:
   1.1. 30 percent of the peak *primary airflow*; or
   1.2. The design zone outdoor airflow rate as specified by Section 401.2.1.1.3 *[Section 120.1(c)3]*.

401.3.6.3 *[New Section]* **Zones in HCAI facilities.**

HCAI facilities served by variable air-volume systems that include a space(s) designed to California Mechanical Code Section 402.1.2 Table 4-A shall be designed to meet the following requirements:

1. For each occupied zone the volume of primary air supplied to the space shall:
   1.1. Not exceed minimum ventilation rates defined in California Mechanical Code Table 4-A if the space is designed per California Mechanical Code Table 4-A.
   1.2. Comply with the referenced design standard if the space is not designed per California Mechanical Code Table 4-A.
2. For each unoccupied zone the volume of primary air supplied to the space shall:
   2.1. Not exceed minimum ventilation rates defined in California Mechanical Code Table 4-A if the space is designed per California Mechanical Code Table 4-A.
   2.2. Comply with the referenced design standard if the space is not designed per California Mechanical Code Table 4-A
3. The ventilation rate for zones with two or more spaces with similar comfort requirements but refer to different ventilation codes or standards shall be the sum of the separately calculated minimum *supply air* flow rates and *outside air* flow rates of each space from each reference standard.

401.3.7 *[Section 140.4(e)]* **Economizers.**

Each cooling *air handler* that has a design total *mechanical cooling* capacity over 33,000 Btu/hr or chilled-water cooling systems without a fan or that use induced airflow that has a cooling capacity greater than the systems listed in Table 401.4 ~~C~~(3) *[Table 140.4-E]*, shall include either:

1. An *air economizer* capable of modulating outside-air and return-air dampers to supply 100 percent of the design *supply air* quantity as *outside air*; or
2. A *water economizer* capable of providing 100 percent of the expected system cooling load at *outside air* temperatures of 50°F dry-bulb and 45°F wet-bulb and below.

Exception 1 to Section 401.3.7: Where special *outside air* filtration and treatment, for the reduction and treatment of unusual outdoor contaminants, makes compliance infeasible.

Exception 2 to Section 401.3.7: Where the use of *outdoor air* for cooling will affect other systems, such as humidification, dehumidification, or supermarket refrigeration systems, so as to increase overall *building LSC*.

Exception 3 to Section 401.3.7: Systems serving *hotel/motel* guestrooms.

Exception 4 to Section 401.3.7: Where comfort cooling systems have the cooling efficiency that meets or exceeds the cooling efficiency improvement requirements in Table 401.3 ~~F~~(6) *[Table 140.4-F]*.

Exception 5 to Section 401.3.7: *Fan systems* primarily serving *computer rooms*. See Section 910.2 *[Section 140.9(a)]* for *computer room* economizer requirements.

Exception 6 to Section 401.3.7: In all *climate zones*, each *air handler* that has a design total *mechanical cooling* capacity less than 54,000 Btu/hr where ventilation is provided by a *dedicated outdoor air system (DOAS)* with exhaust air heat recovery in accordance with Section 401.3.17 *[Section 140.4(p)]* and the following:

1. The *DOAS* unit shall meet the exhaust air heat recovery ratio as specified in Section 401.3.18.1 *[Section 140.4(q)1]* and include bypass or control to disable energy recovery as specified in Section 401.3.18.2 *[Section 140.4(q)2]*.
2. The *DOAS* unit shall provide at least the minimum ventilation air flow rate as specified in Section 401.2.1.1.3 *[Section 120.1(c)3]* and provide no less than 0.3 cfm/ft2 during economizer conditions.

Exception 7 to Section 401.3.7: Where the use of an *air economizer* in *controlled environment horticulture spaces* will affect *carbon dioxide enrichment* systems.

Exception 8 to Section 401.3.7: Systems complying with Section 401.3.3.1.1 and Section 401.3.3.1.2 *[Sections 140.4(a)3Ai, 140.4(a)3Aii]*.

TABLE 401.3~~-E~~(5) [TABLE 140.4-E] - CHILLED WATER SYSTEM COOLING CAPACITY

Total Building Chilled Water System Capacity, Minus Capacity of the Cooling units with Air Economizers

CLIMATE ZONES	*BUILDING* WATER-COOLED CHILLED WATER SYSTEM	AIR-COOLED CHILLED WATER SYSTEMS OR DISTRICT CHILLED WATER SYSTEMS
15	≥ 960,000 Btu/h (280 kW)	≥ 1,250,000 Btu/h (365 kW)
1-14	≥720,000 Btu/h (210 kW)	≥940,000 Btu/h (275 kW)
16	≥1,320,000 Btu/h (385 kW)	≥1,720,000 Bu/h (505 kW)

TABLE 401.3~~-F~~(6) [TABLE 140.4-F] - ECONOMIZER TRADE-OFF TABLE FOR COOLING SYSTEMS

CLIMATE ZONE	EFFICIENCY IMPROVEMENT[a]
1	70%
2	65%
3	65%
4	65%
5	70%
6	30%
7	30%
8	30%
9	30%
10	30%
11	30%
12	30%
13	30%
14	30%
15	30%
16	70%

Footnote to Table 401.3(6) *[TABLE 140.4-F]*:

a. If a unit is rated with an annualized or part-load metric, then to eliminate the required economizer, only the applicable minimum cooling efficiency of the unit must be increased by the percentage shown. If the unit is only rated with a full load metric, like *EER* or *COP* cooling, then that metric must be increased by the percentage shown. To determine the efficiency required to eliminate the economizer, when the unit equipment efficiency is rated with an energy-input divided by work-output metric, the metric shall first be converted to *COP* prior to multiplying by the efficiency improvement percentage and then converted back to the rated metric.

~~Footnote to Table 401.3-F *[TABLE 140.4-F]*:~~

~~a. If a unit is rated with an annualized or part-load metric, then to eliminate the required economizer, only the applicable minimum cooling efficiency of the unit must be increased by the percentage shown. If the unit is only rated with a full load metric, like *EER* or *COP* cooling, then that metric must be increased by~~

~~the percentage shown. To determine the efficiency required to eliminate the economizer, when the unit equipment efficiency is rated with an energy input divided by work output metric, the metric shall first be converted to *COP* prior to multiplying by the efficiency improvement percentage and then converted back to the rated metric.~~

401.3.7.1 *[Section 140.4(e)2]* **Air economizers.**

If an economizer is required by Section 401.3.7 *[Section 140.4(e)1]*, and an *air economizer* is used to meet the requirement, then it shall be:

401.3.7.1.1- Designed and equipped with controls so that economizer operation does not increase the *building* heating energy use during normal operation; and

Exception to Section 401.3.7.1.1: Systems that provide 75 percent of the annual energy used for *mechanical heating* from site-*recovered energy* or a site-solar energy source.

401.3.7.1.2- Capable of providing partial cooling even when additional *mechanical cooling* is required to meet the remainder of the cooling load.

401.3.7.1.3- Designed and equipped with a device type and high limit shut off complying with Table 401.3~~-G~~(7) *[Table 140.4-G]*.

401.3.7.1.4- If controlled by a *DDC* system, configured with control sequences of operation in accordance with *ASHRAE Guideline 36*.

TABLE 401.3~~-G~~(7) [TABLE 140.4-G] - AIR ECONOMIZER HIGH LIMIT SHUT OFF CONTROL REQUIREMENTS

DEVICE TYPE[a]	CLIMATE ZONES	REQUIRED HIGH LIMIT (ECONOMIZER OFF WHEN): EQUATION[b]	DESCRIPTION
Fixed Dry-Bulb	1, 3, 5, 11-16	T_{OA} > 75°F	*Outdoor air* temperature exceeds 75°F
Fixed Dry-Bulb	2, 4, 10	T_{OA} > 73°F	*Outdoor air* temperature exceeds 73°F
Fixed Dry-Bulb	6, 8, 9	T_{OA} > 71°F	*Outdoor air* temperature exceeds 71°F
Fixed Dry-Bulb	7	T_{OA} > 69°F	*Outdoor air* temperature exceeds 69°F
Differential Dry-Bulb	1, 3, 5, 11-16	T_{OA} > T_{RA}°F	*Outdoor air* temperature exceeds *return air* temperature
Differential Dry-Bulb	2, 4, 10	T_{OA} > T_{RA}-2°F	*Outdoor air* temperature exceeds *return air* temperature minus 2°F
Differential Dry-Bulb	6, 8, 9	T_{OA} > T_{RA}-4°F	*Outdoor air* temperature exceeds *return air* temperature minus 4°F
Differential Dry-Bulb	7	T_{OA} > T_{RA}-6°F	*Outdoor air* temperature exceeds *return air* temperature minus 6°F
Fixed Enthalpy[c] + Fixed Dry-bulb	All	h_{OA} > 28 Btu/lb[c] or T_{OA} > 75°F	*Outdoor air* enthalpy exceeds 28 Btu/lb of dry air[c] or *Outdoor air* temperature exceeds 75°F

Footnotes to Table 401.3(7) *[TABLE 140.4-G]*:

a. Only the high limit control devices listed are allowed to be used and at the setpoints listed. Others such as Dew Point, Fixed Enthalpy, Electronic Enthalpy, and Differential Enthalpy Controls, may not be used in any Climate Zone for compliance with Section 401.3.7 *[Section 140.4(e)1]* unless approval for use is provided by the *Energy Commission Executive Director*.

b. Devices with selectable (rather than adjustable) setpoints shall be capable of being set to within 2°F and 2 Btu/lb of the setpoint listed.

c. At altitudes substantially different than sea level, the Fixed Enthalpy limit value shall be set to the enthalpy value at 75°F and 50% relative humidity. As an example, at approximately 6,000 foot elevation, the fixed enthalpy limit is approximately 30.7 Btu/lb.

~~Footnotes to Table 401.3-G *[TABLE 140.4-G]*:~~

a. ~~Only the high limit control devices listed are allowed to be used and at the setpoints listed. Others such as Dew Point, Fixed Enthalpy, Electronic Enthalpy, and Differential Enthalpy Controls, may not be used in any Climate Zone for compliance with Section 401.3.7 *[Section 140.4(e)1]* unless approval for use is provided by the *Energy Commission Executive Director*.~~

b. ~~Devices with selectable (rather than adjustable) setpoints shall be capable of being set to within 2°F and 2 Btu/lb of the setpoint listed.~~

c. ~~At altitudes substantially different than sea level, the Fixed Enthalpy limit value shall be set to the enthalpy value at 75°F and 50% relative humidity. As an example, at approximately 6,000 foot elevation, the fixed enthalpy limit is approximately 30.7 Btu/lb.~~

401.3.7.1.5- The *air economizer* and all air dampers shall have the following features:

1. **Warranty.** 5-year manufacturer warranty of economizer assembly.
2. **Damper reliability testing.** Suppliers of economizers shall certify that the economizer assembly, including but not limited to *outdoor air* damper, *return air* damper, drive linkage and actuator, have been tested and are able to open and close against the rated airflow and pressure of the system for 60,000 damper opening and closing cycles.
3. **Damper leakage.** Economizer *outdoor air* and *return air* dampers shall have a maximum leakage rate of 10 cfm/sf at 250 Pascals (1.0 in. of water) when tested in accordance with *AMCA* Standard 500-D. The economizer *outside air* and *return air* damper leakage rates shall be *certified to the Energy Commission* in accordance with Section 101.2 *[Section 110.0]*.
4. **Adjustable setpoint.** If the high-limit control is fixed dry-bulb or fixed enthalpy + fixed dry-bulb, then the control shall have an adjustable setpoint.
5. **Sensor accuracy.** *Outdoor air*, *return air*, mixed air, and *supply air* sensors shall be calibrated within the following accuracies.
   5.1. Dry-bulb and wet-bulb temperatures accurate to ±2°F over the range of 40°F to 80°F;
   5.2. Enthalpy accurate to ±3 Btu/lb over the range of 20 Btu/lb to 36 Btu/lb;
   5.3. Relative humidity (RH) accurate to ±5 percent over the range of 20 percent to 80 percent RH;

6. **Sensor calibration data.** Data used for control of the economizer shall be plotted on a sensor performance curve.
7. **Sensor high limit control.** Sensors used for the high limit control shall be located to prevent false readings, including but not limited to being properly shielded from direct sunlight.
8. **Relief air system.** Relief air systems shall be capable of providing 100 percent *outside air* without over-pressurizing the *building*.

401.3.7.1.6- The *space-conditioning system* shall include the following:

1. Unit controls shall have mechanical capacity controls interlocked with economizer controls such that the economizer is at 100 percent open position when *mechanical cooling* is on and does not begin to close until the leaving air temperature is less than 45°F.
2. Direct Expansion (DX) units greater than 65,000 Btu/hr that control the capacity of the *mechanical cooling* directly based on occupied space temperature shall have a minimum of two stages of *mechanical cooling* capacity. All other DX units shall comply with the requirements in Table 401.3~~-H~~(8) *[Table 140.4-H]* and have controls that do not false load the *mechanical cooling* system by limiting or disabling the economizer or by any other means except at the lowest stage of *mechanical cooling* capacity.

TABLE 401.3~~-H~~(8) [TABLE 140.4-H] - DIRECT EXPANSION (DX) UNIT REQUIREMENTS FOR COOLING STAGES AND COMPRESSOR DISPLACEMENT

COOLING CAPACITY	MINIMUM NUMBER OF *MECHANICAL COOLING* STAGES	MINIMUM COMPRESSOR DISPLACEMENT
≥ 65,000 Btu/h and < 240,000 Btu/h	3 stages	≤ 35% full load
≥ 240,000 Btu/h	4 stages	≤ 25% full load

401.3.7.2 *[Section 140.4(e3)]* **Water economizers.**

Systems that include a *water economizer* to meet Section 401.3.7 *[Section 140.4(e)1]* shall include the following:

1. Precooling coils and water-to-water heat exchangers used as part of a *water economizer* shall either have a waterside pressure drop of less than 15 feet of water, or a secondary loop shall be installed so that the coil or heat exchanger pressure drop is not contributing to pressure drop when the system is in the normal cooling (non-economizer) mode.
2. Economizer systems shall be integrated with the *mechanical cooling* system so that they are capable of providing partial cooling even when additional *mechanical cooling* is required to meet the remainder of the cooling load. Controls shall not false load the *mechanical cooling* system by limiting or disabling the economizer or by any

other means, such as hot gas bypass, except at the lowest stage of *mechanical cooling*.

401.3.8 *[Section 140.4(f)]* **Supply air temperature reset controls.**

Space-conditioning systems supplying heated or cooled air to multiple zones shall include controls that automatically reset *supply air* temperatures. Air distribution systems serving zones that are likely to have constant loads shall be designed for the air flows resulting from the fully reset *supply air* temperature. *Supply air* temperature reset controls shall be:

1. In response to representative *building* loads or to *outdoor air* temperature; and
2. At least 25 percent of the difference between the design supply-air temperature and the design room air temperature.
3. Configured with control sequences of operation in accordance with *ASHRAE Guideline 36*.

Exception 1 to Section 401.3.8: Systems that meet the requirements of Section 401.3.6.1 *[Section 140.4(d)1]*, without using Exception 1 to Section 401.3.6.

Exception 2 to Section 401.3.8: Where supply-air temperature reset would increase overall *building* energy use.

Exception 3 to Section 401.3.8: Systems supplying zones in which specific humidity levels are required to satisfy *process loads*. *Computer rooms* or other spaces with only *IT equipment* may not use this exception.

Exception 4 to Section 401.3.8: Systems serving *healthcare facilities*.

401.3.9 *[Section 140.4(g)]* **Electric resistance heating.**

Electric resistance heating systems shall not be used for space heating.

Exception 1 to Section 401.3.9: Where an electric resistance heating system supplements a heating system in which at least 60 percent of the annual energy requirement is supplied by site-solar or *recovered energy*.

Exception 2 to Section 401.3.9: Where an electric resistance heating system supplements a *heat pump* heating system, and the heating capacity of the *heat pump* is more than 75 percent of the design heating load calculated in accordance with Sections 401.3.1, 401.3.2, and 401.3.3 *[Section 140.4(a)]* at the design outdoor temperature specified in Section 401.3.4 *[Section 140.4(b)4]*.

Exception 3 to Section 401.3.9: Where the total capacity of all electric resistance heating systems serving the *entire building* is less than 10 percent of the total design output capacity of all *heating equipment* serving the *entire building*.

Exception 4 to Section 401.3.9: Where the total capacity of all electric resistance heating systems serving the *entire building*, excluding those allowed under Exception 2, is no more than 3 kW.

Exception 5 to Section 401.3.9: Where an electric resistance heating system serves an *entire building* that is not a *hotel/motel building*; and has a *conditioned floor area* no greater than

5,000 square feet; and has no *mechanical cooling*; and is in an area where natural gas is not currently available.

Exception 6 to Section 401.3.9: Heating systems serving as emergency backup to gas *heating equipment*.

Exception 7 to Section 401.3.9: Supplemental electric resistance heating systems complying with Section 401.3.3.2 *[Section 140.4(a)3C]*.

401.3.10 *[Section 140.4(h)]* **Heat rejection systems.**

Heat rejection *equipment* used in comfort cooling systems, such as air-cooled *condensers*, *open cooling towers*, *closed-circuit cooling towers* and evaporative *condensers* shall include the following:

401.3.10.1- Fan speed control. Each fan powered by a motor of 7.5 hp (5.6 kW) or larger shall have the capability to operate that fan at two thirds of full speed or less and shall have controls that automatically change the fan speed to control the leaving fluid temperature or *condensing temperature* or pressure of the heat rejection device.

Exception 1 to Section 401.3.10.1: Heat rejection devices included as an integral part of the *equipment* listed in Tables 400.5-~~A~~(1) through 400.5-~~L~~(12) *[Tables 110.2-A through 110.2-L]*.

Exception 2 to Section 401.3.10.1: *Condenser* fans serving multiple refrigerant circuits.

Exception 3 to Section 401.3.10.1: *Condenser* fans serving flooded *condensers*.

Exception 4 to Section 401.3.10.1: Up to one third of the fans on a *condenser* or tower with multiple fans where the lead fans comply with the speed control requirement.

401.3.10.2- Tower flow turndown. *Open cooling towers* configured with multiple *condenser* water pumps shall be designed so that all cells can be run in parallel with the larger of:

1. The flow that is produced by the smallest pump, or
2. 50 percent of the design flow for the cell.

401.3.10.3- Limitation on centrifugal fan cooling towers. *Open cooling towers* with a combined rated capacity of 900 gpm and greater at 95°F *condenser* water return, 85°F *condenser* water supply and 75°F outdoor wet-bulb temperature shall use propeller fans and shall not use centrifugal fans.

Exception 1 to Section 401.3.10.3: Cooling towers that are ducted (inlet or discharge) or have an external sound trap that requires external static pressure capability.

Exception 2 to Section 401.3.10.3: Cooling towers that meet the energy efficiency requirement for propeller fan towers in Section 400.5 *[Section 110.2]*, Table 400.5-~~F~~(6) *[Table 110.2-F]*.

401.3.10.4- Multiple cell heat rejection equipment. Multiple cell heat rejection *equipment* with variable speed fan drives shall:

1. Operate the maximum number of fans allowed that comply with the manufacturer's requirements for all system components, and
2. Control all operating fans to the same speed. Minimum fan speed shall comply with the minimum allowable speed of the fan drive as specified by the manufacturer's recommendation. Staging of fans is allowed once the fans are at their minimum operating speed.

401.3.10.5- Cooling tower efficiency. Axial fan, *open-circuit cooling towers* serving *condenser* water loops for chilled water plants with a total of 900 gpm or greater, shall have a minimum rated efficiency based on Table 401.3~~-I~~(9) *[Table 140.4-H-2]* when rated in accordance with the conditions as *listed* in Table 400.5~~-F~~(6) *[Table 110.2-F]*.

Exception to Section 401.3.10.5: Replacement of existing cooling towers that are inside an existing *building* or on an existing *roof*.

TABLE 401.3~~-I~~(9) [TABLE 140.4-H-2] - MINIMUM EFFICIENCY FOR PROPELLER OR AXIAL FAN OPEN-CIRCUIT COOLING TOWERS (GPM/HP)

CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
42.1	70	60	70	70	80	80	80	80	80	60	70	80	60	80	42.1

401.3.11 *[Section 140.4(i)]* **Minimum chiller efficiency.**

Chillers shall meet or exceed Path B from Table 400.5~~-D~~(4) *[Table 110.2-D]*.

Exception 1 to Section 401.3.11: Chillers with electrical *service* > 600V.

Exception 2 to Section 401.3.11: Chillers attached to a heat recovery system with a design heat recovery capacity > 40 percent of the design chiller cooling capacity.

Exception 3 to Section 401.3.11: Chillers used to charge thermal energy storage systems where the charging temperature is < 40°F.

Exception 4 to Section 401.3.11: In *buildings* with more than three chillers, only three chillers are required to meet the Path B efficiencies.

401.3.12 *[Section 140.4(j)]* **Limitation of air-cooled chillers.**

Chilled water plants shall not have more than 300 tons of cooling provided by air-cooled chillers.

Exception 1 to Section 401.3.12: Where the water quality at the *building* site fails to meet manufacturer's specifications for the use of water-cooled chillers.

Exception 2 to Section 401.3.12: Chillers that are used to charge a thermal energy storage system with a design temperature of less than 40°F (4°C).

Exception 3 to Section 401.3.12: Systems serving *healthcare facilities*.

~~**Exception 4 to Section 401.3.12:** *Air- to- water heat pumps* that provide space or hydronic heating only.~~

Exception 4~~5~~ to Section 401.3.12: Air-cooled chillers with

path B efficiencies of greater or equal 10.72 *EER* and greater or equal 20.1 *IPLV* when rated in accordance with the testing procedures of Table 400.5(4).

Exception 5~~6~~ to Section 401.3.12: Air-~~-~~cooled chillers with heat recovery where the cooling capacity minus the recovered heating capacity of air-~~-~~cooled chillers is no more than 300 tons per chilled water plant.

401.3.13 *[Section 140.4(k)]* **Hydronic system measures.**

401.3.13.1 *[Section 140.4(k)1]* **Hydronic variable flow systems.**

HVAC chilled and hot water pumping shall be designed for variable fluid flow and shall be capable of reducing pump flow rates to no more than the larger of:

1. 50 percent or less of the design flow rate; or
2. the minimum flow required by the equipment manufacturer for the proper operation of *equipment* served by the system.

Exception 1 to Section 401.3.13.1: Systems that include no more than three control valves.

Exception 2 to Section 401.3.13.1: Systems having a total pump system power less than or equal to 1.5 hp.

401.3.13.2 *[New Section]* **Stage-off of flow for non-operating hydronic variable flow systems.**

401.3.13.2.1 *[Section 140.4(k)2]* **Chillers ~~isolation~~.**

Chilled water systems with ~~When a chilled water system includes~~ more than one chiller, ~~provisions shall be made so that flow through any chiller is automatically shut off when that chiller is shut off~~ shall include control systems that automatically stage off, reduce, or otherwise minimize flow through the chiller evaporator, and *condenser* if applicable, that is off or staged off while ~~still~~ maintaining flow through operating chiller(s). Chillers that are piped in series ~~for the purpose of increased~~ to increase temperature differential shall be as considered one chiller. The manufacturer's minimum flow requirements for safe and reliable operation may be maintained during any of the following conditions:

1. Start-up operations;
2. Post-purge or heat-recovery operations;
3. Defrost cycles;
4. Burst or freeze protection during cold-weather or heat-recovery operation~~**Exception to 401.3.13.2.1:** Group R occupancies~~.

~~**401.3.13.2.2. [***Section 140.4(k)2***] Chiller isolation.**~~

~~**When a chilled water system includes more than one chiller, provisions shall be made so that flow through any chiller is automatically shut off when that chiller is shut off while still maintaining flow through other operating chiller(s). Chillers that**~~

~~**are piped in series for the purpose of increased temperature differential shall be considered as one chiller.**~~

401.3.13.2.2~~3~~ *[Section 140.4(k)3]* **Boilers ~~isolation~~.**

~~When a hot~~Hot water plants with ~~includes~~ more than one *boiler*, ~~provisions shall be made so that flow through any boiler is automatically shut off when that boiler is shut off~~ shall include control systems that automatically stage off, reduce, or otherwise minimize flow through any *boiler* that is off or staged off while ~~still~~ maintaining flow through operating *boiler(s)*. The manufacturer's minimum flow requirements for safe and reliable operation may be maintained during any of the following conditions:

1. Start-up operations;
2. Post-purge or heat-recovery operations; or
3. Burst or freeze protection during cold-weather or heat-recovery operation.~~**Exception to 401.3.13.2.:** Group R occupancies~~

~~**401.3.13.3. [Section 140.4(k)3] Boiler Isolation**~~

~~When a hot water plant includes more than one boiler, provisions shall be made so that flow through any boiler is automatically shut off when that boiler is shut off while still maintaining flow through other operating boiler(s).~~

401.3.13.2.3 *[New Section]* ***Air-to-Water Heat Pump (AWHPs)*** **and** ***Water-to-Water Heat Pumps*** **(WWHPs).**

Central plants with more than one *AWHP* or more than one *WWHP*, shall include control systems that automatically stage off, reduce, or otherwise minimize flow through the evaporator and *condenser* if applicable, of any *heat pumps* that are off or staged off while maintaining flow through operating *heat pump*(s).

For purposes of this section, two or more hydronic *heat pumps* piped in series to increase the system temperature differential shall be considered a single *heat pump* and flow through the series-connected units may be controlled as a single unit.

This requirement also applies to each module of modular *heat pumps* when the modules are intended to be staged. The control strategy may use valves, pumps, or other control methods, and shall be clearly indicated on the mechanical drawings.

The manufacturer's minimum flow requirements for safe and reliable operation may be maintained during any of the following conditions:

1. ~~1.~~Start-up operations;
2. ~~2.~~Post-purge or heat-recovery operation;
3. ~~3.~~Defrost cycles; or
4. ~~4.~~Burst or freeze protection during cold-weather or heat-recovery operation.

Exception to 401.3.13.2.5: *Group R occupancies*.

401.3.13.4~~—~~3 *[Section 140.4(k)4]* **Chilled and hot water temperature reset controls.**

Systems with a design capacity exceeding 500,000 Btu/hr supplying chilled or heated water shall include controls that automatically reset supply water temperatures as a function of representative *building* loads or *outside air* temperature.

Exception 1 to Section 401.3.13.43: Hydronic systems that use variable flow to reduce pumping energy in accordance with Section 401.3.13.1 *[Section 140.4(k)1]*.

Exception 2 to Section 401.3.13.43: Systems serving *healthcare facilities*.

401.3.13.5 *[Section 140.4(k)5]* **Water-cooled air conditioner and hydronic heat pump systems.**

Water circulation systems serving water-cooled *air conditioners*, hydronic *heat pumps*, or both that have total pump system power exceeding 5 hp shall have flow controls that meet the requirements of Section 401.3.13.6 *[Section 140.4(k)6]*. Each such *air conditioner* or *heat pump* shall have a two-position *automatic* valve interlocked to shut off water flow when the compressor is off.

401.3.13.6 *[Section 140.4(k)6]* **Variable flow controls.**

1. **Variable speed drives.** Individual pumps serving variable flow systems and having a motor horsepower exceeding 5 hp shall have controls or devices (such as variable speed control) that will result in pump motor demand of no more than 30 percent of design wattage at 50 percent of design water flow. The pumps shall be controlled as a function of required differential pressure.
2. **Pressure sensor location and setpoint.** For systems without *direct digital control* of individual coils reporting to the central control panel, differential pressure shall be measured at the most remote heat exchanger or the heat exchanger requiring the greatest differential pressure.

   For systems with *direct digital control* of individual coils with a central control panel, the static pressure setpoint shall be reset based on the valve requiring the most pressure, and the setpoint shall be no less than 80 percent open. Pressure sensors may be mounted anywhere.

Exception 1 to Section 401.3.13.6: Heating hot water systems.

Exception 2 to Section 401.3.13.6: *Condenser* water systems serving only water-cooled chillers.

401.3.13.7 *[Section 140.4(k)7]* **Hydronic heat pump (WLHP) controls.**

Hydronic *heat pumps* connected to a common *heat pump* water loop with central devices for heat rejection and heat addition shall have controls that are capable of providing a *heat pump* water supply temperature dead band of at least 20°F between initiation of heat rejection and heat addition by the central devices.

Exception to Section 401.3.13.7: Where a system loop temperature optimization controller is used to determine the most efficient operating temperature based on real-time conditions of demand and capacity, dead bands of less than 20°F shall be allowed.

401.3.13.8 *[Section 140.4(k)8]* **High capacity space heating gas boiler systems.**

In *Climate Zones* 1 through 6, 9 through 14, and 16, gas hot water *boiler systems* for space heating with a total system input of at least 1 MMBtu/h but no more than 10 MMBtu/h shall meet all of the following requirements:

1. ***Boiler system* efficiency.** Gas hot water boilers shall have a minimum thermal efficiency of 90 percent. Systems with multiple boilers can meet this requirement if the space-heating input provided by *equipment* with thermal efficiencies above and below 90 percent has an input capacity-weighted average thermal efficiency of at least 90 percent. For boilers federally regulated by *combustion efficiency*, the calculation for the input capacity-weighted average thermal efficiency shall use the *combustion efficiency* value.
2. **Hot water distribution design.** The hot water distribution system shall be designed to comply with the following:
   2.1. Coils and other heat exchangers shall be selected so that at *design conditions* the hot water return temperature entering the boilers is 120°F or less.
   2.2. Under all operating conditions, the water temperature entering the boiler is 120°F or less or the flow rate of supply hot water that recirculates directly into the return system, such as by three-way valves or minimum flow bypass controls, shall be no greater than 20 percent of the design flow of the operating boilers.

Exception 1 to Section 401.3.13.8: Where 25 percent of the annual space heating requirement is provided by on-site renewable energy, site-*recovered energy* or heat recovery chillers.

Exception 2 to Section 401.3.13.8: Space heating boilers installed in individual *dwelling units*.

Exception 3 to Section 401.3.13.8: Where 50 percent or more of the design heating load is served using perimeter convective heating, radiant ceiling panels or both.

Exception 4 to Section 401.3.13.8: Individual gas boilers with input capacity less than 300,000 Btu/h shall not be included in the calculations of the total system input or total system efficiency.

401.3.14 *[Section 140.4(m)]* **Fan control.**

Each cooling system listed in Table 401.3~~.I~~(10) *[Table 140.4-I]* shall be designed to vary the indoor fan airflow as a function of load and shall comply with the following requirements:

1. DX and chilled water cooling systems that control the capacity of the *mechanical cooling* directly based on occupied space temperature shall:
   1.1. Have a minimum of two stages of fan control with no more than 66 percent speed when operating on stage 1; and
   1.2. Draw no more than 40 percent of the fan power at full fan speed, when operating at 66 percent speed.

2. All other systems, including but not limited to DX cooling systems and chilled water systems that control the space temperature by modulating the airflow to the space, shall have proportional fan control such that at 50 percent air flow the power draw is no more than 30 percent of the fan power at full fan speed.

3. Systems that include an air side economizer to meet Section 401.3.7 *[Section 140.4(e)1]* shall have a minimum of two speeds of fan control during economizer operation.

4. *Multiple zone systems* in *nonresidential buildings* other than *Group R occupancies* shall meet all of the following:

   4.1. Be able and configured to be able to reduce airflow from the supply fan to the minimum outdoor airflow required in Section 401.2.1.1.3 *[Section 120.1(c)3]*.

   4.2. When all zones are operating either within their *thermostat deadband* or in *occupied standby mode*, the system shall operate at a supply airflow no greater than the rate defined in Section 401.3.14.4.1. Upon calls for *mechanical heating* or *mechanical cooling* from the zones, the system supply airflow shall not exceed the sum of the *primary airflow* setpoints for each zone.

   Exception to Section 401.3.14.4.2: During *mechanical cooling*, the system may operate at the minimum *supply air* flow rate, in accordance with the equipment manufacturer's specifications.

   Exception to Section 401.3.14.4: ~~T~~Systems without *DDC*.

Exception 1 to Section 401.3.14: Modulating fan control is not required for chilled water systems with all fan motors < 1 HP, or for evaporative systems with all fan motors < 1 HP, if the systems are not used to provide ventilation air and all indoor fans cycle with the load.

Exception 2 to Section 401.3.14: Systems serving *healthcare facilities* other than *HCAI facilities*.

TABLE 401.3 ~~J~~(10) [TABLE 140.4-I] - FAN CONTROL SYSTEMS

COOLING SYSTEM TYPE	FAN MOTOR SIZE	COOLING CAPACITY
DX Cooling	Any	≥ 65,000 Btu/hr
Chilled Water and Evaporative	≥ 1/4 HP	Any

401.3.15 *[Section 140.4(n)]* **Mechanical system shut-off.**

Any *directly conditioned space* with operable wall or *roof* openings to the outdoors shall be provided with interlock controls that disable or reset the temperature setpoint to 55°F for *mechanical heating* and disable or reset the temperature setpoint to 90°F for *mechanical cooling* to that space when any such opening is open for more than 5 minutes.

Exception 1 to Section 401.3.15: Interlocks are not required on *doors* with *automatic* closing devices.

Exception 2 to Section 401.3.15: Any space without a thermostatic control (*thermostat* or a space temperature sensor used to control heating or cooling to the space).

Exception 3 to Section 401.3.15: *Healthcare facilities*.

401.3.16 *[Section 140.4(o)]* **Exhaust system transfer air.**

Conditioned *supply air* delivered to any space with mechanical exhaust shall not exceed the greater of:

1. The supply flow required to meet the space heating or cooling load; or
2. The ventilation rate required by the authority having jurisdiction, the facility Environmental Health and Safety Department, or by Section 401.2.1.1.3 *[Section 120.1(c)3]*; or
3. The mechanical exhaust flow minus the *available transfer air*. *Available transfer air* shall be from another *conditioned space* or *return air* plenums on the same floor and same smoke or fire compartment, and that at their closest point are within 15 feet of each other.

Exception 1 to Section 401.3.16: Biosafety level classified *laboratories* 3 or higher.

Exception 2 to Section 401.3.16: Vivarium spaces.

Exception 3 to Section 401.3.16: Spaces that are required by applicable codes and standards to be maintained at a positive pressure differential relative to adjacent spaces.

Exception 4 to Section 401.3.16: Spaces where the highest amount of *transfer air* that could be used for exhaust makeup may exceed the available transfer airflow rate and where the spaces have a required negative pressure relationship.

Exception 5 to Section 401.3.16: *Healthcare facilities*.

401.3.17 *[Section 140.4(p)]* **Dedicated outdoor air systems (DOAS).**

HVAC systems that utilize a *dedicated outdoor air system (DOAS)* such as a *DX-DOAS*, *HRV* or *ERV* unit to condition, temper, or filter 100 percent *outdoor air* separate from local or central *space-conditioning systems* serving the same space shall meet the following criteria:

401.3.17.1- *DOAS* unit *fan systems* with input power less than 1 kW shall not exceed a total combined fan power of 1.0 W/cfm. *DOAS* with fan power greater than or equal to 1 kW shall meet the requirements of Section 401.3.5 *[Section 140.4(c)]*.

Exception to Section 401.3.17.1: *DOAS* complying with Section 401.3.3.4 *[Section 140.4(a)3E]*.

401.3.17.2- *The DOAS supply air* shall be delivered using one of the following options:

1. Ddirectly to the occupied space. or
2. Aat the outlet of any terminal heating or cooling coils, and shall cycle off any zone heating and *cooling equipment* fans, circulation pumps and terminal unit fans when there is no call for heating or cooling in the zone.

Exception 1 to Section 401.3.17.2: Active chilled beam systems.

Exception 2 to Section 401.3.17.2: Sensible-only cooling terminal units with pressure-independent variable-airflow regulating devices limiting the *DOAS supply air* to the greater of latent load or minimum ventilation requirements.

Exception 3 to Section 401.3.17.2: Any configuration where a *DOAS* unit provides ventilation air to a downstream fan (a terminal box, air handling unit or other space-conditioning *equipment*) where the total system airflow can be reduced to ventilation minimum or the downstream fan power is no greater than 0.12 watts per cfm when space temperatures are within the *thermostat deadband* (at low speed per manufacturer's literature).

401.3.17.3- *DOAS* supply and exhaust fans shall have a minimum of three speeds to facilitate system balancing.

401.3.17.4- *DOAS* with *mechanical cooling* providing ventilation to multiple zones and operating in conjunction with zone heating and cooling systems shall not use heating or heat recovery to warm *supply air* above 60°F when representative *building* loads or *outdoor air* temperature indicates that the majority of zones require cooling.

401.3.18 *[Section 140.4(q)]* **Exhaust air heat recovery.**

Fan systems designed to operate to the criteria listed in Table 401.3~~-K~~(11) *[Table 140.4-J]*, Table 401.3~~-L~~(12) *[Table 140.4-K]*, or where required by Section 401.3.3 *[Section 140.4(a)3]*, shall include an exhaust air heat recovery system that meets Sections 401.3.18.1 and 401.3.18.2.

Exception 1 to Section 401.3.18: Systems meeting Section 912.2 *[Section 140.9(c)]*, Prescriptive requirements for *laboratory* and *factory* exhaust systems.

Exception 2 to Section 401.3.18: Systems serving spaces that are not cooled and that are heated to less than 60°F.

Exception 3 to Section 401.3.18: Where more than 60 percent of the *outdoor air* heating energy is provided from site-*recovered energy* in *Climate Zone* 16.

Exception 4 to Section 401.3.18: Where the sum of the airflow rates exhausted and relieved within 20 feet of each other is less than 75 percent of the design outdoor airflow rate, excluding exhaust air that is either:

1. used for another energy recovery system,
2. not allowed by the California Mechanical Code (Title 24, Part 4) (*CMC*) for use in energy recovery systems with leakage potential, or
3. of Class 4 as specified in Section 401.2.1.5 *[Section 120.1(g)]*.

Exception 5 to Section 401.3.18: Systems expected to operate less than 20 hours per week.

401.3.18.1 *[Section 140.4(q)1]* **Sensible energy recovery ratio/ Enthalpy recovery ratio.**

A *sensible energy recovery ratio* of at least 60 percent or an *enthalpy recovery ratio* of at least 50 percent for both heating and cooling *design conditions* and a rating in accordance with *AHRI 1060*.

Exception 1 to Section 401.3.18.1: Compliance is not required for sensible recovery ratio at heating *design conditions* for *Climate Zone* 15.

Exception 2 to Section 401.3.18.1: Compliance is not required for sensible recovery ratio at cooling *design conditions* for *Climate Zone* 1.

401.3.18.2 *[Section 140.4(q)2]* **Energy recovery bypass/ control.**

Energy recovery bypass or control to disable energy recovery and to directly economize with ventilation air based on *outdoor air* temperature limits specified in Table 401.3 ~~G~~(7) *[Table 140.4-G]*. For energy recovery systems where the transfer of energy cannot be stopped, bypass shall prevent the total airflow rate of either *outdoor air* or exhaust air through the energy recovery exchanger from exceeding 10 percent of the full design airflow rate.

Exception to Section 401.3.18.2: For *DOAS* units with the capability to shut off when a separate *space-conditioning system* serving the same space meets the economizer requirements in Section 401.3.7 *[Section 140.4(e)1A]*.

TABLE 401.3~~-K~~(11) [TABLE 140.4-J] – ENERGY RECOVERY REQUIREMENTS BY CLIMATE ZONE AND PERCENT OUTDOOR AIR AT FULL DESIGN AIRFLOW (< 8,000 HOURS / YEAR)

% OUTDOOR AIR AT FULL DESIGN AIRFLOW	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
≥ 10% and < 20%	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
≥ 20% and < 30%	≥ 15,000	≥ 20,000	NR	NR	NR	NR	NR	NR	NR	NR	≥ 18,500	≥ 18,500	≥ 18,500	≥ 18,500	≥ 18,500	≥ 18,500
≥ 30% and < 40%	≥ 13,000	≥ 15,000	NR	NR	NR	NR	NR	NR	NR	NR	≥ 15,000	≥ 15,000	≥ 15,000	≥ 15,000	≥ 15,000	≥ 15,000
≥ 40% and < 50%	≥ 10,000	≥ 12,000	NR	NR	NR	NR	NR	NR	NR	≥ 22,000	≥ 10,000	≥ 10,000	≥ 10,000	≥ 10,000	≥ 10,000	≥ 10,000
≥ 50% and < 60%	≥ 9,000	≥ 10,000	NR	≥ 18,500	NR	NR	NR	NR	NR	≥ 17,000	≥ 8,000	≥ 8,000	≥ 8,000	≥ 8,000	≥ 8,000	≥ 8,000
≥ 60% and < 70%	≥ 7,000	≥ 7,500	NR	≥ 16,500	NR	NR	NR	NR	≥ 20,000	≥ 15,000	≥ 7,000	≥ 7,000	≥ 7,000	≥ 7,000	≥ 7,000	≥ 7,000
≥ 70% and < 80%	≥ 6,500	≥ 7,000	NR	≥ 15,000	NR	NR	NR	NR	≥ 17,000	≥ 14,000	≥ 5,000	≥ 5,000	≥ 5,000	≥ 5,000	≥ 5,000	≥ 5,000
≥ 80%	≥ 4,500	≥ 6,500	NR	≥ 14,000	NR	NR	NR	NR	≥ 15,000	≥ 13,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000

Footnotes to Table 401.3(11) *[Table 140.4-J]*:

a. Flow rates in Table 401.3(11) *[Table 140.4-J]* represent the design supply fan airflow rate in cfm.

b. For a *DOAS* unit providing *outdoor air* to another *space-conditioning system*, the full design supply fan airflow rate shall be the total airflow of only the *DOAS* unit

~~Footnotes to Table 401.3-K *[Table 140.4-J]*:~~

~~1. Flow rates in Table 401.3-K *[Table 140.4-J]* represent the design supply fan airflow rate in CFM.~~

~~2. For a *DOAS* unit providing *outdoor air* to another *space-conditioning system*, the full design supply fan airflow rate shall be the total airflow of only the *DOAS* unit.~~

TABLE 401.3~~L~~(12) [TABLE 140.4-K] – ENERGY RECOVERY REQUIREMENTS BY CLIMATE ZONE AND PERCENT OUTDOOR AIR AT FULL DESIGN AIRFLOW (≥ 8,000 HOURS / YEAR)

% OUTDOOR AIR AT FULL DESIGN AIRFLOW	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
≥ 10% and < 20%	≥ 10,000	≥ 10,000	NR	NR	NR	NR	NR	NR	NR	≥ 40,000	≥ 40,000	≥ 20,000	≥ 10,000	≥ 10,000	≥ 10,000	≥ 10,000
≥ 20% and < 30%	≥ 2,000	≥ 5,000	≥ 13,000	≥ 9,000	≥ 9,000	NR	NR	NR	NR	≥ 15,000	≥ 15,000	≥ 5,000	≥ 5,000	≥ 5,000	≥ 5,000	≥ 5,000
≥ 30% and < 40%	≥ 2,000	≥ 3,000	≥ 10,000	≥ 6,500	≥ 6,500	NR	NR	NR	≥ 15,000	≥ 7,500	≥ 7,500	≥ 3,000	≥ 3,000	≥ 3,000	≥ 3,000	≥ 3,000
≥ 40% and < 50%	≥ 2,000	≥ 2,000	≥ 8,000	≥ 6,000	≥ 6,000	NR	NR	NR	≥ 12,000	≥ 6,000	≥ 6,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000
≥ 50% and < 60%	≥ 2,000	≥ 2,000	≥ 7,000	≥ 6,000	≥ 6,000	NR	NR	≥ 20,000	≥ 10,000	≥ 5,000	≥ 5,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000
≥ 60% and < 70%	≥ 2,000	≥ 2,000	≥ 6,000	≥ 6,000	≥ 6,000	NR	NR	≥ 18,000	≥ 9,000	≥ 4,000	≥ 4,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000
≥ 70% and < 80%	≥ 2,000	≥ 2,000	≥ 6,000	≥ 5,000	≥ 5,000	NR	NR	≥ 15,000	≥ 8,000	≥ 3,000	≥ 3,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000
≥ 80%	≥ 2,000	≥ 2,000	≥ 6,000	≥ 5,000	≥ 5,000	NR	NR	≥ 12,000	≥ 7,000	≥ 3,000	≥ 3,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000	≥ 2,000

Footnotes to Table 401.3(12) *[Table 140.4-K]*:

a. Flow rates in Table 401.3(12) *[Table 140.4-K]* represent the design supply fan airflow rate in cfm.

b. For a *DOAS* unit providing *outdoor air* to another *space-conditioning system*, the full design supply fan airflow rate shall be the total airflow of only the *DOAS* unit.

~~Footnotes to Table 401.3-L *[Table 140.4-K]*:~~

~~1. Flow rates in Table 401.3-L *[Table 140.4-K]* represent the design supply fan airflow rate in CFM.~~

~~2. For a *DOAS* unit providing *outdoor air* to another *space-conditioning system*, the full design supply fan airflow rate shall be the total airflow of only the *DOAS* unit.~~

401.3.19 *[Section 140.4(s)]* **Mechanical heat recovery.**

Exception to Section 401.3.19: *Buildings* with a *computer room* heat recovery system or wastewater heat recovery system capable of providing not less than 25 percent of SWHCAP + HCAP.

401.3.19.1 *[Section 140.4(s)1]* **Simultaneous mechanical heat recovery.**

Simultaneous mechanical heat recovery is required for *newly constructed buildings* that meet either criteria below:

1. CHL + 0.1 x CLL ≥ 200 tons and SWHCAP + HCAP ≥ 2200 kBtuh; or
2. CCAP ≥ 300 tons and SWHCAP + 0.1 x HCAP ≥ 700 kBtuh

where:

CCAP	=	design capacity of all *mechanical cooling* systems.
CHL	=	coincident peak cooling load of all spaces with a design equipment power density > 5 watts/ft^2 and a minimum outdoor airflow requirement < 0.5 cfm/ft^2 (i.e., high load spaces).
CLL	=	CCAP - CHL. If the design includes capacity for future cooling systems, then assume 20 percent of future systems serve high load spaces.
SWHCAP	=	design capacity of all *service water heating* (SWH) systems, excluding systems expected to operate less than 5 hours per week, such as instant-hot water systems for emergency eyewash stations.
HCAP	=	design capacity of all space-heating systems.

The heat recovery system shall include a heat recovery chiller, or other means, capable of transferring the lesser of the following from spaces in cooling to spaces in heating and/or to the SWH system:

1. 25 percent of the peak heat rejection of the cooling system.
2. 25 percent of (SWHCAP + HCAP).

Exception 1 to Section 401.3.19.1: *Laboratory buildings* with exhaust air heat recovery systems meeting Section 912.2.6 *[Section 140.9(c)6]*.

Exception 2 to Section 401.3.19.1: *Buildings* in *Climate Zone* 15 with SWHCAP < 600 kBtuh.

401.3.19.2 *[Section 140.4(s)2]* **Heat recovery for service water heating.**

If the *building* is required to have *simultaneous mechanical heat recovery* by Section 401.3.19.1 *[Section 140.4(s)1]*, and SWHCAP ≥ 500 kBtu/h, then the heat recovery system shall also heat or preheat the service hot water. The heat recovery system shall have the capacity to transfer the smaller of:

1. 30 percent of the peak heat rejection of the cooling system; or

2. 30 percent of SWHCAP.

401.3.20 *[Section 140.4(r)]* **DDC controller logic using ASHRAE Guideline 36.**

HVAC systems with *DDC* controllers shall use controller logic originating from a *programming library* based on sequences of operation from *ASHRAE Guideline 36* in accordance with 401.3.20.1 through 401.3.20.3.

Exception 1 to Section 401.3.20: Logic from the certified *programming library* modified to suit application-specific operations that are not included in *ASHRAE Guideline 36* sequences.

Exception 2 to Section 401.3.20: Systems serving *healthcare facilities*.

401.3.20.1- Requirement applies to all controllers that are capable of being programmed in the field; and

401.3.20.2- Requirement applies to the entirety or all applicable portions of *equipment* control for configurations included in the *programming library*; and

401.3.20.3- The *programming library* shall be *certified to the Energy Commission* as meeting the requirements of Reference Joint Appendix JA18.

Exception to Section 401.3.20.3: Non-programmable (configurable-only) controllers for zone terminal units shall follow applicable *ASHRAE Guideline 36* zone sequences referenced in Reference Joint Appendix JA18, Table 18.3-1, but are not subject to certification requirements.

401.4 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

401.5 *[Section 141.0]* **Additions and alterations to existing buildings.**

401.5.1 *[Section 141.0]* **Additions.**

Additions to existing *nonresidential*, and *hotel/motel* *use designations* ~~*buildings*~~ shall meet the mandatory requirements of Section 401.5.1.1 that are applicable to the ~~*building*~~ project scope, and either the performance compliance approach (*energy budgets*) in Section 401.5.1.3 or the prescriptive compliance approach in Section 401.5.1.2 for the *Climate Zone* in which the *building* is located. *Climate zones* are shown in Figure 102.2-A *[FIGURE 100.1-A]*.

Covered process requirements for *additions* to existing *nonresidential*, and *hotel/motel* *use designations* ~~*buildings*~~ are specified in Subchapter 9 *[Section 141.1]*.

Exception to Section 401.5.1: When heating or cooling to an *addition* other than in *Group R occupancies* are provided by expanding existing systems, the existing systems and *equipment* ~~need not~~shall comply with ~~this Section~~the applicable *DDC* requirements in Section 401.2.2.11.

401.5.1.1 *[Section 141.0(a)]* **Mandatory requirements (Additions).**

Any newly installed *space-conditioning system* shall meet the applicable requirements of the sections listed below:

101 *[Section 100.0(h), 110.0, 110.1, 110.5]* Systems and Equipment

400.2, 400.3, 400.4.4, 400.5, 401.1, 401.2 *[Section 110.2, 110.5, 110.8(d)3, 120.0 through 120.5, 120.9, 120.10]* Mandatory Requirements for *HVAC Systems*

400.6 *[Section 110.12]* Mandatory Requirements for Demand Management

Exception to Section 401.5.1.1: *Duct Sealing*. When ducts are extended from an existing *duct system* to serve the *addition*, the existing *duct system* and the extended ducts shall meet the applicable requirements specified in Section 401.5.2.2.4 *[Section 141.0(b)2D]*.

401.5.1.2 *[Section 141.0(a)1]* **Prescriptive requirements (Additions).**

Any newly installed *space-conditioning system* shall meet the applicable requirements of the sections listed below:

102.4 *[Section 140.2]* Prescriptive Requirements for *Newly Constructed Buildings*

401.3 *[Section 140.4]* Prescriptive Requirements for *HVAC Systems*

Exception 1 to Section 401.5.1.2: Where an existing system with electric *reheat* is expanded by adding variable air volume (*VAV*) boxes to serve an *addition*, total electric *reheat capacity* may be expanded so that the total capacity does not exceed 150 percent of the existing installed electric heating capacity in any one permit, and the system need not comply with Section 401.3.9 *[Section 140.4(g)]*. Additional electric *reheat capacity* in excess of 150 percent of the existing installed electric heating capacity may be added subject to the requirements of Section 401.3.9 *[Section 140.4(g)]*.

Exception 2 to Section 401.5.1.2: A gas hot water *boiler system* with a total system input of at least 1 MMBtu/h but no more than 10 MMBtu/h added to an existing *building* is not required to comply with Section 401.3.13.8 *[Section 140.4(k)8]*.

Exception 3 to Section 401.5.1.2: Section 401.3.2 *[Section 140.4(a)2]* shall not apply to new space conditioning systems or components.

401.5.1.3 *[Section 141.0(a)2]* **Performance requirements (Additions).**

Any newly installed *space-conditioning system* shall meet the applicable requirements of Section 102 and either the *addition* alone shall comply or the existing *building* plus *addition* plus *alteration* shall comply.

401.5.2 *[Section 141.0(b)]* **Alterations.**

Alterations to components of existing *nonresidential*, *hotel/mote use designations l*, or *relocatable public school buildings*, including *alterations* made in conjunction with a change in *building occupancy* to a *nonresidential, ~~high-rise residential,~~* or *hotel/motel occupancy* shall meet mandatory requirements of Section 401.5.2.1, and either prescriptive requirements of Section 401.5.2.2 or performance requirements of Section 401.5.2.3.

Exception 1 to Section 401.5.2: *Alterations* to *healthcare facilities* other than *HCAI facilities* are not required to comply with this Section.

Exception 2 to Section 401.5.2: When heating or cooling for an *alteration* other than in *Group R occupancies* are provided by expanding existing systems, the existing systems and *equipment* shall~~need not~~ comply with ~~this section~~the applicable *DDC* requirements in Section 401.2.2.11.

Exception 3 to Section 401.5.2: When existing heating or cooling systems or components are moved within a *building*, the existing systems or components need not comply with this section.

401.5.2.1 *[Section 141.0(b)1]* **Mandatory requirements (Alterations).**

Altered components in a *nonresidential*, or *hotel/motel use designations~~building,~~ or* in *HCAI facilities,* shall meet the requirements specified in the sections listed below that are applicable to the ~~*building*~~ project scope and the minimum requirements in Section 401.5.2.1.1.

Covered process requirements for *alterations*, and *repairs* to existing *nonresidential*, and *hotel/motel use designations~~buildings~~* are specified in Subchapter 9 *[Section 141.1]*.

101 *[Section 100.0(h), 110.0, 110.1, 110.5]* Systems and Equipment

400.2, 400.3, 400.4.4, 400.5, 401.1, 401.2 *[Section 110.2, 110.5, 110.8(d)3, 120.0 through 120.5, 120.9, 120.10]* Mandatory Requirements for *HVAC Systems*

400.6 *[Section 110.12]* Mandatory Requirements for Demand Management

Exception to Section 401.5.2.1: The requirements of Section 401.2.2.9 *[Section 120.2(i)]* and Section 401.2.2.10 *[New section]* shall not apply to *alterations* of *space-conditioning systems* or components.

401.5.2.1.1 *[Section 141.0(b)1D]* **Fan Energy Index.**

New *fan systems* serving an existing *building* shall meet the requirements of Section 401.2.6 *[Section 120.10]*.

401.5.2.2 *[Section 141.0(b)2]* **Prescriptive requirements (Alterations).**

401.5.2.2.1 *[Section 141.0(b)2C]* **New or Replacement Space-Conditioning Systems or Components.**

New or Replacement *Space-Conditioning Systems* or Components other than new or replacement *space-conditioning system* ducts shall meet the requirements of Section 401.3 *[Section 140.4]* applicable to the systems or components being altered and meet the requirements of Sections 401.5.2.2.1.1, ~~and~~ 401.5.2.2.1.2, and 401.5.2.2.1.3.

Exception 1 to Section 401.5.2.2.1: Section 401.3.2 *[Section 140.4(a)2]* shall not apply to new or replacement *space-conditioning systems* or components. Section 401.3.3 *[Section 140.4(a)3]* shall not apply to new or replacement *space-conditioning systems* or components.

Exception 2 to Section 401.5.2.2.1: Section 401.5.2.2.1 *[Section 141.0(b)2C]* does not apply to replacement of electric *reheat* of equivalent or lower capacity electric resistance space heaters, when natural gas is not available.

Exception 3 to Section 401.5.2.2.1: Section 401.3.15 *[Section 140.4(n)]* is not applicable to newly installed or replacement space conditioning systems with existing operable wall or *roof* openings without interlock controls.

Exception 4 to Section 401.5.2.2.1: A new or replacement gas hot water *boiler system* with a total system input of at least 1 MMBtu/h but no more than 10 MMBtu/h need not comply with the requirements of Section 401.3.13.8 *[Section 140.4(k)8]*.

Exception 5 to Section 401.5.2.2.1: Requirements for the use of *ASHRAE Guideline 36* in Sections 401.3.5.2, 401.3.6.2, 401.3.7.1, 401.3.8, and 401.3.20 *[Sections 140.4(c)2Bii, 140.4(d)2Av, 140.4(e)2D, 140.4(f)3, and 140.4(r)]* shall not apply to new or replacement components unless the *space-conditioning systems* are also new or replacements.

Exception 6 to Section 401.5.2.2.1: Section 401.3.7 *[Section 140.4(e)]* is not applicable to systems that meet both of the following:

1. The system is not a single package air-cooled commercial unitary *air conditioner* or *heat pump*; and
2. The cooling capacity of the system is less than 54,000 Btu/h.

Exception 7 to Section 401.5.2.2.1: Where an existing system with electric *reheat* is expanded when adding variable air volume (*VAV*) boxes to serve an *alteration*, total electric *reheat capacity* may be expanded not to exceed 20 percent of the existing installed electric capacity in any one permit and the system need not comply with Section 401.3.9 *[Section 140.4(g)]*. Additional electric *reheat capacity* in excess of 20 percent may be added subject to the requirements of the Section 401.3.9 *[Section 140.4(g)]*.

401.5.2.2.1.1- Additional Fan Power Allowances are available when determining the Fan Power Budget (Fan kWbudget) as specified in Table 401.5-~~A~~(1) *[Table 141.0-D]*. These values can be added to the Fan Power Allowance values in Table 401.3-~~A~~(1) *[Table 140.4-A]* and Table 401.3-~~B~~(2) *[Table 140.4-B]*.

TABLE 401.5-A(1) [TABLE 141.0-D]: ADDITIONAL FAN POWER ALLOWANCES (WATTS/ CFM)

AIRFLOW	MULTI-ZONE VAV SYSTEMS[a1] ≤5,000 CFM	MULTI-ZONE VAV SYSTEMS[a1] >5,000 AND ≤10,000 CFM	MULTI-ZONE VAV SYSTEMS[a1] >10,000 CFM	ALL OTHER FAN SYSTEMS ≤5,000 CFM	ALL OTHER FAN SYSTEMS >5,000 AND ≤10,000 CFM	ALL OTHER FAN SYSTEMS >10,000 CFM
Supply *Fan System* Additional Allowance	0.135	0.114	0.105	0.139	0.12	0.107
Supply *Fan System* Additional Allowance In Unit with Adapter Curb	0.033	0.033	0.043	0.000	0.000	0.000
Exhaust/ Relief/ Return/ *Transfer Fan System* Additional Allowance	0.07	0.061	0.054	0.07	0.062	0.055
Exhaust/ Relief/ Return/ *Transfer Fan System* Additional Allowance In Unit with Adapter Curb	0.016	0.017	0.022	0.000	0.000	0.000

Footnotes to Table 401.5(1) *[Table 141.0-D]*:

a. See *FAN SYSTEM, MULTI-ZONE VARIABLE AIR VOLUME (VAV)* in definitions for "Multi-zone" to be classified as a multi-zone *VAV* system

~~Footnotes to Table 401.5-A *[Table 141.0-D]*:~~

~~1. See *FAN SYSTEM, MULTI-ZONE VARIABLE AIR VOLUME (VAV)* in definitions for "Multi-zone" to be classified as a multi-zone VAV system.~~

401.5.2.2.1.2- New or replacement single zone packaged rooftop ~~systems~~ units with direct expansion cooling ~~with~~ shall comply with Item 1 ~~or~~, Item 2, or Item 3, as applicable:

1. ~~1. rated~~ Rated cooling capacity less than 65,000 Btu/hr: The unit shall meet the applicable requirements specified in Table 401.5 ~~B~~(2) *[Table 141.0-E-1]*.

   Air conditioners with furnaces or dual fuel *heat pumps* complying with Table 401.5(2) *[Table 141.0-E-1]* using variable speed fan and controls shall be designed to vary the indoor fan air-flow rate as a function of the load and shall have a minimum of two stages of fan control. The minimum speed at stage 1 shall be set for ventilation only mode and shall be the greater of 50 percent or the minimum fan speed required to meet the minimum ventilation airflow rate. The indoor fan shall draw not more than 30 percent of the fan power at full fan speed when operating at 50 percent speed.

2. ~~2.~~ Rated cooling capacity greater than or equal to 65,000 Btu/h and less than 240,000 Btu/h in *nonresidential buildings* other than *Group R occupancies*: The unit shall meet the applicable requirements specified in Table 401.5(3) *[New Table]*.

3. ~~or shall meet the performance compliance requirements of~~ Shall demonstrate compliance using the performance approach of Section 401.5.2.3 *[Section 141.0(b)3]*.

Exception 1 to Section 401.5.2.2.1.2: ~~This requirement~~ Item 1 is not applicable if the *alteration* exceeds the existing main *service* panel or *service* transformer capacity. An electrical load calculation shall be submitted by a registered professional engineer in accordance with Article 220 of the California Electrical Code.

Exception 2 to Section 401.5.2.2.1.2: Item 2 is not applicable if the *alteration* requires an increase to the existing main *service* panel or *service* transformer capacity.

An electrical load calculation, prepared by a licensed electrical contractor in accordance with Article 220 of the California Electrical Code, shall be submitted to the *enforcement agency* with the permit application.

TABLE 401.5~~-B~~(2) [TABLE 141.0-E-1] – NEW OR REPLACEMENT SINGLE ZONE AIR CONDITIONER OR HEAT PUMP REQUIREMENT (RATED CAPACITY NOT EXCEEDING 65,000 BTU/H)

~~BUILDING TYPE~~USE DESIGNATION	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Retail and grocery	NR	NR	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	NR	*SZHP* or SZAC1	NR
School	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	NR
Office, financial institution	NR	NR	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	NR	*SZHP* or SZAC1	NR
Library	*SZHP* or SZAC1	NR	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	*SZHP* or SZAC1	NR

Footnotes to Table 401.5(2) *[Table 141.0-E-1]*:

a. *SZHP* = Single Zone *Heat Pump* + Economizer in accordance with Section 401.3.7 *[Section 140.4(e)]*

b. SZAC1 = Single Zone *Air Conditioner* with furnace + Variable Speed Fan + Economizer in accordance with Section 401.3.7 *[Section 140.4(e)]*, or Dual Fuel *Heat Pump* + Variable Speed Fan + Economizer in accordance with Section 401.3.7 *[Section 140.4(e)]*

c. NR = No Requirement

~~Footnotes to Table 401.5-B *[Table 141.0-E-1]*:~~

~~1. SZHP = Single Zone *Heat Pump* + Economizer in accordance with Section 401.3.7 *[Section 140.4(e)]*~~

~~2. SZAC1 = Single Zone *Air Conditioner* with furnace + Variable Speed Fan + Economizer in accordance with Section 401.3.7 *[Section 140.4(e)]*, or Dual Fuel *Heat Pump* + Variable Speed Fan + Economizer in accordance with Section 401.3.7 *[Section 140.4(e)]*~~

~~3. NR = No Requirement~~

~~*Air conditioners* with furnaces or dual fuel *heat pumps* complying with Table 401.5-B(2) *[Table 141.0-E-1]* using variable speed fan and controls shall be designed to vary the indoor fan air-flow rate as a function of the load and shall have a minimum of two stages of fan control. The minimum speed at stage 1 shall be set for ventilation only mode and shall be the greater of 50 percent or the minimum fan speed required to meet the minimum ventilation airflow rate. The indoor fan shall draw not more than 30 percent of the fan power at full fan speed when operating at 50 percent speed.~~

TABLE 401.5(3) [TABLE 141.0-E-1] – NEW OR REPLACEMENT SINGLE ZONE AIR CONDITIONER OR HEAT PUMP REQUIREMENT-FOR BUILDINGS CONSTRUCTED BEFORE 2006 (RATED CAPACITY EXCEEDING 65,000 BTU/H AND NOT EXCEEDING 240,000 BTU/H)

USE DESIGNATION	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Restaurant	NR	NR	NR	NR	NR	SZVAVHP or SZVAVAC1	NR ~~SZVAVHP or SZVAVAC1~~	SZVAVHP or SZVAVAC1	SZVAVHP or SZVAVAC1	SZVAVHP or SZVAVAC1	NR	NR	SZVAVHP or SZVAVAC1	NR	NR	SZVAVDFHP or SZVAVAC1
Retail	NR	NR	NR	SZVAVHP or SZVAVAC1	NR	NR	NR	NR	SZVAVHP or SZVAVAC1	SZVAVHP or SZVAVAC1	NR	NR	SZVAVHP or SZVAVAC1	SZVAVHP or SZVAVAC1	NR	SZVAVDFHP or SZVAVAC1
Library	NR	NR	NR	NR	NR	SZVAVHP or SZVAVAC1	SZVAVHP or SZVAVAC1	SZVAVHP or SZVAVAC1	NR	NR	NR	NR	NR	NR	NR	NR

Footnotes to Table 401.5(3) *[Table 141.0-E-1]*:

a. SZVAVHP = Single Zone Variable Air Volume *Heat Pump* + Economizer in accordance with Section 401.3.7 *[Section 140.4(e)]*

b. SZVAVAC1 = Single-zone Variable Air Volume *air conditioner* with economizer, heat recovery (*ERR* = 85%), three-stage DX cooling coil, two-stage gas heating coil, no-load fan speed reduced to 25%, and fan power reduced by 15% in addition to not taking the extra fan power allowance permitted under Table 401.5(1) *[Table 141.0-D]*.

~~c.~~ NR = No Requirement

d.

401.5.2.2.1.3 *[New Section]* **Existing Building Commissioning (EBCx)**

Existing building commissioning (EBCx) shall be performed as specified in Section 1001.5.2.1.1, when a new or replacement *space-conditioning* system meets any of the following criteria:

1. A new or replacement air-handling system with a design heating or cooling capacity of 150 kBtu/h or greater;
2. A new or replacement chiller in a plant with a design cooling capacity of 300 kBtu/h or greater; or
3. A new or replacement boiler in a plant with a design heating capacity of 300 kBtu/h or greater.

Exception ~~1~~ to 401.5.2.2.1.3: *Group R Occupancies.*

401.5.2.2.2 *[Section 141.0(b)2E]* **Altered Space-Conditioning Systems.**

Space-conditioning systems altered by the installation or replacement of *space-conditioning system equipment* (including replacement of the *air handler*, outdoor condensing unit of a *split system air conditioner* or *heat pump*, or cooling or heating coil) shall meet the requirements below:

401.5.2.2.2.1 *[Section 141.0(b)2Ei]* **Demand responsive thermostat.**

1. For all altered units where the existing *thermostat* does not comply with the requirements for *demand responsive controls* specified in Section 400.6 *[Section 110.12]*, the existing *thermostat* shall be replaced with a demand responsive *thermostat* that complies with Section 400.6 [*Section 110.12*].
2. All newly installed *space-conditioning systems* requiring a *thermostat* shall be equipped with a demand responsive *thermostat* that complies with Section 400.6 *[Section 110.12]*.

401.5.2.2.2.2 *[Section 141.0(b)2Eii]* **Duct sealing.**

The *duct system* that is connected to the new or replaced *space-conditioning system equipment* shall be sealed in accordance with Section 401.5.2.2.4 *[Section 141.0(b)2Dii]*.

Exception 1 to Section 401.5.2.2.2.2: *Buildings* altered so that the *duct system* no longer meets the criteria of Section 401.5.2.2.4 *[Section 141.0(b)2Dii]*.

Exception 2 to Section 401.5.2.2.2.2: *Duct systems* that are documented to have been previously sealed as confirmed through field verification and diagnostic testing in accordance with procedures in the Reference Nonresidential Appendix NA2.

Exception 3 to Section 401.5.2.2.2.2: Existing *duct systems* constructed, insulated, or sealed with asbestos are not required to be sealed in accordance with Section 401.5.2.2.4.

401.5.2.2.2.3 *[New Section]* **Existing Building Commissioning.**

Existing building commissioning (EBCx) shall be performed as specified ~~by~~in Section 1001.5.2.1.1 when an altered *space-conditioning system* meets any of the following criteria:

1. An altered air-handling system with a design heating or cooling capacity of 150 kBtu/h or greater;
2. An altered chiller in a plant with a design cooling capacity of 300 kBtu/h or greater; or
3. An altered boiler in a plant with a design heating capacity of 300 kBtu/h or greater.

Exception 1 to 401.5.2.2.2.3: *Group R Occupancies.*

401.5.2.2.3 *[Section 141.0(b)2Di]* **New or replacement duct systems.**

Entirely new or complete replacement *duct systems* installed as part of an *alteration* shall meet the requirements of Sections 401.2.4.1 through 401.2.4.6 *[Section 120.4(a) through (f)]* and shall be leakage tested in accordance with Section 401.2.4.7 *[Section 120.4(g)]*.

This applies to replacement *duct systems* installed as part of an *alteration* that are constructed of at least 75 percent new duct material. Up to 25 percent of that *alteration* may consist of reused parts from the *building*'s existing *duct system*, including registers, grilles, boots, *air handlers*, coils, plenums, and ducts, if the reused parts are *accessible* and can be sealed to prevent leakage.

401.5.2.2.4 *[Section 141.0(b)2Dii]* **Extension of existing duct systems.**

New or replacement *space-conditioning system* ducts installed to serve an existing *building* shall meet the requirements of Sections 401.2.4.1 through 401.2.4.6 *[Section 120.4(a) through (f)]* and if the new ducts are an extension of an existing *duct system* and the combined new and existing *duct system* meets the criteria below, the *duct system* shall be sealed to a leakage rate not to exceed 15 percent of the nominal *air handler* airflow rate as confirmed through acceptance testing, in accordance with the applicable procedures in Reference Nonresidential Appendix NA7.5.3:

1. The *duct system* does not serve a *healthcare facility*;
2. The *duct system* provides conditioned air to an *occupiable space* for a constant volume, single zone, *space-conditioning system*;
3. The space conditioning system serves less than 5,000 square feet of *conditioned floor area*; and
4. The combined surface area of the ducts located outdoors or in *unconditioned space* is more than 25 percent of the total surface area of the entire *duct system*.

Exception 1 to Section 401.5.2.2.4: When it is not possible to achieve the duct leakage criterion in Section 401.5.2.2.4 *[Section 141.0(b)2Dii]*, then all *accessible* leaks shall be sealed and verified through a visual inspection and a smoke test

performed by a certified mechanical acceptance test technician utilizing the methods specified in Reference Nonresidential Appendix NA7.5.3.

Exception 2 to Section 401.5.2.2.4: Existing *duct systems* that are extended, which are constructed, insulated or sealed with asbestos are not required to be sealed in accordance with Section 401.5.2.2.4 *[Section 141.0(b)2Dii]*.

401.5.2.2.5 *[Section 141.0(b)2Diii]* **New ducts leakage testing.**

If new ducts installed as part of an *alteration* are not required to comply with leakage testing specified by Section 401.5.2.2.3 *[Section 141.0(b)2Di]* or Section 401.5.2.2.4 *[Section 141.0(b)2Dii]*, then the new ducts shall meet the duct leakage testing requirements of *CMC* Section 603.9.2.

Exception to Section 401.5.2.2: *Alterations* to *healthcare facilities*.

401.5.2.3 *[Section 141.0(b)3]* **Performance requirements (Alterations).**

The altered space–conditioning system components, and any newly installed *equipment* serving the *alteration*, shall meet the applicable requirements of Section 102.

Exception to Section 401.5.2.3: *Alterations* to *healthcare facilities*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code;* Section 18930*, Health and Safety Code*.

SECTION 402

SINGLE-FAMILY RESIDENTIAL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

402.1 *[Section 150.0]* **General.**

Single-family *use designation* ~~*residential building*~~ mechanical systems and *equipment* shall comply with the applicable requirements of Section 402.

NOTE: The requirements of Sections 402.2 through 402.4 apply to *newly constructed buildings*. Sections 402.2 and 402.5 apply to *additions* or *alterations*.

402.2 *[Section 150.0]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

402.2.1 *[Section 150.0(e)]* **Installation of fireplaces, decorative gas appliances and gas logs.**

If a masonry or factory-built *fireplace* is installed, it shall comply with Section 101.4 *[Section 110.5]*, Section 4.503 of Part 11, and shall have the following:

402.2.1.1- Closable metal or glass *doors* covering the entire opening of the firebox; and

402.2.1.2- A combustion air intake to draw air from the outside of the *building*, which is at least 6 square inches in area and is equipped with a *readily accessible*, operable and tight-fitting damper or combustion-air control device; and

Exception to Section 402.2.1.2: An outside combustion-air intake is not required if the *fireplace* will be installed over concrete slab flooring and the *fireplace* will not be located on an *exterior wall*.

402.2.1.3- A flue damper with a *readily accessible* control.

Exception to Section 402.2.1.3: When a *gas log*, log lighter or *decorative gas appliance* is installed in a *fireplace*, the flue damper shall be blocked open if required by the *CMC* or the manufacturer's installation instructions.

402.2.2 *[Section 150.0(h)]* **Space-conditioning equipment.**

402.2.2.1 *[Section 150.0(h)1]* **Building cooling and heating loads.**

Building heating and cooling loads shall be determined using a method based on any one of the following:

1. The *ASHRAE* Handbook, Equipment Volume, Applications Volume and Fundamentals Volume; or
2. The *SMACNA Residential Comfort System Installation Standards Manual*; or
3. The *ACCA Manual J*.

402.2.2.2 *[Section 150.0(h)2]* **Design conditions.**

Design conditions shall be determined in accordance with the following:

1. For the purpose of sizing the space- conditioning (HVAC) system, the indoor design temperatures shall be 68°F for heating and 75°F for cooling.
2. Outdoor *design conditions* shall be selected from one of the following:
   2.1. Reference Joint Appendix JA2, which is based on data from the *ASHRAE Climatic Data for Region X*; or
   2.2. The *ASHRAE Handbook, Fundamentals Volume*; or
   2.3. The *ACCA Manual J*.
3. The outdoor design temperatures for heating shall be no lower than the 99.0 percent Heating Dry--Bulb or the Heating Winter Median of Extremes values.
4. The outdoor design temperatures for cooling shall be no greater than the 1.0 percent Cooling Dry--Bulb and Mean Coincident Wet--Bulb values.

402.2.2.3 *[Section 150.0(h)3]* **Outdoor condensing units.**

Installed *air conditioner* and *heat pump* outdoor condensing units shall have a clearance of at least five (5) feet (1.5 meters) from the outlet of any dryer vent.

Installed *air conditioner* and *heat pump* systems shall be equipped with liquid line filter driers if required, as specified by manufacturer's instructions.

402.2.2.4 *[Section 150.0(h)4]* **Central forced-air heating furnaces.**

Central forced-air heating furnace installations shall be configured to operate in conformance with the furnace manufacturer's maximum inlet-to-outlet temperature rise specifications.

402.2.2.5 *[Section 150.0(h)5]* **System selection.**

Equipment sizing and selection shall meet the cooling and heating loads of Sections 402.2.2.1 and 402.2.2.2 *[Section 150.0(h)1 and 2]*.

Systems shall be sized based on *ACCA Manual* S-*2023* in accordance with these requirements:

1. **Cooling Capacity.** There is no limit on the minimum capacity.
2. **Furnaces.** Heating capacity shall be sized based on *ACCA Manual* S-*2023*, Table N2.5.
3. ***Heat Pump* Heating Capacity.** Heating systems are required to have a heating capacity meeting the minimum requirements of the *CBC* not including any supplementary heating. There is no limit on the maximum heating capacity.

402.2.2.6 *[Section 150.0(h)6]* **Defrost.**

If a *heat pump* is equipped with an installer-adjustable defrost delay timer, the delay timer shall be set to greater than or equal to 90 minutes.

The installer shall certify on the Certificate of Installation (CF2R) that the control configuration has been tested in accordance with the testing procedure in the CF2R.

Exception 1 to Section 402.2.2.6. *Dwelling units* in *Climate Zones* 6 and 7.

Exception 2 to Section 402.2.2.6. *Dwelling units* with a *conditioned floor area* of 500 square feet or less in *Climate Zones* 3, 5 through 10, and 15.

402.2.2.7 *[Section 150.0(h)7]* **Supplementary heating control configuration.**

Heat pumps with supplementary heat, including, but not limited to, electric resistance heaters or gas furnace supplementary heating, shall comply with the following requirements:

1. Lock out supplementary heating above an *outdoor air* temperature of no greater than 35°F. There are additional *thermostat* requirements in Section 402.2.4.2 *[Section 150.0(i)2]*.
2. The installer shall certify on the Certificate of Installation that the control configuration has been tested in accordance with the testing procedure found in the CF2R.
3. The controls may allow supplementary heater operation above 35°F only during defrost; or when the user selects emergency operation.

Exception 1 to Section 402.2.2.7: For *buildings* with a *conditioned floor area* less than 500 square feet, and for *buildings* of any size in *climate zones* 7 and 15, *heat pumps* with supplementary heaters shall have controls that meet either option below:

1. **Option A:** That prevent supplementary heater operation when the heating load can be met by the *heat pump* alone; and

   In which the cut-on temperature for *heat pump* heating is higher than the cut-on temperature for supplementary heating, and the cut-off temperature for *heat pump* heating is higher than the cut-off temperature for supplementary heating.
2. **Option B:** The controls may allow supplementary heater operation during defrost mode and *transient* periods, such as start-ups and following a room *thermostat* setpoint advance, if the controls prevent the unnecessary operation of supplementary heating.

Exception 2 to Section 402.2.2.7: Room air-conditioner *heat pumps*.

402.2.2.8 *[Section 150.0(h)8]* **Sizing of electric resistance supplementary heat.**

Where *heat pumps* have electric resistance heat, the capacity of electric resistance heat shall not exceed the *heat pump* nominal cooling capacity (at 95°F ambient conditions) multiplied by 2.7 kW per ton, rounded up to the closest kW.

402.2.2.9 *[Section 150.0(h)9]* **Capacity variation with third-party thermostats.**

Variable or multi-speed systems shall comply with the following requirements:

1. The space conditioning system and *thermostat* together shall be capable of responding to heating and cooling loads by modulating system compressor speed, and meet *thermostat* requirements in Section 402.2.4.2 *[Section 150.0(i)2]*.
2. The installer shall certify on the Certificate of Installation that the control configuration has been tested in accordance with the testing procedure found in the CF2R.

402.2.3 *[Section 150.0(t)]* **Heat pump space heater ready.**

Systems using gas or propane furnaces to serve individual *dwelling units* shall meet *heat pump* space heater ready requirements in Section 602.2.2.2.

402.2.4 *[Section 150.0(i)]* **Thermostats.**

402.2.4.1 *[Section 150.0(i)1]* **Setback thermostats.**

All heating or cooling systems, including *heat pumps*, not controlled by a central *energy management control system (EMCS)* shall have a setback *thermostat*, as specified in Section 400.5.3 *[Section 110.2(c)]*.

402.2.4.2 *[Section 150.0(i)2]* **Thermostats that are applied to heat pumps with supplemental heating.**

In addition to the requirements in Section 402.2.4.1 *[Section 150.0(i)1]*, *thermostats* controlling *heat pumps* with electric resistance supplementary heat or gas furnace supplementary heat shall comply with the requirements of 402.2.4.2.1 through 402.2.4.2.4.

Exception 1 to Section 402.2.4.2: Systems compliant with Exception 1 to Section 402.2.2.7 *[Section 150.0(h)7]*.

Exception 2 to Section 402.2.4.2: Room air-conditioner *heat pumps*.

402.2.4.2.1- *Outdoor Air* Temperature. The *thermostat* shall receive *outdoor air* temperature from an *outdoor air* temperature sensor or from an internet weather service. The *thermostat* shall display the *outdoor air* temperature.

As described in Section 402.2.2.7 *[Section 150.0(h)7]*, the *thermostat* and *heat pump* shall lock out supplementary heat when the *outdoor air* temperature is above 35°F.

Exception to Section 402.2.4.2.1: Where supplementary heat is locked out above 35°F by another control device in accordance with Section 402.2.2.7 *[Section 150.0(h)7]*.

402.2.4.2.2- Supplementary Heat Indicator. The *thermostat* shall have an indicator to notify when supplementary heat or emergency heat is in use.

402.2.4.2.3- Supplementary Heat Operation. During defrost or when the user selects emergency heating, supplementary heat operation is permitted above 35°F.

402.2.4.2.4- Installer Certification. The installer shall certify on the Certificate of Installation that the system has been tested in accordance with the testing procedure found in the CF2R.

402.2.5 *[Section 150.0(j)]* **Insulation for piping and tanks.**

402.2.5.1 *[Section 150.0(j)1]* **Space-conditioning system line insulation thickness and conductivity.**

Piping for *space-conditioning systems* and distribution piping for steam and hydronic heating system shall be insulated to meet the requirements of Section 401.2.3.1 *[Section 120.3(a)]*.

Exception 1 to Section 402.2.5.1: Factory-installed piping within space-conditioning *equipment* certified under Section 101.3 *[Section 110.1]* or Section 400.2 *[Section 110.2]*.

Exception 2 to Section 402.2.5.1: Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration. Piping that penetrates metal framing shall use grommets, plugs, wrapping or other insulating material to assure that no contact is made with the metal framing. Insulation shall butt securely against all framing members.

Exception 3 to Section 402.2.5.1: Piping installed in interior or *exterior walls* shall not be required to have pipe insulation if all of the requirements are met for compliance with (QII) as specified in the Reference Residential Appendix RA3.5.

Exception 4 to Section 402.2.5.1: Piping surrounded with a minimum of 1 inch of wall insulation, 2 inches of crawlspace insulation, or 4 inches of *attic* insulation shall not be required to have pipe insulation.

402.2.5.2 *[Section 150.0(j)2]* **Insulation protection.**

Pipe insulation shall meet the insulation protection requirements of Section 401.2.3.2 *[Section 120.3(b)]*.

402.2.6 *[Section 150.0(m)]* **Air-distribution and ventilation system ducts, plenums, and fans.**

402.2.6.1 *[Section 150.0(m)1]* **CMC compliance.**

1. All air-distribution system ducts and plenums, including but not limited to, mechanical closets and air-handler boxes, shall meet the requirements of the *CMC* Sections 601.0, 602.0, 603.0, 604.0, 605.0 and *ANSI*/*SMACNA*-006-2006 HVAC Duct Construction Standards Metal and Flexible, 3rd Edition, incorporated herein by reference.
2. Connections of metal ducts and the inner core of flexible ducts shall be mechanically fastened.
3. Openings shall be sealed with mastic, tape or other duct-closure system that meets the applicable requirements of *UL 181*, *UL181A* or *UL 181B* or aerosol sealant that meets the requirements of *UL 723*. If mastic or tape is used to seal openings greater than 1/4 inch, the combination of mastic and either mesh or tape shall be used.
4. *Building* cavities, support platforms for *air handlers* and plenums designed or constructed with materials other than sealed sheet metal, duct board or flexible duct shall not be used for conveying conditioned air. *Building* cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms shall not be compressed to cause reductions in the cross-sectional area of the ducts.
5. Portions of supply-air and return-air ducts and plenums of a space heating or cooling system shall be insulated in accordance with either 402.2.6.1.1 or 402.2.6.1.2.

Exception to Section 402.2.6.1: Ducts and fans integral to a *wood heater* or *fireplace*.

402.2.6.1.1- Ducts in conditioned space. Ducts do not require insulation when the *duct system* is located entirely within *conditioned space*, as confirmed through field verification and diagnostic testing in accordance with the requirements of Reference Residential Appendix RA3.1.4.3.8. For *dwelling units* with *attics*, the *duct system* shall be located below the ceiling separating the *occupiable space* from the *attic*, or

402.2.6.1.2- Minimum insulation. Ducts shall have a minimum installed level of R-6.0.

Exception 1 to Section 402.2.6.1.2: Portions of the *duct system* located in *conditioned space* below the ceiling separating the *occupiable space* from the *attic* are not required to be insulated if all of the following conditions are met:

1. The noninsulated portion of the *duct system* is located entirely inside the *building*'*s* thermal *envelope* as confirmed by visual inspection.
2. At all locations where noninsulated portions of the *duct system* penetrate into *unconditioned space*, the penetration shall be draft stopped compliant with *CFC* Sections 703.1 and 704.1 and air-sealed to the construction materials that are penetrated, using materials compliant with *CMC* Section E502.4.2 to prevent air *infiltration* into the cavity. All connections in *unconditioned space* are insulated to a minimum of R-6.0 as confirmed by visual inspection.

Exception 2 to Section 402.2.6.1.2: Ducts located in an unvented *attic* shall have a minimum insulation value of R-4.2, verified by visual inspection when:

1. The *attic* has at least R-30 insulation between the *roof* rafters in contact with the *roof* deck,
2. The gable ends meet the wall insulation requirements of Section 302.3.1.2 *[Section 150.1(c)1B]*, and
3. The *dwelling unit* achieves a whole *building* leakage rate of 3.0 ACH50 or less, as confirmed by field verification and diagnostic testing in accordance with Reference Residential Appendix RA3.8.

402.2.6.2 *[Section 150.0(m)2]* **Factory-fabricated duct systems.**

1. All factory-fabricated *duct systems* shall comply with *UL 181* for ducts and closure systems, including collars, connections and splices, and be labeled as complying with *UL 181*. *UL 181* testing may be performed by *UL* laboratories, or a *laboratory* approved by the *Executive Director*.
2. **Tapes and mastics in rigid fiberglass ducts.** All pressure-sensitive tapes, heat-activated tapes, and mastics used in the manufacture of rigid fiberglass ducts shall comply with *UL 181* and *UL 181A*.
3. **Tapes and mastics in flexible ducts.** All pressure-sensitive tapes and mastics used with flexible ducts shall comply with *UL 181* and *UL 181B*.
4. **Cloth-back rubber adhesive duct tapes.** Joints and seams of *duct systems* and their components shall not be sealed with cloth-back rubber adhesive duct tapes unless such tape is used in combination with mastic and drawbands.

402.2.6.3 *[Section 150.0(m)3]* **Field-fabricated duct systems.**

1. Factory-made rigid fiberglass and flexible ducts for *field-fabricated duct systems* shall comply with *UL 181*. All pressure-sensitive tapes, mastics, aerosol sealants or other closure systems used for installing *field-fabricated duct systems* shall meet the applicable requirements of *UL 181*, *UL 181A* and *UL 181B*.
2. **Mastic sealants and mesh.** Sealants shall comply with the applicable requirements of *UL 181*, *UL 181A* and *UL 181B*, and be nontoxic and water resistant.

   Sealants for interior applications shall be tested in accordance with *ASTM C731* and *D2202* incorporated herein by reference.

Sealants for exterior applications shall be tested in accordance with *ASTM C731*, *C732* and *D2202*, incorporated herein by reference.

Sealants and meshes shall be rated for exterior use.

3. **Pressure-sensitive tape.** Pressure-sensitive tapes shall comply with the applicable requirements of *UL 181*, *UL 181A* and *UL 181B*.
4. **Cloth-back rubber adhesive duct tapes.** Joints and seams of *duct systems* and their components shall not be sealed with cloth-back rubber adhesive duct tapes unless such tape is used in combination with mastic and drawbands.
5. **Drawbands used with flexible duct.** Drawbands shall be either stainless-steel worm-drive hose clamps or UV-resistant nylon duct ties.

   Drawbands shall have a minimum tensile strength rating of 150 pounds.

   Drawbands shall be tightened as recommended by the manufacturer with an adjustable tensioning tool.
6. **Aerosol-sealant closures.** Aerosol sealants shall meet the requirements of *UL 723* and be applied according to manufacturer specifications. Tapes or mastics used in combination with aerosol sealing shall meet the requirements of this section.

402.2.6.4 *[Section 150.0(m)4]* **Duct insulation R-value ratings.**

All duct insulation product *R-values* shall be based on insulation only (excluding air films, vapor retarder or other duct components) and tested *C-values* at 75°F mean temperature at the installed thickness, in accordance with *ASTM C518* or *ASTM C177*, incorporated herein by reference, and certified pursuant to Section 400.4 *[Section 110.8].*

402.2.6.5 *[Section 150.0(m)5]* **Duct insulation thickness.**

The installed thickness of duct insulation used to determine its *R-value* shall be determined as follows:

402.2.6.5.1 *[Section 150.0(m)5A]* **Duct board, duct liner, factory-made rigid ducts.**

For duct board, duct liner and factory-made rigid ducts not normally subjected to compression, the nominal insulation thickness shall be used.

402.2.6.5.2 *[Section 150.0(m)5B]* **Duct wrap.**

For duct wrap, installed thickness shall be assumed to be 75 percent (25 percent compression) of nominal thickness.

402.2.6.5.3 *[Section 150.0(m)5C]* **Factory-made flexible air ducts.**

For factory-made flexible air ducts, the installed thickness shall be determined by dividing the difference between the actual outside diameter and nominal inside diameter by two.

402.2.6.6 *[Section 150.0(m)6]* **Duct labeling.**

Insulated flexible duct products installed to meet this requirement shall include labels, in maximum intervals of 3 feet, showing the thermal performance *R-value* for the duct insulation itself (excluding air films, vapor retarders or other duct components), based on the

tests in Section 402.2.6.4 *[Section 150.0(m)4]* and the installed thickness determined by Section 402.2.6.5.3 *[Section 150.0(m)5C]*.

402.2.6.7 *[Section 150.0(m)9]* **Protection of insulation.**

Insulation shall be protected from damage, including that due to sunlight, moisture, *equipment* maintenance and wind, but not limited to the following: Insulation exposed to weather shall be suitable for outdoor service, e.g., protected by aluminum, sheet metal, painted canvas or plastic cover. Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation that can cause degradation of the material.

402.2.6.8 *[Section 150.0(m)10]* **Porous inner core flex duct.**

Flexible ducts having porous inner cores shall have a non-porous layer or *air barrier* between the inner core and the outer vapor barrier.

402.2.6.9 *[Section 150.0(m)11]* **Duct system sealing and leakage testing.**

When *space-conditioning systems* utilize forced air *duct systems* to supply conditioned air to an *occupiable space*, the ducts shall be sealed as confirmed through field verification and diagnostic testing in accordance with all applicable procedures specified in Reference Residential Appendix RA3.1, and conforming to one of the following options as applicable. *Air handler* airflow for calculation of duct leakage rate compliance targets shall be determined according to methods specified in Reference Residential Appendix RA3.1.4.2.

1. For single-family *dwellings* and *townhouses* with the *air-handling unit* installed and the ducts connected directly to the *air handler*, the total leakage of the *duct system* shall not exceed 5 percent of the *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.1.
2. For single-family *dwellings* and *townhouses* at the rough-in stage of construction prior to installation of the *dwelling's* interior finishing:
    2.1. If the *air-handling unit* is installed and the ducts are connected directly to the *air handler*, the total leakage of the *duct system* shall not exceed 5 percent of the *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix Sections RA3.1.4.3.2, RA3.1.4.3.2.1 and RA3.1.4.3.3.
    2.2. If the *air-handling unit* is not yet installed, the total leakage of the *duct system* shall not exceed 4 percent of the *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix Sections RA3.1.4.3.2, RA3.1.4.3.2.2 and RA3.1.4.3.3.

402.2.6.10 *[Section 150.0(m)7]* **Backdraft dampers.**

All *fan systems*, regardless of volumetric capacity, that exchange air between the *building conditioned space* and the outside of the *building* shall be provided with backdraft or *automatic* dampers to prevent unintended air leakage through the *fan system* when the *fan system* is not operating.

402.2.6.11 *[Section 150.0(m)8]* **Gravity ventilation dampers.**

All gravity ventilating systems that serve *conditioned space* shall be provided with either *automatic* or *readily accessible*, manually operated dampers in all openings to the outside except combustion inlet and outlet air openings and elevator shaft vents.

402.2.6.12 *[Section 150.0(m)12]* **Air filtration.**

System types specified below shall be provided with *air filters* in accordance with Sections 402.2.6.12.1 through 402.2.6.12.3 *[Sections 150.0(m)12B, 150.0(m)12C, and 150.0(m)12D]*.

1. Mechanical *space-conditioning systems* that *supply air* to an *occupiable space* through ductwork exceeding 10 feet (3 m) in length. These system types shall also comply with Section 402.2.6.12.4 *[Section 150.0(m)12E]*.
2. Mechanical supply-only ventilation systems and *makeup air* systems that provide *outside air* to an *occupiable space*.
3. The supply side of mechanical *balanced ventilation systems*, including *heat recovery ventilation systems*, and *energy recovery ventilation systems* that provide *outside air* to an *occupiable space*.

Exception to Section 402.2.6.12: Evaporative coolers are not required to comply with the air filtration requirements in Section 402.2.6.12 *[Section 150.0(m)12]*.

402.2.6.12.1 *[Section 150.0(m)12B]* **System design and installation.**

402.2.6.12.1.1- Filter location. The system shall be designed to ensure that all recirculated air and all *outdoor air* supplied to the *occupiable space* is filtered before passing through any system's thermal conditioning components.

Exception 1 to Section 402.2.6.12.1.1: For heat recovery ventilators and energy recovery ventilators the location of the filters required by Section 402.2.6.12 *[Section 150.0(m)12]* may be downstream of a system thermal conditioning component, provided the system is equipped with ancillary filtration upstream of the system's thermal conditioning component.

402.2.6.12.1.2- Pressure drop. All systems shall be designed to accommodate the clean-filter pressure drop imposed by the system *air filter*(*s*). The design airflow rate and maximum allowable clean-filter pressure drop at the design airflow rate applicable to each *air filter* shall be determined and reported on labels according to the permanently affixed labeling requirements below.

Mechanical *space-conditioning systems* that *supply air* to an *occupiable space* through ductwork exceeding 10 feet (3 m) in length shall be equipped with *air filters* that meet either option below:

1. Nominal two-inch minimum depth filter(s) shall be sized by the system designer, or
2. Nominal one-inch minimum depth filter(s) shall be allowed if the filter(s) are sized according to Equation 402.2-A *[Equation 150.0-A]*, based on a maximum face velocity of 150 ft per minute, and according to the maximum allowable clean-filter pressure drop specified in Section 402.2.6.12.3 *[Section 150.0(m)12Dii]*.

$$A_{face} = Q_{filter}/V_{face} \qquad \text{(Equation 402.2-A } \textit{[Equation 150.0-A]}\text{)}$$

where:

A_{face} = *air filter* face area, the product of *air filter* nominal length x nominal width, ft^2.

Q_{filter} = design airflow rate for the *air filter*, ft^3/min.

V_{face} = *air filter* face velocity ≤ 150, ft/min.

402.2.6.12.1.3- Service accessibility. All system *air filters* shall be located and installed in such a manner as to be *accessible* for regular service by the system owner.

402.2.6.12.1.4- Permanently affixed labeling. All system *air filter* installation locations shall be labeled to disclose the applicable design airflow rate and the maximum allowable clean-filter pressure drop. The labels shall be permanently affixed to the *air filter* installation location, readily legible, and visible to a person replacing the *air filter*.

402.2.6.12.1.5- Air bypass prevention. Filter racks or grilles shall use gaskets, sealing or other means to close gaps around inserted filters to and prevent air from bypassing the filter.

402.2.6.12.2 *[Section 150.0(m)12C]* **Air filter efficiency.**

The system shall be provided with *air filter*(*s*) having a designated efficiency equal to or greater than *MERV* 13 when tested in accordance with *ASHRAE Standard 52.2*, or a *particle size efficiency* rating equal to or greater than 50 percent in the 0.30-1.0 µm range, and equal to or greater than 85 percent in the 1.0-3.0 µm range when tested in accordance with *AHRI* Standard 680.

402.2.6.12.3 *[Section 150.0(m)12D]* **Air filter pressure drop.**

All system shall be provided with air-filter(s) that conforms to the applicable maximum allowable clean-filter pressure drop specified in one of the options below, when tested using *ASHRAE Standard 52.2*, or as rated using *AHRI* Standard 680, for the applicable design airflow rate(s) for the system *air filter*(s).

1. The maximum allowable clean-filter pressure drop shall be determined by the system design for the nominal two-inch minimum depth *air filter* required by Section 402.2.6.12.1 *[Section 150.0(m)12Biia]*, or
2. A maximum of 25 PA (0.1 inches water) clean-filter pressure drop shall be allowed for a nominal one-inch depth *air filter* sized according to Section 402.2.6.12.1 *[Section 150.0(m)12Biib]*, or
3. For mechanical supply-only ventilation systems and *makeup air* systems, or for the supply side of mechanical *balanced ventilation systems*, including *heat recovery ventilation systems*, and *energy recovery ventilation systems*, that provide *outside air* to an *occupiable space*, the maximum allowable clean filter pressure drop shall be determined by the system design.
4. If Exception 1 to Sections 402.2.6.13.2 or 402.2.6.13.4 *[Section 150.0(m)13B or D]* is utilized for compliance with cooling system airflow rate and fan efficacy requirements, the clean-filter pressure drop for the system *air filter* shall conform to the

requirements given in Table 402.2~~-A~~(1) *[Table 150.0-B]* or Table 402.2~~-B~~(2) *[Table 150.0-C]*.

TABLE 402.2~~-A~~(1) [TABLE 150.0-B]: RETURN DUCT SIZING FOR SINGLE RETURN DUCT SYSTEMS

~~1. Return duct length shall not exceed 30 feet and shall contain no more than 180 degrees of bend. If the total bending exceeds 90 degrees, one bend shall be a metal elbow.~~

~~2. Return grille devices shall be labeled in accordance with the permanently affixed labeling requirements in Section 402.2.6.12.1.4 *[Section 150.0(m)12Biv]* to disclose the grille's design airflow rate and a maximum allowable clean-filter pressure drop of 25 Pa (0.1 inches water) for the *air filter* when tested using *ASHRAE Standard 52.2*, or as rated in accordance with *AHRI* Standard 680 for the design airflow rate for the return grille.~~

SYSTEM NOMINAL COOLING CAPACITY (TON)[a]~~*~~	RETURN DUCT MINIMUM NOMINAL DIAMETER (INCH)	MINIMUM TOTAL RETURN FILTER GRILLE NOMINAL AREA (SQUARE INCHES)
1.5	16	500
2.0	18	600
2.5	20	800

Footnotes for Table 402.2(1):

a. Not applicable to systems with nominal cooling capacity greater than 2.5 tons or less than 1.5 ton.

b. Return duct length shall not exceed 30 feet and shall contain no more than 180 degrees of bend. If the total bending exceeds 90 degrees, one bend shall be a metal elbow.

c. Return grille devices shall be labeled in accordance with the permanently affixed labeling requirements in Section 402.2.6.12.1.4 *[Section 150.0(m)12Biv]* to disclose the grille's design airflow rate and a maximum allowable clean-filter pressure drop of 25 Pa (0.1 inches water) for the *air filter* when tested using *ASHRAE Standard 52.2*, or as rated in accordance with *AHRI* Standard 680 for the design airflow rate for the return grille.~~*Not applicable to systems with nominal cooling capacity greater than 2.5 tons or less than 1.5 ton.~~

~~*Not applicable to systems with nominal cooling capacity greater than 2.5 tons or less than 1.5 ton.~~

TABLE 402.2-~~B~~(2) [TABLE 150.0-C]: RETURN DUCT SIZING FOR MULTIPLE RETURN DUCT SYSTEMS

~~1. Each return duct length shall not exceed 30 feet and shall contain no more than 180 degrees of bend. If the total bending exceeds 90 degrees,°, one bend shall be a metal elbow.~~

~~2. Return grille devices shall be labeled in accordance with the permanently affixed labeling requirements in Section 402.2.6.12.1.4 *[Section 150.0(m)12Biv]* to disclose the grille's design airflow rate and a maximum allowable clean-filter pressure drop of 25 Pa (0.1 inches water) for the *air filter* when tested using *ASHRAE Standard 52.2*, or as rated in accordance with *AHRI* Standard 680 for the design airflow rate for the return grille.~~

SYSTEM NOMINAL COOLING CAPACITY (TON)~~*~~[a]	RETURN DUCT 1 MINIMUM NOMINAL DIAMETER (INCH)	RETURN DUCT 2 MINIMUM NOMINAL DIAMETER (INCH)	MINIMUM TOTAL RETURN FILTER GRILLE NOMINAL AREA (SQUARE INCHES)
1.5	12	10	500
2.0	14	12	600
2.5	14	14	800
3.0	16	14	900
3.5	16	16	1000
4.0	18	18	1200
5.0	20	20	1500

Footnotes for Table 402.2(1):

a. Not applicable to systems with nominal cooling capacity greater than 5.0 tons or less than 1.5 ton.

b. Each return duct length shall not exceed 30 feet and shall contain no more than 180 degrees of bend. If the total bending exceeds 90 degrees, one bend shall be a metal elbow.

c. Return grille devices shall be labeled in accordance with the permanently affixed labeling requirements in Section 402.2.6.12.1.4 *[Section 150.0(m)12Biv]* to disclose the grille's design airflow rate and a maximum allowable clean-filter pressure drop of 25 Pa (0.1 inches water) for the *air filter* when tested using *ASHRAE Standard 52.2*, or as rated in accordance with *AHRI* Standard 680 for the design airflow rate for the return grille.

~~*Not applicable to systems with nominal cooling capacity greater than 5.0 tons or less than 1.5 tons.~~

402.2.6.12.4 *[Section 150.0(m)12E]* **Air filter product labeling.**

Mechanical *space-conditioning systems* that *supply air* to an *occupiable space* through ductwork exceeding 10 feet (3 m) in length shall be equipped with *air filters* that have been labeled by the manufacturer to disclose the efficiency and pressure drop ratings that demonstrate conformance with Sections 402.2.6.12.2 and 402.2.6.12.3 *[Sections 150.0(m)12C and 150.0(m)12D]*.

402.2.6.13 *[Section 150.0(m)13]* **Space conditioning system airflow rate and fan efficacy.**

Space conditioning systems that utilize forced air ducts to supply cooling to an *occupiable space* shall:

402.2.6.13.1 *[Section 150.0(m)13A]* **Static pressure probe.**

Have a hole for the placement of a static pressure probe (HSPP), or a permanently installed static pressure probe (PSPP) in the supply plenum downstream of the air conditioning evaporator coil. The size, location, and labeling of the HSPP or PSPP shall conform to the requirements specified in Reference Residential Appendix RA3.3.1.1 as confirmed by field verification and diagnostic testing; and

Exception to 402.2.6.13.1: Systems that cannot conform to the specifications for hole location in Reference Residential Appendix Figure RA3.3-1 shall not be required to provide holes as described in Figure RA3.3-1.

402.2.6.13.2 *[Section 150.0(m)13B]* **Single zone central forced air systems.**

Demonstrate, in every control mode, airflow greater than or equal to 350 ~~CFM~~ cfm per ton of nominal cooling capacity through the return grilles, and an *air-handling unit* fan efficacy less than or equal to the maximum W/~~CFM~~ cfm specified below.

1. 0.45 W/~~CFM~~ cfm for gas furnace *air-handling units*.
2. 0.58 W/~~CFM~~ cfm for *air-handling units* that are not gas furnaces.

The airflow rate and fan efficacy requirements in this section shall be confirmed by field verification and diagnostic testing in accordance with the procedures given in Reference Residential Appendix RA3.3.

Exception 1 to Section 402.2.6.13.2: Standard *ducted systems* (without zoning dampers) may comply by meeting the applicable requirements in Table 402.2~~-A~~(1) *[Table 150.0-B]* or Table 402.2~~-B~~(2) *[Table 150.0-C]* as confirmed by field verification and diagnostic testing in accordance with the procedures in Reference Residential Appendix Sections RA3.1.4.4 and RA3.1.4.5. The design clean-filter pressure drop requirements specified by Section 402.2.6.12.3 *[Section 150.0(m)12Div]* for the system *air filter*(*s*) shall conform to the requirements given in Table 402.2~~-A~~(1) *[Table 150.0-B]* or Table 402.2~~-B~~(2) *[Table 150.0-C]*.

Exception 2 to Section 402.2.6.13.2: Multispeed compressor systems or variable speed compressor systems shall verify air flow (cfm/ton) and fan efficacy (Watt/cfm) for system operation at the maximum compressor speed and the maximum *air handler* fan speed.

Exception 3 to Section 402.2.6.13.2: Gas furnace *air-handling units manufactured* prior to July 3, 2019 shall comply with a fan efficacy value less than or equal to 0.58 w/cfm as confirmed by field verification and diagnostic testing in accordance with the procedures given in Reference Residential Appendix RA3.3.

402.2.6.13.3 *[Section 150.0(m)13C]* **Zonally controlled central forced air systems.**

Zonally controlled central forced air cooling systems shall be capable of simultaneously delivering, in every *zonal* control mode, an airflow from the *dwelling*, through the *air handler* fan and delivered to the *dwelling*, of greater than or equal to 350 cfm per ton of

nominal cooling capacity, and operating at an *air-handling unit* fan efficacy of less than or equal to the maximum W/~~CFM~~ cfm specified below.

1. 0.45 W/~~CFM~~ cfm for gas furnace *air-handling units*.
2. 0.58 W/~~CFM~~ cfm for *air-handling units* that are not gas furnaces.

The airflow rate and fan efficacy requirements in this section shall be confirmed by field verification and diagnostic testing in accordance with the applicable procedures specified in Reference Residential Appendix RA3.3.

Exception 1 to Section 402.2.6.13.3: Multispeed or variable speed compressor systems, with controls that vary fan speed subject to the number of zones, as certified by the installer may demonstrate compliance with the airflow (cfm/ton) and fan efficacy (Watt/cfm) requirements of Section 402.2.6.13.3 *[Section 150.0(m)13C]* by operating the system at maximum compressor capacity and system fan speed with all zones calling for conditioning.

Exception 2 to Section 402.2.6.13.3: Gas furnace *air-handling units manufactured* prior to July 3, 2019 shall comply with a fan efficacy value less than or equal to 0.58 w/cfm as confirmed by field verification and diagnostic testing in accordance with the procedures given in Reference Residential Appendix RA3.3.

402.2.6.13.4 *[Section 150.0(m)13D]* **Small duct high velocity forced air systems.**

Demonstrate, in every control mode, airflow greater than or equal to 250 CFM per ton of nominal cooling capacity through the return grilles, and an *air-handling unit* fan efficacy less than or equal to 0.62 W/CFM as confirmed by field verification and diagnostic testing in accordance with the procedures given in Reference Residential Appendix RA3.3.

Exception 1 to Section 402.2.6.13.4: Standard *ducted systems* (without zoning dampers) may comply by meeting the applicable requirements in Table 402.2~~-A~~(1) *[Table 150.0-B]* or Table 402.2~~-B~~(2) *[Table 150.0-C]* as confirmed by field verification and diagnostic testing in accordance with the procedures in Reference Residential Appendix Sections RA3.1.4.4 and RA3.1.4.5. The design clean-filter pressure drop requirements specified by Section 402.2.6.12.3 *[Section 150.0(m)12Div]* for the system *air filter(s)* shall conform to the requirements given in Table 402.2~~-A~~(1) *[Table 150.0-B]* or Table 402.2~~-B~~(2) *[Table 150.0-C]*.

Exception 2 to Section 402.2.6.13.4: Multispeed compressor systems or variable speed compressor systems shall verify air flow (cfm/ton) and fan efficacy (Watt/cfm) for system operation at the maximum compressor speed and the maximum *air handler* fan speed.

402.2.7 *[Section 150.0(o)1]* **Requirements for ventilation and indoor air quality.**

All *dwelling units* shall meet the requirements of *ASHRAE Standard 62.2*. Ventilation and Acceptable Indoor Air Quality in *Residential Buildings* subject to the amendments specified in Sections 402.2.7.1 through 402.2.7.9 *[Section 150.0(o)1]* below.

Exception to Section 402.2.7: The following sections of *ASHRAE* 62.2 shall not be required for compliance: Section 4.1.1, Section 4.1.2, Section 4.1.4, Section 4.3, Section 4.6, Section 5, Section 6.1.1, Section 6.1.3 and Normative Appendix A.

402.2.7.1 *[Section 150.0(o)1A]* **Window operation.**

Window operation is not a permissible method of providing the *dwelling unit* ventilation airflow specified in Section 402.2.7.3 *[Section 150.0(o)1C]* below.

402.2.7.2 *[Section 150.0(o)1B]* **Central fan integrated (CFI) ventilation systems.**

CFI ventilation systems shall meet the following requirements:

1. **Continuous operation prohibition.** Continuous operation of a *dwelling unit's* central forced air system *air handler* used in *CFI ventilation systems* is not a permissible method of providing the whole-dwelling unit ventilation airflow required in Section 402.2.7.3 *[Section 150.0(o)1C]*.
2. **Outdoor air damper(s).** A motorized damper(s) shall be installed on the connected ventilation duct(s) of *CFI* systems that prevents all airflow into or out of the space-conditioning *duct system* when the damper(s) is closed.
3. **Damper control.** The required motorized damper(s) shall be controlled to be in an opened position when *outdoor air* ventilation is required for compliance, and shall be in the closed position when ventilation air is not required. The damper(s) shall be closed whenever the *space-conditioning system* air handling unit is not operating. If the outdoor airflow for the *CFI ventilation system* is fan-powered, then the *outdoor air* fan shall not operate when the required motorized damper(s) on the *outdoor air* ventilation duct(s) is closed.
4. **Variable ventilation.** *CFI ventilation systems* shall incorporate controls that track *outdoor air* ventilation run time, and either open or close the required motorized damper(s) depending on whether or not *outdoor air* ventilation is required for compliance with Section 402.2.7.3 *[Section 150.0(o)1C]*. During periods when comfort conditioning is not called for by the space-conditioning *thermostat*, the *CFI ventilation system* controls shall operate the *space-conditioning system* central fan and *outdoor air* damper(s) when necessary to ensure compliance with the minimum *outdoor air* ventilation required by Section 402.2.7 and Section 402.2.8 *[Section 150.0(o)]* in accordance with applicable variable mechanical ventilation methods specified in *ASHRAE* 62.2 Section 4.5.

402.2.7.3 *[Section 150.0(o)1C]* **Whole-dwelling unit mechanical ventilation for single-family dwellings.**

Single-family *dwellings* shall have mechanical ventilation as specified in Sections 402.2.7.3.1, and 402.2.7.3.4 *[Sections 150.0(o)1Ci and iv]*. Single family detached *dwelling units* and *attached dwelling units* not sharing ceilings or floors with other *dwelling units*, *occupiable spaces*, public *garages*, or commercial spaces may reduce their required mechanical ventilation rates in accordance with Sections 402.2.7.3.2 and 402.2.7.3.3 *[Sections 150.0(o)1Cii and iii]*. Vertically *attached dwelling units* shall not reduce their minimum ventilation rates in accordance with Sections 402.2.7.3.2 and 402.2.7.3.3 *[Sections 150.0(o)1Cii and iii]* below.

402.2.7.3.1 *[Section 150.0(o)1Ci]* **Total Required Ventilation Rate [ASHRAE 62.2:4.1.1].**

The total required ventilation rate shall be calculated using Equation 402.2-B *[Equation 150.0-B]*.

$Q_{tot} = 0.03A_{floor} + 7.5(N_{br} + 1)$ (Equation 402.2-B *[Equation 150.0-B]*)

where:

Q_{tot} = total required ventilation rate, cfm

A_{floor} = *dwelling*-unit floor area, ft^2

N_{br} = number of bedrooms (not to be less than 1)

402.2.7.3.2 *[Section 150.0(o)1Cii]* **Effective Annual Average Infiltration Rate.**

The effective annual average *infiltration* rate shall be determined in accordance with Subsections 1 and 2:

1. An enclosure leakage rate in cubic feet per minute at 50 Pa (0.2 inch water) (Q_{50}) shall be determined by either option below.

   1.1. Q_{50} shall be calculated based on the *conditioned volume* of the *dwelling unit* and a default value for *dwelling unit envelope* leakage of 2 air changes per hour at 50 PA (0.2 inch water) (2 ACH_{50}) as specified by Equation 402.2-C *[Equation 150.0-C]* below.

   $Q_{50} = V_{du}$ x 2 ACH_{50}/60 min

   (Equation 402.2-C *[Equation 150.0-C]*)

   where:

   Q_{50} = leakage rate at 50 Pa.

   V_{du} = *dwelling unit conditioned volume*, ft^3.

   ACH_{50} = air changes per hour at 50 Pa (0.2 inch water).

   1.2. If *dwelling unit envelope* leakage less than 2 ACH_{50} is confirmed by field verification and diagnostic testing, Q_{50} shall be calculated according to Equation 402.2-D *[Equation 150.0-D]* below, using the value for *dwelling unit envelope* leakage less than 2 ACH_{50} verified by the procedures specified in Reference Residential Appendix RA3.8.

   $Q_{50} = V_{du}$ x *Verified* ACH_{50}/60 min (Equation 402.2-D *[Equation 150.0-D]*)

   where:

   Q_{50} = leakage rate at 50 Pa.

   V_{du} = *dwelling unit conditioned volume*, ft^3.

   ACH_{50} = air changes per hour at 50 Pa (0.2 inch water).

2. The Effective Annual Average *Infiltration* Rate (Q_{inf}) shall be calculated using Equation 402.2-E *[Equation 150.0-E]* [*ASHRAE* 62.2:4.1.2.1].

   $Q_{inf} = 0.052 \times Q_{50} \times wsf \times [H/H_r]^z$ (Equation 402.2-E *[Equation 150.0-E]*)

   where:

Q_{inf} = effective annual *infiltration* rate, cfm (L/s).

Q_{50} = leakage rate at 50 Pa from Equation 402.2-C *[Equation 150.0-C]*, or Equation 402.2-D *[Equation 150.0-D]*.

wsf = weather and shielding factor from Table 402.2-~~C~~(3) *[Table 150.0-D]*.

H = vertical distance between the lowest and highest above-grade points within the *pressure boundary*, ft (m).

H_r = reference height, 8.2 ft (2.5 m).

z = 0.4 for the purpose of calculating the Effective Annual Average *Infiltration* Rate.

TABLE 402.2~~–C~~(3) [TABLE 150.0-D]: INFILTRATION EFFECTIVENESS WEATHER AND SHIELDING FACTORS [ASHRAE 62.2:TABLE B1]

TMY3	WSF	WEATHER STATION	LATITUDE	LONGITUDE	STATE
690150	0.50	Twentynine Palms	34.30	–116.17	California
722860	0.43	March AFB	33.90	–117.25	California
722868	0.45	Palm Springs Intl	33.83	–116.50	California
722869	0.42	Riverside Muni	33.95	–117.45	California
722880	0.39	Burbank–Glendale–Pasadena AP	34.20	–118.35	California
722885	0.39	Santa Monica Muni	34.02	–118.45	California
722886	0.39	Van Nuys Airport	34.22	–118.48	California
722895	0.55	Lompoc (AWOS)	34.67	–120.47	California
722897	0.51	San Luis Co Rgnl	35.23	–120.63	California
722899	0.45	Chino Airport	33.97	–117.63	California
722900	0.38	San Diego Lindbergh Field	32.73	–117.17	California
722903	0.39	San Diego/Montgomery	32.82	–117.13	California
722904	0.40	Chula Vista Brown Field NAAS	32.58	–116.98	California
722906	0.39	San Diego North Island NAS	32.70	–117.20	California
722926	0.40	Camp Pendleton MCAS	33.30	–117.35	California
722927	0.38	Carlsbad/Palomar	33.13	–117.28	California
722930	0.39	San Diego Miramar NAS	32.87	–117.13	California
722950	0.42	Los Angeles Intl Arpt	33.93	–118.40	California
722956	0.38	Jack Northrop Fld H	33.92	–118.33	California
722970	0.38	Long Beach Daugherty Fld	33.83	–118.17	California
722976	0.34	Fullerton Municipal	33.87	–117.98	California
722977	0.36	Santa Ana John Wayne AP	33.68	–117.87	California
723805	0.51	Needles Airport	34.77	–114.62	California
723810	0.59	Edwards AFB	34.90	–117.87	California
723815	0.58	Daggett Barstow–Daggett AP	34.85	–116.80	California
723816	0.62	Lancaster Gen Wm Fox Field	34.73	–118.22	California
723820	0.57	Palmdale Airport	34.63	–118.08	California
723830	0.68	Sandberg	34.75	–118.72	California
723840	0.43	Bakersfield Meadows Field	35.43	–119.05	California
723890	0.45	Fresno Yosemite Intl AP	36.78	–119.72	California
723895	0.42	Porterville (AWOS)	36.03	–119.07	California
723896	0.43	Visalia Muni (AWOS)	36.32	–119.40	California
723910	0.45	Point Mugu Nf	34.12	–119.12	California
723925	0.44	Santa Barbara Municipal AP	34.43	–119.85	California
723926	0.43	Camarillo (AWOS)	34.22	–119.08	California
723927	0.45	Oxnard Airport	34.20	–119.20	California
723940	0.52	Santa Maria Public Arpt	34.92	–120.47	California
723965	0.53	Paso Robles Municipal Arpt	35.67	–120.63	California
724800	0.55	Bishop Airport	37.37	–118.35	California

TMY3	WSF	WEATHER STATION	LATITUDE	LONGITUDE	STATE
724815	0.46	Merced/Macready Fld	37.28	–120.52	California
724830	0.51	Sacramento Executive Arpt	38.50	–121.50	California
724837	0.45	Beale AFB	39.13	–121.43	California
724838	0.50	Yuba Co	39.10	–121.57	California
724839	0.51	Sacramento Metropolitan AP	38.70	–121.58	California
724915	0.49	Monterey Naf	36.60	–121.87	California
724917	0.54	Salinas Municipal AP	36.67	–121.60	California
724920	0.50	Stockton Metropolitan Arpt	37.90	–121.23	California
724926	0.47	Modesto City–County AP	37.63	–120.95	California
724927	0.53	Livermore Municipal	37.70	–121.82	California
724930	0.54	Oakland Metropolitan Arpt	37.72	–122.22	California
724935	0.47	Hayward Air Term	37.67	–122.12	California
724936	0.53	Concord–Buchanan Field	38.00	–122.05	California
724940	0.60	San Francisco Intl AP	37.62	–122.40	California
724945	0.48	San Jose Intl AP	37.37	–121.93	California
724955	0.55	Napa Co. Airport	38.22	–122.28	California
724957	0.49	Santa Rosa (AWOS)	38.52	–122.82	California
725845	0.44	Blue Canyon AP	39.30	–120.72	California
725846	0.66	Truckee–Tahoe	39.32	–120.13	California
725847	0.64	South Lake Tahoe	38.90	–120.00	California
725905	0.47	Ukiah Municipal AP	39.13	–123.20	California
725910	0.50	Red Bluff Municipal Arpt	40.15	–122.25	California
725920	0.47	Redding Municipal Arpt	40.52	–122.32	California
725945	0.56	Arcata Airport	40.98	–124.10	California
725946	0.60	Crescent City Faa Ai	41.78	–124.23	California
725955	0.55	Montague Siskiyou County AP	41.78	–122.47	California
725958	0.59	Alturas	41.50	–120.53	California
745090	0.45	Mountain View Moffett Fld NAS	37.40	–122.05	California
745160	0.67	Travis Field AFB	38.27	–121.93	California
746120	0.52	China Lake Naf	35.68	–117.68	California
747020	0.50	Lemoore Reeves NAS	36.33	–119.95	California
747185	0.46	Imperial	32.83	–115.58	California
747187	0.46	Palm Springs Thermal AP	33.63	–116.17	California
747188	0.48	Blythe Riverside Co Arpt	33.62	–114.72	California

402.2.7.3.3 *[Section 150.0(o)1Ciii]* **Required Mechanical Ventilation Rate [ASHRAE 62.2:4.1.2]**

The Required Mechanical Ventilation Rate (Q_{fan}) shall be calculated using Equation 402.2-F *[Equation 150.0-F]*.

$Q_{fan} = Q_{tot} - F\,(Q_{inf} \times A_{ext})$ (Equation 402.2-F *[Equation 150.0-F]*)

where:

Q_{fan} = required mechanical ventilation rate, cfm (L/s).

Q_{tot} = total required ventilation rate, cfm (L/s) from Equation 402.2-B *[Equation 150.0-B]*.

Q_{inf} = effective annual average *infiltration* rate, cfm (L/s) from Equation 402.2-E *[Equation 150.0-E]*.

A_{ext} = 1 for single-family detached homes, or the ratio of exterior *envelope* surface area that is not attached to *garages* or other *dwelling units* to total *envelope* surface area for *attached dwelling units* not sharing ceilings or floors with other *dwelling units*, *occupiable spaces*, public *garages*, or commercial spaces.

F = 1 for *balanced ventilation systems* and Q_{inf}/Q_{tot} otherwise.

402.2.7.3.4 *[Section 150.0(o)1Civ]* **Requirements for balanced and supply only ventilation systems**

402.2.7.3.4.1- IAQ filter and HRV/ERV accessibility. System *air filters* and *HRV*/*ERV* heat/energy recovery cores shall be located such that they are *accessible* for service from within *occupiable spaces*, basements, *garages*, balconies, and mechanical closets. Filters and heat/energy cores behind access panels, access doors, or grilles located no more than 10 feet above a walking surface inside a space specified above comply with this requirement.

Exception to Section 402.2.7.3.4.1: Systems that require servicing from inside the *attic* shall have the following:

1. A *Fault* Indicator Display (FID) meeting the requirements of Reference Appendix JA17; and
2. An *attic* access *door* located in a wall or, where *attic* access is provided through a ceiling, an *attic* access hatch that includes an integrated ladder; and
3. A walkway from the *attic* access *door* to the *HRV*/*ERV*.

402.2.7.3.4.2- IAQ System component accessibility. Fans, motors, heat exchangers, filters and recovery cores shall meet all applicable requirements of California Mechanical Code Section 304.0 accessibility for service.

402.2.7.3.4.3- *Outdoor air* intake design. *Outdoor air* intakes shall comply with California Mechanical Code Section 402.4.1.

402.2.7.3.4.4- *Outdoor air* intake location and accessibility. To provide access for cleaning, *outdoor air* intakes shall be *accessible*. Air intakes located not more than 10 feet above a walking surface comply with this requirement. If located on *roofs*, they shall meet the requirements of California Mechanical Code Section 304.3.1.

Exception to Section 402.2.7.3.4.4: *Outdoor air* intake serving *equipment* with an FID meeting requirements of Reference Appendix JA 17.

402.2.7.4 *[Section 150.0(o)1D]* **Air filtration.**

Air filtration shall conform to the specifications in Section 402.2.6.12 *[Section 150.0(m)12]*. Compliance with *ASHRAE* 62.2 Sections 6.7 (Minimum Filtration) and 6.7.1 (Filter Pressure Drop) shall not be required.

402.2.7.5 *[Section 150.0(o)1G]* **Local mechanical exhaust.**

A local mechanical exhaust system shall be installed in each *kitchen* and *bathroom*. Systems shall be rated for airflow in accordance with *ASHRAE* 62.2 Section 7.1.

Nonenclosed *kitchens* shall have a demand-controlled mechanical exhaust system meeting the requirements of Section 402.2.7.5.1 *[Section 150.0(o)1Giii]*.

Enclosed *kitchens* and all *bathrooms* shall have either one of the following alternatives:

1. A demand-controlled mechanical exhaust system meeting the requirements of Section 402.2.7.5.1 *[Section 150.0(o)1Giii]*.
2. A continuous mechanical exhaust system meeting the requirements of Section 402.2.7.5.2 *[Section 150.0(o)1Giv]*.

402.2.7.5.1 *[Section 150.0(o)1Giii]* **Demand-controlled mechanical exhaust.**

A local mechanical exhaust system shall be designed to be operated as needed.

Control and operation. Demand-controlled mechanical exhaust systems shall be provided with at least one of the following controls:

1. A *readily accessible* occupant-controlled ON-OFF control.
2. An *automatic* control that does not impede occupant ON control.

Ventilation rate and capture efficiency. The system shall meet or exceed either the minimum airflow in accordance with Table 402.2-~~D~~(4) *[Table 150.0-E]* or the minimum capture efficiency in accordance with Table 402.2-~~D~~(4) *[Table 150.0-E]*, and Table 402.2-~~E~~(5) *[Table 150.0-G]*. Capture efficiency ratings shall be determined in accordance with *ASTM E3087* and listed in a product directory approved by the *Energy Commission*.

TABLE 402.2-~~D~~(4) [TABLE 150.0-E] DEMAND-CONTROLLED LOCAL VENTILATION EXHAUST AIRFLOW RATES AND CAPTURE EFFICIENCY

APPLICATION	COMPLIANCE CRITERIA
Enclosed *Kitchen* or Nonenclosed *Kitchen*	Vented range hood, including appliance-range hood combinations shall meet either the capture efficiency (CE) or the airflow rate specified in Table 402.2-~~E~~(5) *[Table 150.0-G]* as applicable.
Enclosed *Kitchen* or Nonenclosed *Kitchen*	Other *kitchen* exhaust fans, including downdraft: 300 cfm (150 L/s)
Bathroom	50 cfm (25 L/s)

TABLE 402.2-~~E~~(5) [TABLE 150.0-G] KITCHEN RANGE HOOD AIRFLOW RATES (CFM) AND ASTM E3087 CAPTURE EFFICIENCY (CE) RATINGS ACCORDING TO DWELLING UNIT FLOOR AREA AND KITCHEN RANGE FUEL TYPE

***DWELLING UNIT* FLOOR AREA (FT^2)**	**HOOD OVER ELECTRIC RANGE**	**HOOD OVER NATURAL GAS RANGE**
>1500	50% CE or 110 cfm	70% CE or 180 cfm
>1000 - 1500	50% CE or 110 cfm	80% CE or 250 cfm
750 - 1000	55% CE or 130 cfm	85% CE or 280 cfm
<750	65% CE or 160 cfm	85% CE or 280 cfm

402.2.7.5.2 *[Section 150.0(o)1Giv]* **Continuous mechanical exhaust.**

A mechanical exhaust system shall be installed to operate continuously. The system may be part of a balanced mechanical ventilation system.

Control and operation. A *manual* ON-OFF control shall be provided for each continuous mechanical exhaust system. The system shall be designed to operate during all occupiable hours. The ON-OFF control shall be *accessible* to the *dwelling unit* occupant.

Ventilation rate. The minimum delivered ventilation shall be at least the amount indicated in Table 402.2-~~F~~(6) *[Table 150.0-F]* during each hour of operation.

TABLE 402.2-~~F~~(6) [TABLE 150.0-F] CONTINUOUS LOCATION VENTILATION EXHAUST AIRFLOW RATES

APPLICATION	AIRFLOW
Enclosed *kitchen*	5 ach, based on *kitchen* volume
Bathroom	20 cfm (10 L/s)

402.2.7.5.3 *[Section 150.0(o)1Gv]* **Airflow measurement of local mechanical exhaust by the system installer.**

The airflow required by Section 402.2.7.5 *[Section 150.0(o)1G]* is the quantity of indoor air exhausted by the ventilation system as installed in the *dwelling unit*. When a vented range hood utilizes a capture efficiency rating to demonstrate compliance with Section 402.2.7.5.1 *[Section 150.0(o)1Giiib]*, the airflow listed in the approved directory corresponding to the compliant capture efficiency rating point shall be met by the installed system. The as-installed airflow shall be verified by the system installer to ensure compliance by use of either option below:

1. The system installer shall measure the airflow by using a flow hood, flow grid or other airflow measuring device at the mechanical ventilation fan's inlet terminals/grilles or outlet terminals/grilles in accordance with the procedures in Reference Residential Appendix RA3.7.

2. As an alternative to performing an airflow measurement of the system as installed in the *dwelling unit*, compliance may be demonstrated by installing an exhaust fan and *duct system* that conforms to the specifications of Table 402.2-~~G~~(7) *[Table 150.0-H]*. Visual inspection shall verify the installed system conforms to the requirements of Table 402.2-~~G~~(7) *[Table 150.0-H]*.

   When using Table 402.2-~~G~~(7) *[Table 150.0-H]* for demonstrating compliance, the airflow rating shall be greater than or equal to the value required by Section 402.2.7.5 *[Section 150.0(o)1G]* at a static pressure greater than or equal to 0.25 in. of water (62.5 Pa). When a vented range hood utilizes a capture efficiency rating to demonstrate compliance with Section 402.2.7.5.1 *[Section 150.0(o)1Giiib]*, a static pressure greater than or equal to 0.25 in. of water at the rating point shall not be required, and the airflow listed in the approved directory corresponding to the compliant capture efficiency rating point shall be applied to Table 402.2-~~G~~(7) *[Table 150.0-H]* for determining compliance.

   Use of Table 402.2-~~G~~(7) *[Table 150.0-H]* is limited to ventilation systems that conform to all of the following three specifications:

   2.1. Total duct length is less than or equal to 25 ft (8 m),

   2.2. *Duct system* has no more than three elbows, and

   2.3. *Duct system* has exterior termination fitting with a hydraulic diameter greater than or equal to the minimum duct diameter and not less than the hydraulic diameter of the fan outlet.

TABLE 402.2-~~G~~(7) [TABLE 150.0-H] PRESCRIPTIVE VENTILATION SYSTEM DUCT SIZING [ASHRAE 62.2:TABLE 5-3]

FAN AIRFLOW RATING, CFM AT MINIMUM STATIC PRESSURE[f], 0.25 IN. WATER (L/S AT MINIMUM 62.5 PA)	MINIMUM DUCT DIAMETER FOR RIGID DUCT, IN. (MM) [a,b]	MINIMUM DUCT DIAMETER FOR FLEX DUCT[c], IN. (MM) [a,b]
≤50 (25)	4[e] (100)	4 (100)
≤80 (40)	5 (125)	5 (125)
≤100 (50)	5 (125)	6 (150)
≤125 (60)	6 (150)	6 (150)
≤150 (70)	6 (150)	7 (150)
≤175 (85)	7 (180)	7 (180)
≤200 (95)	7 (180)	8 (205)
≤250 (120)	8 (205)	8 (205)
≤350 (165)	9 (230)	9 (230)
≤400 (190)	10 (255)	10 (255)
≤450 (210)	10 (255)	NP
≤700 (330)	12 (305)	NP
≤800 (380)	12[d] (305)	NP

Footnotes for Table 402.2(7) *[Table 150.0-H]*:

a. For noncircular ducts, calculate the diameter as four times the cross-sectional area divided by the perimeter.

b. NP = application of the prescriptive table is not permitted for this scenario.

c. Use of this table for verification of flex *duct systems* requires flex duct to be fully extended and any flex duct elbows to have a minimum bend radius to duct diameter ratio of 1.0.

d. For this scenario, use of elbows is not permitted.

e. For this scenario, 4 in. (100 mm) oval duct shall be permitted, provided the minor axis of the oval is greater than or equal to 3 in. (75 mm)

f. When a vented range hood utilizes a capture efficiency rating to demonstrate compliance with Section 402.2.7.5.1 *[Section 150.0(o)1Giiib]*, a static pressure greater than or equal to 0.25 in. of water at the rating point shall not be required, and the airflow listed in the approved directory corresponding to the compliant capture efficiency rating point shall be applied to Table 402.2(7) *[Table 150.0-H]* for determining compliance

~~Footnotes for Table 402.2-G *[Table 150.0-H]*:~~

~~a. For noncircular ducts, calculate the diameter as four times the cross-sectional area divided by the perimeter.~~

~~b. NP = application of the prescriptive table is not permitted for this scenario.~~

~~c. Use of this table for verification of flex *duct systems* requires flex duct to be fully extended and any flex duct elbows to have a minimum bend radius to duct diameter ratio of 1.0.~~

~~d. For this scenario, use of elbows is not permitted.~~

~~e. For this scenario, 4 in. (100 mm) oval duct shall be permitted, provided the minor axis of the oval is greater than or equal to 3 in. (75 mm)~~

~~f. When a vented range hood utilizes a capture efficiency rating to demonstrate compliance with Section 402.2.7.5.1 *[Section 150.0(o)1Giiib]*, a static pressure greater than or equal to 0.25 in. of water at the~~

~~rating point shall not be required, and the airflow listed in the approved directory corresponding to the compliant capture efficiency rating point shall be applied to Table 402.2-G *[Table 150.0-H]* for determining compliance.~~

402.2.7.5.4 *[Section 150.0(o)1Gvi]* **Sound ratings for local mechanical exhaust.**

Local mechanical exhaust systems shall be rated for sound in accordance with Section 7.3 of *ASHRAE* 62.2 at no less than the minimum airflow rate required by Section 402.2.7.5 *[Section 150.0(o)1G]*.

Exception to Section 402.2.7.5.4: *Kitchen* range hoods may be rated for sound at no less than 100 cfm at a static pressure determined at working speed as specified in *HVI 916* section 7.2.

402.2.7.6 *[Section 150.0(o)1H]* **Airflow measurement of whole-dwelling unit ventilation.**

The airflow required by Section 402.2.7.3 *[Section 150.0(o)1C]* is the quantity of outdoor ventilation air supplied or indoor air exhausted by the mechanical ventilation system as installed and shall be measured by using a flow hood, flow grid or other airflow measuring device at the mechanical ventilation fan's inlet terminals/grilles or outlet terminals/grilles in accordance with the procedures in Reference Residential Appendix RA3.7. Balanced mechanical ventilation system airflow shall be the average of the supply fan and exhaust fan flows.

402.2.7.7 *[Section 150.0(o)1I]* **Sound ratings for whole-dwelling unit ventilation systems.**

Whole-dwelling unit ventilation systems shall be rated for sound in accordance with Section 7.3 of *ASHRAE* 62.2 at no less than the minimum airflow rate required by Section 402.2.7.3 *[Section 150.0(o)1C]*.

402.2.7.8 *[Section 150.0(o)1J]* **Label for whole-dwelling unit ventilation system on-off control.**

Compliance with *ASHRAE* 62.2 Section 4.4 (Control and Operation) shall require *manual* ON-OFF control switches associated with whole-dwelling unit ventilation systems to have a label clearly displaying the following text, or equivalent text: "This switch controls the indoor air quality ventilation for the home. Leave switch in the 'on' position at all times unless the *outdoor air* quality is very poor."

402.2.7.9 *[Section 150.0(o)1K]* **Combustion air and compensating outdoor air or makeup air.**

All *dwelling units* shall conform to the applicable requirements specified in California Mechanical Code Chapter 7, Combustion Air.

All *dwelling units* shall conform to the requirements in *ASHRAE* 62.2 Section 6.4, Combustion and Solid-Fuel-Burning Appliances.

402.2.8 *[Section 150.0(o)2]* **Field verification and diagnostic testing for ventilation and indoor air quality.**

All *dwelling units* shall comply with Section 402.2.8 *[Section 150.0(o)2]* below.

Whole-dwelling unit ventilation airflow performance. The whole-dwelling unit ventilation airflow required by Section 402.2.7.3 *[Section 150.0(o)1C]* shall be confirmed through field

verification and diagnostic testing in accordance with the applicable procedures specified in Reference Residential Appendix RA3.7. Balanced mechanical ventilation system airflow shall be the average of the supply fan and exhaust fan flows. Ventilation airflow of systems with multiple operating modes shall be tested in all modes designed to comply with the required ventilation airflows.

***Kitchen* local mechanical exhaust—vented range hoods**. Vented range hoods installed to comply with local mechanical exhaust requirements specified in Section 402.2.7.5 *[Section 150.0(o)1G]* shall be field verified in accordance with the procedures in Reference Residential Appendix RA3.7.4.3 to confirm the model is rated by HVI or *AHAM* to comply with the following requirements:

1. The minimum ventilation airflow rate as specified by Section 402.2.7.5 *[Section 150.0(o)1G]*, or alternatively the minimum capture efficiency as specified by Section 402.2.7.5 *[Section 150.0(o)1G]*.
2. The maximum sound rating as specified in Section 402.2.7.5.4 *[Section 150.0(o)1Gvi]*.

Heat recovery ventilation (*HRV*) and energy recovery ventilation (*ERV*) system fan efficacy. Systems with heat or energy recovery serving a single *dwelling unit* shall have a fan efficacy of ≤1.0 W/cfm as confirmed by field verification in accordance with Reference Appendix RA3.7.4.4.

402.3 *[Section 150.1]* Prescriptive Requirements (Newly Constructed).

402.3.1 *[Section 150.1(c)6]* Heating system type.

Heating system types shall be installed as required in Table 402.3~~-A~~(1) *[Table 150.1-A]* in Section 402.3.8. The space conditioning system shall be a *heat pump*, or shall meet the performance compliance requirements of Section 402.4 *[Section 150.1(b)1]*.

Exception to Section 402.3.1: A supplemental heating unit may be installed in a space served directly or indirectly by a primary heating system, provided that the unit thermal capacity does not exceed 2 kW or 7,000 Btu/hr and is controlled by a time-limiting device not exceeding 30 minutes.

402.3.2 *[Section 150.1(c)7]* Space heating and space cooling.

All space heating and space *cooling equipment* shall comply with minimum *Appliance Efficiency Regulations* as specified in Sections 400.1, 400.2, and 400.5 *[Sections 110.0 through 110.2]* and meet all applicable requirements of Sections 402.1, 402.2, *[Sections 150.0]* and 402.3.2.1 *[Section 150.1(c)7A]*.

402.3.2.1 *[Section 150.1(c)7A]* Refrigerant charge verification.

When refrigerant charge verification is shown as required by Table 402.3~~-A~~(1) *[Table 150.1-A]* in Section 402.3.8, *air-cooled air conditioners* and *air-source heat pumps*, including but not limited to ducted *split systems*, ducted packaged systems, small duct high velocity systems, and mini-split systems, shall comply with Section 402.3.2.1.1 *[Section 150.1(c)7Ai]* unless the system is of a type that cannot be verified using the specified procedures. Systems which are of a type that cannot be verified using the specified procedures with the requirements of

Section 402.3.2.1.1 *[Section 150.1(c)7Ai]* shall comply with Section 402.3.2.1.2 *[Section 150.1(c)7Aii]* as applicable.

Exception to Section 402.3.2.1: Packaged systems for which the manufacturer has verified correct system refrigerant charge prior to shipment from the *factory* are not required to have refrigerant charge confirmed through field verification and diagnostic testing. The installer of these packaged systems shall certify on the Certificate of Installation that the packaged system was pre-charged at the *factory* and has not been altered in a way that would affect the charge. *Ducted systems* shall comply with minimum system airflow rate requirements in Section 402.3.2.1.1 *[Section 150.1(c)7Aib]*, provided that the system is of a type that can be verified using the procedure specified in Section RA3.3 or an approved alternative in Section RA1.

402.3.2.1.1 *[Section 150.1(c)7Ai]* **Airflow and refrigerant charge verification procedures.**

402.3.2.1.1.1- Measurement access hole. Have measurement access holes (MAH) installed according to the specifications in Reference Residential Appendix Section RA3.2.2.3; and

Exception to Section 402.3.2.1.1.1: Systems that cannot conform to the specifications for hole location in Reference Residential Appendix Figure RA3.2-1, shall not be required to provide holes as described in Figure RA3.2-1.

402.3.2.1.1.2- Minimum system airflow rate. System airflow rate in accordance with 1 or 2 below shall be confirmed through field verification and diagnostic testing in accordance with all applicable procedures specified in Reference Residential Appendix Section RA3.3 or an approved alternative procedure as specified by Section RA1; and

1. For small duct high velocity systems the system airflow rate shall be greater than or equal to 250 cfm per ton; or
2. For all other *air-cooled air conditioner* or *air-source heat pump* systems the system airflow rate shall be greater than or equal to 350 cfm per ton.

Exception to Section 402.3.2.1.1.2: Standard *ducted systems* without zoning dampers may comply with the minimum airflow rate by meeting the applicable requirements in Table 402.2-~~A~~(1) or Table 402.2-~~B~~(2) *[Table 150.0-B or 150.0-C]* as confirmed by field verification and diagnostic testing in accordance with the procedures in Reference Residential Appendix Section RA3.1.4.4 and RA3.1.4.5. The design clean-filter pressure drop requirements of Section 402.2.6.12.3 *[Section 150.0(m)12D]* for the system *air filter device*(s) shall conform to the requirements given in Table 402.2-~~A~~(1) and Table 402.2-~~B~~(2) *[Table 150.0-B and 150.0-C]*.

402.3.2.1.1.3- Refrigerant charge. The installer shall charge the system according to manufacturer's specifications. Refrigerant charge shall be verified according to one of the following options, as applicable:

1. The installer and rater shall perform the standard charge procedure as specified by Reference Residential Appendix Section RA3.2.2, or an approved alternative procedure as specified by Section RA1; or

2. The installer shall perform the weigh-in charging procedure as specified by Reference Residential Appendix Section RA3.2.3.1 provided the system is of a type that can be verified using the Section RA3.2.2 standard charge verification procedure and Section RA3.3 airflow rate verification procedure or approved alternatives in Section RA1. The ECC-Rater shall verify the charge using Sections RA3.2.2 and RA3.3 or approved alternatives in Section RA1.

Exception 1 to Section 402.3.2.1.1.3: When the outdoor temperature is less than 55°F and the installer utilizes the weigh-in charging procedure in Reference Residential Appendix Section RA3.2.3.1 to verify the refrigerant charge, the installer may elect to utilize the verification procedure in Reference Residential Appendix Section RA3.2.3.2. If the verification procedure in Section RA3.2.3.2 is used for compliance, the system's *thermostat* shall conform to the specifications in Section 400.6 *[Section 110.12]*. *Ducted systems* shall comply with minimum system airflow rate requirement in Section 402.3.2.1.1.2 *[Section 150.1(c)7Aib]*.

402.3.2.1.2 *[Section 150.1(c)7Aii]* **Airflow and refrigerant charge alternate verification procedures.**

Systems that utilize forced air ducts shall comply with the minimum system airflow rate requirement in Section 402.3.2.1.1 *[Section 150.1(c)7Aib]* provided the system is of a type that can be verified using the procedures in Section RA3.3 or an approved alternative procedure in Section RA1.

The installer shall confirm the refrigerant charge using the weigh-in charging procedure specified in Reference Residential Appendix Section RA3.2.3.1, as verified by an ECC-Rater according to the procedures specified in Reference Residential Appendix Section RA3.2.3.2.

402.3.3 *[Section 150.1(c)9]* **Space conditioning distribution systems.**

All space conditioning systems shall meet all applicable requirements of Section 402.3.3.1 or Section 402.3.3.2.

402.3.3.1 *[Section 150.1(c)9A]* **High performance attics.**

Air handlers or ducts are allowed to be in ventilated *attic* spaces when the *roof* and ceiling insulation level meet Option B in Table 402.3~~-A~~(1) *[Table 150.1-A]* in Section 402.3.8. Duct insulation levels shall meet the requirements in Table 402.3~~-A~~(1) *[Table 150.1-A]* in Section 402.3.8.

402.3.3.2 *[Section 150.1(c)9B]* **Ducts and air handlers in conditioned space.**

Duct systems and *air handlers* of *HVAC systems* shall be located entirely in *conditioned space*, and confirmed through field verification and diagnostic testing to meet the criterion of Reference Residential Appendix RA3.1.4.3.8. Duct insulation levels shall meet the requirements in Table 402.3~~-A~~(1) *[Table 150.1-A]* in Section 402.3.8. For *dwelling units* with *attics*, the *duct system* and *air handlers* of *HVAC systems* shall be located below the ceiling separating the *occupiable space* from the *attic*.

NOTE: Gas heating appliances installed in *conditioned spaces* must meet the combustion air requirements of the California Mechanical Code Chapter 7, as applicable.

402.3.4 *[Section 150.1(c)10]* **Central fan integrated ventilation systems.**

Central forced air system fans used to provide *outside air*, shall have an *air-handling unit* fan efficacy less than or equal to the maximum W/cfm specified in one of the options below.

1. 0.45 W/cfm for gas furnace *air-handling units manufactured* on or after July 3, 2019. Gas furnace *air-handling units manufactured* prior to July 3, 2019 shall comply with a fan efficacy value less than or equal to 0.58 w/cfm as confirmed by field verification and diagnostic testing in accordance with the procedures given in Reference Residential Appendix RA3.3.
2. 0.58 W/cfm for *air-handling units* that are not gas furnaces.
3. 0.62 W/cfm for small duct high velocity *air-handling units*.

The airflow rate and fan efficacy requirements in this section shall be confirmed through field verification and diagnostic testing in accordance with all applicable procedures specified in Reference Residential Appendix RA3.3. *Central Fan integrated ventilation systems* shall be *certified to the Energy Commission* as intermittent ventilation systems as specified in Reference Residential Appendix RA3.7.4.2.

402.3.5 *[Section 150.1(c)12]* **Ventilation cooling.**

Single-family homes shall comply with the Whole-house fan (WHF) requirements shown in Table 402.3~~-A~~(1) *[Table 150.1-A]* in Section 402.3.8. When a WHF is required, comply with 402.3.5.1 through 402.3.5.3.

Exception to Section 402.3.5: New *dwelling units* with a *conditioned floor area* of 500 square feet or less shall not be required to comply with the WHF requirements.

402.3.5.1- Have installed one or more WHFs whose total airflow cfm is equal to or greater than 1.5 cfm/ft^2 of *conditioned floor area*. Airflow cfm for WHF's shall be determined based on the airflow listed in the Home Ventilating Institute Certified Products Directory.

402.3.5.2- Have at least 1 square foot of *attic* vent free area for each 750 cfm of rated whole-house fan airflow cfm, or if the manufacturer has specified a greater free vent area, the manufacturers' free vent area specifications.

Exception to Section 402.3.5.2: WHFs that are directly vented to the outside.

402.3.5.3- Provide homeowners who have WHFs with a one page "How to operate your whole-house fan" informational sheet.

402.3.6 *[Section 150.1(c)13]* **HVAC system bypass ducts.**

Bypass ducts that deliver conditioned *supply air* directly to the space conditioning system return duct airflow shall not be used.

402.3.7 *[Section 150.1(c)15]* **Ventilation System Fault Indicator Display (FID).**

All *HRV*/*ERV* systems serving individual *dwelling units* shall have a *Fault* Indicator Display (FID) that is ECC-rater field verified as specified in Joint Reference Appendix JA17.

402.3.8 Single-family standard building design.

TABLE 402.3-A(1) [TABLE 150.1-A] COMPONENT PACKAGE – SINGLE-FAMILY STANDARD BUILDING DESIGN

BUILDING HVAC SYSTEMS	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Space Heating - Electric-Resistance Allowed	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Space Heating - If gas, AFUE[e5]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Space Heating - If *Heat Pump*, HSPF2[c3]	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
Space Cooling -SEER2	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
Space Cooling - Whole-house fan[d4]	NR	NR	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR	NR
Refrigerant Charge Verification *Air Conditioners*	NR	REQ	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
Refrigerant Charge Verification *Heat Pumps*	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
Central Fan Integrated Ventilation System - Fan Efficacy	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
Option B[d4] Below *Roof* Deck Insulation [a1,b2] (with air space)	NR	NR	NR	R19	NR	NR	NR	R19	R19	R19	R19	R19	R19	R19	R19	R19
Option B[d4] Ceiling Insulation	R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
Option B[g7] *Roof*/Ceiling - Duct Insulation	R 8	R 8	R 6	R 8	R 6	R 6	R 6	R 8	R 8	R 8	R 8	R 8	R 8	R 8	R 8	R 8
Option B[g7] – §402.3.3.1 *[§150.1(c)9A]*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

(CONTINUED): TABLE 402.3 ~~A~~(1) [TABLE 150.1-A] COMPONENT PACKAGE – SINGLE-FAMILY STANDARD BUILDING DESIGN

BUILDING HVAC SYSTEMS	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Option C[h,8] *Roof*/Ceiling - Duct Insulation	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6
Option C[h,8] – §402.3.3.2 *[§150.1(c)9B]*	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
FID required if *HRV*/*ERV* systems installed – §402.3.7 *[§150.1(c)15]*	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ

Footnote requirements to Table 402.3(1) *[Table 150.1-A]*:

a. Install the specified *R-value* with an air space present between the roofing and the *roof* deck, such as standard installation of concrete or clay tile.

b. *R-values* shown for below *roof* deck insulation are for wood-frame construction with insulation installed between the framing members. Alternatives including insulation above rafters or above *roof* deck shall comply with the performance standards.

c. *HSPF2* means *heating seasonal performance factor*.

d. When whole-house fans are required (REQ), only those whole-house fans that are listed in the Home Ventilating Institute Certified Products Directory may be installed. Compliance requires installation of one or more WHFs whose total airflow cfm is capable of meeting or exceeding a minimum 1.5 cfm/square foot of *conditioned floor area* as specified by Section 402.3.5 *[Section 150.1(c)12]*.

e. A supplemental heating unit may be installed in a space served directly or indirectly by a primary heating system, provided that the unit thermal capacity does not exceed 2 kilowatts or 7,000 Btu/hr and is controlled by a time-limiting device not exceeding 30 minutes.

f. For duct and *air handler* location: REQ denotes location in *conditioned space*. When the table indicates ducts and *air handlers* are in *conditioned space*, a verification is required as specified by Reference Residential Appendix RA3.1.4.3.8.

g. Option B meets Section 402.3.3.1 *[Section 150.1(c)9A]*

h. Option C meets Section 402.3.3.2 *[Section 150.1(c)9B]*

~~Footnote requirements to Table 402.3-A *[Table 150.1-A]*:~~

~~1. Install the specified *R-value* with an air space present between the roofing and the *roof* deck, such as standard installation of concrete or clay tile.~~

~~2. *R-values* shown for below *roof* deck insulation are for wood-frame construction with insulation installed between the framing members. Alternatives including insulation above rafters or above *roof* deck shall comply with the performance standards.~~

~~3. *HSPF2* means *heating seasonal performance factor*.~~

4. When whole-house fans are required (REQ), only those whole-house fans that are listed in the Home Ventilating Institute Certified Products Directory may be installed. Compliance requires installation of one or more WHFs whose total airflow cfm is capable of meeting or exceeding a minimum 1.5 cfm/square foot of *conditioned floor area* as specified by Section 402.3.5 *[Section 150.1(c)12]*.

5. A supplemental heating unit may be installed in a space served directly or indirectly by a primary heating system, provided that the unit thermal capacity does not exceed 2 kilowatts or 7,000 Btu/hr and is controlled by a time-limiting device not exceeding 30 minutes.

6. For duct and air handler location: REQ denotes location in *conditioned space*. When the table indicates ducts and air handlers are in *conditioned space*, a verification is required as specified by Reference Residential Appendix RA3.1.4.3.8.

7. Option B meets Section 402.3.3.1 *[Section 150.1(c)9A]*

8. Option C meets Section 402.3.3.2 *[Section 150.1(c)9B]*

402.4 [Section 100.2] Performance requirements (Newly Constructed).

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

402.5 *[Section 150.2]* Additions and alterations to existing buildings.

402.5.1 *[Section 150.2(a)]* Additions.

Additions to existing *single-family* *use designations* ~~*residential buildings*~~ shall meet the mandatory requirements of Section 402.5.1.1, and either prescriptive requirements of Section 402.5.1.2 or performance requirements of Section 402.5.1.3 *[Section 150.2(a)1 or 2]*.

Exception to Section 402.5.1: When heating or cooling will be extended to an *addition* from the existing system(s), the existing heating and *cooling equipment* need not comply with *Part 6*. The heating system capacity must be adequate to meet the minimum requirements of CRC 303.10.

402.5.1.1 *[Section 150.2(a)]* Mandatory requirements (Additions).

Mechanical systems and *equipment* shall meet the requirements of the sections listed below:

101.2, 101.3, 101.4 *[Section 110.0, 110.1, 110.5]* Systems and Equipment

400.2, 400.4.4, 400.5, 402.2.1, 402.2.2, 402.2.4, 402.2.5, 402.2.6 *[Section 110.2, 110.8(d)3, 150.0]* Mandatory Requirements for Space-conditioning Equipment

Exception 1 to Section 402.5.1.1: Existing inaccessible piping shall not require insulation as defined under Section 402.2.5 *[Section 150.0(j)1]*.

Exception 2 to Section 402.5.1.1: When any length of duct is extended from an existing *duct system* to serve the *addition*, the existing *duct system* and the extended duct shall meet the applicable requirements specified in Section 402.5.2.2.5 *[Section 150.2(b)1Di and 150.2(b)1Dii]*.

Exception 3 to Section 402.5.1.1: Block loads, the total load for all rooms combined that are served by the central *equipment*, may be used to comply with Section 402.2.2.1 *[Section 150.0(h)1]* for the purpose of system sizing for *additions*.

402.5.1.2 *[Section 150.2(a)1]* Prescriptive requirements (Additions).

Additions shall meet the requirements of Section 402.3 *[Section 150.1(c)]* and the applicable requirements of Sections 402.5.1.2.1 and 402.5.1.2.2.

Exception to Section 402.5.1.2: *Additions* 1,000 square feet or less are not required to comply with the ventilation cooling requirements of Section 402.3.5 *[Section 150.1(c)12]*.

402.5.1.2.1 *[Section 150.2(a)1C]* Mechanical ventilation for indoor air quality.

Additions to existing *buildings* shall comply with Sections 402.2.7 and 402.2.8 *[Section 150.0(o)]* subject to the requirements specified below.

Whole-dwelling unit mechanical ventilation.

Dwelling units that meet the conditions in subsections 1, or 2 below shall not be required to comply with the whole-dwelling unit ventilation airflow specified in Section 402.2.7.3 *[Section 150.0(o)1C]*.

1. *Additions* to an existing *dwelling unit* that increase the *conditioned floor area* of the existing *dwelling unit* by less than or equal to 1000 square feet.
2. *Junior Accessory Dwelling Units* (*JADU*) that are *additions* to an existing *building*.

Additions to an existing *dwelling unit* that increase the *conditioned floor area* of the existing *dwelling unit* by more than 1,000 square feet shall have mechanical ventilation airflow in accordance with Section 402.2.7.3 *[Section 150.0(o)1C]* as applicable. The mechanical ventilation airflow rate shall be based on the *conditioned floor area* of the entire *dwelling unit* comprised of the existing *dwelling unit conditioned floor area* plus the *addition conditioned floor area*.

New *dwelling units* that are *additions* to an existing *building* shall have mechanical ventilation airflow provided in accordance with Section 402.2.7.3 *[Section 150.0(o)1C]* as applicable. The mechanical ventilation airflow rate shall be based on the *conditioned floor area* of the new *dwelling unit*.

Local mechanical exhaust. *Additions* to existing *buildings* shall comply with all applicable requirements specified in Section 402.2.7.5 *[Section 150.0(o)1G]* and Section 402.2.8 *[Section 150.0(o)2]*.

402.5.1.2.2 *[Section 150.2(a)1E]* **Space-Conditioning load calculations and system capacity.**

402.5.1.2.2.1- Minimum capacity limits and supplemental heating requirements are as described in Section 402.2.2 *[Section 150.0(h)]*.

402.5.1.2.2.2- The maximum capacity depends on the relative sizes of the calculated heating design load (HL) and cooling design load (CL), the type of space conditioning system, and the duct sizing.

In situations where airflow is field verified to be at least 350 cfm/ton, there is no maximum capacity limit.

In situations where airflow is NOT field verified to be at least 350 cfm/ton, the system capacities shall be no larger than indicated in Table 402.5-~~A~~(1) *[Table 150.2-A]* for heating and Table 402.5-~~B~~(2) *[Table 150.2-B]* for cooling.

Exception 1 to Section 402.5.1.2.2.2: Ductless *space-conditioning systems*.

Exception 2 to Section 402.5.1.2.2.2: For variable-speed and multi-speed systems, if the maximum system capacity specified in Tables 402.5-~~A~~(1) or 402.5-~~B~~(2) *[Tables 150.2-A or 150.2-B]* falls between two available system capacities for a *space-conditioning system*, the larger of the two available capacities may be selected.

402.5.1.2.2.3- For *additions*, the *envelope* leakage specified in the load calculation shall be no greater than the values shown in Table 402.5 ~~C~~(3) *[Table 150.2-C]*.

Exception to Section 402.5.1.2.2.3: If leakage is established through field verification and diagnostic testing following procedures specified in Reference Residential Appendix RA3.8, the tested *envelope* leakage value may be used in the load calculations and no disclosure is required.

TABLE 402.5 ~~A~~(1) [TABLE 150.2-A] MAXIMUM HEATING CAPACITY

SYSTEM TYPE	MAXIMUM HEATING CAPACITY FOR HEATING ONLY SYSTEMS	*HEAT PUMP* MAXIMUM HEATING CAPACITY WHEN HL IS GREATER THAN CL	*HEAT PUMP* MAXIMUM HEATING CAPACITY WHEN CL IS GREATER THAN HL BY LESS THAN 12 KBTUH	*HEAT PUMP* MAXIMUM HEATING CAPACITY WHEN CL IS GREATER THAN HL BY 12 KBTUH OR MORE
Single Speed System Capacity	HL + 6 kBtuh	No Maximum	HL + 12 kBtuh	No Maximum
Variable or Multi Speed System Maximum Capacity	HL + 6 kBtuh	No Maximum	HL + 12 kBtuh	No Maximum
Variable or Multi Speed System Capacity at Lowest Speed	80% of HL	80% of HL	No Maximum	No Maximum

TABLE 402.5 ~~B~~(2) [TABLE 150.2-B] MAXIMUM COOLING CAPACITY

SYSTEM TYPE	MAXIMUM COOLING CAPACITY FOR COOLING ONLY SYSTEMS	*HEAT PUMP* MAXIMUM COOLING CAPACITY WHEN HL IS GREATER THAN CL	*HEAT PUMP* MAXIMUM COOLING CAPACITY WHEN CL IS GREATER THAN HL BY LESS THAN 12 KBTUH	*HEAT PUMP* MAXIMUM COOLING CAPACITY WHEN CL IS GREATER THAN HL BY 12 KBTUH OR MORE
Single Speed System Capacity	CL + 6 kBtuh	No Maximum	CL + 6 kBtuh	CL + 6 kBtuh
Variable or Multi Speed System Maximum Capacity	CL + 6 kBtuh	No Maximum	CL + 6 kBtuh	CL + 6 kBtuh
Variable or Multi Speed System Capacity at Lowest Speed	80% of CL	No Maximum	80% of CL	80% of CL

Footnote for Table 402.5(1) and 402.5(2) *[Table 150.2-A and Table 150.2-B]*:

a. HL and CL refer to the design heating load and design cooling load respectively.

~~Footnote for Table 402.5-A and 402.5-B *[Table 150.2-A and Table 150.2-B]*:~~

~~1. HL and CL refer to the design heating load and design cooling load respectively.~~

TABLE 402.5 ~~C~~(3) [TABLE 150.2-C] MAXIMUM INFILTRATION AIR CHANGES PER HOUR FOR LOAD CALCULATIONS

FLOOR AREA OF CONDITIONED SPACE	SINGLE STORY HEATING	SINGLE STORY COOLING	TWO STORY HEATING	TWO STORY COOLING	TOWNHOUSE OR CONDOMINIUM HEATING	TOWNHOUSE OR CONDOMINIUM COOLING
ACH for ≤900 sqft	0.61	0.32	0.79	0.41	0.69	0.36
ACH for 901-1500 sqft	0.45	0.23	0.80	0.30	0.50	0.27
ACH for 1501-2000 sqft	0.38	0.20	0.50	0.26	0.43	0.23
ACH for 2001-3000 sqft	0.32	0.16	0.41	0.21	0.36	0.19
ACH for ≥3001 sqft	0.28	0.15	0.37	0.19	0.32	0.17
CFM for one *Fireplace*	20	0	20	0	20	0

402.5.1.3 *[Section 150.2(a)2]* **Performance requirements (Additions).**

Performance calculations shall meet the requirements of Section 102 for the *addition* alone or for the existing *building* plus *addition*.

Mechanical Ventilation for Indoor Air Quality. *Additions* to existing *buildings* shall comply with Sections 402.2.7 and 402.2.8 *[Section 150.0(o)]* subject to the requirements specified below:

1. **Whole-dwelling unit mechanical ventilation.** *Dwelling units* that meet either conditions below shall not be required to comply with the whole-*dwelling unit* ventilation airflow specified in Section 402.2.7.3 *[Section 150.0(o)1C]*.

   1.1. *Additions* to an existing *dwelling unit* that increase the *conditioned floor area* of the existing *dwelling unit* by less than or equal to 1000 square feet.

   1.2. *Junior Accessory Dwelling Units* (*JADU*) that are *additions* to an existing *building*.

   Additions to an existing *dwelling unit* that increase the *conditioned floor area* of the existing *dwelling unit* by more than 1,000 square feet shall have mechanical ventilation airflow in accordance with Section 402.2.7.3 *[Section 150.0(o)1C]* as applicable. The mechanical ventilation airflow rate shall be based on the *conditioned floor area* of the entire *dwelling unit* comprised of the existing *dwelling unit conditioned floor area* plus the *addition conditioned floor area*.

   New *dwelling units* that are *additions* to an existing *building* shall have mechanical ventilation airflow provided in accordance with Section 402.2.7.3 *[Section 150.0(o)1C]* as applicable. The mechanical ventilation airflow rate shall be based on the *conditioned floor area* of the new *dwelling unit*.

2. **Local mechanical exhaust.** *Additions* to existing *buildings* shall comply with all applicable requirements specified in Section 402.2.7.5 *[Section 150.0(o)1G]* and Section 402.2.8 *[Section 150.0(o)2]*.

Space-Conditioning Load Calculations and System Capacity: *Additions* to existing *buildings* shall comply with all applicable requirements specified in Section 402.5.1.2.2 *[Section 150.2(a)1E]*.

402.5.2 *[Section 150.2(b)]* **Alterations.**

Alterations to existing *single-family* *use designations* ~~*residential buildings*~~ or *alterations* in conjunction with a change in *building occupancy* to a *single-family* *use designation* ~~residential occupancy~~ shall meet mandatory requirements of Section 402.5.2.1, and either prescriptive requirements of Section 402.5.2.2 or performance requirements of Section 402.5.2.3.

402.5.2.1 *[Section 150.2(b)]* **Mandatory requirements (Alterations).**

The *altered component* and any newly installed *equipment* serving the *alteration* shall meet the applicable requirements of the sections listed below:

101.2, 101.3, 101.4 *[Section 110.0, 110.1, 110.5]* Systems and Equipment

400.2, 400.5, 402.1, 402.2.1, 402.2.2, 402.2.4, 402.2.5, 402.2.6.1 through 402.2.6.8, 402.2.6.10, 402.2.6.11 *[Section 110.2, 150.0]* Mandatory Requirements for Space-conditioning Equipment

402.5.2.2 *[Section 150.2(b)1]* **Prescriptive requirements (Alterations).**

402.5.2.2.1 *[Section 150.2(b)1C]* **Entirely new or complete replacement space-conditioning systems.**

Entirely new or complete replacement *space-conditioning systems* installed as part of an *alteration*, shall include all the system heating or *cooling equipment*, including but not limited to: condensing unit cooling or heating coil, and *air handler* for *split systems*; or complete replacement of a packaged unit; plus entirely new or replacement *duct system* (Section 402.5.2.2.5 *[Section 150.2(b)1Diia]*).

Entirely new or complete replacement *space-conditioning systems* shall meet the requirements of the sections *listed* below, and Table 402.5 ~~A~~(1) *[TABLE 150.2-A]*.

402.2.6.1 through 402.2.6.8, 402.2.6.10 through 402.2.6.13 *[150.0(m)1-10, 12, 13]*

402.3.2 *[Section 150.1(c)7]*

402.5.2.2.2 *[Section 150.2(b)1Fii]*

402.5.2.2.3 *[Section 150.2(b)1G]*

402.5.2.2.2 *[Section 150.2(b)1F]* **Altered space-conditioning system - mechanical cooling.**

When a *space-conditioning system* is an *air conditioner* or *heat pump* that is altered by the installation or replacement of refrigerant-containing system components such as the compressor, condensing coil, evaporator coil, refrigerant metering device or refrigerant piping, the altered system shall comply with the following requirements:

402.5.2.2.2.1- *Thermostats*. All *thermostats* associated with the system shall be replaced with setback *thermostats* meeting the requirements of Section 400.5.3 *[Section 110.2(c)]*.

402.5.2.2.2.2- Airflow and refrigerant charge verification procedures. *Air-cooled air conditioners* in *Climate Zones* 2 and 8 through 15 and *air-source heat pumps* in all *climate zones*, including but not limited to ducted *split systems*, ducted package systems, small duct high velocity air systems, and minisplit systems, shall comply with Sections 402.5.2.2.2.3 and 402.5.2.2.2.4, unless the system is of a type that cannot be verified using the specified procedures. Systems that cannot comply with the requirements of Section 402.5.2.2.2.2 *[Section 150.2(b)1Fii]* shall comply with Section 402.5.2.2.2.5 *[Section 150.2(b)1Fiii]*.

Exception to Section 402.5.2.2.2.2: Entirely new or complete replacement packaged systems for which the manufacturer has verified correct system refrigerant charge prior to shipment from the *factory* are not required to have refrigerant charge confirmed through field verification and diagnostic testing. The installer of these packaged systems shall certify on the Certificate of Installation that the packaged system was pre-charged at the *factory* and has not been altered in a way that would affect the charge. *Ducted systems* shall comply with minimum system airflow rate requirement in Section 402.5.2.2.2.3 *[Section 150.2(b)1Fiia]*, provided that the system is of a type that can be verified using the procedure specified in RA3.3 or an approved alternative in RA1.

402.5.2.2.2.3- Minimum system airflow rate. Minimum system airflow rate shall comply with the applicable requirement below as confirmed through field verification and diagnostic testing in accordance with the procedures specified in Reference Residential Appendix Section RA3.3 or an approved alternative procedure as specified in Section RA1.

1. Small duct high velocity systems shall demonstrate a minimum system airflow rate greater than or equal to 250 cfm per ton of nominal cooling capacity; or
2. All other *air-cooled air conditioner* or *air-source heat pump* systems shall demonstrate a minimum system airflow rate greater than or equal to 300 cfm per ton of nominal cooling capacity.

Exception 1 to Section 402.5.2.2.2.3: Systems unable to comply with the minimum airflow rate requirement shall demonstrate compliance using the procedures in Section RA3.3.3.1.5; and the system's *thermostat* shall conform to the specifications in Section 400.6 *[Section 110.12]*.

Exception 2 to Section 402.5.2.2.2.3: Entirely new or complete replacement space conditioning systems, as specified by Section 402.5.2.2.1 *[Section 150.2(b)1C]*, without zoning dampers may comply with the minimum airflow rate by meeting the applicable requirements in Tables 402.2-~~A~~(1) and 402.2-~~B~~(2) *[Tables-150.0-B or 150.0-C]* as confirmed by field verification and diagnostic testing in accordance with the procedures in Reference Residential Appendix Section RA3.1.4.4 and RA3.1.4.5. The design clean-filter pressure drop requirements of Section 402.2.6.12.2 *[Section 150.0(m)12C]* for the system *air filter device*(*s*) shall conform to the requirements given in Tables 402.2-~~A~~(1) and 402.2-~~B~~(2) *[Tables150.0-B and 150.0-C]*.

402.5.2.2.2.4- Refrigerant charge. The installer shall charge the system according to manufacturer's specifications. Refrigerant charge shall be verified according to one of the following options, as applicable.

1. The installer and rater shall perform the standard charge verification procedure as specified in Reference Residential Appendix Section RA3.2.2, or an approved alternative procedure as specified in Section RA1; or
2. The installer shall perform the weigh-in charging procedure as specified by Reference Residential Appendix Section RA3.2.3.1 provided the system is of a type that can be verified using the RA3.2.2 standard charge verification procedure and RA3.3 airflow rate verification procedure or approved alternatives in RA1. The ECC-Rater shall verify the charge using RA3.2.2 and RA3.3 or approved alternatives in RA1.

Exception to Section 402.5.2.2.2.4: When the outdoor temperature is less than 55° F and the installer utilizes the weigh-in charging procedure in Reference Residential Appendix Section RA3.2.3.1 to demonstrate compliance, the installer may elect to utilize the verification procedure in Reference Residential Appendix Section RA3.2.3.2. If the verification procedure in Section RA3.2.3.2 is used for compliance, the system's *thermostat* shall conform to the specifications in Section 400.6 *[Section 110.12]*. *Ducted systems* shall comply with the minimum system airflow rate requirements in Section 402.5.2.2.2.3 *[Section 150.2(b)1Fiia]*.

402.5.2.2.2.5- Airflow and refrigerant charge alternate verification procedures. *Air-cooled air conditioners* in *climate Zones* 2 and 8 through 15 and *air-source heat pumps* in all *climate zones*, including but not limited to ducted *split systems*, ducted package systems, small duct high velocity, and minisplit systems, which are of a type that cannot comply with the requirements of Section 402.5.2.2.2.4 *[150.2(b)1Fiib]* shall comply with Sections 402.5.2.2.2.6 and 402.5.2.2.2.7, as applicable.

Exception to Section 402.5.2.2.2.5: Entirely new or complete replacement packaged systems for which the manufacturer has verified correct system refrigerant charge prior to shipment from the *factory* are not required to have refrigerant charge confirmed through field verification and diagnostic testing. The installer of these packaged systems shall certify on the Certificate of Installation that the packaged system was pre-charged at the *factory* and has not been altered in a way that would affect the charge. *Ducted systems* shall comply with minimum system airflow rate requirement in Section 402.5.2.2.2.6 *[Section 150.2(b)1Fiiib]*, provided that the system is of a type that can be verified using the procedure specified in Section RA3.3 or an approved alternative in Section RA1.

402.5.2.2.2.6- Minimum system airflow rate alternate procedure. Systems that utilize forced air ducts shall comply with the minimum system airflow rate requirement in Section 402.5.2.2.2.3 *[Section 150.2(b)1Fiia]* provided the system is of a type that can be verified using the procedures in Section RA3.3 or an approved alternative procedure in Section RA1.

402.5.2.2.2.7- Refrigerant charge alternate procedure. The installer shall confirm the refrigerant charge using the weigh-in charging procedure specified in Reference

Residential Appendix Section RA3.2.3.1, as verified by an ECC-Rater according to the procedures specified in Reference Residential Appendix RA3.2.3.2.

402.5.2.2.3 *[Section 150.2(b)1G]* **Altered space heating system.**

Altered or replacement space heating systems shall not use electric resistance as the primary heat source.

Exception 1 to Section 402.5.2.2.3: Non-ducted electric resistance space heating systems, if the existing space heating system is electric resistance.

Exception 2 to Section 402.5.2.2.3: Ducted electric resistance space heating systems, if the existing space heating system is electric resistance and a ducted space cooling system is not being replaced or installed.

Exception 3 to Section 402.5.2.2.3: Electric resistance space heating systems, if the existing space heating system is electric resistance and the *building* is located in *climate zones* 7 or 15.

402.5.2.2.4 *[Section 150.2(b)1E]* **Altered space-conditioning system - duct sealing.**

In all *climate zones*, when a *space-conditioning system* serving a single-family *dwelling* is altered by the installation or replacement of *space-conditioning system equipment*, including replacement of the *air handler*, outdoor condensing unit of a *split system air conditioner* or *heat pump*, or cooling or heating coil; the *duct system* that is connected to the altered *space-conditioning system equipment* shall be sealed, as confirmed through field verification and diagnostic testing in accordance with the applicable procedures for *duct sealing* of altered existing *duct systems* as specified in Reference Residential Appendix RA3.1 and the leakage compliance criteria specified below.

1. The measured duct leakage shall be equal to or less than 10 percent of system *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix RA3.1.4.3.1; or
2. The measured duct leakage to outside shall be equal to or less than 7 percent of system *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.4; or
3. If it is not possible to meet either of the duct leakage compliance criteria specified above, then, all *accessible* leaks shall be sealed and verified through a visual inspection and a smoke test by a certified ECC-Rater utilizing the methods specified in Reference Residential Appendix Section RA3.1.4.3.5.

Additionally, when altered ducts, *air-handling units*, cooling or heating coils, or plenums are located in *garage* spaces, the system shall comply with Section 402.5.2.2.5.5 *[Section 150.2(b)1Diic]* regardless of the length of any new or replacement space-conditioning ducts installed in the *garage* space.

Exception 1 to Section 402.5.2.2.4: *Duct systems* that are documented to have been previously sealed as confirmed through field verification and diagnostic testing in accordance with procedures in the Reference Residential Appendix RA3.1.

Exception 2 to Section 402.5.2.2.4: *Duct systems* with less than 40 linear feet as determined by visual inspection.

Exception 3 to Section 402.5.2.2.4: Existing *duct systems* constructed, insulated or sealed with asbestos.

402.5.2.2.5 *[Section 150.2(b)1D]* **Altered duct systems - duct sealing**

In all *Climate Zones*, when more than 25 feet of new or replacement *space-conditioning system* ducts are installed, the ducts shall comply with the applicable requirements below.

402.5.2.2.5.1- Duct design and construction. New ducts located in *unconditioned space* shall meet the applicable requirements of Sections 402.2.6.1 through 402.2.6.8, Section 402.2.6.10 and 402.2.6.11 *[Sections 150.0(m)1 through 150.0(m)10]*, and the duct insulation requirements of Table 402.5~~-D~~(4) *[Table 150.2-D]*; and

TABLE 402.5~~-D~~(4) [TABLE 150.2-D] DUCT INSULATION R-VALUE

REQUIREMENT	CLIMATE ZONE 3, 5 THROUGH 7	CLIMATE ZONE 1, 2, 4, 8 THROUGH 16
Duct *R-Value*	R-6	R-8

402.5.2.2.5.2- Field verification and diagnostic testing. The altered *duct system*, regardless of location, shall be sealed as confirmed through field verification and diagnostic testing in accordance with all applicable procedures for *duct sealing* of altered existing *duct systems* as specified in Reference Residential Appendix Section RA3.1, utilizing the leakage compliance criteria specified in Section 402.5.2.2.5.3 or 402.5.2.2.5.4 below.

Additionally, when altered ducts, *air-handling units*, cooling or heating coils, or plenums are located in *garage* spaces, the system shall comply with Section 402.5.2.2.5.5 *[Section 150.2(b)1Diic]* regardless of the length of any new or replacement space-conditioning ducts installed in the *garage* space.

402.5.2.2.5.3- Leakage compliance criteria - entirely new or complete replacement *duct system*. If the new ducts form an entirely new or complete replacement *duct system* directly connected to the *air handler*, the *duct system* measured leakage shall be equal to or less than 5 percent of the system *air handler* airflow as confirmed by field verification and diagnostic testing utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.1.

Entirely new or complete replacement *duct systems* installed as part of an *alteration* is constructed of at least 75 percent new duct material, and up to 25 percent may consist of reused parts from the *dwelling unit's* existing *duct system*, including but not limited to registers, grilles, boots, *air handler*, coil, plenums, duct material; if the reused parts are *accessible* and can be sealed to prevent leakage.

Entirely new or complete replacement *duct systems* shall also conform to the requirements of Sections 402.2.6.12 and 402.2.6.13 *[Sections 150.0(m)12 and 150.0(m)13]*. If the *air handler* and ducts are located within a vented *attic*, the requirements of Section 302.5.2.2.4 *[Section 150.2(b)1J]* shall also be met.

402.5.2.2.5.4- Leakage compliance criteria - extension of an existing *duct system*. If the new ducts are an extension of an existing *duct system* serving single-family *dwellings*, the combined new and existing *duct system* shall meet one of the following requirements:

1. The measured duct leakage shall be equal to or less than 10 percent of system *air handler* airflow as confirmed by field verification and diagnostic testing utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.1; or
2. The measured duct leakage to outside shall be equal to or less than 7 percent of system *air handler* airflow as confirmed by field verification and diagnostic testing utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.4; or
3. If it is not possible to meet either of the leakage compliance criteria specified above, then all *accessible* leaks shall be sealed and verified through a visual inspection and a smoke test by a certified ECC-Rater utilizing the methods specified in Reference Residential Appendix RA3.1.4.3.5.

Exception to Section 402.5.2.2.5.4: Existing *duct systems* that are extended, which are constructed, insulated or sealed with asbestos.

402.5.2.2.5.5- Leakage compliance criteria - altered ducts and *duct system* components in *garage* spaces. When new or replacement space-conditioning ducts, *air-handling units*, cooling or heating coils, or plenums are located in a *garage* space, compliance with either option below is required.

1. The measured system duct leakage shall be less than or equal to 6 percent of system *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.1; or
2. All *accessible* leaks located in the *garage* space shall be sealed and verified through a visual inspection and a smoke test by a certified ECC-Rater utilizing the methods specified in Reference Residential Appendix RA3.1.4.3.5.

402.5.2.2.6 *[Section 150.2(b)1L]* **Mechanical ventilation for indoor air quality - entirely new or complete replacement ventilation Systems.**

Entirely new or complete replacement ventilation systems shall comply with all applicable requirements in Sections 402.2.7 and 402.2.8 *[Section 150.0(o)]*. An entirely new or complete replacement ventilation system includes a new ventilation fan component and an entirely new *duct system*. An entirely new or complete replacement *duct system* is constructed of at least 75 percent new duct material, and up to 25 percent may consist of reused parts from the *dwelling unit's* existing *duct system*, including but not limited to registers, grilles, boots, air filtration devices and duct material, if the reused parts are *accessible* and can be sealed to prevent leakage.

402.5.2.2.7 *[Section 150.2(b)1M]* **Mechanical ventilation for indoor air quality - altered ventilation systems.**

Altered ventilation system components or newly installed ventilation *equipment* serving the *alteration* shall comply with Sections 402.2.7 and 402.2.8 *[Section 150.0(o)]* as applicable subject to the requirements specified below.

402.5.2.2.7.1 *[Section 150.2(b)1Mia]* **Whole-dwelling unit mechanical ventilation.**

If the whole-dwelling ventilation fan is altered or replaced, then one of the following options shall be used for compliance as applicable.

1. *Dwellings* that were required by a previous *building* permit to comply with the whole-dwelling unit airflow requirements in Sections 402.2.7 and 402.2.8 *[Section 150.0(o)]* shall meet or exceed the whole-dwelling unit mechanical ventilation airflow specified in Section 402.2.7.3 *[Section 150.0(o)1C]* as confirmed through field verification and diagnostic testing in accordance with the applicable procedures specified in Reference Residential Appendix RA3.7.
2. *Dwellings* that were not required by a previous *building* permit to have a whole-*dwelling unit* ventilation system shall not be required to comply with the whole-*dwelling unit* ventilation airflow specified in Section 402.2.7.3 *[Section 150.0(o)1C]*.

402.5.2.2.7.2 *[Section 150.2(b)1Mib]* **Replacement ventilation fans.**

Whole-dwelling unit replacement ventilation fans shall be rated for airflow and sound in accordance with the requirements of *ASHRAE* 62.2 Sections 7.1 and 7.3. Additionally, when conformance to a specified whole-dwelling unit airflow rate is required for compliance, the replacement fans shall be rated at no less than the airflow rate required for compliance.

402.5.2.2.7.3 *[Section 150.2(b)1Mic]* **Air filters.**

If the air filtration device for a whole-dwelling unit ventilation system is altered or replaced, then one of the following subsections 1 or 2 shall be used for compliance as applicable.

1. *Dwellings* that were required by a previous *building* permit to comply with the ventilation system air filtration requirements in Section 402.2.6.12 *[Section 150.0(m)12]* shall comply with the air filtration requirements in Section 402.2.6.12 *[Section 150.0(m)12]*.
2. *Dwellings* that were not required by a previous *building* permit to comply with the ventilation system air filtration requirements in Section 402.2.6.12 *[Section 150.0(m)12]* shall not be required to comply with the air filtration requirements specified in Section 402.2.6.12 *[Section 150.0(m)12]*.

402.5.2.2.7.4 *[Section 150.2(b)1Miia]* **Bathroom local mechanical exhaust.**

Altered *bathroom* local mechanical exhaust systems shall comply with the applicable requirements specified in Section 402.2.7.5 *[Section 150.0(o)1G]*.

402.5.2.2.7.5 *[Section 150.2(b)1Miib]* **Kitchen local mechanical exhaust.**

If the *kitchen* local ventilation fan is altered or replaced, then one of the following subsections 1, 2, or 3 shall be used for compliance as applicable.

1. *Dwellings* that were required by a previous *building* permit to comply with the *kitchen* local exhaust requirements in Section 402.2.7.5 *[Section 150.0(o)1G]* shall meet or exceed the applicable airflow or capture efficiency requirements in Section 402.2.7.5 *[Section 150.0(o)1G]*.

2. *Dwellings* that were required by a previous *building* permit to install a vented *kitchen* range hood or other *kitchen* exhaust fan, shall install a replacement fan that meets or exceeds the airflow required by the previous *building* permit, or 100 cfm, whichever is greater.
3. *Dwellings* that were not required to have a *kitchen* local ventilation exhaust system according to the conditions in either subsection 1 or 2 above shall not be required to comply with the requirements of Section 402.2.7.5 *[Section 150.0(o)1G]*.

402.5.2.2.7.6 *[Section 150.2(b)1Miic]* **Replacement ventilation fans.**

New or replacement local mechanical exhaust fans shall be rated for airflow and sound in accordance with the requirements of *ASHRAE* 62.2 Section 7.1 and Title 24, *Part 6* Section 402.2.7.5.4 *[Section 150.0(o)1Gvi]*. Additionally, when compliance with a specified exhaust airflow rate is required, the replacement fan shall be rated at no less than the airflow rate required for compliance.

402.5.2.3 *[Section 150.2(b)2]* **Performance requirements (Alterations).**

The *altered component*(*s*) and any newly installed *equipment* serving the *alteration* shall meet the applicable requirements of Section 102.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code;* Section 18930*, Health and Safety Code*..

SECTION 403

MULTIFAMILY OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

403.1 *[Section 160.0]* **General.**

Multifamily *use designation*~~*building*~~ mechanical systems and *equipment* shall comply with the applicable requirements of Section 403. Section 403 applies to *dwelling units* and *common use areas* in *multifamily* *use designation*~~*buildings*~~. Nonresidential *use designations*~~occupancies~~ in a mixed *occupancy building* shall comply with nonresidential requirements in Section 401.

NOTE: The requirements of Sections 403.2 through 403.4 apply to *newly constructed buildings*. Sections 403.2 and 403.5 apply to *additions* or *alterations*.

403.2 *[Section 160.2, 160.3]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

403.2.1 *[Section 160.1(f)]* **Installation of fireplaces, decorative gas appliances and gas logs.**

Shall comply with Section 402.2.1.

403.2.2 *[Section 160.2]* **Mandatory requirements for ventilation and indoor air quality.**

Attached dwelling units in *multifamily* *use designations*~~*buildings*~~ shall comply with the applicable requirements of Sections 403.2.2.2 and 403.2.2.3 *[Section 160.2(b)]* below. Occupied~~*Occupiable*~~ *spaces* in *multifamily* *use designations*~~*buildings*~~ other than *attached dwelling units* shall comply with the applicable requirements of Section 403.2.2.4 *[Section 160.2(c)]*. When field verification and diagnostic testing of *attached dwelling units* is required by Section 403.2.2 *[Section 160.2]*, ~~*buildings* with three habitable stories or fewer~~ *multifamily 3 stories or less use designation* shall use the applicable procedures in the Residential Appendices, and *multifamily more than 3 stories use designation* ~~*buildings* with four or more habitable stories~~ shall use the applicable procedures in Nonresidential Appendices NA1 and NA2.

NOTE: Section 403.2.2 *[Section 160.2]* is not applicable to *townhouses* or *dwellings* that contain two *dwelling units*.

403.2.2.1 *[Section 160.2(a)2]* **Compliance documentation.**

The required outdoor air-ventilation rate and the air-distribution system design shall be clearly identified on the *building* design plans submitted to the *enforcement agency* in accordance with Section 100.5 *[Section 10-103 of Title 24, Part 1]*.

403.2.2.2 *[Section 160.2(b)1]* **Air filtration – Attached dwelling units.**

Shall comply with Section 402.2.6.12.

403.2.2.3 *[Section 160.2(b)2]* **Ventilation and indoor air quality- Attached dwelling units.**

All *attached dwelling units* shall meet the requirements of *ASHRAE Standard 62.2*, Ventilation and Acceptable Indoor Air Quality in *Residential Buildings* subject to the amendments specified in Sections 403.2.2.3.1 through 403.2.2.3.11 *[Section 160.2(b)2A]* below. All *dwelling units* shall comply with Section 403.2.2.3.12 *[Section 160.2(b)2B]* below.

Exception to Section 403.2.2.3: The following sections of *ASHRAE* 62.2 shall not be required for compliance: Section 4.1.1, Section 4.1.2, Section 4.1.4, Section 4.2, Section 4.3, Section 4.6, Section 5, Section 6.1.1, Section 6.1.3 and Normative Appendix A.

403.2.2.3.1 *[Section 160.2(b)2Ai]* **Window operation.**

Shall comply with Section 402.2.7.1.

403.2.2.3.2 *[Section 160.2(b)2Aii]* **Central fan integrated (CFI) ventilation systems.**

Shall comply with Section 402.2.7.2.

Exception to Section 403.2.2.3.2: The *Energy Commission* may approve continuous operation of *central fan integrated ventilation systems* pursuant to Section 10-109(h).

403.2.2.3.3 *[Section 160.2(b)2Aiii]* **Air filtration.**

Shall comply with Section 402.2.7.4.

403.2.2.3.4 *[Section 160.2(b)2Aiv]* **Whole-dwelling unit mechanical ventilation.**

Multifamily *attached dwelling units* shall comply with requirements below:

1. Mechanical ventilation airflow shall be provided at rates greater than or equal to the value determined in accordance with Equation 403.2-A *[Equation 160.2-B]*.

   Total Required Ventilation Rate [*ASHRAE* 62.2:4.1.1].

   $Q_{tot} = 0.03A_{floor} + 7.5(N_{br} + 1)$ (Equation 403.2-A *[Equation 160.2-B]*)

   where:

   Q_{tot} = total required ventilation rate, cfm

   A_{floor} = *dwelling unit* floor area, ft^2

   N_{br} = number of bedrooms (not to be less than 1)

2. All *dwelling units* in a *multifamily building* shall use the same whole-dwelling unit ventilation system type. The *dwelling unit* shall comply with requirements below:

2.1. **Balanced or supply ventilation**. A balanced or *supply ventilation system* shall provide the required whole-dwelling-unit ventilation airflow. Balanced systems with heat recovery or energy recovery that serve a single *dwelling unit* shall have a fan efficacy of ≤1.0 W/cfm; and

2.2. ***Compartmentalization*** **Testing**. The air leakage rate shall not exceed 0.3 cubic feet per minute at 50 Pa (0.2 inch water) per ft^2 of *dwelling unit envelope* surface area as confirmed by ECC-rater field verification and diagnostic testing in accordance with the procedures specified in Reference Appendix RA3.8 or NA2.3 as applicable. In *multifamily buildings* with four or more *habitable stories*, the field verification and diagnostic testing which requires an ECC-Rater may alternatively be performed by a certified Mechanical Acceptance Test Technician according to the requirements specified in Reference Appendix NA1.9.

403.2.2.3.5 *[Section 160.2(b)2Av]* **Central ventilation system airflow rate tolerance.**

1. *Multifamily building* central ventilation systems that serve multiple *dwelling units* shall have airflow rates in each *dwelling unit* served that meet or exceed a design ventilation airflow rate specification.
2. Designers shall specify a design ventilation airflow rate for each *dwelling unit* that is equal to or greater than the rate specified by Equation 403.2-A *[Equation 160.2-B]*.
3. The design ventilation airflow rate for each *dwelling unit* shall be stated on the *building* design plans approved by the *enforcement agency*.
4. Airflow in each *dwelling unit* shall be no more than twenty percent greater than the specified design ventilation airflow rate. Ventilation systems shall utilize mechanical or software airflow control means to ensure each of the *dwelling unit* airflows can be maintained at the design ventilation airflow within this tolerance at all times. System airflow control-means may include but are not limited to constant air regulation devices, orifice plates and variable speed central fans.

403.2.2.3.6 *[Section 160.2(b)2Avi]* **Local mechanical exhaust.**

Shall comply with Section 402.2.7.5.

403.2.2.3.6.1 *[Section 160.2(b)2Avic]* **Demand-controlled mechanical exhaust.**

Shall comply with Section 402.2.7.5.1.

403.2.2.3.6.2 *[Section 160.2(b)2Avid]* **Continuous mechanical exhaust.**

Shall comply with Section 402.2.7.5.2 with the following modification:

For multifamily *dwelling units*, the *manual* ON-OFF control may be *accessible* to the *dwelling unit* occupant; however, the *manual* ON-OFF control shall not be required to be *accessible* to the *dwelling unit* occupant.

403.2.2.3.6.3 *[Section 160.2(b)2Avie]* **Airflow measurement of local mechanical exhaust by the system installer.**

Shall comply with Section 402.2.7.5.3 with the following modification:

The system installer shall measure the airflow by using a flow hood, flow grid or other airflow measuring device at the mechanical ventilation fan's inlet terminals/grilles or outlet terminals/grilles in accordance with the procedures in Reference Appendix RA3.7 or NA2.2 as applicable.

403.2.2.3.6.4 *[Section 160.2(b)2Avif]* **Sound ratings for local mechanical exhaust**.

Shall comply with Section 402.2.7.5.4.

Exception to Section 403.2.2.3.6.4: *Kitchen* range hoods may be rated for sound at a static pressure determined at working speed as specified in *HVI 916* Section 7.2.

403.2.2.3.7 *[Section 160.2(b)2Avii]* **Airflow measurement of whole-dwelling unit ventilation.**

The airflow required by Section 403.2.2.3.4 or 403.2.2.3.5 *[Section 160.2(b)2Aiv or 160.2(b)2Av]* is the quantity of outdoor ventilation air supplied or indoor air exhausted by the mechanical ventilation system as installed and shall be measured by using a flow hood, flow grid or other airflow measuring device at the mechanical ventilation fan's inlet terminals/grilles or outlet terminals/grilles in accordance with the procedures in Reference Appendix Section RA3.7.4.1.1 or NA2.2.4.1.1 as applicable for supply and exhaust systems or RA3.7.4.1.2 or NA2.2.4.1.2 as applicable for balanced systems. Balanced mechanical ventilation system airflow shall be the average of the supply fan and exhaust fan flows.

403.2.2.3.8 *[Section 160.2(b)2Aviii]* **Sound ratings for whole-dwelling unit ventilation systems.**

Shall comply with Section 402.2.7.7.

403.2.2.3.9 *[Section 160.2(b)2Aix]* **Label for whole-dwelling unit ventilation system on-off control.**

Shall comply with Section 402.2.7.8.

403.2.2.3.10 *[Section 160.2(b)2Ax]* **Combustion air and compensating outdoor air or makeup air.**

Shall comply with Section 402.2.7.9.

403.2.2.3.11 *[Section 160.2(b)2Axi]* **Balanced and supply ventilation component accessibility.**

Balanced and *supply ventilation systems* shall meet the following requirements for accessibility:

403.2.2.3.11.1- IAQ filter and *HRV/ERV* accessibility. System *air filters* and *HRV/ERV* heat/energy recovery cores shall be located such that they are *accessible* for service from within *occupiable spaces*, basements, *garages*, balconies, mechanical closets or *accessible* rooftops. Filters and heat/energy recovery cores behind access panels, access doors, or grilles located no more than 10 feet above a walking surface inside a space specified above comply with this requirement.

Exception to Section 403.2.2.3.11.1: Systems that require servicing from inside the *attic* shall have the following:

1. A *Fault* Indicator Display (FID) meeting the requirements of Reference Appendix JA 17; and
2. An *attic* access *door* located in a wall or, where *attic* access is provided through a ceiling, an *attic* access hatch that includes an integrated ladder; and
3. A walkway from the *attic* access *door* to the *HRV/ERV*.

403.2.2.3.11.2- IAQ system component accessibility.

Shall comply with Section 402.2.7.3.4.2.

403.2.2.3.12 *[Section 160.2(b)2B]* **Dwelling unit field verification and diagnostic testing.**

1. The whole-dwelling unit ventilation airflow required by Section 403.2.2.3.4 or 403.2.2.3.5 *[Section 160.2(b)2Aiv or 160.2(b)2Av]* shall be confirmed through field verification and diagnostic testing in accordance with Reference Appendix RA3.7.4.1.1 or NA2.2.4.1.1 as applicable for supply and exhaust systems or RA3.7.4.1.2 or NA2.2.4.1.2 as applicable for balanced systems. Balanced mechanical ventilation system airflow shall be the average of the supply fan and exhaust fan flows. Ventilation airflow of systems with multiple operating modes shall be tested in all modes designed to comply with the required ventilation airflows.
2. ***Kitchen* local mechanical exhaust—vented range hoods.** Vented range hoods installed to comply with local mechanical exhaust requirements specified in Section 403.2.2.3.6 *[Section 160.2(b)2Avi]* shall be field verified in accordance with Reference Appendix RA3.7.4.3 or NA2.2.4.1.4 as applicable to confirm the model is rated by HVI or *AHAM* to comply with the following requirements:
   2.1. The minimum ventilation airflow rate as specified by Section 403.2.2.3.6 *[Section 160.2(b)2Avi]*, or alternatively the minimum capture efficiency as specified by Section 403.2.2.3.6 *[Section 160.2(b)2Avi]*; and
   2.2. The maximum sound rating as specified in Section 403.2.2.3.6.4 *[Section 160.2(b)2Avif]*.

3. **Heat recovery ventilation (*HRV*) and energy recovery ventilation (*ERV*) system fan efficacy.** At a minimum, systems with heat or energy recovery serving a single *dwelling unit* shall have a fan efficacy of ≤1.0 W/cfm as confirmed by field verification in accordance with Reference Appendix RA3.7.4.4 or NA2.2.4.1.5 as applicable. If Section 403.3.1.2.4.1 *[Section 170.2(c)3Biva]* requirements are applicable to the *dwelling unit*, then field verification shall instead confirm compliance with the maximum fan efficacy and minimum sensible recovery efficiency specified in Section 403.3.1.2.4.1 *[Section 170.2(c)3Biva]* in accordance with the procedures specified in Reference Appendix RA3.7.4.4 or NA2.2.4.1.5 as applicable.

4. In *multifamily more than 3 stories use designation*~~buildings with four or more habitable stories~~, the field verification and diagnostic testing required in Section 403.2.2.3.12 *[Section 160.2(b)2Bi, ii and iii]* which requires an ECC-Rater may alternatively be performed by a certified Mechanical Acceptance Test Technician according to the requirements specified in Reference Appendix NA1.9.

403.2.2.3.13 *[Section 160.2(b)2C]* **Central ventilation system field verification.**

Central ventilation system *duct sealing*. Ventilation ducts that meet the conditions below shall meet the *duct sealing* requirements in California Mechanical Code Section 603.10 and have leakage that is no greater than six percent of the rooftop fan or central fan design airflow rate as confirmed by field verification in accordance with the procedures in Reference Appendix NA7.18.3. The leakage test shall be conducted using a test pressure of 25 Pa (0.1 inches) for ducts serving six or fewer *dwelling units* and 50 Pa (0.2 inches) for ducts serving more than six *dwelling units*, and shall measure the leakage of all ductwork between the central fan and the connection point to the in-unit grille or fan.

1. The ventilation ducts serve multiple *dwelling units*.
2. The ventilation ducts provide continuous airflows or airflows to provide balanced ventilation to meet the requirements specified in Section 403.2.2.3.4 or 403.2.2.3.5 *[Section 160.2(b)2Aiv or 160.2(b)2Av]* as applicable.

Exception to Section 403.2.2.3.13: *Multifamily buildings* with three or fewer *habitable stories* in *Climate Zone* 6 are not required to comply with Section 403.2.2.3.13 *[Section 160.2(b)2C]*.

403.2.2.4 *[Section 160.2(c)1]* **Air filtration – Common use areas.**

All *occupiable spaces* shall comply with the requirements of 401.2.1.1.1.

403.2.2.5 *[Section 160.2(c)2 and Section 160.2(c)3]* **Natural and mechanical ventilation – Common use areas.**

All *occupiable spaces* shall comply with the natural ventilation requirements of 401.2.1.1.2 or the mechanical ventilation requirements of 401.2.1.1.3.

403.2.2.6 *[Section 160.2(c)4]* **Exhaust ventilation – Common use areas.**

Shall comply with the requirements of 401.2.1.1.4.

403.2.2.7 *[Section 160.2(c)5]* **Operation and control requirements for minimum quantities of outdoor air – Common use areas.**

Shall comply with the requirements of 401.2.1.2.

403.2.2.8 *[Section 160.2(c)6]* **Ducting for zonal heating and cooling units – Common use areas.**

Shall comply with the requirements of 401.2.1.3.

403.2.2.9 *[Section 160.2(c)7]* **Design and control requirements for quantities of outdoor air – Common use areas.**

Shall comply with the requirements of 401.2.1.4 with the following modification:

Measured *outdoor air* rates of constant volume mechanical ventilation and *space-conditioning systems* shall be within 10 percent of the required *outside air* rate.

403.2.2.10 *[Section 160.2(c)8]* **Air classification and recirculation limitations – Common use areas.**

Shall comply with the requirements of 401.2.1.5 with the following modification:

Table 403.2-A(1) *[Table 160.2-D]* shall be used in lieu of Table 401.2-C(3).

TABLE 403.2-A(1) [TABLE 160.2-D] – AIRSTREAMS OR SOURCES [ASHRAE 62.1:TABLE 6-3]

DESCRIPTION	AIR CLASS
Commercial *kitchen* grease hoods	4
Commercial *kitchen* hoods other than grease	3
Hydraulic elevator machine room	2
Refrigerating machinery rooms	3

403.2.2.11 *[Section 160.2(d)]* **Parking garages.**

Mechanical ventilation systems for enclosed parking *garages* in *multifamily buildings* shall comply with Section 903 *[Section 120.6(c)]*.

403.2.3 *[Section 160.3]* **Mandatory requirements for space conditioning systems.**

Space conditioning systems serving multifamily *dwelling units* and *common use areas* shall comply with the applicable requirements of Sections 403.2.3.1 through 403.2.3.4 *[Sections 160.3(a) through 160.3(c)]*.

403.2.3.1 *[Section 160.3(a)1]* **Dwelling unit thermostats.**

All heating or cooling systems, including *heat pumps*, not controlled by a central *energy management control system (EMCS)* shall have a setback *thermostat*, as specified in Section 400.5.3 *[Section 110.2(c)]*.

403.2.3.2 *[Section 160.3(a)2]* **Common use area controls.**

Heating or cooling systems serving *common use areas* of *multifamily buildings* shall comply with the applicable requirements below:

Exception to Section 403.2.3.2: Heating or cooling systems exclusively serving *dwelling units* and *common use areas* providing shared provisions for living, eating, cooking or sanitation to *dwelling units* that would otherwise lack these provisions may instead comply with Section 403.2.3.1 *[Section 160.3(a)1]*.

403.2.3.2.1 *[Section 160.3(a)2A]* **Thermostatic controls for each zone.**

Shall comply with the requirements of 401.2.2.1.

403.2.3.2.2 *[Section 160.3(a)2B]* **Criteria for zonal thermostatic controls.**

Shall comply with the requirements of 401.2.2.2.

403.2.3.2.3 *[Section 160.3(a)2C]* **Heat pump controls.**

Shall comply with the requirements of 401.2.2.4.

403.2.3.2.4 *[Section 160.3(a)2Di]* **Automatic shut-off.**

Shall comply with the requirements of 401.2.2.5.1.

403.2.3.2.5 *[Section 160.3(a)2Dii]* **Automatic restart.**

The control shall automatically restart and temporarily operate the system as required to maintain:

403.2.3.2.5.1- Heating setpoint. A setback heating *thermostat* setpoint if the system provides *mechanical heating*; and

Exception to Section 403.2.3.2.5.1: *Thermostat* setback controls are not required in *multifamily buildings* in areas where the Winter Median of Extremes *outdoor air* temperature determined in accordance with Section 403.3.2.1.1.3 *[Section 170.2(c)2C]* is greater than 32°F.

403.2.3.2.5.2- Cooling setpoint. A setup cooling *thermostat* setpoint if the system provides *mechanical cooling*.

Exception to Section 403.2.3.2.5.2: *Thermostat* setup controls are not required in *multifamily buildings* in areas where the summer design dry-bulb 0.5-percent temperature determined in accordance with Section 403.3.2.1.1.3 *[Section 170.2(c)2C]* is less than 100°F.

403.2.3.2.6 *[Section 160.3(a)2Diii]* **Occupant sensing zone controls.**

Shall comply with the requirements of 401.2.2.5.3 with the following modification:

Occupant sensing zone controls shall comply with the occupant sensor ventilation control device requirements of Section 403.2.2.7 *[Section 160.2(c)5E]* and allow preoccupancy ventilation requirements of Section 403.2.2.7 *[Section 160.2(c)5B]*.

Exception to Section 403.2.3.2.6: Zones that are only ventilated by a natural ventilation system in accordance with Section 401.2.1.1.2 *[Section 120.1(c)2]*.

403.2.3.2.7 *[Section 160.3(a)2E]* **Dampers for air supply and exhaust equipment.**

Shall comply with the requirements of 401.2.2.6.

403.2.3.2.8 *[Section 160.3(a)2F]* **Isolation area devices.**

Shall comply with the requirements of 401.2.2.7.

403.2.3.2.9 *[Section 160.3(a)2G]* **Automatic demand shed controls.**

Shall comply with the requirements of 401.2.2.8.

403.2.3.2.10 *[Section 160.3(a)2H]* **Economizer Fault Detection and Diagnostics (FDD).**

Shall comply with the requirements of 401.2.2.9.

403.2.3.2.11 *[Section 160.3(a)2I]* **Direct Digital Controls (DDC).**

Shall comply with the requirements of 401.2.2.11~~0~~.

403.2.3.2.12 *[Section 160.3(a)2J]* **Optimum start/stop controls.**

Shall comply with the requirements of 401.2.2.1~~1~~2.

403.2.3.3 *[Section 160.3(b)]* **Space-conditioning and air distribution systems – Dwelling units.**

403.2.3.3.1 *[Section 160.3(b)1]* **Building cooling and heating loads.**

Building heating and cooling loads shall be determined using a method based on any one of the following, using cooling and heating loads as two of the criteria for *equipment* sizing and selection:

1. The *ASHRAE* Handbook, Equipment Volume, Applications Volume and Fundamentals Volume; or
2. The *SMACNA Residential Comfort System Installation Standards Manual*; or
3. The *ACCA Manual J*.

NOTE: Heating systems are required to have a minimum heating capacity adequate to meet the minimum requirements of the *CBC*.

403.2.3.3.2 *[Section 160.3(b)2]* **Design conditions.**

Shall comply with the requirements of 402.2.2.2.

403.2.3.3.3 *[Section 160.3(b)3]* **Outdoor condensing units.**

Shall comply with the requirements of 402.2.2.3.

403.2.3.3.4 *[Section 160.3(b)4]* **Central forced-air heating furnaces.**

Shall comply with the requirements of 402.2.2.4.

403.2.3.3.5 *[Section 160.3(b)5]* **Air-distribution and ventilation system ducts, plenums and fans.**

403.2.3.3.5.1 *[Section 160.3(b)5A]* ***CMC*** **compliance.**

All air-distribution system ducts and plenums, including, but not limited to, mechanical closets and air-handler boxes, shall meet the requirements of the *CMC* Sections 601.0, 602.0, 603.0, 604.0 and 605.0 and *ANSI*/*SMACNA*-006-2006 HVAC Duct Construction Standards Metal and Flexible 3rd Edition, incorporated herein by reference.

Portions of supply-air and return-air ducts and plenums of a space heating or cooling system shall be insulated in accordance with either Section 403.2.3.3.5.2 or Section 403.2.3.3.5.3.

Exception to Section 403.2.3.3.5.1: Ducts and fans integral to a *wood heater* or *fireplace*.

403.2.3.3.5.2 *[Section 160.3(b)5Aiia]* ***CMC*** **compliance - minimum insulation option.**

Ducts shall have a minimum installed level of R-6.0.

Exception to Section 403.2.3.3.5.2: Portions of the *duct system* located in *conditioned space* below the ceiling separating the *occupiable space* from the *attic* are not required to be insulated if all of the following conditions are met:

1. The noninsulated portion of the *duct system* is located entirely inside the *building's* thermal *envelope* as confirmed by visual inspection.
2. At all locations where noninsulated portions of the *duct system* penetrate into *unconditioned space*, the penetration shall be draft stopped compliant with *CFC* Sections 703.1 and 704.1 and air-sealed to the construction materials that are penetrated, using materials compliant with *CMC* Section E502.4.2 to prevent air *infiltration* into the cavity. All connections in *unconditioned space* are insulated to a minimum of R-6.0 as confirmed by visual inspection.

403.2.3.3.5.3 *[Section 160.3(b)5Aiib]* ***CMC*** **compliance - ducts in *conditioned space* option.**

1. Ducts do not require insulation when the *duct system* is located entirely in *conditioned space*. For *buildings* with three or fewer *habitable stories*, *duct systems* located entirely in *conditioned space* shall be confirmed through field verification and diagnostic testing in accordance with the requirements of Reference Residential Appendix RA3.1.4.3.8.
2. Connections of metal ducts and the inner core of flexible ducts shall be mechanically fastened.
3. Openings shall be sealed with mastic, tape, or other duct-closure system that meets the applicable requirements of *UL 181*, *UL 181A* or *UL 181B* or aerosol

sealant that meets the requirements of *UL 723*. If mastic or tape is used to seal openings greater than 1/4 inch, the combination of mastic and either mesh or tape shall be used.

4. *Building* cavities, support platforms for *air handlers*, and plenums designed or constructed with materials other than sealed sheet metal, duct board or flexible duct shall not be used for conveying conditioned air. *Building* cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms shall not be compressed to cause reductions in the cross-sectional area of the ducts.

403.2.3.3.5.4 *[Section 160.3(b)5B]* **Factory-fabricated *duct systems*.**

Shall comply with the requirements of 402.2.6.2.

403.2.3.3.5.5 *[Section 160.3(b)5C]* **Field-fabricated *duct systems*.**

Shall comply with the requirements of 402.2.6.3.

403.2.3.3.5.6 *[Section 160.3(b)5D]* **Duct insulation *R-value* ratings.**

Shall comply with the requirements of 402.2.6.4.

403.2.3.3.5.7 *[Section 160.3(b)5E]* **Duct insulation thickness.**

Shall comply with the requirements of 402.2.6.5.

403.2.3.3.5.8 *[Section 160.3(b)5F]* **Duct labeling.**

Shall comply with the requirements of 402.2.6.6.

403.2.3.3.5.9 *[Section 160.3(b)5I]* **Protection of insulation.**

Shall comply with the requirements of 402.2.6.7.

403.2.3.3.5.10 *[Section 160.3(b)5J]* **Porous inner core flex duct.**

Shall comply with the requirements of 402.2.6.8.

403.2.3.3.6 *[Section 160.3(b)5K]* **Duct system sealing and leakage testing.**

When *space-conditioning systems* utilize forced air *duct systems* to supply conditioned air to an individual *dwelling unit*, the ducts shall be sealed, as confirmed through field verification and diagnostic testing, in accordance with all applicable procedures specified in Reference Residential Appendix RA3.1. *Air handler* airflow for calculation of duct leakage rate compliance targets shall be determined according to methods specified in Reference Residential Appendix RA3.1.4.2**.**

For multifamily *dwellings* with the *air-handling unit* installed and the ducts connected directly to the *air handler*, regardless of *duct system* location:

1. The total leakage of the *duct system* shall not exceed 12 percent of the *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.1; or

2. The *duct system* leakage to outside shall not exceed 6 percent of the *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.4.

Exception 1 to Section 403.2.3.3.6: The field verification and ECC-Provider data registry requirements of Reference Residential Appendix RA2 and RA3 are not required for multifamily *dwelling units* in *buildings* four *habitable stories* and greater. The installer shall certify that diagnostic testing was performed in accordance with the applicable procedures.

Exception 2 to Section 403.2.3.3.6: Multifamily *dwelling units* in *buildings* four *habitable stories* and greater in *Climate Zones* 1, 3, 5 and 7.

403.2.3.3.7 *[Section 160.3(b)5G]* **Backdraft dampers.**

Shall comply with the requirements of 402.2.6.10.

403.2.3.3.8 *[Section 160.3(b)5H]* **Gravity ventilation dampers.**

Shall comply with the requirements of 402.2.6.11.

403.2.3.3.9 *[Section 160.3(b)5L]* **System airflow rate and fan efficacy.**

Space-conditioning systems that utilize forced air ducts to supply cooling to an individual *dwelling unit* shall meet the requirements in Sections 403.2.3.3.9.1 through 403.2.3.3.9.4.

Exception 1 to Section 403.2.3.3.9: The field verification and ECC-Provider data registry requirements of Reference Residential Appendix RA2 and RA3 are not required for multifamily *dwelling units* in *buildings* four *habitable stories* and greater. The installer shall certify that diagnostic testing was performed in accordance with the applicable procedures.

Exception 2 to Section 403.2.3.3.9: Multifamily *dwelling units* in *buildings* four *habitable stories* and greater in Climate Zone 1.

403.2.3.3.9.1 *[Section 160.3(b)5Li]* **Static pressure probe.**

Shall comply with the requirements of 402.2.6.13.1.

403.2.3.3.9.2 *[Section 160.3(b)5Lii]* **Single zone central forced air systems.**

Shall comply with the requirements of 402.2.6.13.2.

403.2.3.3.9.3 *[Section 160.3(b)5Liii]* **Zonally controlled central forced air systems.**

Shall comply with the requirements of 402.2.6.13.3.

403.2.3.3.9.4 *[Section 160.3(b)5Liv]* **Small duct high velocity forced air systems.**

Shall comply with the requirements of 402.2.6.13.4.

403.2.3.3.10 *[Section 160.3(b)6]* **Pipe insulation.**

Piping for *space-conditioning systems*, and distribution piping for steam and hydronic heating system shall meet the requirements of Section 403.2.3.4.1 *[Section 160.3(c)1]*.

403.2.3.3.11 *[Section 160.3(b)7]* **Defrost.**

Shall comply with the requirements of 402.2.2.6 with the following modification:

Exceptions 1 and 2 to Section 402.2.2.6 do not apply to multifamily *dwelling units*.

Exception to 403.2.3.3.11. *Dwelling units* in *Climate Zones* 1, 6 through 10, 15, and 16 shall not be required to comply with the 90 minute delay timer requirements.

403.2.3.3.12 *[Section 160.3(b)8]* **Capacity variation with third-party thermostats.**

Variable or multi-speed systems shall comply with the following requirements:

1. The space conditioning system and *thermostat* together shall be capable of responding to heating and cooling loads by modulating system compressor speed.
2. The installer shall certify on the Certificate of Installation that the control configuration has been tested in accordance with the testing procedure found in the Certificate of Installation.

403.2.3.4 *[Section 160.3(c)]* **Fluid distribution systems; common area space-conditioning systems.**

Multifamily common areas shall comply with the applicable requirements of Sections 403.2.3.4.1 and 403.2.3.4.2 .

403.2.3.4.1 *[Section 160.3(c)1]* **Pipe insulation.**

Multifamily buildings shall comply with the applicable requirements of Sections 403.2.3.4.1.1 through 403.2.3.4.1.3 *[Sections 160.3(c)1A through 160.3(c)1D]*.

Exception 1 to Section 403.2.3.4.1: Factory-installed piping within space-conditioning *equipment* certified under Section 101.3 or Section 400.5 *[Section 110.1 or 110.2]*.

Exception 2 to Section 403.2.3.4.1: Piping that conveys fluids with a design operating temperature range between 60°F and 105°F.

Exception 3 to Section 403.2.3.4.1: Where the heat gain or heat loss to or from piping without insulation will not increase *building source energy* use.

Exception 4 to Section 403.2.3.4.1: Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration. Metal piping that penetrates metal framing shall use grommets, plugs, wrapping or other insulating material to ensure that no contact is made with the metal framing.

403.2.3.4.1.1 *[Section 160.3(c)1A and B]* **General requirements.**

Shall comply with the requirements of 401.2.3.1.

403.2.3.4.1.2 *[Section 160.3(c)1C]* **Insulation protection.**

Shall comply with the requirements of 401.2.3.2.

403.2.3.4.1.3 *[Section 160.3(c)1D]* **Insulation thickness.**

Shall comply with the requirements of 401.2.3.3.

403.2.3.4.2 *[Section 160.3(c)2]* **Air distribution system, ducts and plenum.**

Multifamily common areas shall comply with the applicable requirements of Sections 403.2.3.4.2.1 through 403.2.3.4.2.5 *[Sections 160.3(c)2A through 160.3(c)2F]*.

403.2.3.4.2.1 *[Section 160.3(c)2A and B]* **CMC compliance.**

Shall comply with the requirements of 401.2.4.1.

403.2.3.4.2.2 *[Section 160.3(c)2C]* **Duct and plenum materials.**

Shall comply with the requirements of 401.2.4.2 with the following modification:

Field-fabricated duct systems.

Ductwork and plenums with pressure class ratings shall be constructed to *Seal Class A*. Joints and seams of *duct systems* and their components shall not be sealed with cloth back rubber adhesive duct tapes unless such tape is used in combination with mastic and drawbands with no exception.

403.2.3.4.2.3 *[Section 160.3(c)2D]* **Product R-values.**

Shall comply with the requirements of 401.2.4.3.

403.2.3.4.2.4 *[Section 160.3(c)2E]* **Installed thickness.**

Shall comply with the requirements of 401.2.4.4.

403.2.3.4.2.5 *[Section 160.3(c)2F]* **Insulated flexible duct labels.**

Shall comply with the requirements of 401.2.4.5.

403.2.3.4.2.6 *[Section 160.3(c)2G]* **Protection of insulation.**

Shall comply with the requirements of 401.2.4.6.

403.2.3.4.2.7 *[Section 160.3(c)2Hi]* **Duct leakage testing.**

New *duct systems* that meet the criteria below or ductwork that is part of a system that meets the criteria of Sections 403.5.2.2.8 through 403.5.2.2.10 *[Section 180.2(b)2B]* shall be sealed to a leakage rate not to exceed 6 percent of the nominal *air handler* airflow rate as confirmed through acceptance testing, in accordance with Reference Nonresidential Appendix NA7.5.3.

1. The *duct system* provides conditioned air to an *occupiable space* for a constant volume, single zone, *space-conditioning system*; and
2. The *space-conditioning system* serves less than 5,000 square feet of *conditioned floor area*; and

3. The combined surface area of the ducts located in the following spaces is more than 25 percent of the total surface area of the entire *duct system*:

   3.1. Outdoors; or

   3.2. In a space directly under a *roof* that has a *U-factor* greater than the *U-factor* of the ceiling, or if the *roof* does not meet the requirements of Section 303.3.1.1 *[Section 170.2(a)1]*; or

   3.3. In a space directly under a *roof* that has fixed vents or openings to the outside or *unconditioned spaces*; or

   3.4. In an unconditioned *crawl space*; or

   3.5. In other *unconditioned spaces*.

403.2.3.4.2.8 *[Section 160.3(c)2Hii]* **Duct leakage testing - CMC compliance.**

All *duct systems* that do not meet the criteria in Section 403.2.3.4.2.7 *[Section 160.3(c)2Hi]* shall meet the duct leakage testing requirements of *CMC* Section 603.9.2.

403.2.3.5 *[Section 160.3(d)]* **Mechanical acceptance testing.**

403.2.3.5.1 *[Section 160.3(d)1]* **Common use areas.**

Before an occupancy permit is granted, the following systems and *equipment* serving multifamily common areas shall be certified as meeting the *Acceptance Requirements for Code Compliance*, as specified by Reference Nonresidential Appendix NA7. These systems and *equipment* shall also comply with the applicable requirements of Section 403.2.3.5.3 *[Section 160.3(d)3]*. A Certificate of Acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements:

403.2.3.5.1.1- *Outdoor air* ventilation systems shall be tested in accordance with NA7.5.1.

403.2.3.5.1.2- Constant volume, single zone air conditioning and *heat pump* unit controls shall be tested in accordance with NA7.5.2.

403.2.3.5.1.3- *Duct systems* shall be tested in accordance with NA7.5.3 where either they are new *duct systems* or they are part of an altered system.

403.2.3.5.1.4- *Air economizers*, *DOAS*, *HRV* or *ERV* systems shall be tested in accordance with NA7.5.4.

Exception to Section 403.2.3.5.1.4: *Air economizers* installed by the *HVAC system* manufacturer and *certified to the Energy C~~e~~ommission* as being *factory* calibrated and tested are not required to comply with the Functional Testing section of the *Air Economizer* Controls acceptance test as described in NA7.5.4.2.

403.2.3.5.1.5- *Demand control ventilation* systems required by Section 403.2.2.7 *[Section 160.2(c)5C]* shall be tested in accordance with NA7.5.5.

403.2.3.5.1.6- Supply fan variable flow controls shall be tested in accordance with NA7.5.6.

403.2.3.5.1.7- Hydronic system variable flow controls shall be tested in accordance with NA7.5.7 and NA7.5.9.

403.2.3.5.1.8- Boilers or chillers that require isolation controls as specified by Section 403.3.2.10.2 *[Section 170.2(c)4Iii]* or Section 403.3.2.10.3 *[Section 170.2(c)4Iiii]* shall be tested in accordance with NA7.5.7.

403.2.3.5.1.9- Hydronic systems with supply water temperature reset controls shall be tested in accordance with NA7.5.8.

403.2.3.5.1.10- *Automatic* demand shed controls shall be tested in accordance with NA7.5.10.

403.2.3.5.1.11- *Fault detection and diagnostics* (FDD) for packaged direct expansion units shall be tested in accordance with NA7.5.11.

403.2.3.5.1.12- *Automatic fault detection and diagnostics* (FDD) for air handling units and zone terminal units shall be tested in accordance with NA7.5.12.

403.2.3.5.1.13- Distributed energy storage DX AC systems shall be tested in accordance with NA7.5.13.

403.2.3.5.1.14- Thermal energy storage (TES) systems shall be tested in accordance with NA7.5.14.

403.2.3.5.1.15- *Supply air* temperature reset controls shall be tested in accordance with NA7.5.15.

403.2.3.5.1.16- Water-cooled chillers served by cooling towers with *condenser* water reset controls shall be tested in accordance with NA7.5.16.

403.2.3.5.1.17- When an *energy management control system* is installed, it shall functionally meet all of the applicable requirements of *Part 6*.

403.2.3.5.1.18- Occupant sensing zone controls shall be tested in accordance with NA7.5.17.

403.2.3.5.2 *[Section 160.3(d)2]* **Dwelling units.**

Before an occupancy permit is granted, the following systems and *equipment* serving multifamily *dwelling units* shall be certified as meeting the *acceptance requirements for code compliance*, as specified by the Reference Nonresidential Appendix NA7. These systems and *equipment* shall also comply with the applicable requirements of Section 403.2.3.5.3 *[Section 160.3(d)3]*. A Certificate of Acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements:

1. *Multifamily building* central ventilation ducts subject to Section 403.2.2.3.13 *[Section 160.2(b)2C]* shall be leak tested in accordance with NA7.18.3.

2. *Multifamily* ~~*building*~~ central ventilation system heat recovery or energy recovery systems in *multifamily* *more than 3 stories use designation* ~~*buildings* with four or more habitable stories~~ shall be tested in accordance with NA7.18.4.

403.2.3.5.3 *[Section 160.3(d)3]* **Certified Mechanical Acceptance Test Technician (CMATT).**

When certification is required by Section 103.2 *[Title 24, Part 1, Section 10-103.2]*, the acceptance testing specified by Sections 403.2.3.5.1 and 403.2.3.5.2 *[Section 160.3(d)1 and 2]* shall be performed by a Certified Mechanical Acceptance Test Technician (CMATT). If the CMATT is operating as an employee, the CMATT shall be employed by a Certified Mechanical Acceptance Test Employer. The CMATT shall disclose on the Certificate of Acceptance a valid CMATT certification identification number issued by an approved Acceptance Test Technician Certification Provider. The CMATT shall complete all Certificate of Acceptance documentation in accordance with the applicable requirements in Section 100.5.1.3 *[Section 10-103(a)4]*.

403.2.4 *[Section 160.9(b)]* **Heat pump space heater ready.**

Systems using gas or propane furnaces to serve individual *dwelling units* shall meet *heat pump* space heater ready requirements in Section 603.2.4.3.

403.3 *[Section 170.2(c)]* **Prescriptive requirements (Newly Constructed)**

All space heating, space cooling and ventilation *equipment* shall comply with minimum *Appliance Efficiency Regulations* as specified in Sections 400.1 and 400.2 *[Sections 110.0 through 110.2]* and the applicable requirements of this section.

403.3.1 *[Section 170.2(c)3]* **Space-conditioning systems - Dwelling units.**

403.3.1.1 *[Section 170.2(c)3A]* **Heating system type.**

Space-conditioning systems serving *dwelling units* shall meet the applicable option below. Systems that cannot meet the requirements below, including multi-zone systems and systems using central boilers or chillers, shall comply with the performance requirements of Section 403.4 *[Section 170.1]*.

1. **Multifamily buildings three habitable stories or fewer.**

   For *Climate Zones* 1 through 15, the *space-conditioning system* shall be a *heat pump*.

   For Climate Zone 16, the *space-conditioning system* shall be an *air conditioner* with furnace. Additionally, *balanced ventilation systems* serving these *dwelling units* shall meet the applicable requirements of Section 403.3.1.2.5 *[Section 170.2(c)3Bv]*.

2. **Multifamily buildings four habitable stories or greater.**

   For *Climate Zones* 2 through 15, the *space-conditioning system* shall be a *heat pump*.

For *Climate Zones* 1 and 16, the *space-conditioning system* shall be a *dual-fuel heat pump*.

Exception to Section 403.3.1.1: A supplemental heating unit may be installed in a space served directly or indirectly by a primary heating system, provided that the unit thermal capacity does not exceed 2 kW or 7,000 Btu/hr and is controlled by a time-limiting device not exceeding 30 minutes.

403.3.1.2 *[Section 170.2(c)3B]* **Space-conditioning and ventilation systems.**

All space heating and space *cooling equipment* serving *dwelling units* shall comply with all applicable requirements of this section.

Exception to Section 403.3.1.2: The field verification and ECC-Provider data registry requirements of Reference Residential Appendix RA2 and RA3 are not required for multifamily *dwelling units* in *buildings* four *habitable stories* and greater. The installer shall certify that diagnostic testing was performed in accordance with the applicable procedures.

403.3.1.2.1 *[Section 170.2(c)3Bi]* **Refrigerant charge verification—systems serving individual dwelling units.**

Shall comply with the requirements of 402.3.2.1 with the following modification:

In *climate zones* 2 and 8-15 *air-cooled air conditioners* and *air-source heat pumps*, including but not limited to ducted *split systems*, ducted packaged systems, small duct high velocity systems, and mini-split systems, shall comply with Section 402.3.2.1.1 *[Section 150.1(c)7Ai]* unless the system is of a type that cannot be verified using the specified procedures. Systems which are of a type that cannot be verified using the specified procedures with the requirements of Section 402.3.2.1.1 *[Section 150.1(c)7Ai]* shall comply with Section 402.3.2.1.2 *[Section 150.1(c)7Aii]* as applicable.

Exception to Section 403.3.1.2.1: The field verification and ECC-Provider data registry requirements of Reference Residential Appendix RA2 and RA3 are not required for ~~multifamily~~ *dwelling units* in *multifamily more than 3 stories use designation*~~*buildings* four habitable stories and greater~~. The installer shall certify that diagnostic testing was performed in accordance with the applicable procedures.

403.3.1.2.2 *[Section 170.2(c)3Bii]* **Space-conditioning distribution systems.**

All *space-conditioning systems* shall meet all applicable requirements of Section 403.3.1.2.2.1 or Section 403.3.1.2.2.2.

403.3.1.2.2.1 *[Section 170.2(c)3Biia]* **High performance *attics*.**

Air handlers or ducts are allowed to be in ventilated *attic* spaces when the *roof* and ceiling insulation level meet Option B in Table 303.3~~-A~~(1) *[Table 170.2-A]*.

403.3.1.2.2.2 *[Section 170.2(c)3Biib]* **Duct and air handlers located in conditioned space.**

Duct systems and *air handlers* of *HVAC systems* shall be located in *conditioned space*, and confirmed by field verification and diagnostic testing to meet the criterion of Reference Residential Appendix RA3.1.4.3.8.

NOTE: Gas heating appliances installed in *conditioned spaces* must meet the combustion air requirements of California Mechanical Code Chapter 7, as applicable.

403.3.1.2.3 *[Section 170.2(c)3Biii]* **Central fan integrated ventilation systems—systems serving individual dwelling units.**

Central forced air system fans used to provide *outside air* shall have an *air-handling unit* fan efficacy less than or equal to the maximum W/cfm specified in one of the options below.

1. 0.45 W/cfm for gas furnace *air-handling units*; or
2. 0.58 W/cfm for *air-handling units* that are not gas furnaces.

The airflow rate and fan efficacy requirements in this section shall be confirmed through field verification and diagnostic testing in accordance with all applicable procedures specified in Reference Residential Appendix RA3.3. *Central Fan Integrated Ventilation Systems* shall be *certified to the Energy Commission* as Intermittent Ventilation Systems as specified in Reference Residential Appendix RA3.7.4.2.

403.3.1.2.4 *[Section 170.2(c)3Biv]* **Balanced ventilation systems with heat/energy recovery in climate zones 1, 2, 4, 11-14, and 16.**

A *balanced ventilation system* with heat or energy recovery shall be used to meet Section 403.2.2.3.4 *[Section 160.2(b)2Aivb1]*, and shall meet the applicable requirements below:

403.3.1.2.4.1- In *Climate Zones* 1, 2, 4, 11-14, and 16, *balanced ventilation systems* serving individual *dwelling units* shall:

1. Be an energy recovery ventilator (*ERV*) or heat recovery ventilator (*HRV*),
2. Have a minimum sensible recovery efficiency of 67 percent, rated at 32 degrees Fahrenheit (0 degrees Celsius), and
3. Have a fan efficacy less than or equal to 0.6 W per cfm.

These measures shall be confirmed through field verification in accordance with the procedures in RA3.7.4.4 for *buildings* with three *habitable stories* or less, or the procedures in NA2.2.4.1.5 for *buildings* with four or more *habitable stories*.

403.3.1.2.4.2- In *Climate Zones* 1, 2, 4, 11-14, and 16, *balanced ventilation systems* serving multiple *dwelling units* in *multifamily more than 3 stories use* designation ~~*buildings* with four or more habitable stories~~ shall:

1. Be an *ERV* or *HRV*,

2. Have a minimum sensible recovery efficiency or effectiveness of 67 percent, rated at 32 degrees Fahrenheit (0 degrees Celsius),
3. Meet the fan power requirements of Section 403.3.2.2 *[Section 170.2(c)4A]*, and
4. Have recovery bypass or control to directly economize with ventilation air based on *outdoor air* temperature limits specified in Table 401.3~~-G~~(7) *[Table 170.2-G]*.

These measures shall be field verified in accordance with NA7.18.4.

403.3.1.2.5 *[Section 170.2(c)3Bv]* **Balanced ventilation system fan efficacy.**

In ~~*buildings* with three habitable stories or less~~*multifamily 3 stories or less use designation* in *Climate Zones* 5–10 and *Climate Zone* 15, when a *heat pump space-conditioning system* is installed to meet the requirements of Section 403.3.1.1 *[Section 170.2(c)3Ai]*, *balanced ventilation systems* without an *ERV* or *HRV* shall have a fan efficacy less than or equal to 0.4 W/cfm.

403.3.1.2.6 *[Section 170.2(c)3Bvi]* **Ventilation system Fault Indicator Display (FID).**

All *HRV*/*ERV* systems serving individual *dwelling units* shall have a *Fault* Indicator Display (FID) that is manufacturer certified in compliance with the requirements in Joint Appendix JA17.4. The FID certification shall be verified by an ECC-Rater.

403.3.1.3 *[Section 170.2(c)3C]* **HVAC system bypass ducts.**

Bypass ducts that deliver conditioned *supply air* directly to the *space-conditioning system* return duct airflow shall not be used per Section 402.3.6.

403.3.2 *[Section 170.2(c)4]* **Space-conditioning systems - Common use areas.**

A *building* complies with this section by being designed with and having constructed and installed a *space-conditioning system* that meets the applicable requirements of this section.

403.3.2.1 *[Section 170.2(c)1]* **Sizing and equipment selection.**

Mechanical heating and *mechanical cooling equipment* serving *common use areas* of *multifamily buildings* shall be the smallest size, within the available options of the desired *equipment* line, necessary to meet the design heating and cooling loads of the *building*, as calculated according to Section 403.3.2.1.1 below.

Exception 1 to Section 403.3.2.1: Where it can be demonstrated to the satisfaction of the enforcing agency that oversizing will not increase *building LSC* energy use.

Exception 2 to Section 403.3.2.1: Standby *equipment* with controls that allow the standby *equipment* to operate only when the primary *equipment* is not operating.

Exception 3 to Section 403.3.2.1: Multiple units of the same *equipment* type, such as multiple chillers and boilers, having combined capacities exceeding the design load, if

they have controls that sequence or otherwise optimally control the operation of each unit based on load.

403.3.2.1.1 *[Section 170.2(c)2]* **Calculations.**

Shall comply with the requirements of 401.3.4 with the following modifications:

403.3.2.1.1.1 *[Section 170.2(c)2A]* **Heating and cooling loads.**

Heating and cooling system design loads shall be determined in accordance with the method in the ~~2017~~ *ASHRAE Handbook, Fundamentals Volume*, or as specified in a method approved by the *Energy C~~c~~ommission*.

403.3.2.1.1.2 *[Section 170.2(c)2B]* **Indoor design conditions.**

Indoor design temperature and humidity conditions for comfort applications shall be determined using *ASHRAE Standard 55* or the ~~2021~~ *ASHRAE Handbook, Fundamentals Volume*, except that winter humidification and summer dehumidification shall not be required.

403.3.2.1.1.3 *[Section 170.2(c)2C]* **Outdoor design conditions.**

Shall comply with the requirements of 401.3.4.3.

403.3.2.2 *[Section 170.2(c)4A]* **Fan systems.**

Shall comply with the requirements of 401.3.5 with the following modifications:

403.3.2.2.1 *[Section 170.2(c)4Ai]* **Fan power budget.**

Shall comply with the requirements of 401.3.5.1.

403.3.2.2.2 *[Section 170.2(c)4Aii]* **VAV systems.**

Shall comply with the requirements of 401.3.5.2 with the following modification:

Setpoint reset. For systems with *direct digital control* of individual zone boxes reporting to the central control panel, static pressure setpoints shall be reset based on the zone requiring the most pressure, i.e., the setpoint is reset lower until one zone damper is nearly wide open.

403.3.2.2.3 *[Section 170.2(c)4Aiii]* **Fractional HVAC motors for fans.**

Shall comply with the requirements of 401.3.5.3.

403.3.2.3 *[Section 170.2(c)4B]* **Space-conditioning zone controls.**

Each *space-conditioning zone* shall have controls designed in accordance with Section 403.3.2.3.1 or Section 403.3.2.3.2.

Exception 1 to Section 403.3.2.3: Zones with special pressurization relationships or cross-contamination control needs.

Exception 2 to Section 403.3.2.3: Zones served by *space-conditioning systems* in which at least 75 percent of the energy for reheating, or providing warm air in mixing systems, is provided from a site-recovered or site-solar energy source.

Exception 3 to Section 403.3.2.3: Zones in which specific humidity levels are required to satisfy *non-covered process loads*. *Computer rooms* or other spaces where the only *process load* is from *IT equipment* may not use this exception.

Exception 4 to Section 403.3.2.3: Zones with a peak supply-air quantity of 300 cfm or less.

403.3.2.3.1 *[Section 170.2(c)4Bi]* **Reheating, recooling, simultaneous heating and cooling.**

Each *space-conditioning zone* shall have controls that prevent:

1. Reheating; and
2. Recooling; and
3. Simultaneous provisions of heating and cooling to the same zone, such as mixing or simultaneous supply of air that has been previously mechanically heated and air that has been previously cooled, either by *cooling equipment* or by economizer systems.

403.3.2.3.2 *[Section 170.2(c)4Bii]* **Zones served by VAV Systems.**

Zones served by variable air-volume systems that are designed and controlled to reduce, to a minimum, the volume of reheated, recooled, or mixed air are allowed only if the controls meet all of the following requirements:

1. For each zone with *direct digital controls* (*DDC*):
    1.1. the volume of primary air that is reheated, recooled, or mixed air supply shall not exceed the larger of:
        1.1.1. 50 percent of the peak *primary airflow*; or
        1.1.2. The design zone outdoor airflow rate as specified for mechanical ventilation by Section 403.2.2.5 *[Section 160.2(c)3]*.
    1.2. The volume of primary air in the *deadband* shall not exceed the design zone outdoor airflow rate as specified for mechanical ventilation by Section 403.2.2.5 *[Section 160.2(c)3]*.
    1.3. The first stage of heating consists of modulating the zone *supply air* temperature setpoint up to a maximum setpoint no higher than 95 F degrees F while the airflow is maintained at the dead band flow rate.
    1.4. The second stage of heating consists of modulating the airflow rate from the dead band flow rate up to the heating maximum flow rate.
2. For each zone without *DDC*:
    2.1. the volume of primary air that is reheated, re-cooled, or mixed air supply shall not exceed the larger of the following:
        2.1.1. 30 percent of the peak *primary airflow*; or

2.1.2. The design zone outdoor airflow rate as specified for mechanical ventilation by Section 403.2.2.5 *[Section 160.2(c)3]*.

403.3.2.4 *[Section 170.2(c)4C]* **Economizers.**

Shall comply with the requirements of 401.3.7 with the following modifications:

Exception 3 to Section 401.3.7: Systems serving *dwelling units*.

403.3.2.4.1 *[Section 170.2(c)4Cii, iii, iv]* **Air economizers.**

Shall comply with the requirements of 401.3.7.1 with the following modifications:

If an economizer is required by Section 401.3.7.1, and an *air economizer* is used to meet the requirement, then it shall be:

403.3.2.4.1.1- Designed and equipped with controls so that economizer operation does not increase the *building* heating energy use during normal operation; and

Exception to Section 403.3.2.4.1.1: Systems that provide 75 percent of the annual energy used for *mechanical heating* from site-*recovered energy* or a site-solar energy source.

403.3.2.4.1.2- Capable of providing partial cooling even when additional *mechanical cooling* is required to meet the remainder of the cooling load.

403.3.2.4.1.3- Designed and equipped with a device type and high limit shut off complying with Table 401.3~~-G~~(7).

403.3.2.4.2 *[Section 170.2(c)4Cv]* **Water economizers.**

Shall comply with the requirements of 401.3.7.2.

403.3.2.5 *[Section 170.2(c)4D]* **Supply air temperature reset controls.**

Shall comply with the requirements of 401.3.8.

403.3.2.6 *[Section 170.2(c)4E]* **Electric-resistance heating.**

Electric-resistance heating systems shall not be used for space heating.

Exception 1 to Section 403.3.2.6: Where an electric-resistance heating system supplements a heating system in which at least 60 percent of the annual energy requirement is supplied by site-solar or *recovered energy*.

Exception 2 to Section 403.3.2.6: Where an electric-resistance heating system supplements a *heat pump* heating system, and the heating capacity of the *heat pump* is more than 75 percent of the design heating load calculated in accordance with Section 403.3.2.1 *[Section 170.2(c)1]* at the design outdoor temperature specified in Section 403.3.2.1.1 *[Section 170.2(c)2]*.

Exception 3 to Section 403.3.2.6: Where the total capacity of all electric-resistance heating systems serving the *entire building* is less than 10 percent of the total design output capacity of all *heating equipment* serving the *entire building*.

Exception 4 to Section 403.3.2.6: Where the total capacity of all electric-resistance heating systems serving the *entire building*, excluding those allowed under Exception 2, is no more than 3 kW.

Exception 5 to Section 403.3.2.6: Heating systems serving as emergency backup to gas *heating equipment*.

403.3.2.7 *[Section 170.2(c)4F]* **Heat rejection systems.**

Shall comply with the requirements of 401.3.10.

403.3.2.8 *[Section 170.2(c)4G]* **Minimum chiller efficiency.**

Shall comply with the requirements of 401.3.11.

403.3.2.9 *[Section 170.2(c)4H]* **Limitation of air-cooled chillers.**

Shall comply with the requirements of 401.3.12.

403.3.2.10 *[Section 170.2(c)4I]* **Hydronic system measures.**

403.3.2.10.1 *[Section 170.2(c)4Ii]* **Hydronic variable flow systems.**

Shall comply with the requirements of 401.3.13.1.

403.3.2.10.2 *[Section 170.2(c)4Iii]* **Chiller isolation.**

Shall comply with the requirements of 401.3.13.2.

403.3.2.10.3 *[Section 170.2(c)4Iiii]* **Boiler isolation.**

Shall comply with the requirements of 401.3.13.3.

403.3.2.10.4 *[Section 170.2(c)4Iiv]* **Chilled and hot water temperature reset controls.**

Shall comply with the requirements of 401.3.13.4.

403.3.2.10.5 *[Section 170.2(c)4Iv]* **Water-cooled air conditioner and hydronic heat pump systems.**

Shall comply with the requirements of 401.3.13.5.

403.3.2.10.6 *[Section 170.2(c)4Ivi]* **Variable flow controls.**

Shall comply with the requirements of 401.3.13.6.

403.3.2.10.7 *[Section 170.2(c)4Ivii]* **Hydronic heat pump (WLHP) controls.**

Shall comply with the requirements of 401.3.13.7.

403.3.2.11 *[Section 170.2(c)4K]* **Fan control.**

Shall comply with the requirements of 401.3.14.

403.3.2.12 *[Section 170.2(c)4L]* **Mechanical system shut-off.**

Shall comply with the requirements of 401.3.15.

403.3.2.13 *[Section 170.2(c)4M]* **Exhaust system transfer air.**

Shall comply with the requirements of 401.3.16.

403.3.2.14 *[Section 170.2(c)4N]* **Dedicated outdoor air systems (DOAS).**

Shall comply with the requirements of 401.3.17.

403.3.2.15 *[Section 170.2(c)4O]* **Exhaust air heat recovery.**

Shall comply with the requirements of 401.3.18 with the following modification:

Fan systems designed to operate to the criteria listed in either Table 401.3~~-K~~(11) *[Table 170.2-I]* or Table 401.3~~-L~~(12) *[Table 170.2-J]* shall include an exhaust air heat recovery system that meets Sections 401.3.18.1 and 401.3.18.2.

Exception 1 to Section 403.3.2.15: Systems meeting Section 912.2 *[Section 140.9(c)]* prescriptive requirements for *laboratory* and *factory* exhaust systems.

Exception 2 to Section 403.3.2.15: Systems serving spaces that are not cooled and that are heated to less than 60°F.

Exception 3 to Section 403.3.2.15: Where more than 60 percent of the *outdoor air* heating energy is provided from site-*recovered energy* in Climate Zone 16.

Exception 4 to Section 403.3.2.15: Where the sum of the airflow rates exhausted and relieved within 20 feet of each other is less than 75 percent of the design outdoor airflow rate, excluding exhaust air that is either:

1. used for another energy recovery system;
2. not allowed by the California Mechanical Code (Title 24, Part 4) for use in energy recovery systems with leakage potential; or
3. of Class 4 as specified in Section 401.2.1.5 *[Section 160.2(c)8]*.

Exception 5 to Section 403.3.2.15: Systems expected to operate less than 20 hours per week.

403.3.2.15.1 *[Section 170.2(c)4Oi]* **Sensible energy recovery ratio/ Enthalpy recovery ratio.**

A *sensible energy recovery ratio* of at least 60 percent or an *enthalpy recovery ratio* of at least 50 percent for both heating and cooling *design conditions*.

Exception 1 to Section 403.3.2.15.1: Sensible recovery ratio requirements at heating *design conditions* are not required for *Climate Zone* 15.

Exception 2 to Section 403.3.2.15.1: Sensible recovery ratio requirements at cooling *design conditions* are not required for *Climate Zone* 1.

403.3.2.15.2 *[Section 170.2(c)4Oii]* **Energy recovery bypass/ control.**

Shall comply with the requirements of 401.3.18.2.

403.3.2.15.3 *[Section 170.2(c)4Oiii]* **Design supply fan airflow rate.**

For a *DOAS* unit and a separate independent *space-conditioning system* meeting the requirements of Section 170.2(c)4Nia, the design supply fan airflow rate shall be the total airflow of only the *DOAS* unit.

403.4 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

403.5 *[Sections 180.1, 180.2]* **Additions and alterations to existing buildings.**

403.5.1 *[Section 180.1]* **Additions.**

Additions to existing *multifamily use designations~~buildings~~* shall meet the mandatory requirements of Section 403.5.1.1, and either prescriptive requirements of Section 403.5.1.2 *[Section 180.1(a)]* or performance requirements of Section 403.5.1.3 *[Section 180.1(b)]*.

Exception 1 to Section 403.5.1: When heating or cooling will be extended to an *addition* from the existing system(s), the existing heating and *cooling equipment* need not comply with *Part 6*. The heating system capacity must be adequate to meet the minimum requirements of *CBC* Section 1204.1.

Exception 2 to Section 403.5.1: When any length of duct is extended from an existing *duct system* to serve the *addition*, the existing *duct system* and the extended duct shall meet the applicable requirements specified in Section 403.5.2.2.1 and Section 403.5.2.2.5 *[Sections 180.2(b)2Ai and 180.2(b)2Aii]*.

Exception 3 to Section 403.5.1: New or replacement space heating systems serving a *dwelling unit* in an *addition* may be a *heat pump* or *gas heating system*.

403.5.1.1 *[Section 180.1]* **Mandatory requirements (Additions).**

The *addition* shall meet the requirements of the sections listed below:

101 *[Section 100.0(h), 110.0, 110.1, 110.5]* Systems and Equipment

400.2, 400.3, 400.4.4, 400.5, 403.2.1, 403.2.2.4 through 403.2.2.11, 403.2.3, 403.2.4 *[Section 110.2, 110.5, 110.8(d)3, 160.1(f), 160.2(c) and (d), 160.3, 160.7(a), 160.9(b)]* Mandatory Requirements for *HVAC Systems*

Exception to Section 403.5.1.1: Block loads, the total load for all rooms combined that are served by the central *equipment*, may be used to comply with Section 403.2.3.3.1 *[Section 160.3(b)1]* for the purpose of system sizing for *additions*.

403.5.1.2 *[Section 180.1(a)]* **Prescriptive requirements (Additions).**

Any newly installed space-conditioning or ventilation system shall meet the applicable requirements of the sections listed below:

400.6 *[Section 110.12]* Mandatory Requirements for Demand Management

403.3 *[Section 170.2(c)]* Prescriptive Requirements for *HVAC Systems*

403.5.1.2.1 *[Section 180.1(a)2]* **Mechanical ventilation for indoor air quality.**

1. *Additions* to existing *buildings* shall comply with Section 403.2.2 *[Section 160.2]* subject to the requirements specified below.
2. When field verification and diagnostic testing are required by Section 403.5.1.2.1 *[Section 180.1(a)2]*, ~~*buildings*~~ *multifamily 3 stories or less use designation* ~~with three habitable stories or less~~ shall use the applicable procedures in the Residential Appendices, and ~~*buildings* with four or more habitable stories~~ *multifamily more than 3 stories use designation* shall use the applicable procedures in Nonresidential Appendices NA1 and NA2.

Exception to Section 403.5.1.2.1: A *dwelling unit* air leakage test is not required for *additions*.

Whole-dwelling unit mechanical ventilation.

403.5.1.2.1.1- *Dwelling units* that meet the conditions below shall not be required to comply with the whole-dwelling unit ventilation airflow specified in Section 403.2.2.3.4 *[Section 160.2(b)2Aiv]* or Section 403.2.2.3.5 *[Section 160.2(b)2Av]*.

1. *Additions* to an existing *dwelling unit* that increase the *conditioned floor area* of the existing *dwelling unit* by less than or equal to 1000 square feet.
2. *Junior Accessory Dwelling Units* (*JADU*) that are *additions* to an existing *building*.

403.5.1.2.1.2- *Additions* to an existing *dwelling unit* that increase *conditioned floor area* by more than 1,000 square feet shall have mechanical ventilation airflow in accordance with Section 403.2.2.3.4 *[Section 160.2(b)2Aiv]* or Section 403.2.2.3.5 *[Section 160.2(b)2Av]*, as applicable. The mechanical ventilation airflow rate shall be based on the *conditioned floor area* of the entire *dwelling unit* comprising the existing *dwelling unit conditioned floor area* plus the *addition conditioned floor area*.

Exception to Section 403.5.1.2.1.2: Mechanical ventilation systems in *additions* shall be supply, balanced or the existing ventilation type.

403.5.1.2.1.3- New *dwelling units* that are *additions* to an existing *building* shall have mechanical ventilation airflow provided in accordance with Section 403.2.2.3.4 *[Section 160.2(b)2Aiv]* or Section 403.2.2.3.5 *[Section 160.2(b)2Av]* as applicable. The mechanical ventilation airflow rate shall be based on the *conditioned floor area* of the new *dwelling unit*.

Local mechanical exhaust.

Additions to existing *buildings* shall comply with all applicable requirements specified in Section 403.2.2.3.6 *[Sections 160.2(b)2Avi]* and Section 403.2.2.3.12 *[Section 160.2(b)2B]*.

403.5.1.3 *[Section 180.1(b)]* **Performance requirements (Additions).**

Performance calculations shall meet the requirements of Section 102 for the *addition* alone or for the existing *building* plus *addition*.

403.5.2 *[Section 180.2]* **Alterations.**

Alterations to components of existing *multifamily* *use designation*~~*buildings*~~, including *alterations* made in conjunction with a change in *building occupancy* to a multifamily *occupancy*, shall meet mandatory requirements of Section 403.5.2.1, and either prescriptive requirements of Section 403.5.2.2 or performance requirements of Section 403.5.2.3.

Exception 1 to Section 403.5.2: When heating or cooling for an *alteration* is provided by expanding existing systems, the existing systems and *equipment* need not comply with Sections 400.1 through 400.5, 403.1 through 403.2.3 and 403.3.

Exception 2 to Section 403.5.2: When existing heating or cooling systems or components are moved within a *building*, the existing systems or components need not comply with Sections 400.1 through 400.5, 403.1 through 403.2.3 and 403.3.

Exception 3 to Section 403.5.2: Where an existing system with electric *reheat* is expanded when adding variable air volume (*VAV*) boxes to serve an *alteration*, total electric *reheat capacity* may be expanded not to exceed 20 percent of the existing installed electric capacity in any one permit and the system need not comply with Section 403.3.2.6 *[Section 170.2(c)4E]*. Additional electric *reheat capacity* in excess of 20 percent may be added subject to the requirements of Section 403.3.2.6 *[Section 170.2(c)4E]*.

403.5.2.1 *[Sections 180.0, 180.2(a)]* **Mandatory requirements (Alterations).**

Altered components in a *multifamily- use designations*~~*building*~~ shall meet the requirements specified in the sections listed below that are applicable to the ~~building~~ project scope and the minimum requirements in this section.

101.3, 101.4 *[Section 110.1, 110.5]* Systems and Equipment

400.5, 403.1, 403.2.2.4, 403.2.2.5, 403.2.3.1, 403.2.3.2, 403.2.3.3.1 through 403.2.3.3.5, 403.2.3.3.7, 403.2.3.3.8, 403.2.3.3.10, 403.2.3.4 *[Section 110.2, 160.0, 160.1(f), 160.2(c), 160.2(d), 160.3]* Mandatory Requirements for *HVAC Systems*

Exception to Section 403.5.2.1: The requirements of Section 403.2.3.2.10 *[Section 160.3(a)2H]* shall not apply to *alterations* of *space-conditioning systems* or components.

403.5.2.2 *[Sections 180.2(b)]* **Prescriptive requirements (Alterations).**

403.5.2.2.1 *[Section 180.2(b)2Ai]* **Entirely new or complete replacement space-conditioning systems – Dwelling units.**

Entirely new or complete replacement *space-conditioning systems* installed as part of an *alteration* shall include all the system heating or *cooling equipment*, including but not limited to: condensing unit, cooling or heating coil, and *air handler* for *split systems*; or complete replacement of a packaged unit; plus entirely new or replacement *duct system* (Section 403.5.2.2.5.3 *[Section 180.2(b)2AiiaI]*).

Entirely new or complete replacement *space-conditioning systems* shall meet the requirements of the sections listed below:

Section 403.2.2 *[Sections 160.2(a)1]* – Mandatory Requirements for Ventilation and Indoor Air Quality,

Section 403.2.3.1 *[Section 160.3(a)1] – Dwelling unit thermostats*,

Section 403.2.3.3.1 *[Section 160.3(b)1]* – Loads,

Section 403.2.3.3.2 *[Section 160.3(b)2] – Design conditions*,

Section 403.2.3.3.3 *[Section 160.3(b)3]* – Outdoor condensing units,

Section 403.2.3.3.5 *[Section 160.3(b)5A-J]* – Air-distribution and ventilation systems ducts, plenums and fans,

Section 403.2.3.3.6 *[Section 160.3(b)5K] – Duct system* sealing and leakage testing,

Section 403.2.3.3.9 *[Section 160.3(b)5L]* – System airflow rate and fan efficacy,

Section 403.2.3.3.10 *[Section 160.3(b)6]* - Piping,

Section 403.2.3.4.1 *[Section 160.3(c)1]* – Pipe insulation,

Section 403.3.1.2 *[Section 170.2(c)3B]* – Space-conditioning and ventilation systems,

Section 403.5.2.2.3 *[Section 180.2(b)2Av]* – Altered space-heating system, and

Table 403.5~~.A~~(1) *[Table 180.2-C]* – Duct insulation *R-value*.

403.5.2.2.2 *[Section 180.2(b)2Aiv]* **Altered space-conditioning system mechanical cooling – Dwelling units.**

When a *space-conditioning system* is an *air conditioner* or *heat pump* that is altered by the installation or replacement of refrigerant-containing system components such as the compressor, condensing coil, evaporator coil, refrigerant metering device or refrigerant piping, the altered system shall comply with the following requirements:

403.5.2.2.2.1- *Thermostats*. All *thermostats* associated with the system shall be replaced with setback *thermostats* meeting the requirements of Section 400.5.3 *[Section 110.2(c)]*.

403.5.2.2.2.2- Airflow and refrigerant charge verification procedures. In *Climate Zones* 2 and 8 through 15, *air-cooled air conditioners* and *air-source heat pumps*, including but not limited to ducted *split systems*, ducted package systems, small duct high velocity air systems, and minisplit systems, shall comply with Section 403.5.2.2.2.3 *[Section 180.2(b)2AivbI]* and Section 403.5.2.2.2.4 *[Section 180.2(b)2AivbII]*, unless the system is of a type that cannot be verified using the

specified procedures. Systems that cannot comply with the requirements of Section 403.5.2.2.2.2 *[Section 180.2(b)2Aivb]* shall comply with Section 403.5.2.2.2.4 *[Section 180.2(b)2AivbII]*.

Exception 1 to Section 403.5.2.2.2.2: The field verification and ECC-Provider data registry requirements of Reference Residential Appendix RA2 and RA3 are not required for multifamily *dwelling units* in *buildings* four stories and greater. The installer shall certify that diagnostic testing was performed in accordance with the applicable procedures.

Exception 2 to Section 403.5.2.2.2.2: Entirely new or complete replacement packaged systems for which the manufacturer has verified correct system refrigerant charge prior to shipment from the *factory* are not required to have refrigerant charge confirmed through field verification and diagnostic testing. The installer of these packaged systems shall certify that the packaged system was pre-charged at the *factory* and has not been altered in a way that would affect the charge. *Ducted systems* shall comply with the minimum system airflow rate requirement in Section 403.5.2.2.2.3 *[Section 180.2(b)2AivbI]*, provided that the system is of a type that can be verified using the procedure specified in RA3.3 or an approved alternative in RA1.

403.5.2.2.2.3- Minimum system airflow rate. The minimum system airflow rate shall comply with the applicable requirement below as confirmed through field verification and diagnostic testing in accordance with the procedures specified in Reference Residential Appendix Section RA3.3 or an approved alternative procedure as specified in Section RA1.

1. Small duct high velocity systems shall demonstrate a minimum system airflow rate greater than or equal to 250 cfm per ton of nominal cooling capacity; or
2. All other *air-cooled air conditioner* or *air-source heat pump* systems shall demonstrate a minimum system airflow rate greater than or equal to 300 cfm per ton of nominal cooling capacity.

Exception 1 to Section 403.5.2.2.2.3: Systems unable to comply with the minimum airflow rate requirement shall demonstrate compliance using the procedures in Section RA3.3.3.1.5, and the system's *thermostat* shall conform to the specifications in Section 400.6 *[Section 110.12]*.

Exception 2 to Section 403.5.2.2.2.3: Entirely new or complete replacement *space-conditioning systems*, as specified by Section 403.5.2.2.1 *[Section 180.2(b)2Ai]*, without zoning dampers may comply with the minimum airflow rate by meeting the applicable requirements in Table 402.2~~-A~~(1) *[Table 160.3-A]* or Table 402.2~~-B~~(2) *[Table 160.3-B]* as confirmed by field verification and diagnostic testing in accordance with the procedures in Reference Residential Appendix Sections RA3.1.4.4 and RA3.1.4.5. The design clean-filter pressure drop requirements of Section 402.2.6.12.3 *[Section 160.2(a)1D]* for the system *air filter*

device(*s*) shall conform to the requirements given in Table 402.2-A(1) *[Table 160.3-A]* or Table 402.2-B(2) *[Table 160.3-B]*.

403.5.2.2.2.4- Refrigerant charge. The installer shall charge the system according to manufacturer's specifications. Refrigerant charge shall be verified according to one of the following options, as applicable.

1. The installer and rater shall perform the standard charge verification procedure as specified in Reference Residential Appendix Section RA3.2.2, or an approved alternative procedure as specified in Section RA1; or
2. The installer shall perform the weigh-in charging procedure as specified by Reference Residential Appendix Section RA3.2.3.1, provided the system is of a type that can be verified using the RA3.2.2 standard charge verification procedure and RA3.3 airflow rate verification procedure or approved alternatives in RA1. The ECC-Rater shall verify the charge using RA3.2.2 and RA3.3 or approved alternatives in RA1.

Exception to Section 403.5.2.2.2.4: When the outdoor temperature is less than 55 degrees F and the installer utilizes the weigh-in charging procedure in Reference Residential Appendix Section RA3.2.3.1 to demonstrate compliance, the installer may elect to utilize the verification procedure in Reference Residential Appendix Section RA3.2.3.2. If the verification procedure in Section RA3.2.3.2 is used for compliance, the system's *thermostat* shall conform to the specifications in Section 400.6 *[Section 110.12]*. *Ducted systems* shall comply with the minimum system airflow rate requirements in Section 403.5.2.2.2.3 *[Section 180.2(b)2AivbI]*.

403.5.2.2.3 *[Section 180.2(b)2Av]* **Altered space-heating system – Dwelling units.**

Shall comply with the requirements of 402.5.2.2.3 with the following modification:

Exception 3 to Section 402.5.2.2.3: Electric resistance space heating systems, if the existing space heating system is electric resistance in *Climate Zones* 6, 7, 8, or 15.

403.5.2.2.4 *[Section 180.2(b)2Aiii]* **Altered space-conditioning system—duct sealing – Dwelling units.**

In all *climate zones*, when a *space-conditioning system* serving a multifamily *dwelling* is altered by the installation or replacement of *space-conditioning system equipment*, including replacement of the *air handler*, outdoor condensing unit of a *split system air conditioner* or *heat pump*, or cooling or heating coil, the *duct system* that is connected to the altered *space-conditioning system equipment* shall be sealed, as confirmed through field verification and diagnostic testing in accordance with the applicable procedures for *duct sealing* of altered existing *duct systems* as specified in Reference Residential Appendix RA3.1 and the leakage compliance criteria specified below.

1. The measured duct leakage shall be equal to or less than 15 percent of *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.1; or
2. The measured duct leakage to outside shall be equal to or less than 10 percent of *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.4; or
3. If it is not possible to meet the leakage compliance criteria of either one or two specified above, then all *accessible* leaks shall be sealed and verified through a visual inspection and a smoke test by a certified ECC-Rater utilizing the methods specified in Reference Residential Appendix RA3.1.4.3.5.

Exception 1 to Section 403.5.2.2.4: *Duct systems* that are documented to have been previously sealed as confirmed through field verification and diagnostic testing in accordance with procedures in Reference Residential Appendix RA3.1.

Exception 2 to Section 403.5.2.2.4: *Duct systems* with less than 40 linear feet as determined by visual inspection.

Exception 3 to Section 403.5.2.2.4: Existing *duct systems* constructed, insulated or sealed with asbestos.

Exception 4 to Section 403.5.2.2.4: The field verification and ECC-Provider data registry requirements of Reference Residential Appendix RA2 and RA3 are not required for multifamily *dwelling units* in *buildings* four stories and greater. The installer shall certify that diagnostic testing was performed in accordance with the applicable procedures.

403.5.2.2.5 *[Section 180.2(b)2Aii]* **Altered duct systems—duct sealing – Dwelling units.**

In all *climate zones*, when more than 25 feet of new or replacement *space-conditioning system* ducts are installed, the ducts shall comply with the applicable requirements below.

Exception to 403.5.2.2.5: The field verification and ECC-Provider data registry requirements of Reference Residential Appendix RA2 and RA3 are not required for ~~multifamily~~ *dwelling units* in *multifamily more than 3 stories use* designation~~*buildings four stories and greater*~~. The installer shall certify that diagnostic testing was performed in accordance with the applicable procedures.

403.5.2.2.5.1- Duct design and construction. New ducts located in *unconditioned space* shall meet the applicable requirements of Section 403.2.3.3.5, Section 403.2.3.3.7 and Section 403.2.3.3.8 *[Sections 160.3(b)5A through J]* and the duct insulation requirements of Table 403.5~~-A~~(1) *[Table 180.2-C]*, and

TABLE 403.5~~-A~~(1) [TABLE 180.2-C] DUCT INSULATION R-VALUE

***CLIMATE ZONES* 3, 5 THROUGH 7**	***CLIMATE ZONES* 1, 2, 4, 8 THROUGH 16**
R-6	R-8

403.5.2.2.5.2- Field verification and diagnostic testing. The altered *duct system*, regardless of location, shall be sealed as confirmed through field verification and diagnostic testing in accordance with all applicable procedures for *duct sealing* of altered existing *duct systems* as specified in Reference Residential Appendix RA3.1, utilizing the leakage compliance criteria specified in Section 403.5.2.2.5.3 or 403.5.2.2.5.4.

403.5.2.2.5.3- Leakage compliance criteria - entirely new or complete replacement duct system.

1. If the new ducts form an entirely new or complete replacement *duct system* directly connected to the *air handler*, the *duct system* shall meet one of the following requirements:

   1.1. The total leakage of the *duct system* shall not exceed 12 percent of the *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.1, or

   1.2. The *duct system* leakage to outside shall not exceed 6 percent of the *air handler* airflow as determined utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.4.

2. Entirely new or complete replacement *duct systems* installed as part of an *alteration* are constructed of at least 75 percent new duct material, and up to 25 percent may consist of reused parts from the *dwelling unit*'s existing *duct system*, including but not limited to registers, grilles, boots, *air handler*, coil, plenums and duct material, if the reused parts are accessible and can be sealed to prevent leakage.

3. Entirely new or complete replacement *duct systems* shall also conform to the requirements of Section 403.2.2 *[Section 160.2(a)1]* and Section 403.2.3.3.9 *[Section 160.3(b)5L]*. If the *air handler* and ducts are located within a vented *attic*, the requirements of Section 303.5.2.2.2 *[Section 180.2(b)1Bi]* shall also be met.

403.5.2.2.5.4- Leakage compliance criteria - extension of an existing duct system. If the new ducts are an extension of an existing *duct system* serving multifamily *dwellings*, the combined new and existing *duct system* shall meet one of the following requirements:

1. The measured duct leakage shall be equal to or less than 15 percent of *air handler* airflow as confirmed by field verification and diagnostic testing utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.1; or

2. The measured duct leakage to outside shall be equal to or less than 10 percent of *air handler* airflow as confirmed by field verification and diagnostic testing utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.4; or

3. If it is not possible to meet the *duct sealing* requirements of either one or two specified above, then all *accessible* leaks shall be sealed and verified through a visual inspection and a smoke test by a certified ECC-Rater utilizing the methods specified in Reference Residential Appendix RA3.1.4.3.5.

Exception to Section 403.5.2.2.5.4: Existing *duct systems* that are extended, which are constructed, insulated or sealed with asbestos.

403.5.2.2.6 *[Section 180.2(b)5A]* **Mechanical ventilation and indoor air quality - entirely new or complete replacement ventilation systems for dwelling units.**

Shall comply with the requirements of 402.5.2.2.6 with the following modification:

When field verification and diagnostic testing are required by Section 403.5.2.2.6 *[Section 180.2(b)5A]*, *multifamily 3 stories or less use designation* ~~*buildings* with three habitable stories or less~~ shall use the applicable procedures in the Residential Appendices, and *multifamily more than 3 stories use designation* ~~*buildings* with four or more habitable stories~~ shall use the applicable procedures in Nonresidential Appendices NA1 and NA2.

Exception 1 to Section 403.5.2.2.6: The new or replacement ventilation type shall be supply, balanced, or the existing ventilation type being replaced.

Exception 2 to Section 403.5.2.2.6: A *dwelling unit* air leakage test is not required for *alterations*.

403.5.2.2.7 *[Section 180.2(b)5B]* **Mechanical ventilation and indoor air quality - altered ventilation systems for dwelling units.**

Shall comply with the requirements of 402.5.2.2.7 with the following modifications:

When field verification and diagnostic testing are required by Section 403.5.2.2.7 *[Section 180.2(b)5B]*, *multifamily 3 stories or less use designation* ~~*buildings* with three habitable stories or less~~ shall use the applicable procedures in the Residential Appendices, and *multifamily more than 3 stories use designation* ~~*buildings* with four or more habitable stories~~ shall use the applicable procedures in Nonresidential Appendices NA1 and NA2.

Whole-dwelling unit mechanical ventilation.

403.5.2.2.7.1- Whole-dwelling unit ventilation strategy. The altered ventilation system shall be supply, balanced, or the existing ventilation type being altered.

403.5.2.2.7.2- Whole-dwelling unit airflow. If the whole-dwelling ventilation fan is altered or replaced, then one of the following options shall be used for compliance as applicable.

1. *Dwellings* that were required by a previous *building* permit to comply with the whole-dwelling unit airflow requirements in Section 403.2.2.3 *[Section 160.2(b)2]* or Sections 402.2.7 and 402.2.8 *[Section 150.0(o)]* shall meet or exceed the whole-dwelling unit mechanical ventilation airflow specified in Section 403.2.2.3.4 *[Section 160.2(b)2Aiv]* or Section 403.2.2.3.5 *[Section 160.2(b)2Av]* as confirmed through field verification and diagnostic testing in accordance with the applicable procedures specified in Reference Appendix RA3.7 or NA2.2.
2. *Dwellings* that were not required by a previous *building* permit to have a whole-dwelling unit ventilation system to comply with Section 403.2.2.3 *[Section 160.2(b)2]* or Sections 402.2.7 and 402.2.8 *[Section 150.0(o)]* shall not be required to comply with the whole-dwelling unit ventilation airflow specified in Section 403.2.2.3.4 *[Section 160.2(b)2Aiv]* or Section 403.2.2.3.5 *[Section 160.2(b)2Av]*.

403.5.2.2.7.3- Replacement ventilation fans.

Shall comply with the requirements of 402.5.2.2.7.2.

403.5.2.2.7.4- Air filters. If the air filtration device for a whole-dwelling unit ventilation system is altered or replaced, then one of the following options shall be used for compliance.

1. *Dwellings* that were required by a previous *building* permit to comply with the ventilation system air filtration requirements in Section 403.2.2.2 *[Section 160.2(b)1]* or Section 402.2.6.12 *[Section 150.0(m)12]* shall comply with the air filtration requirements in Section 403.2.2.2 *[Section 160.2(b)1]*.
2. *Dwellings* that were not required by a previous *building* permit to comply with the ventilation system air filtration requirements in Section 403.2.2.2 *[Section 160.2(b)1]* or Section 402.2.6.12 *[Section 150.0(m)12]* shall not be required to comply with the air filtration requirements specified in Section 403.2.2.2 *[Section 160.2(b)1]*.

Local mechanical exhaust.

403.5.2.2.7.5- Bathroom local mechanical exhaust.

Shall comply with the requirements of 402.5.2.2.7.4.

403.5.2.2.7.6- Kitchen local mechanical exhaust. If the *kitchen* local ventilation fan is altered or replaced, then one of the following options shall be used for compliance.

1. *Dwellings* that were required by a previous *building* permit to comply with the *kitchen* local exhaust requirements in Section 403.2.2.3.6 *[Section 160.2(b)2Avi]* or Section 402.2.7.5 *[Section 150.0(o)1G]* shall meet or exceed the applicable airflow or capture efficiency requirements in Section 403.2.2.3.6 *[Section 160.2(b)2Avi]*.

2. *Dwellings* that were required by a previous *building* permit to install a vented *kitchen* range hood or other *kitchen* exhaust fan shall install a replacement fan that meets or exceeds the airflow required by the previous *building* permit, or 100 cfm, whichever is greater.
3. *Dwellings* that were not required to have a *kitchen* local ventilation exhaust system according to the conditions in either Subsection 1 or 2 above shall not be required to comply with the requirements of Section 403.2.2.3.6 *[Section 160.2(b)2Avi]*.

403.5.2.2.7.7- Replacement ventilation fans.

Shall comply with the requirements of 402.5.2.2.7.6.

Exception to Section 403.5.2.2.7: A *dwelling unit* air leakage test is not required for *alterations*.

403.5.2.2.8 *[Section 180.2(b)2Bi]* **New or replacement space-conditioning systems or components – Common use areas.**

New or Replacement *Space-Conditioning Systems* or Components other than new or replacement *space-conditioning system* ducts shall meet the requirements of Section 403.3.2 *[Sections 170.2(c)1, 2, and 4]*, applicable to the systems or components being altered.

For compliance with Section 403.3.2.2 *[Section 170.2(c)4A]*, additional fan power adjustment credits are available as specified in Table 403.5~~-B~~(2) *[TABLE 180.2-D]*.

Exception 1 to Section 403.5.2.2.8: Section 403.5.2.2.3 *[Section 180.2(b)2Av]* does not apply to replacement of electric *reheat* of equivalent or lower capacity electric resistance space heaters when natural gas is not available.

Exception 2 to Section 403.5.2.2.8: Operable wall or *roof* openings that have been previously installed without interlock controls are exempt from complying with Section 403.3.2.12 *[Section 170.2(c)4L]*.

Exception 3 to Section 403.5.2.2.8: Section 403.3.2.4 *[Section 170.2(c)4Ci]* is not applicable to systems that meet both of the following:

1. The system is not a single package air-cooled commercial unitary *air conditioner* or *heat pump*; and
2. The cooling capacity of the system is less than 54,000 Btu/h.

TABLE 403.5~~-B~~(2) [TABLE 180.2-D] FAN POWER LIMITATION PRESSURE DROP ADJUSTMENT

AIRFLOW	MULTI-ZONE *VAV* SYSTEMS[1a] ≤5,000 CFM	MULTI-ZONE *VAV* SYSTEMS[1a] >5,000 AND ≤10,000 CFM	MULTI-ZONE *VAV* SYSTEMS[1a] >10,000 CFM	ALL OTHER *FAN SYSTEMS* ≤5,000 CFM	ALL OTHER *FAN SYSTEMS* >5,000 AND ≤10,000 CFM	ALL OTHER *FAN SYSTEMS* >10,000 CFM
Supply *Fan System* Additional Allowance	0.135	0.114	0.105	0.139	0.12	0.107
Supply *Fan System* Additional Allowance In Unit with Adapter Curb	0.033	0.033	0.043	0.000	0.000	0.000
Exhaust/ Relief/ Return/ *Transfer Fan System* Additional Allowance	0.07	0.061	0.054	0.07	0.062	0.055
Exhaust/ Relief/ Return/ *Transfer Fan System* Additional Allowance In Unit with Adapter Curb	0.016	0.017	0.022	0.000	0.000	0.000

Footnotes to Table 403.5(2) *[Table 180.2-D]*:

a. See *FAN SYSTEM, MULTI-ZONE VARIABLE AIR VOLUME* (*VAV*) for the definition of a Multi-Zone *VAV* System.

~~Footnotes to Table 403.5-B *[Table 180.2-D]*:~~

~~1. See *FAN SYSTEM, MULTI-ZONE VARIABLE AIR VOLUME* (*VAV*) for the definition of a Multi-Zone VAV System.~~

403.5.2.2.9 *[Section 180.2(b)2Bii]* **Altered duct systems – Common use areas.**

When new or replacement *space-conditioning system* ducts are installed to serve an existing *building*, the new ducts shall meet the requirements of Section 403.2.3.4.2 *[Section 160.3(c)2]* and the requirements below:

403.5.2.2.9.1 *[Section 180.2(b)2Biib]* **New or replacement *duct systems*.**

Entirely new or replacement *duct systems* installed as part of an *alteration* shall be leakage-tested in accordance with Section 403.2.3.4.2.7 *[Section 160.3(c)2H]*.

Entirely new or replacement *duct systems* installed as part of an *alteration* shall be constructed of at least 75 percent new duct material, and up to 25 percent may consist of reused parts from the *building's* existing *duct system*, including registers, grilles, boots, *air handlers*, coils, plenums, and ducts, if the reused parts are *accessible* and can be sealed to prevent leakage.

Exception 1 to Section 403.5.2.2.9.1: When it is not possible to achieve the duct leakage criteria in Section 403.5.2.2.9.1 *[Section 180.2(b)2Biib]*, all *accessible* leaks shall be sealed and verified through a visual inspection and a smoke test performed by a certified mechanical acceptance test technician utilizing the methods specified in Reference Nonresidential Appendix NA7.5.3.

Exception 2 to 403.5.2.2.9.1: *Duct Sealing*. Existing *duct systems* that are extended, which are constructed, insulated or sealed with asbestos are not required to comply with Section 403.5.2.2.9.1 *[Section 180.2(b)2Biib]*.

403.5.2.2.9.2 *[Section 180.2(b)2Biic]* **Extension of existing duct systems.**

If the new ducts are an extension of an existing *duct system* and the combined new and existing *duct system* meets the criteria below, the *duct system* shall be sealed to a leakage rate not to exceed 15 percent of the nominal *air handler* airflow rate as confirmed through acceptance testing, in accordance with Reference Nonresidential Appendix NA7.5.3:

1. The *duct system* provides conditioned air to an *occupiable space* for a constant volume, single zone, *space-conditioning system*; and
2. The space conditioning system serves less than 5,000 square feet of *conditioned floor area*; and
3. The combined surface area of the ducts located in the following spaces is more than 25 percent of the total surface area of the entire *duct system*:
   - 3.1. Outdoors;
   - 3.2. In a space directly under a *roof* that:

     Has a *U-factor* greater than the *U-factor* of the ceiling, or if the *roof* does not meet the requirements of Section 303.3.1.1.2 *[Section 170.2(a)1B]*, or

     Has fixed vents or openings to the outside or *unconditioned spaces*; or
   - 3.3. In an unconditioned *crawl space*; or

3.4. In other *unconditioned spaces*.

403.5.2.2.10 *[Section 180.2(b)2Biii]* **Altered space-conditioning systems – Common use areas.**

Space-conditioning systems altered by the installation or replacement of *space-conditioning system equipment* (including replacement of the *air handler*, outdoor condensing unit of a *split system air conditioner* or *heat pump*, or cooling or heating coil) shall meet the requirements below:

403.5.2.2.10.1 *[Section 180.2(b)2Biiia]* **Demand responsive thermostat.**

1. For all altered units where the existing *thermostat* does not comply with the requirements for *demand responsive controls* specified in Section 400.6 *[Section 110.12]*, the existing *thermostat* shall be replaced with a demand responsive *thermostat* that complies with Section 400.6 *[Section 110.12]*.
2. All newly installed *space-conditioning systems* requiring a *thermostat* shall be equipped with a demand responsive *thermostat* that complies with Section 400.6 *[Section 110.12]*.

403.5.2.2.10.2 *[Section 180.2(b)2Biiib]* **Duct sealing.**

The *duct system* that is connected to the new or replaced *space-conditioning system equipment* shall be sealed, if the *duct system* meets the criteria of Section 401.2.4.7 *[Section 120.4(g)]*, as confirmed through acceptance testing, in accordance with the applicable procedures for *duct sealing* of altered existing *duct systems* as specified in Reference Nonresidential Appendix NA7.5.3, and conforming to the applicable leakage compliance criteria in Section 403.5.2.2.9 *[Section 180.2(b)2Bii]*.

Exception 1 to Section 403.5.2.2.10.2: *Buildings* altered so that the *duct system* no longer meets the criteria of Section 403.2.3.4.2.7 *[Section 160.3(c)2Hi]* are not required to comply with Section 403.5.2.2.10.2 *[Section 180.2(b)2Biiib]*.

Exception 2 to Section 403.5.2.2.10.2: *Duct systems* that are documented to have been previously sealed as confirmed through acceptance testing in accordance with procedures in the Reference Nonresidential Appendix NA7.5.3 are not required to comply with Section 403.5.2.2.10.2 *[Section 180.2(b)2Biiib]*.

Exception 3 to Section 403.5.2.2.10.2: Existing *duct systems* constructed, insulated or sealed with asbestos are not required to comply with the requirements of Section 403.5.2.2.10.2 *[Section 180.2(b)2Biiib]*.

403.5.2.3 *[Sections 180.2(c)]* **Performance requirements (Alterations).**

The *altered component*(*s*) and any newly installed *equipment* serving the *alteration* shall meet the applicable requirements of Section 102.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code;* Section 18930*, Health and Safety Code*..

SUBCHAPTER 5
PLUMBING

SECTION 500
MANDATORY REQUIREMENTS FOR ALL OCCUPANCIES
(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

500.1 *[Section 110.8(d)2]* **Installation of Insulation in existing buildings.**

Insulation installed on an existing *water heater* shall comply with the applicable requirements below. If a contractor installs the insulation, the contractor shall certify to the customer, in writing, that the insulation meets the applicable requirements below.

1. **Water heaters.** If external insulation is installed on an existing unfired water storage tank or on an existing back-up tank for a solar water-heating system, it shall have an *R-value* of at least R-3.5, or the heat loss of the tank surface based on an 80°F water-air temperature difference shall be less than 6.5 Btu per hour per square foot.

500.2 *[Section 100.0(h)]* **Systems and equipment.**

Part 6 limits the installation of manufactured equipment, products, and devices to those that have been certified as specified by Sections 101.2 *[Section 110.0]* and 101.3 *[Section 110.1]*. Requirements for manufactured equipment, products, and devices, when not specified in Title 24 *Part 6*, are specified in California Code of Regulations, Title 20, Sections 1601-1609.

500.3 *[Section 110.3]* **Service water-heating systems and equipment.**

500.3.1 *[Section 110.3(a)]* **Certification by manufacturers.**

Any *service water-heating* system or equipment may be installed only if the manufacturer has certified that the system or equipment complies with all of the requirements of this subsection for that system or equipment.

Service water-heating systems shall be equipped with *automatic* temperature controls capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use as listed in Table ~~3~~22, Chapter ~~50~~51 of the *ASHRAE* Handbook, HVAC Applications Volume or Table 613.1 of the California Plumbing Code for *healthcare facilities*.

Exception to Section 500.3.1: Residential *occupancies*.

500.3.2 *[Section 110.3(b)]* **Efficiency.**

Equipment shall meet the applicable requirements of the *Appliance Efficiency Regulations* as required by Section 101.3 *[Section 110.1]*, subject to the following:

1. If more than one standard is listed in the *Appliance Efficiency Regulations*, the equipment shall meet all the standards listed; and
2. If more than one test method is listed in the *Appliance Efficiency Regulations*, the equipment shall comply with the applicable standard when tested with each test method; and
3. Where equipment can serve more than one function, such as both heating and cooling, or both space heating and water heating, it shall comply with all the requirements applicable to each function; and
4. Where a requirement is for equipment rated at its "maximum rated capacity" or "minimum rated capacity," the capacity shall be as provided for and allowed by the controls, during steady-state operation.

500.3.3 *[Section 110.3(c)]* **Installation.**

Any *service water-heating* system or equipment may be installed only if the system or equipment complies with all of the applicable requirements of this subsection for the system or equipment.

500.3.3.1 *[Section 110.3(c)1]* **Outlet temperature controls.**

On systems that have a total capacity greater than 167,000 Btu/hr, outlets that require higher than service water temperatures as listed in the *ASHRAE Handbook, Applications Volume*, shall have separate remote heaters, heat exchangers or boosters to supply the outlet with the higher temperature.

Exception to Section 500.3.3.1: Systems covered by California Plumbing Code Section 613.0 shall instead follow the requirements of that section.

500.3.3.2 *[Section 110.3(c)2]* **Controls for hot water distribution systems.**

Service hot water systems with circulating pumps or with electrical heat trace systems shall be capable of automatically turning off the system.

Exception to Section 500.3.3.2: Systems serving *healthcare facilities*.

500.3.3.3 *[Section 110.3(c)3]* **Insulation.**

Unfired service water heater storage tanks and backup tanks for solar water-heating systems shall have:

1. External insulation with an installed *R-value* of at least R-3.5; or
2. Internal and external insulation with a combined *R-value* of at least R-16; or
3. The heat loss of the tank surface based on an 80°F water-air temperature difference shall be less than 6.5 Btu per hour per square foot.

500.3.3.4 *[Section 110.3(c)4]* **Water heating recirculation loops serving multiple dwelling units ~~, high-rise residential~~multifamily, hotel/motel, and nonresidential occupancies.**

A water heating recirculation loop is a type of hot water distribution system that reduces the time needed to deliver hot water to fixtures that are distant from the *water heater*, boiler or other water heating equipment. The recirculation loop is comprised of a supply portion, connected to branches that serve multiple *dwelling units*, guest rooms, or fixtures and a return portion that completes the loop back to the water heating equipment. A water heating recirculation loop shall meet the following requirements:

1. **Air release valve or vertical pump installation.** An *automatic* air release valve shall be installed on the recirculation loop piping on the inlet side of the recirculation pump and no more than 4 feet from the pump. This valve shall be mounted on top of a vertical riser at least 12 inches in length and shall be *accessible* for replacement and *repair*. Alternatively, the pump shall be installed on a vertical section of the return line.
2. **Recirculation loop backflow prevention.** A check valve or similar device shall be located between the recirculation pump and the water heating equipment to prevent water from flowing backwards though the recirculation loop.
3. **Equipment for pump priming.** A hose bibb shall be installed between the pump and the water heating equipment. An isolation valve shall be installed between the hose bibb and the water heating equipment. This hose bibb is used for bleeding air out of the pump after pump replacement.
4. **Pump isolation valves.** Isolation valves shall be installed on both sides of the pump. These valves may be part of the flange that attaches the pump to the pipe. One of the isolation valves may be the same isolation valve as in Item 3 above.
5. **Cold water supply and recirculation loop connection to hot water storage tank.** Storage *water heaters* and boilers shall be plumbed in accordance with the manufacturer's specifications. The cold water piping and the recirculation loop piping shall not be connected to the hot water storage tank drain port.
6. **Cold water supply backflow prevention.** A check valve shall be installed on the cold water supply line between the hot water system and the next closest tee on the cold water supply line. The system shall comply with the expansion tank requirements as described in the California Plumbing Code Section 608.3.

500.3.3.5 *[Section 110.3(c)5]* **Service water heaters in State buildings.**

Any *newly constructed building* constructed by the State shall derive its *service water heating* from a system that provides at least 60 percent of the energy needed for *service water heating* from *site solar energy* or *recovered energy*, per the statutory requirement of California Public Resources Code Section 25498.

Exception to Section 500.3.3.5: *Buildings* for which the state architect determines that *service water heating* from *site solar energy* or *recovered energy* is economically or physically infeasible.

500.3.3.6 *[Section 110.3(c)6]* **Isolation valves.**

Instantaneous *water heaters* with an input rating greater than 6.8 kBTU/hr (2 kW) shall have isolation valves on both the cold water supply and the hot water pipe leaving the *water heater*, and hose bibbs or other fittings on each valve for flushing the *water heater* when the valves are closed.

500.3.3.7 *[Section 110.3(c)7]* **Air-Source Heat Pump Water Heaters (HPWHs). 8**

HPWH shall meet the following requirements:

500.3.3.7.1 *[Section 110.3(c)7A]* **Backup heat.**

Backup heat is required for systems when inlet air is unconditioned, unless the compressor cut-off temperature is below the Heating Winter Median of Extremes for the closest location listed in Table 2-3 from Reference Joint Appendix JA2. Backup heat may be internal or external to the *HPWH*.

500.3.3.7.2 *[Section 110.3(c)7B]* **Ventilation – Residential and Nonresidential with *Group R Occupancies*.**

Consumer integrated *HPWHs* serving single-family or multifamily *dwelling units*, or *nonresidential buildings* with *Group R Occupancies*, shall be installed using a method provided by the manufacturer to meet or exceed the level of performance provided by one of the ventilation requirements below.

Minimum volume and opening size requirements shall be the sum of all *HPWHs* installed within the same space. Compressor capacity shall be determined using *AHRI 540* Table 4 reference conditions for refrigeration with the "High" rating test point.

500.3.3.7.2.1- For *HPWH* installation without ducts, the installation space shall have a volume not less than the greater of 100 cubic feet per kBtu per hour of compressor capacity, or the minimum volume provided by the manufacturer for this method; or

500.3.3.7.2.2- For *HPWH* installation without ducts, the installation space shall be vented to a *communicating space* via permanent openings, according to the following requirements:

1. *Communicating space* shall meet the minimum volume of Section 500.3.3.7.2.1 *[Section 110.3(c)7B2]* above, minus the volume of the *HPWH* installation space; and
2. Permanent openings shall consist of a single layer of fixed flat slat louvers or grilles, with a total minimum *Net Free Area (NFA)* the larger of 125 square inches plus 25 square inches per kBtu per hour of compressor capacity, or the minimum provided by the manufacturer for this method.
3. The permanent openings shall be fully louvered *doors* or two openings of equal area, one in the upper half of the enclosure and one in the bottom half of the enclosure. The top of the upper opening must be 12 inches or less from the enclosure top and the bottom of the lower vent must be 12 inches or less from the enclosure bottom; or

500.3.3.7.2.3- For *HPWH* installations with ducts, the following requirements shall be met:

1. The space joined to the installation space via ducts shall meet the minimum volume of Section 500.3.3.7.2.1 *[Section 110.3(c)7B2]* above, minus the volume of the *HPWH* installation space; and
2. All duct connections and *building* penetrations shall be sealed; and
3. Exhaust air ducts and all ducts which cross *pressure boundaries* shall be insulated to minimum of R-6; and
4. Where only the *HPWH* inlet or outlet is ducted, installation space shall include permanent openings which consist of a single layer of fixed flat slat louvers or grilles in the bottom half of the room, and/or a *door* undercut. With a ducted inlet, the minimum *NFA* shall be equal to the cross-sectional area of the duct. With a ducted exhaust, the minimum *NFA* shall be the larger of 20 square inches or the minimum *NFA* provided by the manufacturer for this method; and
5. Where the inlet and outlet ducts both terminate within the same *pressure boundary*, airflow from the termination points shall be diverted away from each other.

NOTE: Ducting only the inlet or the exhaust across the *pressure boundary* could interfere with *balanced ventilation systems*. This should be considered when specifying *HPWH* location and ventilation method.

500.3.3.7.3 *[Section 110.3(c)7B]* **Ventilation – Nonresidential Excluding Group R Occupancies.**

Consumer integrated HPWHs serving *nonresidential buildings* excluding *Group R occupancies* shall be installed using one of the methods in either Section 500.3.3.7.3.1, 500.3.3.7.3.2, or 500.3.3.7.3.3.

500.3.3.7.3.1- Installations Per Manufacturer Provided Method

For *HPWH* installations following a manufacturer provided method, this method shall meet or exceed the level of performance provided by one of the ventilation requirements in either Section 500.3.3.7.3.2 or 500.3.3.7.3.3.

500.3.3.7.3.2- Installations Without Ducts

For *HPWH* installations without ducts connected to the *HPWH*, the following requirements shall be met:

1. The installation space shall have a volume larger than 100 cubic feet per kBtu per hour of the combined compressor capacity and larger than the minimum volume provided by the manufacturer. Compressor capacity shall be determined using *AHRI 540* Table 4 reference conditions for refrigeration with the “High” rating test point.

2. Minimum room volume shall be at least the sum of all required volumes for all *HPWHs* installed within the same space.
3. The center of the *HPWH* outlet port of all unducted *HPWHs* shall be directed at an angle of 90 degrees or more away from all *ventless surfaces* and permanently installed equipment if the outlet is closer than the manufacturer specified minimum distance. If the manufacturer does not specify a minimum distance, then the minimum distance between *ventless surfaces* and the center of *HPWH* outlet port shall be 24 inches.
4. *HPWH* exhaust air shall be directed at a minimum angle of 90 degrees away from each other or be separated by a minimum of 24 inches.

Exception 1 to 500.3.3.7.3.2-: A *HPWH* may be installed in a smaller volume of space without ducts if the installation space contains permanently installed equipment which generates sufficient waste heat to meet the thermal energy needs of all *HPWHs* installed in the space. The calculation shall be done using an energy model that meets the requirements of the *ACM* to verify that the heat source to the *HPWH* installation space meets or exceeds the level of performance provided by the ventilation requirements of Section 500.3.3.7.3.2.

Permanently installed equipment which generates waste heat may include, but is not limited to, commercial refrigerators, ice makers or ovens.

500.3.3.7.3.3- Installations With Ducts

For *HPWH* installations with ducts connected to the *HPWH*, the following requirements shall be met:

1. Air for the inlet and outlet of the *HPWH* shall both terminate on the same side of a *pressure boundary*, either both to outside or both to inside the *building*; and
2. Minimum ventilation opening size shall be at least the sum of all required openings for all *HPWHs* installed within the same space; and
3. The space joined to the installation space via ducts shall meet the minimum volume of Section 500.3.3.7.3.2 [Section 110.3(c)7C2] above, minus the volume of the *HPWH* installation space; and
4. All duct joints, connections and *building* penetrations shall be sealed; and
5. Outlet ducts and all ducts which cross *pressure boundaries* shall be insulated to minimum of R-6; and
6. Outlet ducts shall be installed such that internal condensation will drain back to the *HPWH*'s internal condensate pan; and
7. All duct vent caps (including exterior facing duct vent caps with a bug screen and rain/snow shield) shall have a minimum *NFA* equal to 110 percent of the cross-sectional area of the unducted *HPWH* outlet port; and

8. Outlet ducts shall terminate at a point within 4 inches of the top of the *HPWH* installation space.

500.3.3.7.3.3.1- Installations with both the inlet and outlet ducted.

For installations where both the inlet and outlet are ducted, airflow from the termination points shall be diverted away from each other and be separated by a minimum of 24 inches.

500.3.3.7.3.3.2- Installations with only the outlet ducted.

For installations where only the outlet is ducted, a permanent opening shall be used to provide *makeup air*. In addition, meet the following applicable requirements:

1. Where only the *HPWH* outlet is ducted to a *communicating space*, the *HPWH* installation space shall be within the *conditioned space pressure boundary* and include permanent openings that consist of a single layer of fixed flat slat louvers or grilles in the bottom two feet of the room, and/or a *door* undercut. The minimum *NFA* of the permanent openings shall be equal to the cross-sectional area of the unducted *HPWH* outlet port.
2. Where only the *HPWH* outlet is ducted to outside, the *HPWH* installation space shall be in the *unconditioned space* outside of the *building pressure boundary* and include permanent openings that consist of a single layer of fixed flat slat louvers or grilles in the bottom two feet of the room, and/or a *door* undercut. The minimum *NFA* of the permanent openings shall be equal to the cross-sectional area of the unducted *HPWH* outlet port.

500.3.4 *[New section]* ***Unitary Commercial Heat Pump Water Heaters (HPWH).***

Unitary commercial HPWH with integrated electric resistance heating elements serving all nonresidential *occupancies* shall meet the sizing requirements of JA14.6.1, shall meet the installation requirements of JA14.6.2, and shall meet the following requirements:

1. The minimum *HPWH* compressor cut-off temperature shall be equal to or lower than 40°F ambient air temperature in heat pump-only mode and equal to or lower than 47°F in hybrid mode in which the unit operates with both *heat pump* and electric resistance heating methods. Only manufacturer provided compressor cut-off temperature shall be used.
2. For *HPWH* without direct ducting to the outside, the system shall comply with the manufacturer's minimum air volume requirements. If *multiple unitary commercial HPWH* installed in a space, then the minimum air volume shall be the sum of the air volume requirements for each *unitary commercial HPWH* installed in the space.
3. If *outside air* is used to meet the heat source requirements, the *heat pump water heater* shall be able to operate in *heat pump* mode under Heating Design Drybulb (0.6%) conditions as described in Table 2.3 from JA2.

Exception to Section 500.3.4: *Unitary commercial HPWH* in *Group R occupancies*.

500.4 *[Section 110.12]* **Mandatory requirements for demand management.**

Buildings, other than *healthcare facilities*, that install or are required to install *demand responsive controls* shall comply with the applicable *demand responsive control* requirements of Section 500.4.1.

500.4.1 *[Section 110.12(a)]* **Demand responsive controls.**

All *demand responsive controls* shall be either:

1. A certified *OpenADR 2.0a* or *OpenADR 2.0b Virtual End Node (VEN)*, as specified under Clause 11, Conformance, in the applicable OpenADR 2.0 Specification; or a certified Baseline Profile OpenADR 3.0 *Virtual End Node*; or
2. *Certified to the Energy Commission* as being capable of responding to a *demand response signal* from a certified *OpenADR 2.0b* or a certified Baseline Profile OpenADR 3.0 *Virtual End Node* by automatically implementing the control functions requested by the *Virtual End Node* for the equipment it controls.

All *demand responsive controls* shall be capable of communicating with the *VEN* using a wired or wireless bidirectional communication protocol.

When the *demand response signal* is disabled or unavailable, all *demand responsive controls* shall continue to perform all other control functions provided by the control.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 501

NONRESIDENTIAL AND HOTEL/MOTEL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

501.1 *[Section 120.0]* **General.**

Section 501 establishes requirements for the design and installation of *service water-heating* systems and equipment in *nonresidential* and *hotel/motel* *use designations*~~*buildings*~~ that are within the scope of Section 100.3 *[Section 100.0(a)]*.

NOTE: The requirements of Sections 501.2 through 501.4 apply to *newly constructed buildings*. Sections 501.2 and 501.5 apply to *additions* or *alterations* to existing *buildings*.

501.2 Mandatory requirements (Newly Constructed, Additions, Alterations).

501.2.1 *[Section 120.3]* Pipe insulation.

Nonresidential and *hotel/motel* *use designations*~~*buildings*~~ shall comply with the applicable requirements of Section 501.2.1.1 through 501.2.1.3 *[Sections 120.3(a) through 120.3(c)]*.

Exception 1 to Section 501.2.1: Piping that conveys fluids with a design operating temperature range between 60°F and 105°F.

Exception 2 to Section 501.2.1: Where the heat gain or heat loss to or from piping without insulation will not increase *building* *S*~~*s*~~*ource* *E*~~*e*~~*nergy* use.

Exception 3 to Section 501.2.1: Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration. Metal piping that penetrates metal framing shall use grommets, plugs, wrapping or other insulating material to assure that no contact is made with the metal framing.

Exception 4 to Section 501.2.1: Valves, strainers, coil u-bends, air separators with at least 0.5 inches of insulation, and piping within *process* equipment.

501.2.1.1 *[Section 120.3(a)]* General requirements.

The piping conditions listed below for *service water-heating* systems piping with fluid normal operating temperatures listed in Table 501.2-(1) *[Table 120.3-A1]*, the fluid distribution system shall have at least the amount of insulation specified in Section 501.2.1.3 *[Section 120.3(c)]*:

1. Recirculating system piping, including the supply and return piping to the *water heater*.
2. The first 8 feet of hot and cold outlet piping, including piping between a storage tank and a heat trap, for a nonrecirculating storage system.

3. Pipes that are externally heated.

Insulation conductivity shall be determined in accordance with *ASTM* C335 at the mean temperature listed in Table 501.2-(1) *[Table 120.3-A1]*, and shall be rounded to the nearest 1/100 Btu-inch per hour per square foot per °F. Fluid distribution systems include all elements that are in series with the fluid flow, such as pipes, fittings, pumps, valves, strainers, coil u-bends, and air separators, but not including elements that are not in series with the fluid flow, such as expansion tanks, fill lines, chemical feeders, and drains.

501.2.1.2 *[Section 120.3(b)]* **Insulation protection.**

Pipe insulation shall be protected from damage due to sunlight, moisture, equipment maintenance and wind. Protection shall, at minimum, include the following:

1. Pipe insulation exposed to weather shall be protected by a cover suitable for outdoor service. The cover shall be water retardant and provides shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be used to provide this protection.
2. Pipe insulation covering chilled water piping and refrigerant suction piping located outside the *conditioned space* shall include, or be protected by, a Class I or Class II vapor retarder. All penetrations and joints shall be sealed.
3. Pipe insulation buried below grade must be installed in a water proof and non-crushable casing or sleeve.

501.2.1.3 *[Section 120.3(c)]* **Insulation thickness**.

For insulation with a conductivity in the range shown in Table 501.2-(1) *[Table 120.3-A1]* for the applicable fluid temperature range, the insulation shall have the applicable minimum thickness or *R-value* shown in Table 501.2-(1) *[Table 120.3-A1]*.

For insulation with a conductivity outside the range shown in Table 501.2-(1) *[Table 120.3-A1]* for the applicable fluid temperature range, the insulation shall have a minimum *R-value* shown in Table 501.2-(1) *[Table 120.3-A1]* or thickness as calculated:

MINIMUM INSULATION THICKNESS EQUATION (Equation 501.2-A)

$$T = PR\left[\left(1 + \frac{t}{PR}\right)^{\frac{K}{k}} - 1\right]$$

where:

T = insulation thickness for material with conductivity K, inches.

PR = actual outside radius, inches.

t = Insulation thickness from Table 501.2-(1) *[TABLE 120.3-A1]*, inches.

K = Conductivity of alternate material at the mean rating temperature indicated in Table 501.2-(1) *[Table 120.3-A]* for the applicable fluid temperature range, in Btu-inch per hour per square foot per °F.

k = The lower value of the conductivity range listed in Table 501.2-(1) *[Table 120.3-A]* for the applicable fluid temperature range, Btu-inch per hour per square foot per °F.

TABLE 501.2-(1) [TABLE 120.3-A-1] SERVICE WATER HEATING SYSTEMS PIPE INSULATION THICKNESS

FLUID OPERATING TEMPERATURE RANGE (°F)	INSULATION CONDUCTIVITY (IN BTU·IN/H·FT^2·°F)	INSULATION MEAN RATING TEMPERATURE (°F)	NOMINAL PIPE DIAMETER < 1 INCH	NOMINAL PIPE DIAMETER 1 TO < 1.5 INCHES	NOMINAL PIPE DIAMETER 1.5 TO < 4 INCHES	NOMINAL PIPE DIAMETER 4 TO < 8 INCHES	NOMINAL PIPE DIAMETER 8 INCHES AND LARGER
Above 350	0.32-0.34	250	4.5 inches	5.0 inches	5.0 inches	5.0 inches	5.0 inches
Above 350	0.32-0.34	250	R 37	R 41	R 37	R 27	R 23
251-350	0.29-0.32	200	3.0 inches	4.0 inches	4.5 inches	4.5 inches	4.5 inches
251-350	0.29-0.32	200	R 24	R 34	R 35	R 26	R 22
201-250	0.27-0.30	150	2.5 inches	2.5 inches	2.5 inches	3.0 inches	3.0 inches
201-250	0.27-0.30	150	R 21	R 20	R 17.5	R 17	R 14.5
141-200	0.25-0.29	125	1.5 inches	1.5 inches	2.0 inches	2.0 inches	2.0 inches
141-200	0.25-0.29	125	R 11.5	R 11	R 14	R 11	R 10
105-140	0.22-0.28	100	1.0 inch	1.5 inches	1.5 inches	1.5 inches	1.5 inches
105-140	0.22-0.28	100	R 7.7	R 12.5	R 11	R 9	R 8

Footnote to Table 501.2(1) *[Table 120.3-A-1]*:

a. These thicknesses are based on energy efficiency considerations only. Issues such as water vapor permeability or surface condensation sometimes require vapor retarders or additional insulation.

~~Footnote to Table 501.2-A *[Table 120.3-A-1]*:~~

~~1. These thicknesses are based on energy efficiency considerations only. Issues such as water vapor permeability or surface condensation sometimes require vapor retarders or additional insulation.~~

501.2.2 *[Section 120.9]* **Commercial boilers.**

501.2.2.1 *[Section 120.9(a)]* **Combustion air positive shut-off.**

Combustion air positive shut-off shall be provided on all newly installed boilers as follows:

1. All boilers with an input capacity of 2.5 MMBtu/h (2,500,000 Btu/h) and above, in which the boiler is designed to operate with a nonpositive vent static pressure.
2. All boilers where one stack serves two or more boilers with a total combined input capacity per stack of 2.5 MMBtu/h (2,500,000 Btu/h).

501.2.2.2 *[Section 120.9(b)]* **Combustion air fans.**

Boiler combustion air fans with motors 10 horsepower or larger shall meet one of the following for newly installed boilers:

1. The fan motor shall be driven by a variable speed drive, or
2. The fan motor shall include controls that limit the fan motor demand to no more than 30 percent of the total design wattage at 50 percent of design air volume.

501.2.2.3 *[Section 120.9(c)]* **Combustion air volume and stack-gas oxygen concentration.**

Newly installed boilers with an input capacity 5 MMBtu/h (5,000,000 Btu/h) and greater shall maintain stack-gas oxygen concentrations at less than or equal to 5.0 percent by volume on a dry basis over firing rates of 20 to 100 percent. Combustion air volume shall be controlled with respect to firing rate or flue gas oxygen concentration. Use of a common gas and combustion air control linkage or jack shaft is prohibited.

Exception to Section 501.2.2.3: Boilers with steady state full-load *combustion efficiency* 90 percent or higher.

501.3 *[Section 140.5]* **Prescriptive requirements (Newly Constructed).**

501.3.1 *[Section 140.5(a)]* **Nonresidential occupancies.**

Service water-heating systems in *nonresidential* *use designations*~~*buildings*~~ shall meet the requirements of Sections 501.3.1.1 or 501.3.1.2, or meet the performance compliance requirements of Section 501.4 *[Section 140.1]*.

501.3.1.1 *[Section 140.5(a)1]* **School buildings less than 25,000 square feet and less than 4 stories in Climate Zones 2 through 15.**

A *heat pump* water-heating system that meets the applicable requirements of Sections 101.3 *[Section 110.1]*, 500.3 *[Section 110.3]* and 501.2.1 *[Section 120.3]*.

Exception to Section 501.3.1.1: A w*ater-heating system* solely serving an individual *bathroom* space may be an instantaneous electric *water heater*. The *bathroom* space may serve one or more occupants at the same time.

501.3.1.2 *[Section 140.5(a)2]* **All other occupancies.**

A *service water-heating* system that meets the applicable requirements of Sections 101.3 *[Section 110.1]*, 500.3 *[Section 110.3],* 501.2.1 *[Section 120.3]* and Section 501.3.3 *[Section 140.5(c)]*.

501.3.2 *[Section 140.5(b)]* **Hotel/motel occupancies.**

A *service water-heating* system installed in *hotel/motel* *use designations*~~*buildings*~~ shall meet the requirements of Section 503.3. *[Section 170.2(d)]*.

501.3.3 *[Section 140.5(c)]* **High-capacity service water-heating systems.**

Gas *service water-heating* systems with a total installed gas water-heating input capacity of 1 MMBtu/h or greater shall have gas *service water-heating* equipment with a minimum thermal efficiency of 90 percent. Multiple units can meet this requirement if the water-

heating input provided by equipment with thermal efficiencies above and below 90 percent averages out to an input capacity-weighted average of at least 90 percent.

Exception 1 to Section 501.3.3: If 25 percent of the annual *service water-heating* requirement is provided by site-solar energy or site-*recovered energy*.

Exception 2 to Section 501.3.3: Individual gas *water heaters* with input capacity at or below 100,000 Btu/h shall not be included in the calculations of the total system input or total system efficiency.

501.3.4 *[New section]* **Circulator pump controls.**

Pumps serving recirculation systems with dedicated hot water return piping shall meet the requirements of Section 501.3.4.1 or 501.3.4.2, and Section 501.3.4.3.

Exception to Section 501.3.4: Recirculation systems in *buildings* with *Group R occupancies*.

501.3.4.1 Pump controls option 1

1. The pump controls shall adjust the pump speed to maintain a constant return temperature setpoint, not to exceed 125°F, or
2. The water heating system shall include a thermal balancing valve installed in the return piping. The pump shall maintain a differential pressure with a thermal balancing valve temperature setpoint that shall not exceed 125°F.

Exception to Section 501.3.4.1: For commercial *kitchens*, the pump or thermal balancing valve setpoint temperature shall not exceed 135°F.

501.3.4.2 Pump controls option 2

Pump controls that activate the pump in response to an associated control signal shall meet the following applicable requirements:

1. Single-loop or single-riser recirculation systems shall include a hot water flow sensor or a temperature sensor capable of detecting hot water draws, and used in combination with a recirculation return temperature sensor. The return temperature setpoint shall not exceed 125°F. In addition, a priming timer shall periodically activate the pump at set intervals to reheat the recirculation system.
2. For multi-loop or multi-riser distribution systems, pump control shall periodically activate the pump at set intervals to reheat the recirculation system.

Exception to Section 501.3.4.2: For commercial *kitchens*, the pump or thermal balancing valve setpoint temperature shall not exceed 135°F.

501.3.4.3 Pump controls requirements for all systems

1. Pump controls shall retain user-defined conditions and operational parameters during loss of power, and shall return to previous operation upon return of power without requiring *manual* input.
2. Control shall include *fault* indication provided by audio or visual alarm, or electronic notifications.

501.3.5 *[New section]* ***Split heat pump water heating systems*** **with** ***recirculation.***

Split heat pump water heating system with recirculation shall meet the applicable requirements below:

Exception to Section 501.3.5: *Buildings* with *Group R occupancies.*

501.3.5.1 Return to Primary Configuration

Installation shall follow the manufacturer's design and installation requirements and:

1. The primary *heat pump water heater (HPWH)* shall be a single-pass *HPWH*.
2. The recirculation system hot water return shall directly connect to the *primary heat pump storage tanks*. For parallel storage tanks, the cold water inlet and recirculation system hot water return inlet shall be balanced.
3. In all *heat pump* operating modes, the maximum *HPWH* compressor cut-off ambient air temperature shall be less than or equal to 23°F.
4. Manufacturer, design, installation and startup documentation shall be provided in accordance with Reference Joint Appendix JA14.3, JA14.4, and JA14.5.

501.3.5.2 Temperature maintenance heater in series configuration

Installation shall follow *NEEA Advanced Water Heater Specification* for commercial *HPWH* Tier 3 or higher, and the system shall meet the following requirements:

1. The *primary heat pump storage tank* temperature setpoint shall be at least 135°F.
2. The temperature maintenance tank temperature setpoint shall be at least 10°F lower than the *primary heat pump storage tank* temperature setpoint.
3. The fuel source for the temperature maintenance tank shall be electricity.

501.3.5.3 Temperature maintenance heater in parallel configuration

Installation shall follow *NEEA Advanced Water Heater Specification* for commercial *HPWH* Tier 3 or higher, where electric *heat pump water heater* shall be the heat source.

501.4 *[Section 100.2]* Performance requirements (Newly Constructed).

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

501.5 *[Section 141.0]* Additions and alterations to existing buildings.

501.5.1 *[Section 141.0]* Additions.

Additions to existing *nonresidential*, and *hotel/motel use designations* ~~*buildings*~~ shall meet the mandatory requirements of Section 501.5.1.1 that are applicable to the ~~*building*~~ project

scope, and either the performance compliance approach (*energy budgets*) in Section 501.5.1.3 or the prescriptive compliance approach in Section 501.5.1.2 for the *Climate Zone* in which the *building* is located. *Climate zones* are shown in Figure 102.2-A *[FIGURE 100.1-A]*.

Covered process requirements for *additions* to existing *nonresidential*, and *hotel/motel buildings* are specified in Subchapter 9 *[Section 141.1]*.

Exception to Section 501.5.1: When *service water heating* to an *addition* is provided by expanding existing systems, the existing systems and equipment need not comply with this section.

501.5.1.1 *[Section 141.0(a)]* **Mandatory requirements (Additions).**

Any newly installed water-heating system shall meet the applicable requirements of the sections listed below:

101 *[Section 100.0(h), 110.0, 110.1, 110.5]* Systems and Equipment

500.1, 500.3, 501.1, 501.2 *[Section 110.8(d), 110.3, 120.0, 120.3, 120.5, 120.9]* Mandatory Requirements for Plumbing Systems

501.5.1.2 *[Section 141.0(a)1]* **Prescriptive requirements (Additions).**

Any newly installed water-heating system shall meet the applicable requirements of the sections listed below:

102.4 *[Section 140.2]* Prescriptive Requirements for *Newly Constructed Buildings*

501.3 *[Section 140.5]* Prescriptive Requirements for Plumbing Systems

Exception to Section 501.5.1.2: A gas *service water heating* system with a total system input of at least 1 MMBtu/h added to an existing *building* is not required to comply with Section 501.3.3 *[Section 140.5(c)]*.

501.5.1.3 *[Section 141.0(a)2]* **Performance requirements (Additions).**

Any newly installed water-heating system shall meet the applicable requirements of Section 102 and either the *addition* alone shall comply or the existing *building* plus *addition* plus *alteration* shall comply.

501.5.2 *[Section 141.0(b)]* **Alterations.**

Alterations to components of existing *nonresidential*, *hotel/motel use designations*, or *relocatable public school buildings*, including *alterations* made in conjunction with a change in *building occupancy* to a *nonresidential, ~~high-rise residential,~~* or *hotel/motel occupancy* shall meet mandatory requirements of Section 501.5.2.1, and either prescriptive requirements of Section 501.5.2.2 or performance requirements of Section 501.5.2.3.

Exception 1 to Section 501.5.2: *Alterations* to *healthcare facilities* are not required to comply with this Section.

Exception 2 to Section 501.5.2: When *service water heating* for an *alteration* is provided by expanding existing systems, the existing systems and equipment need not comply with this section.

Exception 3 to Section 501.5.2: When existing *service water heating* systems or components are moved within a *building*, the existing systems or components need not comply with this section.

501.5.2.1 *[Section 141.0(b)1]* **Mandatory requirements (Alterations).**

Altered components in a *nonresidential*, or *hotel/motel* use designations~~building~~ shall meet the requirements specified in the sections listed below that are applicable to the ~~building~~ project scope.

Covered process requirements for *alterations*, and *repairs* to existing *nonresidential*, and *hotel/motel* use designations ~~buildings~~ are specified in Subchapter 9 *[Section 141.1]*.

101 *[Section 100.0(h), 110.0, 110.1, 110.5]* Systems and Equipment

500.1, 500.3, 501.1, 501.2 *[Section 110.8(d), 110.3, 120.0, 120.3, 120.5, 120.9]* Mandatory Requirements for Plumbing Systems

501.5.2.2 *[Section 141.0(b)2]* **Prescriptive requirements (Alterations).**

501.5.2.2.1 *[Section 141.0(b)2N]* **Service water-heating systems.**

Service water-heating systems shall meet the requirements of Section 501.3.1.2 *[Section 140.5(a)2]* and Section 501.3.2 *[Section 140.5(b)]*, except for the solar water heating requirements.

501.5.2.2.2 *[New section]* **Split heat pump water heater (HPWH)**

Altered or replacement *service water-heating* systems using a split *HPWH* with recirculation shall meet the requirements in Section 501.3.5 [Section 140.5].

Exception 1 to Section 501.5.2.2.2: System where the outlet water temperature can reach 175°F or greater and meet the *NEEA Advanced Water Heater Specification* for commercial *HPWH* Tier 2, may be used to meet the requirements of Section 501.3.2.

Exception 2 to Section 501.5.2.2.2: Multi-pass *HPWH* that meets the *NEEA Advanced Water Heater Specification* for commercial *HPWH* Tier 2, may be used to meet the requirements of Section 501.3.2.

Exception 3 to Section 501.5.2.2.2: *Buildings* with *Group R occupancies*.

501.5.2.3 *[Section 141.0(b)3]* **Performance requirements (Alterations).**

The altered water heating components, and any newly installed equipment serving the *alteration*, shall meet the applicable requirements of Section 102.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 502

SINGLE-FAMILY RESIDENTIAL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

502.1 *[Section 150.0]* **General.**

Single-family *use designations* ~~*residential building*~~ *service water-heating* systems and equipment shall comply with the applicable requirements of Section 502.

NOTE: The requirements of Sections 502.2 through 502.4 apply to *newly constructed buildings*. Sections 502.2 and 502.5 apply to *additions* or *alterations*.

502.2 *[Section 150.0]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

502.2.1 *[Section 150.0(j)]* **Insulation for piping and tanks.**

502.2.1.1 *[Section 150.0(j)1]* **Insulation thickness and conductivity.**

All domestic hot water piping shall be insulated as specified in Section 609.12 of the California Plumbing Code.

Piping for solar water-heating system collector loops shall meet the requirements of Section 501.2.1.1 *[Section 120.3(a)]*.

Exception 1 to Section 502.2.1.1: Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration. Piping that penetrates metal framing shall use grommets, plugs, wrapping or other insulating material to assure that no contact is made with the metal framing. Insulation shall butt securely against all framing members.

Exception 2 to Section 502.2.1.1: Piping installed in interior or *exterior walls* shall not be required to have pipe insulation if all of the requirements are met for compliance with (QII) as specified in the Reference Residential Appendix RA3.5.

Exception 3 to Section 502.2.1.1: Piping surrounded with a minimum of 1 inch of wall insulation, 2 inches of crawlspace insulation, or 4 inches of *attic* insulation shall not be required to have pipe insulation.

502.2.1.2 *[Section 150.0(j)2]* **Insulation protection.**

Pipe insulation shall meet the insulation protection requirements of Section 501.2.1.2 *[Section 120.3(b)]*.

502.2.2 *[Section 150.0(n)1]* **Heat pump water heater ready.**

Systems using gas or propane *water heaters* to serve individual *dwelling units* shall designate a space at least 2.5 feet by 2.5 feet wide and 7 feet tall suitable for the future installation of a *heat pump water heater (HPWH)* and meet electrical requirements in Section 602.2.2.1.

502.2.3 *[Section 150.0(n)2]* **Solar water-heating systems and collectors.**

~~Shall comply with Section 702.2.3.~~

Solar water-heating systems and collectors shall be certified and rated by the Solar Rating and Certification Corporation (SRCC), the International Association of Plumbing and Mechanical Officials, Research and Testing (IAPMO R and T), or by a listing agency that is approved by the *Executive Director*.

502.2.3.1 *[Section 150.0(j)]* **Solar water-heating system collector loop piping.**

Piping for solar water-heating system collector loops shall meet the requirements of Section 501.2.1.1 *[Section 120.3(a)]*.

502.2.4 *[Section 150.0(n)3]* **Isolation valves.**

Instantaneous *water heaters* with an input rating greater than 6.8 kBTU/hr (2kW) shall meet the requirements of Section 500.3.3.6 *[Section 110.3(c)6]*.

502.3 *[Section 150.1]* **Prescriptive requirements (Newly Constructed).**

502.3.1 *[Section 150.1(c)8]* **Domestic water-heating systems.**

Water-heating systems shall meet the requirements of Sections 502.3.1.1, 502.3.1.2, 502.3.1.3 *[Sections 150.1(c)8A, B, C]*, or shall meet the performance compliance requirements of Section 502.4 *[Section 150.1(b)1]*.

For recirculation distribution systems, only demand recirculation systems with *manual* on/off control as specified in the Reference Appendix RA4.4.9 shall be used.

Exception to Section 502.3.1: An electric *water heater* with point of use distribution as specified in RA4.4.5 may be installed for new *dwelling units* with a *conditioned floor area* of 500 square feet or less.

502.3.1.1 *[Section 150.1(c)8A]* **Single 240 volt heat pump water heater.**

1. A single 240 volt *heat pump water heater (HPWH)*. The storage tank shall be located in the *garage* or *conditioned space*.
2. A compact hot water distribution system as specified in the Reference Appendix RA4.4.6 in climate zone 1 and 16; and
3. A *drain water heat recovery* system that is field verified as specified in the Reference Appendix RA3.6.9 in climate zone 16.

Exception to Section 502.3.1.1: A 120V *HPWH* may be installed in place of a 240V *HPWH* for new *dwelling unit* with one bedroom or less.

502.3.1.2 *[Section 150.1(c)8B]* **Single heat pump water heater that meets NEEA Specification.**

1. A single 240 volt *HPWH* that meets the requirements of *NEEA Advanced Water Heater Specification* Tier 3 or higher. The storage tank shall be located in the *garage* or *conditioned space*.
2. A *drain water heat recovery* system that is field verified as specified in the Reference Appendix RA3.6.9 in climate zone 16.

Exception to Section 502.3.1.2: A 120V *HPWH* may be installed in place of a 240V *HPWH* for new *dwelling unit* with one bedroom or less.

502.3.1.3 *[Section 150.1(c)8C]* **Solar water-heating system.**

A solar water-heating system with electric backup meeting the installation criteria specified in Reference Residential Appendix RA4 and with a minimum annual *solar savings fraction* of 0.7.

502.3.2 *[Table 150.1-A]* **Single-family standard building design.**

TABLE 502.3-(1) [TABLE 150.1-A] COMPONENT PACKAGE – SINGLE-FAMILY STANDARD BUILDING DESIGN

BUILDING **WATER HEATING SYSTEMS**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Water Heating – Section 502.3 *[Section 150.1(c)8]*	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ

502.4 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

502.5 *[Section 150.2]* **Additions and alterations to existing buildings.**

502.5.1 *[Section 150.2(a)]* **Additions.**

Additions to existing *single-family* *use designations* ~~*residential buildings*~~ shall meet the mandatory requirements of Section 502.5.1.1, and either prescriptive requirements of Section 502.5.1.2 or performance requirements of Section 502.5.1.3 *[Section 150.2(a)1 or 2]*.

502.5.1.1 *[Section 150.2(a)]* **Mandatory requirements (Additions).**

Water-heating systems and equipment shall meet the requirements of the sections listed below:

101.2, 101.3, *[Section 110.0, 110.1]* Systems and Equipment

500.1, 500.3, 502.1, 502.2 *[Section 110.8(d), 110.3, 150.0]* Mandatory Requirements for Plumbing Systems

Exception to Section 502.5.1.1: Existing inaccessible piping shall not require insulation as defined under Section 502.2.1.1 *[Section 150.0(j)1]*.

502.5.1.2 *[Section 150.2(a)1D]* **Prescriptive requirements (Additions).**

Additions shall meet the requirements of Section 502.3 *[Section 150.1(c)]*, with the following modifications:

1. When an additional *water heater* is installed as part of the *addition*, one of the following types of *water heaters* shall be installed:
    1.1. A single *heat pump water heater*. The storage tank shall not be located outdoors and shall be placed on an incompressible, rigid insulated surface with a minimum *thermal resistance* of R-10. The *water heater* shall be installed with a communication interface that meets either the requirements of Section 500.4.1 *[Section 110.12(a)]* or has a *ANSI/CTA-2045-B* communication port; or
    1.2. A single *heat pump water heater* that meets the requirements of *NEEA Advanced Water Heater Specification* Tier 3 or higher; or
    1.3. For *additions* that are 500 square feet or less, an electric *water heater* with point of use distribution as specified in RA4.4.5; or
    1.4. A water-heating system determined by the *Executive Director* to use no more energy than one specified in Section 502.5.1.2.

502.5.1.3 *[Section 150.2(a)2]* **Performance requirements (Additions).**

Performance calculations shall meet the requirements of Section 102 for the *addition* alone or for the existing *building* plus *addition*.

502.5.2 *[Section 150.2(b)]* **Alterations.**

Alterations to existing *single-family* *use designations* ~~*residential buildings*~~ or *alterations* in conjunction with a change in *building occupancy* to a single-family ~~residential~~ *occupancy* shall meet mandatory requirements of Section 502.5.2.1, and either prescriptive requirements of Section 502.5.2.2 or performance requirements of Section 502.5.2.3.

502.5.2.1 *[Section 150.2(b)1]* **Mandatory requirements (Alterations).**

The *altered component* and any newly installed equipment serving the *alteration* shall meet the applicable requirements of the sections listed below:

101.2, 101.3, *[Section 110.0, 110.1]* Systems and Equipment

500.1, 500.3, 502.2.1 *[Section 110.8(d), 110.3, 150.0(j)]* Mandatory Requirements for Plumbing Systems

502.5.2.1.1 *[Section 150.2(b)1Hi]* **Pipe Insulation.**

For newly installed and existing *accessible* piping, the insulation requirements of Section 502.2.1.1 *[Section 150.0(j)1]* shall be met.

502.5.2.2 *[Section 150.2(b)1H]* **Prescriptive requirements (Alterations).**

Altered or replacement service water-heating systems or components shall meet the applicable requirements below.

502.5.2.2.1 *[Section 150.2(b)1Hii]* **Distribution System.**

For recirculation distribution systems serving individual *dwelling units*, only demand recirculation systems with *manual* on/off control as specified in the Reference Appendix RA4.4.9 shall be installed.

502.5.2.2.2 *[Section 150.2(b)1Hiii]* **Water heating system.**

The water heating system shall meet one of the following:

1. A natural gas or propane water-heating system; or
2. A single *heat pump water heater*. The storage tank shall not be located outdoors and be placed on an incompressible, rigid insulated surface with a minimum *thermal resistance* of R-10. The *water heater* shall be installed with a communication interface that either meets the requirements of Section 500.4 *[Section 110.12(a)]* or has an *ANSI/CTA-2045-B* communication port; or
3. A single *heat pump water heater* that meets the requirements of *NEEA Advanced Water Heater Specification* Tier 3 or higher; or
4. If the existing *water heater* is an electric resistance *water heater*, a consumer electric *water heater*; or

5. A water-heating system determined by the *Executive Director* to use no more energy than the one specified in Item 1 above; or if no natural gas is connected to the existing *water heater* location, a water-heating system determined by the *executive director* to use no more energy than the one specified in Item 4 above.

502.5.2.3 *[Section 150.2(b)2]* **Performance requirements (Alterations).**

The *altered component*(s) and any newly installed equipment serving the *alteration* shall meet the applicable requirements of Section 102.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 503

MULTIFAMILY OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

503.1 *[Section 160.0]* **General.**

Multifamily building service water-heating systems and *equipment* shall comply with the applicable requirements of Section 503. Section 503 applies to *dwelling units* and *common use areas* in *multifamily buildings*. Nonresidential *use designations*~~occupancies~~ in a mixed *occupancy building* shall comply with nonresidential requirements in Section 501.

NOTE: The requirements of Sections 503.2 through 503.4 apply to *newly constructed buildings*. Sections 503.2 and 503.5 apply to *additions* or *alterations*.

503.2 *[Section 160.4]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

503.2.1 *[Section 160.4(b)]* **Solar water-heating systems and collectors.**

Shall comply with Section 702.2.3.

503.2.1.1 *[Section 160.3(b)6]* **Solar water-heating system collector loop piping.**

Shall meet the requirements of Section 503.2.3~~501.2.1~~ *[Section* 160.4(e)*]*~~*160.3(c)1].*~~

503.2.2 *[Section 160.4(d)]* **Commercial boilers.**

Shall comply with Section 501.2.2.

503.2.3 *[Section 160.4(e)]* **Pipe insulation.**

All piping for multifamily domestic hot water systems shall be insulated and meet the applicable requirements of Sections 503.2.3.1 through 503.2.3.3.

Exception 1 to Section 503.2.3: Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration. Piping that penetrates metal framing shall use grommets, plugs, wrapping or other insulating material to ensure that no contact is made with the metal framing. Insulation shall abut securely against all framing members.

Exception 2 to Section 503.2.3: Piping installed in interior or *exterior walls* shall not be required to have pipe insulation if all of the requirements are met for compliance with quality insulation installation (QII) as specified in Reference Residential Appendix RA3.5.

Exception 3 to Section 503.2.3: Piping surrounded with a minimum of 1 inch of wall insulation, 2 inches of *crawl space* insulation or 4 inches of *attic* insulation shall not be required to have pipe insulation.

503.2.3.1 *[Section 160.4(e)1]* **General requirements.**

1. The first 8 feet of inlet cold water piping from the storage tanks, including piping between a storage tank and a heat trap shall be insulated.
2. Insulation on the piping and *domestic hot water system appurtenances* shall be continuous.
3. Pipe supports, hangers, and pipe clamps shall be attached on the outside of rigid pipe insulation to prevent thermal bridges.
4. All pipe insulation seams shall be sealed.
5. Insulation for pipe elbows shall be mitered, preformed, or site fabricated with PVC covers.
6. Insulation for tees shall be notched, preformed, or site fabricated with PVC covers.
7. Extended stem isolation valves shall be installed.
8. All plumbing appurtenances on hot water piping from a heating source to heating plant, at the heating plant, and distribution supply and return piping shall be insulated to meet the following requirements:
   8.1. Where the outer diameter of the appurtenance is less than the outer diameter of the insulated pipe that it is attached to, the appurtenance shall be insulated flush with the insulation surrounding the pipe.
   8.2. Where the outer diameter of the appurtenance is greater than the outer diameter of the insulated pipe that it is attached to, the appurtenance shall be insulated with a minimum thickness of 1 inch.
   8.3. The insulation shall be removable and re-installable to ensure maintenance or replacement services can be completed.
   8.4. Valves shall be fully functional without impediment from the insulation.

503.2.3.2 *[Section 160.4(e)3]* **Insulation protection.**

Pipe Insulation shall be protected from damage due to sunlight, moisture, *equipment* maintenance and wind. Protection shall, at minimum, include the following:

1. Pipe and appurtenance insulation exposed to weather shall be protected by a cover suitable for outdoor service. The cover shall be water retardant and provide shielding from solar radiation that can cause degradation of the material. Appurtenance insulation covers shall be removable and able to be reinstalled. Adhesive tape shall not be used to provide this protection.
2. Pipe insulation covering chilled water piping and refrigerant suction piping located outside the *conditioned space* shall include, or be protected by, a Class I or Class II vapor retarder. All penetrations and joints shall be sealed.
3. Pipe insulation buried below grade must be installed in a waterproof and noncrushable casing or sleeve.

503.2.3.3 *[Section 160.4(e)2]* **Insulation thickness.**

For insulation conductivity in the range shown in Table 503.2-(1) *[Table 160.4-A]* for the applicable fluid temperature range, the insulation shall have the applicable minimum thickness or *R-value* shown in Table 503.2-(1) *[Table 160.4-A]*.

If the insulation conductivity falls outside the range provided in Table 503.2-(1) *[Table 160.4-A]* applicable fluid temperature range, the insulation shall meet a minimum *R-value* as indicated in Table 503.2-(1) *[Table 160.4-A]* or it can have a thickness determined using Equation 503.2-A *[Equation 160.4-A]*.

Insulation conductivity shall be determined in accordance with *ASTM C335* at the mean temperature listed in Table 503.2-(1) *[Table 160.4-A]*, and shall be rounded to the nearest 1/100 Btu-inch per hour per square foot per °F.

$$T = PR\left[\left(1+\frac{t}{PR}\right)^{\frac{K}{k}}-1\right]$$

(Equation 503.2-A *[Equation 160.4-A]*)

where:

T = Minimum insulation thickness for material with conductivity K, inches.

PR = Pipe actual outside radius, inches.

t = Insulation thickness from Table 503.2-(1) *[Table 160.4-A]*, inches.

K = Conductivity of alternate material at the mean rating temperature indicated in Table 503.2-(1) *[Table 160.4-A]* for the applicable fluid temperature range, in Btu-inch per hour per square foot per °F.

k = The lower value of the conductivity range listed in Table 503.2-(1) *[Table 160.4-A]* for the applicable fluid temperature range, Btu-inch per hour per square foot per °F.

TABLE 503.2-(1) [TABLE 160.4-A] PIPE INSULATION THICKNESS – MULTIFAMILY DOMESTIC HOT WATER SYSTEMS

FLUID OPERATING TEMPERATURE RANGE (°F)	INSULATION CONDUCTIVITY (BTU·IN/H·FT² °F)	INSULATION CONDUCTIVITY MEAN RATING TEMP. (°F)	NOMINAL PIPE DIAMETER (IN INCHES) < 1	NOMINAL PIPE DIAMETER (IN INCHES) 1 TO <1.5	NOMINAL PIPE DIAMETER (IN INCHES) 1.5 TO < 4	NOMINAL PIPE DIAMETER (IN INCHES) 4 TO < 8	NOMINAL PIPE DIAMETER (IN INCHES) 8 AND LARGER
105-~~140~~[1]140[a]	0.22-0.28	100	1.0 (R 7.7)	1.5 (R 12.5)	2.0 (R 16)	2.0 (R 12.5)	2.0 (R 11)

Footnote to Table 503.2-(1) *[Table 160.4-A]*:

a. Multifamily domestic hot water systems with water temperature above 140°F shall use the row in Table 501.2-(1) *[Table 120.3-A]* for the applicable water temperature.

~~Footnote to Table 503.2-A *[Table 160.4-A]*:~~

~~1. Multifamily domestic hot water systems with water temperature above 140°F shall use the row in Table 501.2-A *[Table 120.3-A]* for the applicable water temperature.~~

503.2.4 *[Section 160.9(e)]* **Individual heat pump water heater ready.**

Systems using gas or propane *water heaters* to serve individual *dwelling units* shall meet *heat pump water heater* ready requirements in Section 603.2.4.2.

503.2.5 *[Section 160.9(f)]* **Central heat pump water heater ready.**

Central water heating systems using gas or propane to serve multiple *dwelling units* shall meet *heat pump water heater* ready requirements in Section 603.2.4.1.

503.3 *[Section 170.2]* Prescriptive requirements (Newly Constructed).

503.3.1 *[Section 170.2(d)1]* Individual systems.

For systems serving individual *dwelling units*, the water-heating system shall meet the requirement of either Section 503.3.1.1 or 503.3.1.2, or shall meet the performance compliance requirements of Section 503.4 *[Section 170.1]*.

For recirculation distribution systems serving individual *dwelling units*, only demand recirculation systems with *manual* on/off control as specified in the Reference Appendix RA4.4.9 shall be used.

Exception 1 to Section 503.3.1: *Multifamily more than 3 stories ~~buildings~~ ~~four habitable stories or greater~~* may install a gas or propane instantaneous *water heater* with an input of 200,000 Btu per hour or less and no storage tank.

Exception 2 to Section 503.3.1: A 120V *HPWH* may be installed in place of a 240V *HPWH* for new *dwelling unit* with one bedroom or less.

503.3.1.1 *[Section 170.2(d)1A]* Single 240 volt *heat pump water heater*.

1. A single 240 volt *heat pump water heater*.
2. A compact hot water distribution system as specified in Reference Appendix RA4.4.6 in *climate zones* 1 and 16; and
3. A *drain water heat recovery* system that is field verified as specified in the Reference Appendix RA3.6.9 in Climate Zone 16.

503.3.1.2 *[Section 170.2(d)1B]* Single *heat pump water heater* that meets NEEA Specification.

1. A single *heat pump water heater* that meets the requirements of *NEEA Advanced Water Heater Specification* Tier 3 or higher.
2. A *drain water heat recovery* system that is field verified as specified in Reference Appendix RA3.6.9 in climate zone 16.

503.3.2 *[Section 170.2(d)2]* Central systems.

For systems serving multiple *dwelling units*, the water-heating system shall meet the applicable requirement of Sections 503.3.2.1 through 503.3.2.6, or shall meet the performance compliance requirements of Section 503.4 *[Section 170.1]*.

503.3.2.1 *[Section 170.2(d)2A]* Heat pump water-heating systems.

For *heat pump* water-heating systems serving multiple *dwelling units*, the water-heating system shall be installed according to the manufacturer's design and installation guidelines and meet the following requirements, or meet the requirements of *NEEA Advanced Water Heater Specification* for *commercial heat pump water heater* Tier 2 or higher:

1. The primary *heat pump water heater* shall be a single-pass *heat pump water heater*.
2. The hot water return from the recirculation loop shall connect to a recirculation loop tank and shall not directly connect to the primary *heat pump water heater* inlet or the primary thermal storage tanks.
3. The fuel source for the recirculation loop tank shall be electricity.
4. The *primary storage* tank temperature setpoint shall be at least 135°F.
5. The recirculation loop tank temperature setpoint shall be at least 10°F lower than the primary thermal storage tank temperature setpoint.
6. The minimum *heat pump water heater* compressor cut-off temperature shall be equal to or lower than 40°F ambient air temperature.
7. Design documentation shall be provided in accordance with JA14.4.

503.3.2.2 *[Section 170.2(d)2B]* **Gas or propane systems.**

For gas or propane systems serving multiple *dwelling units*, the water-heating system that includes the following components shall be installed:

503.3.2.2.1 *[Section 170.2(d)2Bi]* **Gas system.**

For *Climate Zones* 1 through 9, gas *service water-heating* systems with a total installed gas water-heating input capacity of 1 MMBtu/h or greater shall have gas *service water-heating* equipment with a minimum thermal efficiency of 90 percent. Multiple units are allowed to meet this requirement with an input capacity-weighted average of at least 90 percent.

Exception 1 to Section 503.3.2.2.1: Individual gas *water heaters* with input capacity at or below 100,000 Btu/h shall not be included in the calculations of the total system input or total system efficiency.

Exception 2 to Section 503.3.2.2.1: If 25 percent of the annual water-heating requirement is provided by site-solar energy or *site-recovered energy*.

503.3.2.2.2 *[Section 170.2(d)2Bii]* **Solar system.**

A solar water-heating system meeting the installation criteria specified in Reference Residential Appendix RA4 and with a minimum *solar savings fraction* of either option below:

1. A minimum *solar savings fraction* of 0.20 in *Climate Zones* 1 through 9 or a minimum *solar savings fraction* of 0.35 in *Climate Zones* 10 through 16; or
2. A minimum *solar savings fraction* of 0.15 in *Climate Zones* 1 through 9 or a minimum *solar savings fraction* of 0.30 in *Climate Zones* 10 through 16. In addition, a *drain water heat recovery* system that is field verified as specified in the Reference Appendix RA3.6.9.

503.3.2.3 *[Section 170.2(d)2F]* **Alternative system type.**

A water-heating system serving multiple *dwelling units* determined by the *Executive Director* to use no more energy than the one specified in Section 503.3.2.1 or Section 503.3.2.2.

503.3.2.4 *[Section 170.2(d)2C]* **Hot water pipe sizing.**

All hot water piping shall be sized in accordance with the California Plumbing Code Appendix M.

503.3.2.5 *[Section 170.2(d)2D]* **Thermostatic master mixing valves.**

The central system shall have a recirculation system with mechanical or digital thermostatic master mixing valve on each distribution supply and return loop, and meet the requirements specified in the Residential Reference Appendix RA4.4.19.

Exception to Section 503.3.2.5: *Buildings* with eight or fewer *dwelling units*.

503.3.2.6 *[Section 170.2(d)2E]* **Insulation field verification.**

Insulation for hot water pipes and plumbing appurtenances shall be field verified as specified in Residential Reference Appendix RA3.6.3.

503.3.3 *[Table 170.2-K]* **Multifamily standard building design.**

TABLE 503.3-(1) [TABLE 170.2-K] MECHANICAL COMPONENT PACKAGE – MULTIFAMILY STANDARD BUILDING DESIGN

COMPONENT	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Water Heating - All *Buildings* System Shall meet Section 503.3 *[Section 170.2(d)]*	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ

503.4 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

503.5 *[Sections 180.1, 180.2]* **Additions and alterations to existing buildings.**

503.5.1 *[Section 180.1]* **Additions.**

Additions to existing *multifamily use designations ~~buildings~~* shall meet the mandatory requirements of Section 503.5.1.1, and either prescriptive requirements of Section 503.5.1.2 *[Section 180.1(a)]* or performance requirements of Section 503.5.1.3 *[Section 180.1(b)]*.

503.5.1.1 *[Section 180.1]* **Mandatory requirements (Additions).**

The domestic hot water systems of the *addition* shall meet the requirements of the sections listed below:

101.2, 101.3 *[Section 110.0, 110.1]* Systems and Equipment

500.1, 500.3, 503.1, 503.2 *[Section 110.3, 110.8(d)2, 160.0, 160.4]* Mandatory Requirements for Plumbing Systems

Exception to Section 503.5.1.1: Existing inaccessible piping shall not require insulation as defined under Section 503.2.3 *[Section 160.4(e)]*.

503.5.1.2 *[Section 180.1(a)]* **Prescriptive requirements (Additions).**

Any newly installed water-heating system shall meet the applicable requirements of the sections listed below:

503.3 *[Section 170.2(d)]* Prescriptive Requirements for Plumbing Systems

503.5.1.2.1 *[Section 180.1(a)3]* **Additional water-heating equipment – Dwelling units.**

When additional water-heating equipment is installed to serve a *dwelling unit* as part of the *addition*, one of the following types of *water heaters* shall be installed:

1. A water-heating system that meets the requirements of Section 503.3 *[Section 170.2(d)]*; or
2. A water-heating system determined by the *Executive Director* to use no more energy than one compliant with Section 503.3 *[Section 170.2(d)]*.

503.5.1.3 *[Section 180.1(b)]* **Performance requirements (Additions).**

Performance calculations shall meet the requirements of Section 102 for the *addition* alone or for the existing *building* plus *addition*.

503.5.2 *[Section 180.2]* **Alterations.**

Alterations to components of existing *multifamily* *use designations*~~*buildings*~~, including *alterations* made in conjunction with a change in *building occupancy* to a multifamily *occupancy*, shall meet mandatory requirements of Section 503.5.2.1, and either prescriptive requirements of Section 503.5.2.2 or performance requirements of Section 503.5.2.3.

Exception 1 to Section 503.5.2: When *service water heating* for an *alteration* is provided by expanding existing systems, the existing systems and equipment need not comply with *Part 6*.

Exception 2 to Section 503.5.2: When existing *service water-heating* systems or components are moved within a *building*, the existing systems or components need not comply with *Part 6*.

503.5.2.1 *[Sections 180.0, 180.2(a)]* **Mandatory requirements (Alterations).**

Altered components in a *multifamily* *use designations*~~*building*~~ shall meet the requirements specified in the sections listed below that are applicable to the ~~*building*~~ project scope and the minimum requirements in this section.

101.2, 101.3 *[Section 110.0, 110.1]* Systems and Equipment

500.1, 500.3, 503.1 *[Section 110.3, 110.8(d)2, 160.0]* Mandatory Requirements for Plumbing Systems

503.5.2.2 *[Sections 180.2(b)]* **Prescriptive requirements (Alterations).**

503.5.2.2.1 *[Section 180.2(b)3]* **Hot water systems – Dwelling units.**

Altered or replacement water-heating systems or components serving individual *dwelling units* shall meet the applicable requirements below:

1. **Distribution system.** Shall comply with Section 502.5.2.2.1.
2. **Water-heating system.** Shall comply with Section 502.5.2.2.2.

503.5.2.3 *[Sections 180.2(c)]* **Performance requirements (Alterations).**

The *altered component*(s) and any newly installed equipment serving the *alteration* shall meet the applicable requirements of Section 102.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SUBCHAPTER 6
ELECTRICAL AND LIGHTING

SECTION 600

MANDATORY REQUIREMENTS FOR ALL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

600.1 *[Section 100.0(h)]* **Systems and equipment.**

Part 6 limits the installation of *manufactured equipment*, *products, and devices* to those that have been certified as specified by sections 101.2 *[Section 110.0]* and 101.3 *[Section 110.1]*. Requirements for *manufactured equipment*, *products, and devices,* when not specified in Title 24 *Part 6*, are specified in California Code of Regulations, Title 20, Sections 1601-1609.

600.2 *[Section 110.9(a)]* **Lighting controls devices and systems.**

All *lighting* control devices and systems and all *light sources* subject to the requirements of this section shall meet the following requirements:

1. Shall be installed only if the *lighting* control or *light source* complies with all of the applicable requirements of Section 600.2 *[Section 110.9]*.
2. *Lighting* controls may be individual devices or systems consisting of two or more components.

   600.2.1 *[Section 110.9(b)]* **All lighting controls.**

   Lighting controls listed in Section 600.2.1 *[Section 110.9(b)]* shall comply with the requirements listed below; and all components of the system considered together as installed shall meet all applicable requirements for the application for which they are installed as required in Section 601 *[Sections 130.0 through 130.5]*, *[Sections 140.6 through 140.8]*, *[Section 141.0]*, Section 602 *[Section 150.0(k)]*,and Section 603.

   600.2.1.1 *[Section 110.9(b)1]* **Time-switch lighting controls.**

   All controls that provide time-switch functionality, including all *automatic* and *astronomical time-switch controls*, shall have program backup capabilities that prevent the loss of the device's schedule for at least 7 days, and the device's date and time for at least 72 hours ~~if~~ in the event of a power ~~is interrupted~~interruption. In addition:

   1. Time-switch controls installed in *nonresidential buildings* shall:

      1.1. For each connected load, be capable of providing *manual* override to each connected load and of resuming normally scheduled operation after a *manual* override is initiated within 2 hours; and

1.2. Provided an *automatic* holiday shutoff feature that turns off all connected loads for at least 24 hours and then resumes normally scheduled operation.

2. *Astronomical time-switch controls* shall:

2.1. Have sunrise and sunset prediction accuracy within plus-or-minus 15 minutes and timekeeping accuracy within 5 minutes per year;

2.2. Be capable of displaying date, current time, sunrise time, sunset time, and switching times for each step during programming;

2.3. Be capable of automatically adjusting for daylight savings time; and

2.4. Have the ability to independently offset the on and off for each channel by at least 90 minutes before and after sunrise or sunset.

3. Multilevel time-switch controls shall include at least two separately programmable steps per zone.

4. Time-switch controls installed outdoors shall have setback functions that allow the *lighting* on each controlled channel to be switched or dimmed to lower levels. The setback functions shall be capable of being programmed by the user for at least one specific time of day.

600.2.1.2 *[Section 110.9(b)2]* **Daylight responsive controls.**

Controls that provide *daylight responsive controls* functionality shall:

1. Automatically return to its most recent time delay settings within 60 minutes of the last received input when left in calibration mode;

2. Have a set point control that easily distinguishes settings to within 10 percent of full-scale adjustment;

3. Provide a linear response within 5 percent accuracy over the range of *illuminance* measured by the *light* sensor; and

4. Be capable of being calibrated in a manner that the person initiating the calibration is remote from the sensor during calibration to avoid influencing calibration accuracy, for example by having a *light* sensor that is physically separated from where the calibration adjustments are made.

600.2.1.3 *[Section 110.9(b)3]* **Dimmers.**

Controls that provide dimming functionality shall:

1. Be capable of reducing *lighting* power consumption by a minimum of 65 percent when at its lowest setting;

2. Provide reduced flicker operation, meaning that directly controlled *light sources* shall be provided electrical power such that the *light* output has an amplitude modulation of less than 30 percent for frequencies less than 200 Hz without causing premature *lamp* failure;

3. Provide an offsetting that produces a zero lumen output; and

4. For wall box *dimmers* and associated switches designed for use in three way circuits, be capable of turning *lights* off, and on to the level set by the *dimmer* if the *lights* are off.

600.2.1.4 *[Section 110.9(b)4]* **Occupant sensing controls.**

Occupant sensing controls include occupant sensors, motion sensors, and vacancy sensors, including those with a partial-ON or partial-OFF function. *Occupant sensing controls* shall:

1. Be capable of automatically turning the controlled *lights* in the area either off or down no more than 20 minutes after the area has been vacated;
2. For manual-on controls, have a grace period of no less than 15 seconds and no more than 30 seconds to turn on *lighting* automatically after the sensor has timed out; and
3. Provide a visible status signal that indicates that the device is operating properly, or that it has failed or malfunctioned. The visible status signal may have an override that turns off the signal.

Exception to Section 600.2.1.4: *Occupant sensing control* systems may consist of a combination of single or multilevel occupant, motion or vacancy sensor controls, provided that components installed to comply with manual-on requirements shall not be capable of conversion by occupants from manual-on to automatic-on functionality.

600.2.1.5 *[Section 110.9(b)6]* **Sensors used to detect occupants.**

Sensors that are used by *occupant sensing controls* to detect occupants shall meet all of the following requirements:

1. Sensors shall not incorporate switches or mechanical devices that allow the sensor to be disabled without changing the settings of the control.
2. Sensors that utilize ultrasonic radiation for detection of occupants shall:
   2.1. comply with 21 C.F.R. part 1002.12;
   2.2. not emit audible sound; and
   2.3. not emit ultrasound in excess of the decibel levels shown in Table 600.2-~~A~~(1) *[Table 110.9-A]* measured no more than 5 feet from the source, on axis.
3. Sensors that utilize microwave radiation for detection of occupants shall:
   3.1. comply with 47 C.F.R. parts 2 and 15; and
   3.2. not emit radiation in excess of 1 milliwatt per square centimeter measured at no more than 5 centimeters from the emission surface of the device.

TABLE 600.2-~~A~~(1) [TABLE 110.9-A] - ULTRASOUND MAXIMUM DECIBEL VALUES

MID-FREQUENCY OF SOUND PRESSURE THIRD-OCTAVE BAND (IN KHZ)	MAXIMUM DB LEVEL WITHIN THIRD-OCTAVE BAND (IN DB REFERENCE 20 MICROPASCALS)
Less than 20	80
20 or more to less than 25	105
25 or more to less than 31.5	110
31.5 or more	115

600.2.1.6 *[Section 110.9(b)7]* **Indicator lights.**

Indicator *lights* integral to *lighting* controls shall consume no more than 1 watt of power per indicator *light*.

600.2.2 *[Section 110.9(c)]* **Track lighting integral current limiter.**

An integral current limiter for *line-voltage track lighting* shall be recognized for compliance with *Part 6* only if it meets all of the following requirements:

1. Shall have the identical volt-ampere (VA) rating of the current limiter as installed and rated for compliance with *Part 6* clearly marked as follows:
   1.1. So that it is visible for the *enforcement agency*'*s* field inspection without opening coverplates, fixtures or panels; and
   1.2. Permanently marked on the circuit breaker; and
   1.3. On a factory-printed label that is permanently affixed to a nonremovable base-plate inside the wiring compartment.
2. Shall have a conspicuous *factory* installed label permanently affixed to the inside of the wiring compartment warning against removing, tampering with, rewiring or bypassing the device; and
3. Each electrical panel from which *track lighting integral current limiters* are energized shall have a *factory* printed label permanently affixed and prominently located, stating the following: "NOTICE: Current limiting devices installed in *track lighting integral current limiters* connected to this panel shall only be replaced with the same or lower amperage. Adding track or replacement of existing current limiters with higher continuous ampere rating will void the *track lighting integral current limiter* certification, and will require resubmittal of compliance documentation to the *enforcement agency* responsible for compliance with the California ~~Title 24, Part 6 Building Energy Efficiency Standards~~Energy Code."

600.2.3 *[Section 110.9(d)]* **Track lighting supplementary overcurrent protection panel.**

A *Track Lighting Supplementary Overcurrent Protection Panel* shall be used only for *line-voltage track lighting* and shall be recognized for compliance with *Part 6* only if it meets all of the following requirements:

1. Shall be listed as defined in Section 200 *[Section 100.1]*; and

2. Shall have a permanently installed label that is prominently located stating the following: "NOTICE: This Panel for *Track Lighting* Energy Code Compliance Only." The overcurrent protection devices in this panel shall only be replaced with the same or lower amperage. No other overcurrent protective device shall be added to this panel. Adding to, or replacement of, existing overcurrent protective device(s) with higher continuous ampere rating will void the panel listing and require resubmittal of compliance documentation to the *enforcement agency* responsible for compliance with the California- Energy Code~~Title 24, Part 6 Building Energy Efficiency Standards~~.

600.3 *[Section 110.11]* **Electrical power distribution systems.**

600.3.1 *[Section 110.11]* **Certification by manufacturers.**

Any *electrical power distribution system equipment* listed in this section may be installed only if the manufacture has *certified to the Energy C~~c~~ommission* that the *equipment* complies with all the applicable requirements of this section.

600.3.2 *[Section 110.11(a)]* **Low-voltage dry-type distribution transformer.**

Low-voltage dry-type distribution transformer shall be certified by the Manufacturer as required by the Title 20 *Appliance Efficiency Regulations*.

Exception to Section 600.3.2:

1. autotransformer;
2. drive (isolation) transformer;
3. grounding transformer;
4. machine-tool (control) transformer;
5. nonventilated transformer;
6. rectifier transformer;
7. regulating transformer;
8. sealed transformer;
9. special-impedance transformer;
10. testing transformer;
11. transformer with tap range of 20 percent or more;
12. uninterruptible power supply transformer; or
13. welding transformer.

600.4 *[Section 110.12]* **Demand management.**

Buildings, other than *healthcare facilities and single-family occupancies*, that install or are required to install *demand responsive controls* shall comply with the applicable *demand responsive control* requirements of this section.

600.4.1 *[Section 110.12(a)]* **Demand responsive controls.**

All *demand responsive controls* shall be either:

1. A certified *OpenADR 2.0a* or *OpenADR 2.0b Virtual End Node (VEN)*, as specified under Clause 11, Conformance, in the applicable OpenADR 2.0 Specification; or a certified Baseline Profile OpenADR 3.0 *Virtual End Node*; or
2. *Certified to the Energy Commission* as being capable of responding to a *demand response signal* from a certified *OpenADR 2.0b* or a certified Baseline Profile OpenADR 3.0 *Virtual End Node* by automatically implementing the control functions requested by the *Virtual End Node* for the *equipment* it controls.

All *demand responsive controls* shall be capable of communicating with the *VEN* using a wired or wireless bidirectional communication protocol.

When the *demand response signal* is disabled or unavailable, all *demand responsive controls* shall continue to perform all other control functions provided by the control.

600.4.2 *[Section 110.12(c)]* **Demand responsive lighting controls.**

600.4.2.1 Nonresidential buildings excluding Group R occupancies.

Buildings with *nonresidential lighting* systems having a total installed *lighting* power of 4,000 watts or greater that are subject to the requirements of Section 601.2.2.1.4 *[New section]* shall be equipped with controls capable of automatically reducing *lighting* power in response to a *demand response signal*.

For compliance testing, during a *Demand Response* (DR) event, the *lighting control systems* shall reduce *lighting* output by a minimum of 15 percent of full rated power, and no more than 50 percent of full rated power as specified in NA7.6.3. If the *lighting* output is already below the *demand response* target level at the time the signal is initiated, the system shall not increase *lighting* output above the pre-event *lighting* output.

In *buildings* where *demand responsive controls* are required, *demand responsive controls* shall control the *general lighting* in the spaces required to meet Section 601.2.2.1.4 [New section].

General lighting power shall be reduced by continuous dimming.

600.4.2.2 Buildings with nonresidential lighting systems.

~~*Buildings*~~ *Group R occupancies* with nonresidential *lighting* systems having a total installed *lighting* power of 4,000 watts or greater that are subject to the requirements of Section 601.2.2.2 *[Section 130.1(b)] or Section 160.5(b)4B]* shall install controls that are capable of automatically reducing *lighting* power in response to a *demand response signal*.

For compliance testing, the *lighting* controls shall demonstrate a 15-percent or greater reduction in *lighting* power as described in NA7.6.3. The controls may provide additional demand responsive functions or abilities.

For *buildings* where *demand response* controls are required, *demand responsive controls* shall control the *general lighting* in the spaces required to meet Section 601.2.2.2 *[Section 130.1(b)] or Section 160.5(b)4B]*.

General lighting shall be reduced in a manner consistent with the requirements of Section 601.2.2.2 *[Section 130.1(b)] or Section 160.5(b)4B]*.

Exception to Section 600.4.2.2: Spaces where a health or life safety statute, ordinance, or regulation does not permit the *general lighting* to be reduced are not required to install *demand responsive controls* and do not count toward the 4,000-watt threshold.

600.4.3 *[Section 110.12(d)]* **Demand responsive electronic message center control.**

Controls for *electronic message centers* greater than 15 kW shall be capable of reducing the *lighting* power by a minimum of 30 percent when receiving a *demand response signal*.

Exception to Section 600.4.3: *Electronic message centers* that are not permitted by a health or life safety statute, ordinance, or regulation to be reduced.

600.4.4 *[Section 110.12(e)]* **Demand Responsive Controlled Receptacles.**

In spaces required to have controlled receptacles per Section 601.2.6.4 *[Section 130.5(d)]* or Section 603.2.3.4 *[Section 160.6(d)]* and where demand responsive *lighting* controls are installed, the controlled receptacles shall be capable of automatically turning off all connected loads in response to a *demand response signal*.

Exception to Section 600.4.4: Spaces where a health or life safety statute, ordinance or regulation does not permit the receptacles to be automatically controlled.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 601

NONRESIDENTIAL AND HOTEL/MOTEL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

601.1 *[Section 130.0(a)]* **General.**

The design and installation of all *lighting* systems and *equipment* in *nonresidential* and *hotel/motel* use designations ~~*buildings*~~, *outdoor lighting*, and *electrical power distribution systems* within the scope of Section 100.3 *[Section 100.0(a)]*, shall comply with the applicable provisions of Section 601 .

NOTE: The requirements of Sections 601.2 through 601.4 apply to *newly constructed buildings*. Section 601.5 applies to *additions* or *alterations* to existing *buildings*.

601.1.1 *[Section 130.0(b)]* **Functional areas where compliance with the single-family residential lighting standards is required.**

The design and installation of all *lighting* systems, *lighting* controls and *equipment* in the following functional areas shall comply with the applicable ~~residential~~ *single-family lighting* requirements of Section 602.2.1 *[Section 150.0(k)]*. In *use designations* ~~*buildings*~~ containing these functional areas, all other functional areas, such as common areas, shall comply with the applicable nonresidential *lighting* and controlled receptacle requirements.

1. *Outdoor lighting* attached to a *hotel/motel use designation*~~*building*~~ and separately controlled from the inside of a guest room.
2. Fire station *dwelling* accommodations.
3. Hotel and motel guest rooms. Additionally, hotel and motel guest rooms shall meet the requirements of Section 601.2.2.3.7 *[Section 130.1(c)8]* and Section 601.2.6.4.1 *[Section 130.5(d)4]*.

601.2 Mandatory requirements (Newly Constructed, Additions, Alterations).

601.2.1 *[Section 130.0(c)]* **Luminaire classification, label and power.**

Luminaires shall be classified, and their wattage shall be determined and labeled ~~as follows:~~ in accordance with Section 601.2.1.2 for *Group R occupancies* and Section 601.2.1.1 for all other Nonresidential *Occupancies*.

601.2.1.1 Luminaire classification, and power in Nonresidential Occupancies ~~E~~excluding Group R occupancies.

Luminaires shall be classified, and their wattage shall be determined and labeled ~~as follows:~~in accordance with Sections 601.2.1.1.1 through 601.2.1.1.8.

~~**601.2.1.1 *[Section 130.0(c)1A]* Rated wattage label.**~~

~~The maximum rated wattage or relamping rated wattage of a *luminaire* shall be listed on a permanent, preprinted, factory installed label, as specified by *UL 1574*, 1598, 2108 or 8750, as applicable.~~

~~**601.2.1.2 *[Section 130.0(c)1B]* Permanent label.**~~

~~The factory-installed maximum rated wattage or relamping rated wattage label shall not consist of peel-off or peel-down layers or other methods that allow the rated wattage to be changed after the *luminaire* has been shipped from the manufacturer.~~

~~**Exception to Section 601.2.1.2:** Peel-down labels may be used only for the following *luminaires*, when they can accommodate a range of *lamp* wattages without changing the *luminaire* housing, ballast, transformer or wiring. Qualifying *luminaires* shall have a single *lamp*, and shall have integrated ballasts or transformers. Peel-down labels must be layered such that the rated wattage reduces as successive layers are removed.~~

~~1. High-intensity discharge *luminaires*, having an integral electronic ballast, with a maximum relamping rated wattage of 150 watts.~~

~~2. Low-voltage *luminaires* (except *low voltage* track systems), ≤ 24 volts, with a maximum relamping rated wattage of 50 watts.~~

~~3. Compact fluorescent *luminaires*, having an integral electronic ballast, with a maximum relamping rated wattage of 42 watts.~~

~~**601.2.1.3**~~**601.2.1.1.1** *[Section 130.0(c)2]* **Luminaires with ~~line voltage lamp holders not served by drivers, ballasts or transformers~~ removable line voltage lamps or removable line voltage LED light engines.**

For *luminaires* containing line voltage *LED light engines*, the wattage of such *luminaires* shall be the maximum labelled wattage of installed *LED light engines*. For *luminaires* with line voltage *lamp* holders not served by *drivers*, ballasts, or transformers; the wattage of ~~such~~ the *luminaires* shall be the maximum labeled wattage of *lamps* or other removable line voltage *lighting* device installed in the *lamp* holders. ~~determined as the maximum relamping rated wattage as labeled in accordance with Sections 601.2.1.1 and 601.2.1.2 *[Section 130.0(c)1]* .~~

601.2.1.1.2 *[Section 130.0(c)4]* **Inseparable Solid State Lighting (SSL) luminaires and SSL luminaires with remotely mounted drivers.**

For *inseparable SSL luminaires* and *SSL luminaires* with remotely mounted *drivers*, including *luminaires* where the *light* output or wattage is field-adjustable, the maximum rated wattage of the *SSL luminaire* shall be the maximum rated wattage of the *luminaire* listed on a permanent, preprinted, label installed by the manufacturer or manufacturer's authorized representative, as specified by *UL 1574, UL 1598*, *UL 2108* or *UL 8750*, as applicable.

~~**601.2.1.4**~~ **601.2.1.1.3** *[Section 130.0(c)3]* **Luminaires with permanently installed or remotely installed ballasts.**

For *luminaires* with permanently installed or remotely installed ballasts, the wattage of such *luminaires* shall be the operating input wattage of the rated *lamp*/ballast

combination published ~~in~~ by the ballast manufacturer~~'s catalogs~~ based on independent testing lab reports as specified by *UL 1598*.

~~601.2.1.5 *[Section 130.0(c)4]* **Solid State Lighting (SSL)**~~

~~For inseparable *SSL luminaires* and *SSL luminaires* with remotely mounted *drivers*, the maximum rated wattage shall be the maximum rated input wattage of the *SSL luminaire* as specified in Sections 601.2.1.1 and 601.2.1.2 *[Section 130.0(c)1]* when tested in accordance with *UL 1598*, *2108 or 8750*, or *IES LM-79*.~~

601.2.1.1.4 *[New Section]* **Luminaires with ballasts powering SSLs.**

Wattage of *luminaires* containing HID or fluorescent ballasts powering *SSL* shall be the maximum rated wattage of the ballast published by the manufacturer when powering the HID or fluorescent *light* source. When the rated maximum wattage of the ballast information is not available, the wattage for the applicable HID or fluorescent *lamp*/ballast combination from Reference Appendix NA8 shall be used.

~~**601.2.1.6**~~ **601.2.1.1.5** *[Section 130.0(c)5]* **LED tape lighting.**

For *LED* tape *lighting* and *LED* linear *lighting* with *LED* tape *lighting* components, the maximum rated wattage shall be either the sum of the installed length of the tape *lighting* ~~times~~ multiplied by its rated linear power density in watts per linear feet, or the maximum rated input wattage of the *driver* or power supply ~~providing power~~for ~~to~~ the *lighting* system, with the tape *lighting* system tested in accordance with *UL 2108 or 8750*, or *IES LM-79*.

~~**601.2.1.7**~~ **601.2.1.1.6** *[Section 130.0(c)6]* **Modular lighting systems.**

For modular *lighting* systems that allow the *addition* or relocation of *luminaires* without altering the wiring of the system, shall be determined as follows:

1. The wattage shall be the greater of:
    1.1. 30 watts per linear foot of track or plug-in busway; or
    1.2. the rated wattage of all of the *luminaires* included in the system, where the *luminaire* wattage is determined as specified in Sections 601.2.1.1 and 601.2.1.2 [Section 130.0(c)1].

~~For line-voltage lighting track and plug-in busway served by a track lighting integral current limiter or a dedicated track lighting supplementary overcurrent protection panel, the wattage shall be determined as follows:~~

~~The volt-ampere rating of the current limiter as specified by UL 1077; or~~

~~The sum of the ampere (A) rating of all of the current protection devices times the branch circuit voltages for track lighting supplementary overcurrent protection panel.~~

2. For other modular *lighting* systems with power supplied by a *driver*, power supply or transformer, including but not limited to low-voltage *lighting* systems, the wattage of the system shall be the maximum rated input wattage of the

driver, power supply or transformer published ~~in~~ by the manufacturer~~'s catalogs~~, as specified by *UL 2108* or 8750.

Exception to Section 601.2.1.1.6 ~~601.2.1.7~~: For power-over-Ethernet *lighting* systems, power provided to installed nonlighting devices may be subtracted from the total power rating of the power-over-Ethernet system.

601.2.1.1.7 *[New Section]* ***Lighting*** **controlled by current limiters or supplementary overcurrent protection.**

For any *lighting* system controlled by a current limiter or supplementary overcurrent protection panel, the wattage shall be determined as follows:

1. The volt-ampere rating of the current limiter as specified by *UL 1077*; or
2. The sum of the ampere (A) rating of all of the current protection devices ~~times~~multiplied by the branch circuit voltages for the *lighting* supplementary overcurrent protection panel.

601.2.1.1.8 *[Section 130.0(c)7]* **~~—~~All other lighting equipment.**

For all other *lighting equipment* not addressed by ~~Sections 601.2.1.3~~ Sections 601.2.1.1.1 through ~~601.2.1.7~~601.2.1.1.7 *[Sections 130.0(c)2 through 6]*, the wattage of the *lighting equipment* shall be the maximum rated wattage of the *lighting equipment*, or operating input wattage of the system, labeled on a permanent, preprinted, factory installed label, as specified by *UL 1574*, *UL 1598*, *UL 2108* or *UL 8750*, as applicable~~in accordance with Sections 601.2.1.1 and 601.2.1.2 *[Section 130.0(c)1]*~~, or published be the~~in~~ manufacturer~~'s catalogs~~, based on independent testing lab reports as specified by *UL 1574, 1598, 2108 or 8750,* or *IES LM-79*.

601.2.1.2 Luminaire classification, and power in Group R occupancies.

Luminaires shall be classified, and their wattage shall be determined and labeled according to Sections 601.2.1.2.1 through 601.2.1.2.8.

601.2.1.2.1 *[Section 130.0(c)1A]* **Rated wattage label.**

The maximum rated wattage or relamping rated wattage of a *luminaire* shall be listed on a permanent, preprinted, factory installed label, as specified by *UL 1574, 1598, 2108* or *8750*, as applicable.

601.2.1.2.2 *[Section 130.0(c)1B]* **Permanent label.**

The factory-installed maximum rated wattage or relamping rated wattage label shall not consist of peel-off or peel-down layers or other methods that allow the rated wattage to be changed after the *luminaire* has been shipped from the manufacturer.

Exception to Section 601.2.1.2.2: Peel-down labels may be used only for the following *luminaires*, when they can accommodate a range of *lamp* wattages without changing the *luminaire* housing, ballast, transformer or wiring. Qualifying *luminaires* shall have a single *lamp*, and shall have integrated ballasts or transformers. Peel-down labels must be layered such that the rated wattage reduces as successive layers are removed.

1. High-intensity discharge *luminaires*, having an integral electronic ballast, with a maximum relamping rated wattage of 150 watts.
2. Low-voltage *luminaires* (except *low voltage* track systems), ≤ 24 volts, with a maximum relamping rated wattage of 50 watts.
3. Compact fluorescent *luminaires*, having an integral electronic ballast, with a maximum relamping rated wattage of 42 watts.

601.2.1.2.3 *[Section 130.0(c)2]* **Luminaires with line voltage lamp holders not served by drivers, ballasts or transformers.**

For *luminaires* with line voltage *lamp* holders not served by *drivers*, ballasts, or transformers; the wattage of such *luminaires* shall be determined as the maximum relamping rated wattage as labeled in accordance with Sections 601.2.1.1 and 601.2.1.2 [Section 130.0(c)1].

601.2.1.2.4 *[Section 130.0(c)3]* **Luminaires with permanently installed or remotely installed ballasts.**

For *luminaires* with permanently installed or remotely installed ballasts, the wattage of such *luminaires* shall be the operating input wattage of the rated *lamp*/ballast combination published in the manufacturer based on independent testing lab reports as specified by *UL 1598*.

601.2.1.2.5 *[Section 130.0(c)4]* **Solid State Lighting (SSL).**

For *inseparable SSL luminaires* and *SSL luminaires* with remotely mounted *drivers*, the maximum rated wattage shall be the maximum rated input wattage of the *SSL luminaire* as specified in Sections 601.2.1.1 and 601.2.1.2 [Section 130.0(c)1] when tested in accordance with *UL 1598, 2108* or *8750*, or *IES LM-79*.

601.2.1.~~1~~2.6 *[Section 130.0(c)5]* **LED tape lighting.**

For *LED* tape *lighting* and *LED* linear *lighting* with *LED* tape *lighting* components, the maximum rated wattage shall be the sum of the installed length of the tape *lighting* ~~times~~multiplied by its rated linear power density in watts per linear feet, or the maximum rated input wattage of the *driver* or power supply providing power to the *lighting* system, with tape *lighting* tested in accordance with *UL 2108* or *8750*, or *IES LM-79*.

601.2.1.2.7 *[Section 130.0(c)6]* **Modular lighting systems.**

For modular *lighting* systems that allow the *addition* or relocation of *luminaires* without altering the wiring of the system, shall be determined as follows:

1. The wattage shall be the greater of:
   1.1. 30 watts per linear foot of track or plug-in busway; or
   1.2. The rated wattage of all of the *luminaires* included in the system, where the *luminaire* wattage is determined as specified in ~~Sections 601.2.1.1~~Sections 601.2.1.1 and 601.2.1.2 [Section 130.0(c)1].

2. For line-voltage *lighting* track and plug-in busway served by a *track lighting integral current limiter* or a dedicated *track lighting supplementary overcurrent protection panel*, the wattage shall be determined as follows:

   2.1. The volt-ampere rating of the current limiter as specified by *UL 1077*; or

   2.2. The sum of the ampere (A) rating of all of the current protection devices multiplied by the branch circuit voltages for *track lighting supplementary overcurrent protection panel*.

3. For other modular *lighting* systems with power supplied by a *driver*, power supply or transformer, including but not limited to low-voltage *lighting* systems, the wattage of the system shall be the maximum rated input wattage of the *driver*, power supply or transformer published by the manufacturer, as specified by *UL 2108* or 8750.

Exception to Section 601.2.1.2.7: For power-over-Ethernet *lighting* systems, power provided to installed nonlighting devices may be subtracted from the total power rating of the power-over-Ethernet system.

601.2.1.2.8 *[Section 130.0(c)7]* **All other lighting equipment.**

For all other *lighting equipment* not addressed by Sections 601.2.1.2.3 through 601.2.1.2.7 *[Sections 130.0(c)2 through 6]*, the wattage of the *lighting equipment* shall be the maximum rated wattage of the *lighting equipment*, or operating input wattage of the system, labeled in accordance with Sections 601.2.1.2.1 and 601.2.1.2.2 *[Section 130.0(c)1]*, or published by the~~in~~ manufacturer~~'s catalogs~~, based on independent testing lab reports as specified by *UL 1574, 1598, 2108 or 8750,* or *IES LM-79*.

601.2.2 *[Section 130.0(d) and (e)]* **Indoor lighting controls.**

All *lighting* controls and *equipment* shall comply with the applicable requirements in Section 600.2 *[Section 110.9]* and Section 601.2.2 *[Section 130.1]*, and shall be installed in accordance with any applicable manufacturer instructions.

An *EMCS* may be installed to comply with the requirements of one or more *lighting* controls if it meets the following minimum requirements:

1. Provides all applicable functionality for each specific *lighting* control or system for which it is installed in accordance with Section 600.2 [Section 110.9] and, Section 601.2.2 *[Section 130.1]*; and

2. Complies with all applicable *lighting* control installation requirements in accordance with Section 601.2.5 *[Section 130.4]* for each specific *lighting* control or system for which it is installed; and

3. Complies with all applicable application requirements for each specific *lighting* control or system for which it is installed, in accordance with *Part 6*.

601.2.2.1 *[Section 130.1(a)]* **Manual controls.**

Each space shall be provided with *lighting* controls that allow the *lighting* in that space to be manually turned on and off. The *manual* control shall comply with Sections 601.2.2.1.1 through 601.2.2.1.3 *[Sections 130.1(a)1-130.1(a)3]*.

Exception to Section 601.2.2.1: Up to 0.1 watts per square foot of indoor *lighting* may be continuously illuminated to allow for means of egress *illumination* consistent with California *Building* Code Section 1008. Egress *lighting* complying with this wattage limitation is not required to comply with *manual* control requirements if:

1. The space is designated for means of egress on the plans and specifications submitted to the *enforcement agency* under Section 100.5.1.1.1 *[Section 10-103(a)2 of Part 1]*; and
2. The egress *lighting* controls shall not be controllable by unauthorized personnel during a normal power failure.

601.2.2.1.1 *[Section 130.1(a)1]* **Accessibility.**

Be *readily accessible*; and

Exception to Section 601.2.2.1.1: *Restrooms* having two or more stalls, parking areas, *stairwells*, corridors and spaces of the *building* intended for access or use by the public may use a *manual* control not *accessible* to unauthorized personnel.

601.2.2.1.2 *[Section 130.1(a)2]* **Viewable when operating controls.**

Be located in the same space, or be located such that the controlled *lighting* or the status of the controlled *lighting* can be seen when operating the controls; and

Exception to Section 601.2.2.1.2: In *healthcare facilities*, for *restrooms* and bathing rooms intended for a single occupant, the *lighting* control may be located outside the enclosed area but directly adjacent to the *door*.

601.2.2.1.3 *[Section 130.1(a)3]* **Separate controls.**

Provide separate control of general, floor display, wall display, *window* display, case display, ornamental, and *special effects lighting*, such that each type of *lighting* can be turned on or off without turning on or off other types of *lighting*. Scene controllers may comply with this requirement provided that at least one scene turns on *general lighting* only, and the control provides a means to manually turn off all *lighting*.

601.2.2.1.4 *[New section]* **Manual dimming controls.**

In spaces in *nonresidential buildings*, where the connected *general lighting* exceeds 50 watts, controls shall be capable of continuous *manual* dimming to 10 percent or less of full *lighting* power in addition to full ON and OFF control. Scene controllers may comply with this requirement provided that at least one scene sets the *general lighting* power to a level between 10 and 100 percent of full power.

Exception 1 to Section 601.2.2.1.4: *Lighting* in commercial/industrial shipping and receiving areas, *Copy Rooms*, *Corridor Areas*, *Electrical/Mechanical/Telephone rooms*, *kitchen/food preparation areas*, *Laboratory* areas, *Laundry Areas*, *locker*

Rooms, *Manufacturing, Commercial and Industrial Work Areas*, *Parking Garage Areas*, *Restrooms*, *Stairwells*, and *Transportation Function A~~a~~reas*.

Exception 2 to Section 601.2.2.1.4: HID (high intensity discharge) and induction *lighting* with *manual* controls that have a minimum of one control step between 30 and 70 percent of full rated power in addition to full ON and full OFF.

Exception 3 to Section 601.2.2.1.4: *Healthcare ~~F~~facilities*.

Exception 4 to Section 601.2.2.1.4: Spaces in *Group R occupancies* shall comply with the requirements in Section 601.2.2.2.

601.2.2.2 *[Section 130.1(b)]* **Multilevel lighting controls.**

In *Group R occupancies*, the ~~The~~ *general lighting* of any space with a size of 100 square feet or larger and with a connected *lighting* load greater than 0.5 watts per square foot shall be provided with *multilevel lighting controls*.

The *multilevel lighting controls* shall provide and enable continuous dimming from 100 percent to 10 percent or lower of *lighting* power.

Exception 1 to Section 601.2.2.2: An indoor space that has only one *luminaire*.

Exception 2 to Section 601.2.2.2: *Restrooms*.

Exception 3 to Section 601.2.2.2: *Healthcare facilities*.

Exception 4 to Section 601.2.2.2: The *general lighting* with *light source* of HID and induction shall have a minimum of one control step between 30 and 70 percent of full rated power.

601.2.2.3 *[Section 130.1(c)]* **Shut-OFF lighting controls.**

All installed indoor *lighting* shall be equipped with controls able to automatically reduce *lighting* power when the space is typically unoccupied.

Exception 1 to Section 601.2.2.3: *Healthcare facilities*.

Exception 2 to Section 601.2.2.3: Continuous *illumination* of up to 0.1 watts per square foot in any area designated for egress within a *building* is allowed, provided that the area is designated for means of egress on the plans and specifications submitted to the *enforcement agency* under Section 100.5.1.1.1 *[Section 10-103(a)2 of Part 1]*. The *lighting* providing for means of egress *illumination*, as defined in the California *Building* Code, must be configured to provide no less than the *illumination* required by California *Building* Code Section 1008 while in the partial-off mode.

601.2.2.3.1 *[Section 130.1(c)1]* **General.**

All installed indoor *lighting* shall be equipped with controls that meet the requirements of Sections 601.2.2.3.1.1 through 601.2.2.3.1.3.

Exception 1 to Section 601.2.2.3.1: Where the *lighting* is serving an area that is in continuous use, 24 hours per day/365 days per year.

Exception 2 to Section 601.2.2.3.1: *Lighting* complying with Section 601.2.2.3.5 *[Section 130.1(c)5]* or Section 601.2.2.3.6.5 *[Section 130.1(c)6E]*. *Lighting* in

stairwells and common area corridors that provide access to guestrooms of *hotel/motels* and complying with Section 601.2.2.3.6.3 *[Section 130.1(c)6C]*.

Exception 3 to Section 601.2.2.3.1: Electrical *equipment* rooms subject to Article 110.26(D) of the California Electrical Code.

Exception 4 to Section 601.2.2.3.1: *Illumination* provided by *lighting equipment* that is designated for emergency *lighting*, and is intended to function in emergency mode only when normal power is absent.

601.2.2.3.1.1- *Occupant Sensing Control*. Shall be controlled with an *occupant sensing control* set to no more than a 15~~20~~-minute time delay, *automatic* time-switch control, or other control capable of automatically shutting OFF all of the *lighting* when the space is typically unoccupied; and

Exception to Section 601.2.2.3.1.1: *Occupant Sensing controls* in *Group R occupancies* shall be set to no more than a 20-minute time delay, *automatic* time-switch control, or other control capable of automatically shutting OFF all of the *lighting* when the space is typically unoccupied.

601.2.2.3.1.2- Separate Controls by Floors. Separate controls for the *lighting* on each floor, other than *lighting* in *stairwells*; and

601.2.2.3.1.3 Separate Control Zones. Separate control zones for a space enclosed by ceiling height partitions not exceeding 5,000 square feet.

Exception to Section 601.2.2.3.1.3: The area controlled may not exceed 20,000 square feet in the following function areas: *malls*, auditoriums, single tenant retail, industrial, convention centers and arenas.

601.2.2.3.2 *[Section 130.1(c)2]* **Countdown timer switch.**

Countdown timer switches may be used to comply with the *automatic* shut-OFF control requirements in Section 601.2.2.3.1 *[Section 130.1(c)1]* only in *closets* less than 70 square feet, and *server aisles* in *server rooms*. The maximum timer setting shall be 10 minutes for *closets*, and 30 minutes for *server aisles*.

601.2.2.3.3 *[Section 130.1(c)3]* **Automatic time-switch.**

If an *automatic* time-switch control is installed to comply with Section 601.2.2.3.1 *[Section 130.1(c)1]*, it shall incorporate a *manual* override *lighting* control that allows the *lighting* to remain ON for no more than 2 hours when an override is initiated.

Exception 1 to Section 601.2.2.3.3: In the following function areas, the override time may exceed 2 hours: *Malls*, auditoriums, single tenant retail, industrial, *laboratories* and arenas where *captive-key override* is utilized.

Exception 2 to Section 601.2.2.3.3: Areas where *occupant sensing controls* are installed.

601.2.2.3.4 *[Section 130.1(c)4]* **Automatic holiday "shut-OFF".**

If an *automatic* time-switch control is installed to comply with Section 601.2.2.3.1 *[Section 130.1(c)1]*, it shall incorporate an *automatic* holiday "shut-OFF" feature that

turns OFF all loads for at least 24 hours, and then resumes the normally scheduled operation.

Exception 1 to Section 601.2.2.3.4: *Automatic* holiday shut-OFF features are not required in retail stores, *malls*, restaurants, grocery stores, churches, and theaters.

Exception 2 to Section 601.2.2.3.4: Areas where *occupant sensing controls* are installed.

601.2.2.3.5 *[Section 130.1(c)5]* **Full OFF o~~O~~ccupant sensing controls.**

601.2.2.3.5.1- *Automatic* shut off. In offices 250 square feet or smaller, *multipurpose rooms* of less than 1,000 square feet, *classrooms*, conference rooms, and *restrooms*, *lighting* shall be controlled with *occupant sensing controls* to automatically shut OFF all of the *lighting* in ~~20~~ 15 minutes or less after the control zone is unoccupied.

Exception to Section 601.2.2.3.5.1: In *Group R occupancies occupant sensing controls* shall be permitted to automatically shut OFF all of the *lighting* in 20 minutes or less after the control zone is unoccupied.

601.2.2.3.5.2- -Occupancy sensing operation.

~~In areas required by Section 601.2.2.2 *[Section 130.1(b)]* to have multi-level lighting controls, t~~The *occupant sensing controls* shall function either as a:

1. Partial-ON *occupant sensing controls* ~~capable of~~ configured to automatically ~~activating~~ activate between 50 and 70 percent of controlled *lighting* power, or
2. *Vacancy sensing controls*, where all *lighting* responds to a *manual* ON input only.

Lighting shall be permitted to use *automatic* full on *occupant sensing controls* in any spaces where a *manual dimmer* is not required by Section 601.2.2.1.4 and *multilevel lighting controls* are not required by Section 601.2.2.2 (Section 130.1(b)).

601.2.2.3.5.3- *Manual* shut off. ~~In areas not required by Section 601.2.2.2 *[Section 130.1(b)]* to have multilevel lighting controls, the occupant sensing controls shall function either as:~~

~~Automatic full-on occupant sensing controls; or~~

~~Partial-ON occupant sensing controls, or~~

~~Vacancy sensing controls, where all lighting responds to a manual ON input only.~~

~~In addition,~~ cControls shall be provided that allow the lights to be manually shut OFF in accordance with Section 601.2.2.1 *[Section 130.1(a)]* regardless of the sensor status.

601.2.2.3.6 *[Section 130.1(c)6]* **Full or partial-OFF occupant sensing controls.**

For *warehouse aisle ways*, *warehouse* open areas, library book stack aisles, corridors, *stairwells*, offices greater than 250 square feet, parking *garages*, parking areas, loading areas, ~~and~~ unloading areas, *laboratories*, lounges, *breakrooms*, *waiting areas*, and *ITEF*, the installed *lighting* shall meet the following requirements:

601.2.2.3.6.1- *Warehouse aisle ways* and *warehouse* open areas. In *warehouse aisle ways* and *warehouse* open areas, *lighting* shall be controlled with *occupant sensing controls* that automatically reduce *lighting* power by at least 50 percent when the areas are unoccupied. The *occupant sensing controls* shall independently control *lighting* in each *warehouse aisle way*, and shall not control *lighting* beyond the *aisle way* being controlled by the sensor.

Exception to Section 601.2.2.3.6.1: When metal halide *lighting* or high pressure sodium *lighting* is installed in *warehouses*, *occupant sensing controls* shall reduce *lighting* power by at least 40 percent.

601.2.2.3.6.2- Library book stack aisles. In library book stack aisles 10 feet or longer that are *accessible* from only one end, and library book stack aisles 20 feet or longer that are *accessible* from both ends, *lighting* shall be controlled with *occupant sensing controls* that automatically reduce *lighting* power by at least 50 percent when the areas are unoccupied. The *occupant sensing controls* shall independently control *lighting* in each *aisle way*, and shall not control *lighting* beyond the *aisle way* being controlled by the sensor.

601.2.2.3.6.3- Corridors and *stairwells*. In corridors and *stairwells*, *lighting* shall be controlled by *occupant sensing controls* that separately reduce the *lighting* power in each space by at least 50 percent when the space is unoccupied. The *occupant sensing controls* shall be capable of automatically turning the *lighting* fully ON only in the separately controlled space, and shall be automatically activated from all designed paths of egress. *Lighting* in *stairwells* and common area corridors that provide access to guestrooms of *hotel/motels* shall meet requirements of this section instead of complying with Section 601.2.2.3.1 *[Section 130.1(c)1]*.

601.2.2.3.6.4- Office spaces greater than 250 square feet. In office spaces greater than 250 square feet, *general lighting* shall be controlled with *occupant sensing controls* that meet all of the following:

1. The *occupant sensing controls* shall be configured so that *lighting* shall be controlled separately in control zones not greater than 600 square feet. All control zones in offices greater than 250 square feet shall be shown on the plans; and
2. In ~~20~~ 15 minutes or less after the control zone is unoccupied, the *occupant sensing controls* shall uniformly reduce *lighting* power in the control zone to no more than 20 percent of full power. Control functions that switch control zone *lights* completely off when the zone is vacant meet this requirement; and

3. In ~~20~~ 15 minutes or less after the entire office space is unoccupied, the *occupant sensing controls* shall automatically turn off *lighting* in all control zones in the space; and

4. In each control zone, *lighting* shall be allowed to automatically turn on to any level up to full power upon *occupancy* within the control zone. When *occupancy* is detected in any control zone in the space, the *lighting* in other control zones that are unoccupied shall operate at no more than 20 percent of full power.

Exception 1 to Section 601.2.2.3.6.4: Under-shelf or furniture-mounted *task lighting* controlled by a local switch and either a time switch or an *occupancy* sensor.

Exception 2 to Section 601.2.2.3.6.4: *Occupant Sensing controls* in *Group R occupancies* shall be set to no more than a 20-minute time delay.

601.2.2.3.6.5- Parking garages, parking areas and loading and unloading areas. In parking *garages*, parking areas and loading and unloading areas, *general lighting* shall be controlled by *occupant sensing controls* that meet the requirements below instead of complying with Section 601.2.2.3.1 *[Section 130.1(c)1]*:

1. The *occupant sensing controls* shall uniformly reduce *lighting* power in the control zone to between 20 percent and 50 percent of full power and with at least one control step; and

2. No more than 500 watts of rated *lighting* power shall be controlled together as a single zone; and

3. The *occupant sensing controls* shall be capable of automatically turning the *lighting* fully ON only in the separately controlled zone, and shall be automatically activated from all designed paths of egress.

Interior areas of parking *garages* are under the classification of indoor *lighting* and shall comply with Section 601.2.2.3.6.5 *[Section 130.1(c)6E]*.

Parking areas on the *roof* of a parking structure are under the classification of outdoor *hardscape* and shall comply with Section 601.2.3 *[Section 130.2]*.

~~**EXCEPTION**~~**Exception to Section 601.2.2.3.6.5:** *Luminaires* located in a parking garage *daylight adaptation zone* and dedicated to providing *illuminance* for daylight adaptation.

601.2.2.3.6.6 *[New section]* **– *Laboratory* spaces.** In *laboratory* spaces, *lighting* shall be controlled with *occupant sensing controls* that automatically reduce *lighting* power to between 20 percent and 50 percent of full power when the space is unoccupied for no more than 15 minutes during normally occupied hours and shall turn off *lighting* when the space is unoccupied for an additional 15 minutes during normally unoccupied hours. Where the *lighting* system occupant sensors are providing the occupancy status of the *laboratory* space for airflow

reduction control in accordance with Section 912.2.1 *[Section 140.9(c)1]*, the *occupancy* signal shall be independent of daylighting or *manual lighting* overrides of *lighting*.

Exception to 601.2.2.3.6.6: *Laboratory* spaces where occupancy sensing control of *lighting* conflicts with *laboratory*'s environmental health and safety department requirements.

601.2.2.3.6.7 *[New section]* **– Lounges, *breakrooms*, and *waiting areas*.** In lounges, *breakrooms*, and *waiting areas*, *lighting* shall be controlled by *occupant sensing controls* that automatically turn *lighting* OFF when the space is unoccupied for no more than 15 minutes. The *occupant sensing controls* shall be capable of automatically turning the *lighting* fully ON upon detection of occupancy.

Exception to 601.2.2.3.6.7: *Group R occupancies*.

601.2.2.3.6.8 *[New section]* **– *ITEF*.** In *ITEF*, *general lighting* shall be controlled by *occupant sensing controls* that automatically turn *lighting* OFF when the space is unoccupied for no more than 15 minutes. The *occupant sensing controls* shall be capable of automatically turning the *lighting* fully ON upon detection of occupancy. In *server aisles*, the *occupant sensing controls* shall independently control *lighting* in each *aisle way*.

Exception to 601.2.2.3.6.8: *Group R occupancies*.

601.2.2.3.7 *[Section 130.1(c)8]* **Hotel/motel guest room controls.**

Hotel/motel guest rooms shall be controlled with one of the following controls such that, no longer than 20 minutes after the guest room has been vacated, *lighting* power is switched off:

1. Captive card key controls; or
2. *Occupant sensing controls*; or
3. Other *automatic* controls.

Exception to Section 601.2.2.3.7: A high-efficacy *luminaire* that meets the requirements in Section 602.2.1.1 *[Section 150.0(k)1A]* and that is switched separately with the switch located within 6 feet of the entry *door*.

601.2.2.4 *[Section 130.1(d)]* **Daylight Responsive Controls.**

Daylight responsive controls shall be installed in the locations listed in this section as applicable and shall comply with Sections 601.2.2.4.1 through 601.2.2.4.6.

Exception 1 to Section 601.2.2.4: Areas under *skylights* where it is documented that existing adjacent structures or natural objects block direct sunlight for more than 1,500 daytime hours per year between 8 a.m. and 4 p.m.

Exception 2 to Section 601.2.2.4: Areas adjacent to vertical *glazing* below an *overhang*, where the *overhang* covers the entire width of the vertical *glazing*, no vertical *glazing* is above the *overhang*, and the ratio of the *overhang* projection to the *overhang* rise is

greater than 1.5 for south, east and west orientations or greater than 1 for north orientations.

Exception 3 to Section 601.2.2.4: Where *daylight responsive controls* are not required for the *primary sidelit daylit zones*, and where the total wattage of *general lighting luminaires* in the *secondary sidelit daylit zones* is less than 85 watts, *daylight responsive controls* are not required for the secondary sidelit zone.

Exception 4 to Section 601.2.2.4: Rooms that have a total *glazing* area of less than 24 square feet, or *parking garage areas* with a combined total of less than 36 square feet of *glazing* or opening.

Exception 5 to Section 601.2.2.4: For parking *garages*, *luminaires* located in the *daylight adaptation zone*.

Exception 6 to Section 601.2.2.4: *Luminaires* in sidelit *daylit zones* in *retail merchandise sales* and wholesale showroom areas.

1. In any *enclosed space* where the total installed wattage of *general lighting luminaires* completely or partially within *skylit daylit zones* is 75 watts or greater, the *general lighting* in the *skylit daylit zones* shall be controlled by *daylight responsive controls*.
2. In any *enclosed space* where the total installed wattage of *general lighting luminaires* completely or partially within *primary sidelit daylit zones* is 75 watts or greater, the *general lighting* in the *primary sidelit daylit zones* shall be controlled by *daylight responsive controls*.
3. In any *enclosed space* where the total wattage of *general lighting luminaires* in the secondary zones is 75 watts or greater, the *general lighting* in the *secondary sidelit daylit zones* shall be controlled by *daylight responsive controls*. *General lighting* in the *secondary sidelit daylit zones* shall be controlled independently of *general lighting* in the *primary sidelit daylit zones*.
4. For *skylights* located in an *atrium*, the *skylit daylit zone* definition shall apply to the floor area directly under the *atrium* and the top floor area directly adjacent to the *atrium*.
5. *Parking garage areas* where the total installed wattage of the *general lighting* in the primary and the *secondary sidelit daylit zones* is 60 watts or greater, the *general lighting* in the primary and *secondary sidelit daylit zones* shall be controlled by *daylight responsive controls*.

601.2.2.4.1 *[Section 130.1(d)2A]* **Daylit zones shown on plans.**

All *skylit daylit zones*, *primary sidelit daylit zones*, *secondary sidelit daylit zones*, and the combined primary and *secondary sidelit daylit zones* in parking *garages* shall be shown on the plans; and

NOTE: Parking areas on the *roof* of a parking structure are outdoor *hardscape*, not skylit daylit areas.

601.2.2.4.2 *[Section 130.1(d)2B]* **Separate general lighting control.**

The *daylight responsive controls* shall provide separate control for *general lighting* in each type of *daylit zone*. The *daylight responsive controls* shall meet the following:

601.2.2.4.2.1- *General lighting* in overlapping *skylit daylit zone* and *sidelit daylit zone* shall be controlled as part of the *skylit daylit zone*.

601.2.2.4.2.2- *General lighting* in overlapping *primary and secondary sidelit daylit zones* shall be controlled as part of the *primary sidelit daylit zone*.

601.2.2.4.2.3- *General lighting luminaires* longer than 8 feet shall be controlled as segments of 8 feet or less according to the type of the *daylit zone* in which the segment is primarily located; and

Exception to Section 601.2.2.4.2.3: Where a *luminaire* contains a factory assembled housing and *light source* as an integral unit in segments longer than 8 feet, the *luminaire* segment is allowed to be controlled according to the type of the *daylit zone* in which the segment is primarily located.

601.2.2.4.3 *[Section 130.1(d)2C]* **Daylight responsive control requirements.**

The *daylight responsive controls* shall meet the following:

~~1. For spaces where the installation of *multilevel lighting controls* is required under Section 601.2.2.2 *[Section 130.1(b)]*, allow the *multilevel lighting controls* to adjust the *light* level with continuous dimming;~~

2. For each space, ensure that the combined *illuminance* from the controlled *lighting* and daylight is not less than the *illuminance* from controlled *lighting* alone when no daylight is available; and

3. For areas other than parking *garages*, ensure that, when the daylight *illuminance* is greater than 150 percent of the *illuminance* provided by the controlled *lighting* when no daylight is available, the controlled *lighting* power in that daylight zone shall be reduced by a minimum of 90 percent; and

4. ~~For parking *garages*, ensure that when daylight *illuminance* levels measured at the farthest edge of the *secondary sidelit zone* away from the *glazing* or opening are greater than 150 percent of the *illuminance* provided by the controlled *lighting* when no daylight is available, the controlled *lighting* power in the combined *primary and secondary sidelit daylit zones* shall be reduced by 100 percent; and~~ Reduce controlled *lighting* power in the combined primary and *secondary sidelit daylit zones* by 100 percent when no daylight is available and daylight *illuminance* measured at the farthest edge of the secondary sidelit zone from the *glazing* or opening are greater than 150 percent of the *illuminance* provided by the controlled *lighting*; and

~~5.~~

6. Skylit and sidelit *daylit zones* in *Audience Seating Areas*, *Copy Rooms*, *Electrical/ Mechanical/Telephone rooms*, *Laundry Areas*, *Parking Zones and Ramps* in *Parking Garage Areas*, and *Theater Areas* in *nonresidential buildings* shall

implement *Daylight Continuous dimming Controls* or *Daylight Stepped Switching Controls*;

7. Sidelit *daylit zones* in *Corridor Areas*, *Locker Rooms*, *Dining Areas*, *Warehouse* storage areas, and *Transportation Function Aa~~r~~eas* shall implement *Daylight Continuous dimming Controls* or *Daylight Stepped Switching Controls*;
8. All *daylit zones* in all other spaces in nonresidential *use designations* where the installation of *manual dimming controls* is required under Section 601.2.2.1.4 [New section] shall implement *Daylight Continuous dimming Controls*; and
9. For *Group R occupancies* where the installation of *multilevel lighting controls* is required under Section 601.2.2.2 [Section 130.1(b)], allow the *multilevel lighting controls* to adjust the *light* level with continuous dimming.

601.2.2.4.4 *[Section 130.1(d)2D]* **Photosensors.**

Photosensors shall be located so that they are not *readily accessible* to unauthorized personnel~~; and~~.

601.2.2.4.5 *[Section 130.1(d)2E]* **Calibration adjustments.**

The location where calibration adjustments are made to the *daylight responsive controls* shall be *readily accessible* to authorized personnel but may be inside a locked case or under a cover which requires a tool for access~~; and~~.

601.2.2.4.6 *[Section 130.1(d)2F]* **Multilevel lighting and manual dimming control interaction.**

In *Group R occupancies*, *daylight responsive controls* ~~The *automatic* daylighting control~~ shall permit the *multilevel lighting control* to adjust the level of *lighting*.

In *use designations* where *manual dimming controls* are required, the *manual dimming controls* shall be capable of turning off or decreasing *light* levels below the *light* level set by the *daylight responsive controls*. When *manual dimming controls* are capable of temporarily increasing electric *lighting* above the *light* level set by the *daylight responsive controls*, the controls shall be configured to reset electric *lighting* controls back to the Section 601.2.2.4.3 [Section 130.1(d)2C] defaults after electric *lighting* has been turned off or reduced by a *manual dimming control*, *occupant sensing control*, or timeclock.

601.2.2.5 *[Section 130.1(f)]* **Occupancy sensing controls interactions with space-conditioning systems.**

For *space-conditioning system* zones serving only spaces that are required to have *occupant sensing controls* as specified in Sections 601.2.2.3.5 *[Section 130.1(c)5]* and Section 601.2.2.3.6 *[Section 130.1(c)6]*, and where Table 401.2-~~A~~(2~~1~~) *[Table 120.1-A]* allows the ventilation air to be reduced to zero when the space is in occupied-standby

mode, the *space-conditioning system* shall be permitted to be controlled by occupancy sensing controls as specified in Section 401.2.2.5.3 *[Section 120.2(e)3]*.

601.2.2.6 *[Section 130.1(e)]* **Demand responsive controls.**

See Section 600.4 *[Section 110.12]* for requirements for demand responsive *lighting* controls.

601.2.2.7 *[New Section]* **Parking Garage Daylight Adaptation Zone Lighting Controls.**

Parking garage *daylight adaptation zone lighting* shall be separately controlled to automatically turn off additional transition zone *lighting* power that is allowed per Table 601.3-(3) from sunset to sunrise and automatically turn on the additional transition zone *lighting* power from sunrise to sunset.

Exception to Section 601.2.2.7: *Group R occupancies*.

601.2.3 *[Section 130.2]* **Outdoor lighting controls and equipment.**

Nonresidential and *hotel/motel* *use designations*~~*buildings*~~ shall comply with the applicable requirements of this section.

601.2.3.1 *[Section 130.2(b)]* **Luminaire shielding requirements.**

All outdoor *luminaires* of 6,200 initial *luminaire* lumens or greater shall comply with backlight, uplight and glare (BUG) (in accordance with *ANSI*/*IES TM-15-20*, Annex A) requirements in accordance with Title 24, Part 11, Section 5.106.8.

Exception 1 to Section 601.2.3.1: *Signs*.

Exception 2 to Section 601.2.3.1: *Lighting* for *building* facades, *public monuments*, public art, statues and vertical surfaces of bridges.

Exception 3 to Section 601.2.3.1: *Lighting* not permitted by a health or life safety statute, ordinance or regulation to be a cutoff *luminaire*.

Exception 4 to Section 601.2.3.1: Temporary *outdoor lighting***.**

Exception 5 to Section 601.2.3.1: Replacement of existing pole mounted *luminaires* in *hardscape* areas meeting all of the following conditions:

1. Where the existing *luminaire* does not meet the *luminaire* BUG requirements in Section 601.2.3.1 *[Section 130.2(b)]*; and
2. Spacing between existing poles is greater than six times the mounting height of the existing *luminaires*; and
3. Where no additional poles are being added to the site; and
4. Where new wiring to the *luminaires* is not being installed; and
5. Provided that the connected *lighting* power wattage is not increased.

Exception 6 to Section 601.2.3.1: *Luminaires* that illuminate the public right of way including publicly-maintained or utility-maintained roadways, sidewalks and bikeways.

Exception 7 to Section 601.2.3.1: *Outdoor lighting* attached to a *hotel/motel building* and separately controlled from the inside of a guest room.

Exception 8 to Section 601.2.3.1: *Luminaires* that qualify as exceptions in Sections 5.106.8 of Part 11 of Title 24 and in Section 601.3.2.1 *[Section 140.7(a)]*.

601.2.3.2 *[Section 130.2(c)]* **Controls for outdoor lighting.**

Outdoor lighting shall be independently controlled from other electrical loads, and the controls for *outdoor lighting* shall meet the following functional requirements:

Exception 1 to Section 601.2.3.2: *Outdoor lighting* not permitted by a health or life safety statute, ordinance or regulation to be turned OFF or reduced.

Exception 2 to Section 601.2.3.2: *Lighting* in tunnels required to be illuminated 24 hours per day and 365 days per year.

601.2.3.2.1 *[Section 130.2(c)1]* **Daylight availability.**

All installed *outdoor lighting* shall be controlled by a *photo control*, *astronomical time-switch control*, or other control capable of automatically shutting OFF the *outdoor lighting* when daylight is available.

601.2.3.2.2 *[Section 130.2(c)2]* **Automatic scheduling controls.**

1. *Automatic scheduling controls* shall be installed for all *outdoor lighting*. *Automatic scheduling controls* may be installed in combination with *motion sensing controls* or other *outdoor lighting* controls.
2. *Automatic scheduling controls* shall be capable of reducing the *outdoor lighting* power by 50 to 90 percent, and separately capable of turning the *lighting* OFF, during scheduled unoccupied periods.
3. *Automatic scheduling controls* shall allow scheduling of a minimum of two nighttime periods with independent *lighting* levels, and may include an override function that turns *lighting* ON during its scheduled dim or OFF state for no more than two hours when an override is initiated.

~~4.~~

~~4.1.~~ *Automatic scheduling controls* are not required for *Nonresidential Buildings* excluding *Group R occupancies* where *motion sensing controls* are installed that:

5.

5.1. Are not subject to Section 601.2.3.2.3(1); and

5.2. Installed in accordance with Sections 601.2.3.2.3(2) through 601.2.3.2.3(4); and

5.3. Have demonstrated compliance with NA7.8.1 *Motion Sensing Controls* Acceptance Tests.

Exception 1 to Section 601.2.3.2.2: For *Nonresidential Buildings* excluding *Group R occupancies*, *lighting* illuminating DC Fast Charging *EVSE* (*DCFC EVSE*) controlled by

motion sensing controls in accordance with Sections 601.2.3.2.3(2), 601.2.3.2.3(4) and exception to Section 601.2.3.2.3(3) and have demonstrated compliance with NA7.8.1 - *Motion Sensing Controls* Acceptance Tests.

601.2.3.2.3 *[Section 130.2(c)3]* **Motion sensing controls.**

1. *Motion sensing controls* shall be installed for outdoor *luminaires* providing *lighting* for general *hardscape*, *parking lots*, *outdoor sales lots*, *vehicle service station hardscape*, service station *canopies*, sales *canopies*, and non-sales *canopies*, where the bottom of the *luminaire* is mounted 24 feet above grade or lower.
2. *Motion sensing controls* shall be capable of reducing the *outdoor lighting* power of each controlled *luminaire* by 50 to 90 percent, and separately capable of turning the *luminaire* OFF, during unoccupied periods.
3. *Motion sensing controls* shall ~~be capable of reducing~~ reduce the *lighting* to its dim or OFF state no longer than 15 minutes after the area has been vacated, and ~~of returning~~ return the *lighting* to its ON state when the area becomes occupied.

Exception to Section 601.2.3.2.3(3): *Motion sensing controls* for *lighting* illuminating *DC Fast Charging EVSE (DCFC EVSE)* excluding *Group R occupancies* shall be permitted to reduce the *lighting* to its dim or OFF state no longer than 30 minutes after the area has been vacated.

4. No more than 1,500 watts of *lighting* power shall be controlled by a single sensor or as a single zone.

Exception 1 to Section 601.2.3.2.3: *Luminaires* with a maximum rated wattage of 40 watts each are not required to have *motion sensing controls*.

Exception 2 to Section 601.2.3.2.3: Applications listed as Exceptions to Section 601.3.2.1 *[Section 140.7(a)]* and *luminaires* providing *lighting* for *building façade*, ornamental *hardscape* or outdoor *dining* are not required to have *motion sensing controls*.

Exception 3 to Section 601.2.3.2.3: *Lighting* subject to a health or life safety statute, ordinance, or regulation may have a minimum time-out period longer than 15 minutes or a minimum dimming level above 50 percent when necessary to comply with the applicable law.

601.2.4 *[Section 130.3]* **Sign lighting controls.**

Nonresidential use designations~~buildings~~ ~~other than~~not including *healthcare facilities* and *hotel/motel use designations~~buildings~~* shall comply with the applicable requirements of this section.

All *sign lighting* shall meet the requirements below as applicable:

601.2.4.1 *[Section 130.3(a)1]* **Indoor signs**.

All indoor *sign lighting* other than exit *sign lighting* shall be controlled with an *automatic* time-switch control or *astronomical time-switch control*.

601.2.4.2 *[Section 130.3(a)2]* **Outdoor signs**.

Outdoor *sign lighting* shall meet the following requirements as applicable:

601.2.4.2.1 *[Section 130.3(a)2A]* **Photocontrol and time-switch control.**

All outdoor *sign lighting* shall be controlled with a photocontrol in addition to an *automatic* time-switch control, or an *astronomical time-switch control*.

Exception to Section 601.2.4.2.1: Outdoor *signs* in tunnels, and *signs* in large permanently covered *outdoor areas* that are intended to be continuously lit, 24 hours per day and 365 days per year.

601.2.4.2.2 *[Section 130.3(a)2B]* **Dimmer control.**

All outdoor *sign lighting* that is ON both day and night shall be controlled with a *dimmer* that provides the ability to automatically reduce *sign lighting* power by a minimum of 65 percent during nighttime hours. *Signs* that are illuminated at night and for more than 1 hour during daylight hours shall be considered ON both day and night.

Exception to Section 601.2.4.2.2: Outdoor *signs* in tunnels and large covered areas that are intended to be illuminated both day and night.

601.2.4.3 *[Section 130.3(a)3]* **Demand responsive Electronic Message Center (EMC) control.**

See Section 600.4 *[Section 110.12]* for requirements for demand responsive *EMC* controls.

601.2.5 *[Section 130.4]* **Lighting control and demand responsive controlled receptacle acceptance and installation requirements.**

Nonresidential *use designations* ~~*buildings* other than~~ not including *healthcare facilities* and *hotel/motel* *use designations* ~~*buildings*~~ shall comply with the applicable requirements of this section. *Healthcare facilities* shall comply with the applicable acceptance and installation documentation requirements of ~~*OSHPD*~~HCAI.

601.2.5.1 *[Section 130.4(a)]* **Lighting control and demand responsive controlled receptacle acceptance requirements**.

Before an *occupancy* permit is granted, indoor and *outdoor lighting* and receptacle controls serving the *building*, area or site and installed to comply with Section 600.4 *[Section 110.12]*, Section 601.2.2 *[Section 130.1]*, Section 601.2.3 *[Section 130.2]*, Section 600.4.4, Section 601.3.1 *[140.6]*, or time-switch *lighting* controls complying with Section 908.1.5 *[120.6(h)5B]*, shall be certified as meeting the *Acceptance Requirements for Code Compliance* as specified by the Reference Nonresidential Appendix NA7.6 and NA7.8.

A Certificate of Acceptance shall be submitted to the *enforcement agency* under Section 100.5.1 *[Section 10-103(a) of Part 1]*, that the *equipment* and systems meet the acceptance requirements:

1. *Daylight responsive controls* shall be tested in accordance with Reference Nonresidential Appendix NA7.6.1;

2. *Lighting shut-OFF controls* shall be tested in accordance with Reference Nonresidential Appendix NA7.6.2;
3. Demand responsive *lighting* controls shall be tested in accordance with Reference Nonresidential Appendix NA7.6.3; and
4. *Outdoor lighting* controls shall be tested in accordance with Reference Nonresidential Appendix NA7.8; and
5. *Lighting* systems receiving the *Institutional Tuning* Power Adjustment Factor shall be tested in accordance with Reference Nonresidential Appendix NA7.6.4.
6. *Demand responsive controls* required to control controlled receptacles shall be tested in accordance with Reference Nonresidential Appendix NA7.6.5.

601.2.5.2 *[Section 130.4(b)]* **Lighting control installation certificate requirements.**

To be recognized for compliance with *Part 6* an installation certificate shall be submitted in accordance with Section 100.5.1 *[Section 10-103(a)]* for any *lighting control system*, *energy management control system*, interlocked *lighting* system, *lighting* power adjustment factor, or additional wattage available for a videoconference studio, in accordance with the following requirements, as applicable:

1. Certification that when a *lighting control system* is installed to comply with *lighting* control requirements in *Part 6* it complies with the applicable requirements of Section 600.2 *[Section 110.9]*; and complies with Reference Nonresidential Appendix NA7.7.1.
2. Certification that when an *energy management control system* is installed to function as a *lighting* control required by *Part 6* it functionally meets all applicable requirements for each application for which it is installed, in accordance with Section 600.2 *[Section 110.9]*, Section 601, and Section 602 *[Section 130.0 through 130.5, 140.6 through 150.0, and 150.2]*; and complies with Reference Nonresidential Appendix NA7.7.2.
3. Certification that interlocked *lighting* systems used to serve an approved area comply with Section 601.3.1.1.1 *[Section 140.6(a)1]*; and comply with Reference Nonresidential Appendix NA7.7.4.
4. Certification that *lighting* controls installed to earn a *lighting* power adjustment factor (PAF) comply with Section 601.3.1.1.2 *[Section 140.6(a)2]*; and comply with Reference Nonresidential Appendix NA7.7.5.
5. Certification that additional *lighting* wattage installed for a videoconference studio complies with Section 601.3.1.3.3 *[Section 140.6(c)2Gvii]*; and complies with Reference Nonresidential Appendix NA7.7.6.

601.2.5.3 *[Section 130.4(c)]* **Certified Lighting Controls Acceptance Test Technician (CLCATT).**

When certification is required by Section 103.1 *[Title 24, Part 1, Section 10-103.1]*, the acceptance testing specified by Section 601.2.5 *[Section 130.4]* shall be performed by a Certified *Lighting* Controls Acceptance Test Technician (CLCATT). If the CLCATT is

operating as an employee, the CLCATT shall be employed by a Certified *Lighting* Controls Acceptance Test Employer. The CLCATT shall disclose on the Certificate of Acceptance a valid CLCATT certification identification number issued by an approved acceptance test technician certification provider. The CLCATT shall complete all certificate of acceptance documentation in accordance with the applicable requirements in Section 100.5.1.3 *[Section 10-103(a)4]*.

601.2.6 *[Section 130.5]* **Electrical power distribution systems.**

Nonresidential and *hotel/motel* *use designations*~~*buildings*~~ shall comply with the applicable requirements of Section 601.2.6.1 through 601.2.6.5 *[Sections 130.5(a) through 130.5(e)]*.

NOTE: Definitions of terms and phrases in Section 601.2.6 *[Section 130.5]* are determined as specified in Section 200 *[Section 100.1(b)]*. Terms and phrases not found in Section 200 *[Section 100.1(b)]* shall be defined as specified in Title 24, Part 3, Article 100 of the California Electrical Code.

601.2.6.1 *[Section 130.5(a)]* **Service electrical metering**.

Each electrical *service* or feeder shall have a permanently installed metering system which measures electrical energy use in accordance with Table 601.2-~~A~~(1) *[Table 130.5-A]*.

Exception 1 to Section 601.2.6.1: *Service* or feeder for which the utility company provides a metering system that indicates instantaneous kW demand and kWh for a utility-defined period.

Exception 2 to Section 601.2.6.1: *Electrical power distribution systems* subject to California Electrical Code Article 517.

TABLE 601.2-~~A~~(1) [TABLE 130.5-A] MINIMUM REQUIREMENTS FOR METERING OF ELECTRICAL LOAD

METERING FUNCTIONALITY	ELECTRICAL *SERVICES* RATED 50 KVA OR LESS	ELECTRICAL *SERVICES* RATED MORE THAN 50KVA AND LESS THAN OR EQUAL TO 250 KVA	ELECTRICAL *SERVICES* RATED MORE THAN 250 KVA AND LESS THAN OR EQUAL TO 1000KVA	ELECTRICAL *SERVICES* RATED MORE THAN 1000KVA
Instantaneous (at the time) kW demand	Required	Required	Required	Required
Historical peak demand (kW)	Not required	Not required	Required	Required
Tracking kWh for a user-definable period.	Required	Required	Required	Required
kWh per rate period	Not required	Not required	Not required	Required

601.2.6.2 *[Section 130.5(b)]* **Separation of electrical circuits** ~~**for electrical energy monitoring**~~**.**

Electrical power distribution systems shall be designed so that electrical circuits are separated by electrical ~~measurement devices can monitor the electrical energy usage of~~ load types according to Table 601.2-~~B~~(2) *[Table 130.5-B]*.

Exception 1 to Section 601.2.6.2: For each separate load type, up to 10 percent of the connected load may be of any type.

Exception 2 to Section 601.2.6.2: *Electrical power distribution systems* subject to California Electrical Code Article 517.

TABLE 601.2-~~B~~(2) [TABLE 130.5-B] MINIMUM REQUIREMENTS FOR SEPARATION OF ELECTRICAL LOAD

ELECTRICAL LOAD TYPE	ELECTRICAL *SERVICES* RATED 50 KVA OR LESS	ELECTRICAL *SERVICES* RATED MORE THAN 50 KVA AND LESS THAN OR EQUAL TO 250 KVA	ELECTRICAL *SERVICES* RATED MORE THAN 250 KVA AND LESS THAN OR EQUAL TO 1000 KVA	ELECTRICAL *SERVICES* RATED MORE THAN 1000 KVA
Lighting including exit and egress *lighting* and exterior *lighting*	Not required	All *lighting* in aggregate	All *lighting* disaggregated by floor, type or area	All *lighting* disaggregated by floor, type or area
HVAC systems and components including chillers, fans, heaters, furnaces, package units, cooling towers and circulation pumps associated with HVAC	Not required	All HVAC in aggregate	All HVAC in aggregate and each HVAC load rated at least 50 kVA	All HVAC in aggregate and each HVAC load rated at least 50 kVA
Domestic and service water system pumps and related systems and components	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Plug load including appliances rated less than 25 kVA	Not required	All *plug load* in aggregate Groups of *plug loads* exceeding 25 kVA connected load in an area less than 5000 sf	All *plug load* separated by floor, type or area Groups of *plug loads* exceeding 25 kVA connected load in an area less than 5000 sf	All *plug load* separated by floor, type or area All groups of *plug loads* exceeding 25 kVA connected load in an area less than 5000 sf
Elevators, escalators, moving walks and transit systems	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Other individual non-HVAC loads or appliances rated 25 kVA or greater	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Industrial and commercial load centers 25 kVA or greater, including theatrical *lighting* installations and commercial *kitchens*	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Renewable power source (net or total)	Each group	Each group	Each group	Each group
Loads associated with renewable power source	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Charging stations for electric vehicles	All loads in aggregate	All loads in aggregate	All loads in aggregate	All loads in aggregate

601.2.6.3 *[Section 130.5(c)]* **Voltage drop.**

The maximum combined voltage drop on both installed feeder conductors and branch circuit conductors to the farthest connected load or outlet shall not exceed 5 percent.

Exception to Section 601.2.6.3: Voltage drop permitted by California Electrical Code Sections 647.4, 695.6 and 695.7.

601.2.6.4 *[Section 130.5(d)]* **Circuit controls for 120-volt receptacles and controlled receptacles.**

In all *use designations*~~*buildings*~~, both controlled and uncontrolled 120 volt receptacles shall be provided in *office areas*, lobbies, conference rooms, *kitchen* areas in office spaces and *copy rooms*. Additionally, *hotel/motel* guest rooms shall comply with Section 601.2.6.4.1 *[Section 130.5(d)4]*.

Plug-in strips and other plug-in devices shall not be used to comply with the requirements of this section.

Controlled receptacles shall meet the following requirements, as applicable:

1. Install a control capable of automatically shutting OFF the controlled receptacles when the space is typically unoccupied, either at the receptacle or circuit level. When an *automatic time switch control* is installed it shall incorporate an override control that allows the controlled receptacle to remain ON for no more than 2 hours when an override is initiated and an *automatic* holiday "shut-OFF" feature that turns OFF all loads for at least 24 hours and then resumes the normally scheduled operation. *Countdown timer switches* shall not be used to comply with the *automatic time switch control* requirements; and
2. Install at least one controlled receptacle within 6 feet from each uncontrolled receptacle or install a multiple-receptacle outlet with at least one controlled and one uncontrolled receptacle. Where receptacles are installed in modular furniture in open *office areas*, at least one controlled receptacle shall be installed at each workstation; and
3. Provide a permanent marking for controlled receptacles or circuits to differentiate them from uncontrolled receptacles or circuits.

Exception 1 to Section 601.2.6.4: Receptacles that are only for the following purposes:

1. Receptacles specifically for refrigerators and water dispensers in *kitchen* area.
2. Receptacles located a minimum of six feet above the floor that are specifically for clocks.
3. Receptacles for network copiers, fax machines, A/V and data *equipment* other than personal computers in *copy rooms*.
4. Receptacles on circuits rated more than 20 amperes.
5. Receptacles connected to an uninterruptible power supply (UPS) that are intended to be in continuous use, 24 hours per day/365 days per year, and are marked to differentiate them from other uncontrolled receptacles or circuits.

Exception 2 to Section 601.2.6.4: Receptacles in *healthcare facilities*.

601.2.6.4.1- Hotel and motel guest room receptacle controls. For hotel and motel guest rooms, install controlled receptacles for at least one-half of the 120-volt receptacles in each guestroom. Electric circuits serving controlled receptacles in guestrooms shall have captive card key controls, *occupant sensing controls*, or *automatic* controls so the power is switched OFF no longer than 20 minutes after the guestroom has been vacated.

601.2.6.5 *[Section 130.5(e)]* **Demand responsive controls and equipment.**

See Section 600.4 *[Section 110.12]* for requirements for *demand responsive controls* and *equipment*, including *demand responsive controls* for controlled receptacles, *for nonresidential and hotel/motel occupancies*.

601.3 Prescriptive requirements (Newly Constructed).

601.3.1 *[Section 140.6]* **Indoor Lighting.**

A *building* complies with this section ~~if~~when ~~:~~

~~1. T~~the ~~calculation of adjusted indoor *lighting* power~~total Adjusted Indoor *Lighting* Power of all proposed *building* areas ~~combined~~, calculated in accordance with~~under~~ Section 601.3.1.1 ~~is no greater than~~does not ~~the~~exceed the ~~calculation of allowed indoor *lighting* power~~ Allowed Indoor *Lighting* Power determined ~~in accordance with, specific methodologies calculated under~~ Section 601.3.1.2 and 601.3.1.3. ~~; and~~

~~1. The calculation of allowed indoor *lighting* power, general rules comply with Section 601.3.1.2.~~

The prescriptive ~~limits on~~ indoor *lighting* power limits are the smaller of the adjusted and allowed indoor *lighting* power values determined in accordance with ~~Item 1~~ this section.

601.3.1.1 *[Section 140.6(a)]* **Calculation of adjusted indoor lighting power.**

The adjusted indoor *lighting* power of all proposed *building* areas is the total watts of all planned permanent and *portable lighting* systems in all areas of the proposed *building*; subject to the applicable adjustments under Sections 601.3.1.1.1 through 601.3.1.1.4, and the requirements of Section 601.3.1.1.4.

601.3.1.1.1 *[Section 140.6(a)1]* **Two interlocked lighting systems.**

No more than two *lighting* systems may be ~~used for an~~installed in any area, and ~~if~~ when there are two *lighting* systems provided, they must be interlocked.

Where there are two interlocked *lighting* systems present, the watts of the lower wattage system may be excluded from the adjusted indoor *lighting* power density if:

1. An installation certificate detailing compliance with Section 601.3.1.1.1 *[Section 140.6(a)1]* is submitted in accordance with Section 100.5 *[Sections~~-~~ 10-103]* and Section 601.2.5.2 *[Section 130.4]*; and

2. The area or areas served by the interlocking systems is an auditorium, a convention center, a conference room, a *multipurpose room* or a theater; and
3. The two *lighting* systems are interlocked with a nonprogrammable double-throw switch to prevent simultaneous operation of both systems. For compliance with *Part 6* a nonprogrammable double-throw switch is an electrical switch commonly called a “single pole double throw” or “three-way” switch that is wired as a selector switch allowing one of two loads to be enabled. It can be a line voltage switch or a *low voltage* switch selecting between two relays. It cannot be overridden or changed in any manner that would permit both loads to operate simultaneously.

601.3.1.1.2 *[Section 140.6(a)2]* **Reduction of wattage through controls.**

In calculating adjusted indoor *lighting* power, the installed watts of a *luminaire* providing *general lighting* in an area *listed* in Table 601.3-~~A~~(1) *[Table 140.6-A]* may be reduced by the product of (i) the number of watts controlled as described in Table 601.3-~~A~~(1) *[Table 140.6-A]*, times (ii) the applicable power adjustment factor (PAF), if all of the following conditions are met:

1. **Installation certificate.** An installation certificate is submitted in accordance with Section 601.2.5.2 *[Section 130.4(b)]*, and
2. **Mandatory requirements.** *Luminaires* and controls meet the applicable requirements of Section 600.2.1 *[Section 110.9]*, and Section 601.2 *[Sections 130.0 through 130.5]*; and
3. **Permanent installation.** The controlled *lighting* is permanently installed *general lighting* systems and the controls are permanently installed nonresidential-rated *lighting* controls. When used for determining PAFs for *general lighting* in offices, furniture mounted *luminaires* that comply with all of the following conditions shall qualify as permanently installed *general lighting* systems:
   3.1. The furniture mounted *luminaires* shall be permanently installed no later than the time of *building* permit inspection; and
   3.2. The furniture mounted *luminaires* shall be permanently hardwired; and
   3.3. The furniture mounted *lighting* system shall be designed to provide indirect *general lighting*; and
   3.4. Before multiplying the installed watts of the furniture mounted *luminaire* by the applicable PAF, 0.2 watts per square foot of the area illuminated by the furniture mounted *luminaires* shall be subtracted from installed watts of the furniture mounted *luminaires*; and
   3.5. The *lighting* control for the furniture mounted *luminaire* complies with all other applicable requirements in Section 601.3.1.1.2 *[Section 140.6(a)2]*.
4. **Within applicable area.** At least 50 percent of the *light* output of the controlled *luminaire* is within the applicable area *listed* in Table 601.3-~~A~~(1) *[Table 140.6-A]*.

Luminaires on *lighting* tracks shall be within the applicable area in order to qualify for a PAF.

5. **PAF application per *luminaire*.** Only one PAF from Table 601.3-~~A~~(1) *[Table 140.6-A]* may be used for each qualifying *luminaire*. PAFs shall not be added together unless allowed in Table 601.3-~~A~~(1) *[Table 140.6-A]*.

6. **Adjusted Indoor *Lighting* Power wattage reduction.** Only *lighting* wattage directly controlled in accordance with Section 601.3.1.1.2 *[Section 140.6(a)2]* shall be used to reduce the installed watts as allowed by Section 601.3.1.1.2 *[Section 140.6(a)2]* for calculating the Adjusted Indoor *Lighting* Power. If only a portion of the wattage in a *luminaire* is controlled in accordance with Section 601.3.1.1.2 *[Section 140.6(a)2]*, then only that portion of controlled wattage may be reduced in calculating adjusted indoor *lighting* power.

7. **Qualifying *lighting* controls.** *Lighting* controls used to qualify for a PAF shall be designed and installed in addition to *manual*, multilevel, and *automatic lighting* controls required in Section 601.2.2 *[Section 130.1]*, and in addition to any other *lighting* controls required by any provision of *Part 6*. PAFs shall not be available for *lighting* controls required by *Part 6*.

8. **Daylight continuous dimming plus OFF control PAF.** To qualify for the PAF for daylight continuous dimming plus OFF control, the daylight control and controlled *luminaires* shall comply with Section 601.2.2.4 *[Section 130.1(d)]*, and requirements in Section 601.2.5.1 *[Section 130.4(a)3 and 130.4(a)7]* for *daylight responsive controls* and *lighting* systems receiving the *Institutional Tuning* Power Adjustment Factor. The daylight control shall be continuous dimming and shall additionally turn *lights* completely OFF when the daylight available in the *daylit zone* is greater than 150 percent of the *illuminance* received from the *general lighting* system at full power. The PAF shall apply to the *luminaires* in the *primary sidelit daylit zone*, *secondary sidelit daylit zone* and *skylit daylit zone*.

9. ***Occupant sensing control* PAF.** To qualify for the PAF for an *occupant sensing control* controlling the *general lighting* in large *office areas* above workstations, in accordance with Table 601.3-~~A~~(1) *[Table 140.6-A]*, the following requirements shall be met:

   9.1. The *office area* shall be greater than 250 square feet; and

   9.2. This PAF shall be available only in *office areas* which contain workstations; and

   9.3. Controlled *luminaires* shall only be those that provide *general lighting* directly above the controlled area, or furniture mounted *luminaires* that comply with Section 601.3.1.1.2 *[Section 140.6(a)2]* and provide *general lighting* directly above the controlled area; and

   9.4. *Occupant sensing control* zones in offices greater than 250 square feet shall be shown on the plans; and

9.5. Qualifying *luminaires* shall be controlled by *occupant sensing controls* that meet all of the following requirements, as applicable:

Infrared sensors shall be equipped by the manufacturer, of fitted in the field by the installer, with lenses or shrouds to prevent them from being triggered by movement outside of the controlled area.

Ultrasonic sensors shall be tuned to reduce their sensitivity to prevent them from being triggered by movements outside of the controlled area.

All other sensors shall be installed and adjusted as necessary to prevent them from being triggered by movements outside of the controlled area.

10. ***Institutional Tuning* PAF.** To qualify for the PAF for an *Institutional Tuning* in Table 601.3-~~A~~(1) *[Table 140.6-A]*, the tuned *lighting* system shall comply with all of the following requirements:

10.1. The *lighting* controls shall limit the maximum output or maximum power draw of the controlled *lighting* to 85 percent or less of full *light* output or full power draw; and

10.2. The means of setting the limit is *accessible* only to authorized personnel; and

10.3. The setting of the limit is verified by the acceptance test required by Section 601.2.5.1 *[Section 130.4(a)7]* for *lighting* systems receiving the *Institutional Tuning* Power Adjustment Factor; and

10.4. The construction documents specify which *lighting* systems shall have their maximum *light* output or maximum power draw set to no greater than 85 percent of full *light* output or full power draw.

11. ***Demand responsive control* PAF.** To qualify for the PAF for a *demand responsive control* in Table 601.3-~~A~~(1) *[Table 140.6-A]*, the *general lighting* wattage receiving the PAF shall not be within the scope of Section 600.4.2 *[Section 110.12(c)]* and a *demand responsive control* shall meet all of the following requirements:

11.1. The controlled *lighting* shall be capable of being automatically reduced in response to a *demand response signal*; and

11.2. *General lighting* power in *Group R occupancies* shall be reduced in a manner consistent with the requirements of Section 601.2.2.2 *[Section 130.1(b)]*. *General lighting* power in spaces in other nonresidential *use designations* shall be reduced by continuous dimming.

12. **Daylighting Devices (*Clerestory fenestration*, *horizontal slats*, or *light shelves*) PAFs.** To qualify for the PAFs for *clerestory fenestration*, *horizontal slats*, or *light shelves* in Table 601.3-~~A~~(1) *[Table 140.6-A]*, the daylighting design shall meet the requirements in Section 301.3.11 *[Section 140.3(d)]*. The PAFs shall only apply to *lighting* in a primary or *secondary sidelit daylit zone* where continuous dimming daylighting controls meeting the requirements of Section 601.2.2.4 *[Section 130.1(d)]* are installed.

TABLE 601.3-~~A~~(1) [TABLE 140.6-A] LIGHTING POWER ADJUSTMENT FACTORS (PAF)

TYPE OF CONTROL	TYPE OF AREA	FACTOR
1. Daylight continuous dimming plus OFF control	*Luminaires* in *skylit daylit zone* or *primary sidelit daylit zone* or *secondary sidelit daylit zone*	0.10
2. *Occupant sensing controls* in office larger than 250 square feet	One sensor controlling an area that is no larger than 125 square feet	0.30
3. *Occupant sensing controls* in offices larger than 250 square feet	One sensor controlling an area that is 126-250 square feet	0.20
4. *Institutional tuning*	*Luminaires* in non-daylit areas. *Luminaires* that qualify for other PAFs in this table may also qualify for this tuning PAF.	0.10
4. *Institutional tuning*	*Luminaires* in daylit areas. *Luminaires* that qualify for other PAFs in this table may also qualify for this tuning PAF.	0.05
5. *Demand responsive control*	*General lighting luminaires* not in the scope of Section 600.4.2 *[Section 110.12(c)]*. If DR controls are required of Section 600.4.2 *[Section 110.12(c)]*, this PAF is not available for any *lighting* in the project. *Luminaires* that qualify for other PAFs in this table may also qualify for this *demand responsive control* PAF.	0.05
6. *Clerestory fenestration*	*Luminaires* in daylit areas adjacent to the clerestory. *Luminaires* that qualify for daylight dimming plus OFF control may also qualify for this PAF.	0.05
7. *Horizontal slats*	*Luminaires* in daylit areas adjacent to *vertical fenestration* with interior or exterior *horizontal slats*. *Luminaires* that qualify for daylight dimming plus OFF control may also qualify for this PAF.	0.05
8. *Light shelves*	*Luminaires* in daylit areas adjacent to *clerestory fenestration* with interior or exterior *light shelves*. This PAF may be combined with the PAF for *clerestory fenestration*. *Luminaires* that qualify for daylight dimming plus OFF control may also qualify for this PAF.	0.10

Footnotes for Table 601.3-(1) *[Table 140.6-A]*:

a. To qualify for any of the Power Adjustment Factors in this table, the installation shall comply with the applicable requirements in Section 601.3.1.1.2 *[Section 140.6(a)2]*.

b. Only one PAF may be used for each qualifying *luminaire* unless combined below.

c. *Lighting* controls that are required for compliance with *Part 6* shall not be eligible for a PAF.

~~Footnotes for Table 601.3-A *[Table 140.6-A]*:~~

~~1. To qualify for any of the Power Adjustment Factors in this table, the installation shall comply with the applicable requirements in Section 601.3.1.1.2 *[Section 140.6(a)2]*.~~

~~2. Only one PAF may be used for each qualifying *luminaire* unless combined below.~~

~~3. *Lighting* controls that are required for compliance with *Part 6* shall not be eligible for a PAF.~~

601.3.1.1.3 *[Section 140.6(a)3]* **Lighting wattage excluded.**

The watts of the following indoor *lighting* applications may be excluded from adjusted indoor *lighting* power. (Indoor *lighting* not *listed* below shall comply with all applicable nonresidential indoor *lighting* requirements in *Part 6*):

1. In theme parks: *lighting* for themes and special effects;
2. Studio *lighting* for film or photography, provided that these *lighting* systems are in addition to and separately switched from a *general lighting* system;
3. *Lighting* for dance floors, *lighting* for theatrical and other live performances, and theatrical *lighting* used for religious worship, provided that these *lighting* systems are *additions* to a *general lighting* system and are separately controlled by a multi-scene or theatrical cross-fade control station *accessible* only to authorized operators;
4. *Lighting* intended for makeup, hair, and costume preparation in performing arts facility *dressing rooms*, provided that the *lighting* is separately switched from the *general lighting* system, switched independently at each dressing station, and is controlled with a vacancy sensor.
5. In civic facilities, transportation facilities, convention centers and *hotel function areas*: *lighting* for temporary exhibits, if the *lighting* is in *addition* to a *general lighting* system, and is separately controlled from a panel *accessible* only to authorized operators;
6. *Lighting* installed by the manufacturer in walk-in *coolers* or *freezers*, *vending machines*, *food preparation equipment*, and scientific and industrial *equipment*;
7. Examination and surgical *lights*, low ambient night *lights* and *lighting* integral to medical *equipment*, provided that these *lighting* systems are *additions* to and separately switched from a *general lighting* system;
8. *Lighting* for plant growth or maintenance in non-CEH spaces, if it is controlled by a multilevel *astronomical time-switch control* that complies with the applicable provisions of Section 600.2.1 *[Section 110.9]*;
9. *Lighting equipment* that is for sale;
10. *Lighting* demonstration *equipment* in *lighting* education facilities;
11. *Lighting* that is required for exit *signs* subject to the *CBC*. Exit *signs* shall meet the requirements of the *Appliance Efficiency Regulations*;
12. Exit way or egress *illumination* that is normally off and that is subject to the *CBC*;
13. In *hotel/motel* *use designations*~~*buildings*~~, *lighting* in guest rooms (*lighting* in *hotel/motel* guestrooms shall comply with Section 601.1.1 *[Section 130.0(b)]*. (Indoor *lighting* not in guestrooms shall comply with all applicable nonresidential *lighting* requirements in *Part 6*.)
14. *Temporary lighting* systems.
15. *Lighting* in *occupancy* ~~*group*~~ *Group* U ~~*buildings*~~ *occupancies* less than 1,000 square feet;

16. *Lighting* in unconditioned *agricultural buildings* less than 2,500 square feet;
17. *Lighting* systems in qualified historic *buildings*, as defined in the *California Historical Building Code* (Title 24, Part 8), are exempt from the *lighting* power density allowances, if they consist solely of historic *lighting* components or replicas of historic *lighting* components. If *lighting* systems in qualified *use designations* ~~*buildings*~~ contain some historic *lighting* components or replicas of historic components, combined with other *lighting* components, only those historic or historic replica components are exempt. All other *lighting* systems in qualified historic *buildings* shall comply with the *lighting* power density allowances;
18. *Lighting* in nonresidential parking *garages* for seven or fewer vehicles: *Lighting* in nonresidential parking *garages* for seven or fewer vehicles shall comply with the applicable residential parking *garage* provisions of Section 602.2.1 *[Section 150.0(k)]*.
19. *Lighting* for *signs*: *Lighting* for *signs* shall comply with Section 601.3.3 *[Section 140.8]*.
20. *Lighting* in *refrigerated cases* less than 3,000 square feet. (*Lighting* in *refrigerated cases* less than 3,000 square feet shall comply with the Title 20 *Appliance Efficiency Regulations*).
21. *Lighting* in elevators where the *lighting* meets the requirements in Section 906.1 *[Section 120.6(f)]*.
22. *Lighting* connected to a Life Safety Branch or Critical Branch, as specified in Section 517 of the California Electrical Code.
23. *Horticultural lighting* in *CEH spaces* (*indoor growing* and greenhouses) complying with Section 908.1 *[Section 120.6(h)]*.

601.3.1.1.4 *[Section 140.6(a)4]* **Luminaire classification and power adjustment.**

Luminaire classification and power shall be determined in accordance with Section 601.2.1 *[Section 130.0(c)]*.

Small aperture tunable-white and *dim-to-warm luminaires lighting* power adjustment. For qualifying small aperture tunable-white and *dim-to-warm LED luminaires*, the adjusted indoor *lighting* power of these *luminaires* shall be calculated by multiplying their maximum rated wattage by 0.80.

Qualifying *luminaires* shall meet all of the following:

1. **Small aperture.** Qualifying *luminaires* with a *luminaire* aperture length longer than 18 inches shall have a *luminaire* aperture no wider than four inches. Qualifying *luminaires* with a *luminaire* aperture length of 18 inches or less shall have a *luminaire* aperture no wider than eight inches.
2. **Color changing.** qualifying tunable-white *luminaires* shall be capable of a color change greater than or equal to 2,000 Kelvin *correlated color temperature (CCT)*.

Qualifying *dim-to-warm luminaires* shall be capable of color change greater than or equal to 500 Kelvin *CCT*.

3. **Controls.** Qualifying *luminaires* shall be connected to controls that allows color changing of the *luminaires*.

601.3.1.2 *[Section 140.6(b)1 and 2]* **Calculation of ~~allowed indoor lighting power~~ Allowed Indoor Lighting Power: general rules.**

The ~~allowed indoor *lighting* power~~ Allowed Indoor *Lighting* Power ~~allotment~~ for conditioned areas shall be calculated separately from the ~~allowed *lighting* power allotment~~ Allowed Indoor *Lighting* Power for unconditioned areas. ~~Each allotment is applicable solely to the area to which it applies, and t~~There ~~shall be no t~~Trade-offs between the Allowed Indoor *Lighting* Power for conditioned and unconditioned areas shall not be permitted. ~~allotments.~~

~~Allowed indoor *lighting* power~~Allowed Indoor *Lighting* Power ~~allotment~~ shall be calculated separately from the ~~allowed *outdoor lighting* power allotment~~ Allowed *Outdoor Lighting* Power. ~~Each allotment is applicable solely to the area to which it applies, and t~~There ~~shall be no t~~Trade-offs between Indoor Allowed *Lighting* Power and Outdoor Allowed *Lighting* Power shall not be permitted~~the separate indoor and outdoor allotments~~.

601.3.1.2.1 *[Section 140.6(b)3]* **General Rules for Calculation methodologies: ~~general lighting~~.**

The ~~allowed indoor *lighting* power density allotment for *general lighting*~~Allowed Indoor *Lighting* Power shall be calculated as follows:

1. **Complete *Building* Method.** The complete *building* method, as described in Section 601.3.1.3.1 *[Section 140.6(c)1]* for Nonresidential *use designations* excluding *Group R Occupancies*~~,~~ shall only be used ~~only~~ for an *entire building* or *tenant space*, except as ~~permitted by Section 601.3.1.3.1 *[Section 140.6(c)1]*.~~ As described in more ~~fully~~ detail in Section 601.3.1.3.1 *[Section 140.6(c)1]*, and subject to the adjustments ~~listed~~ specified therein, the ~~allowed indoor lighting power allotment for general lighting~~ Allowed Indoor *Lighting* Power for the *entire building* or *tenant space* shall be calculated as follows:

   1.1. For a conditioned *building*, the product of the square feet of *conditioned space* of the *building* or *tenant space* times the applicable ~~allotment of watts per square foot~~Allowed Indoor *Lighting* Power described in Table 601.3-~~B~~(2) *[Table 140.6-B]*.

   1.2. For an unconditioned *building*, the product of the square foot of *unconditioned space* of the *building* or *tenant space* times the applicable ~~allotment of watts per square feet~~Allowed Indoor *Lighting* Power described in Table 601.3-~~B~~(2) *[Table 140.6-B]*.

2. **Area Category Method.** The area category method, ~~as described in Section 601.3.1.3.2 *[Section 140.6(c)2]*~~, shall be used for all areas in the *building* in accordance with Section 601.3.1.3.3 for *Group R occupancies* and in accordance

with Section 601.3.1.3.2 for all other Nonresidential *Occupancies*. Under the ~~area~~ Area ~~category~~ Category ~~m~~Method ~~as described more fully in Section 601.3.1.3.2 *[Section 140.6(c)2]*~~, separate compliance for the entire conditioned portion and the entire unconditioned portion of the *building* shall be calculated as follows:~~and subject to the adjustments listed there, the allowed indoor lighting power allotment for general lighting shall be calculated for each area in the building as follows:~~

2.1. All installed wattages, *general lighting* power allowances, and additional *lighting* power allowances shall be allocated separately to the conditioned and unconditioned portions of the *building* with no trade-off allowed between the conditioned and unconditioned compliance calculation. ~~For conditioned areas, by multiplying the conditioned square feet of the area times the applicable allotment of watts per square foot for the area shown in Table 601.3-C(3) *[Table 140.6-C]*.~~

2.2. Compliance for the conditioned portion of the *building* is achieved if the total Adjusted Installed *Lighting* Power in the conditioned portions of the *building* is no greater than the sum of Allowed *Lighting* Power for all the primary function areas in the conditioned portions of the *building*.

2.3. Compliance for the unconditioned portion of the *building* is achieved if the total Adjusted Installed *Lighting* Power in the unconditioned portions of the *building* is no greater than the sum of Allowed *Lighting* Power for all the primary function areas in the conditioned portions of the *building*.~~For unconditioned areas, by multiplying the unconditioned square feet of the area times the applicable allotment of watts per square foot for the area shown in Table 601.3-C(3) *[Table 140.6-C]*.~~

~~The allowed indoor lighting power allotment for general lighting for one area for which the area category method was used may be increased up to the amount that the allowed indoor lighting power allotment for general lighting for another area using the area category method is decreased, except that such increases and decreases shall not be made between conditioned and unconditioned space.~~

~~**601.3.1.2.2** *[Section 140.6(b)4]* **Calculation methodologies: lighting other than general lighting.**~~

~~Allowed Indoor Lighting Power allotments for all *lighting* power allotments other than *general lighting* shall be restricted as follows:~~

~~**Area Category Method.** When using the Area Category Method, allowed Indoor Lighting Power allotments for specialized task work, *precision* commercial and industrial work, white board or chalk board, accent, display *decorative*, *Videoconferencing Studio*, wall display, floor display, task, or very valuable display case, may not be increased as a result of, or otherwise traded off against, decreasing any other allotment.~~

601.3.1.3 *[Section 140.6(c)]* **Calculation of Allowed Indoor Lighting Power ~~allowed indoor lighting power~~: specific methodologies.**

The Allowed Indoor *Lighting* Power ~~allowed indoor lighting power~~ for each *building* type, or each primary function area shall be calculated using only one of the methods in Section 601.3.1.3.1, ~~or~~ Section 601.3.1.3.2 or Section 601.3.1.3.3 below as applicable.

601.3.1.3.1 *[Section 140.6(c)1]* **Complete Building Method for Nonresidential Buildings Excluding Group R Occupancies.**

Requirements for using the Complete *Building* Method include all of the following:

1. This section shall not be used for *use designations* that include any *Group R Occupancies*.
2. The Complete *Building* Method shall be used only for *building* types, as defined in Section 200 *[Section 100.1]*, that are specifically listed in Table 601.3-~~B~~(2) *[TABLE 140.6-B]*. For all other *use designations* not specifically listed in Table 601.3-(2), the Complete *Building* Method shall use the *lighting* power density allowance for "All Other *Buildings*." ~~(For example, retail and wholesale stores, *hotel/motel*, and *high-rise residential buildings* shall not use this method.)~~
3. The Complete *Building* Method shall be used only on projects involving:
   3.1. *Entire buildings* with one type of *use designation* ~~*occupancy*~~; or
   3.2. Mixed *occupancy buildings* where one type of *use designation* makes up at least 90 percent of the *entire building* (in which case, when applying the Complete *Building* Method, it shall be assumed that the primary use is 100 percent of the *building*); or
   3.3. A *tenant space* where one type of use makes up at least 90 percent of the entire *tenant space* (in which case, when applying the Complete *Building* Method, it shall be assumed that the primary use is 100 percent of the *tenant space*).
4. The Complete *Building* Method shall be used only when the applicant is applying for a *lighting* permit and submits plans and specifications for the *entire building* or the entire *tenant space*.
5. Under the Complete *Building* Method, for projects involving *entire buildings* the Allowed Indoor *Lighting* Power ~~allowed indoor lighting power allotment~~ is the *Lighting* Power Density Allowance listed in Table 601.3-(2) *[TABLE 140.6-B]* ~~lighting power density value times~~multiplied by the floor area of the *entire building or tenant space*.
6. Under the Complete *Building* Method, for projects involving *tenant spaces* the Allowed Indoor *Lighting* Power is the *Lighting* Power Density Allowance listed in Table 601.3-(2) [TABLE 140.6-B] multiplied by the floor area of the entire *tenant space*.
7. For *buildings* that contain both ~~including~~ a parking *garage* and ~~plus~~ another *occupancy type* ~~of use~~ listed in Table 601.3-~~B~~(2) *[TABLE 140.6-B]*, the parking

garage portion ~~of the *building*~~ and the other type ~~of~~ *use designation* portion of the *building* shall each use the Complete *Building* Method separately ~~use the Complete Building Method~~.

TABLE 601.3-~~B~~(2) [TABLE 140.6-B] COMPLETE BUILDING METHOD LIGHTING POWER DENSITY VALUES FOR NONRESIDENTIAL BUILDINGS EXCLUDING GROUP R OCCUPANCIES

USE DESIGNATIONS	***LIGHTING* POWER DENSITY ALLOWANCE (WATTS PER SQUARE FOOT)**
Assembly Use	0.55
Data Center Use	0.40
Events and Exhibits Use – *Museum*	0.60
Events and Exhibits Use – Motion Pictures Theater	0.55
Events and Exhibits Use – Performing Arts Theater	0.60
Financial Institution Use	0.55
Grocery Store Use	0.80
Healthcare Facility	0.80
Industrial/*Manufacturing Use*	0.60
Library Use	0.65
Office Use	0.55
Parking Garage Use	0.11
Religious Worship Use	0.65
Restaurant Use	0.60
Retail Use	0.75
School Use	0.55
Service Facility Use	0.55
Sports and Recreation Use – Gymnasium	0.55
Sports Areana Use	0.70
All Other *Buildings*	0.40

~~TYPE OF BUILDING~~	~~ALLOWED LIGHTING POWER DENSITY (WATTS PER SQUARE FOOT)~~
~~Assembly Building~~	~~0.65~~
~~Bank or Financial Institution Building~~	~~0.65~~
~~Grocery Store Building~~	~~0.90~~
~~Gymnasium Building~~	~~0.60~~
~~Healthcare Facility~~	~~0.90~~
~~Industrial/Manufacturing Facility Building~~	~~0.60~~
~~Library Building~~	~~0.70~~
~~Motion Picture Theater Building~~	~~0.60~~
~~Museum Building~~	~~0.65~~
~~Office Building~~	~~0.60~~
~~Parking Garage Building~~	~~0.13~~
~~Performing Arts Theater Building~~	~~0.75~~
~~Religious Facility Building~~	~~0.70~~
~~Restaurant Building~~	~~0.65~~
~~Retail Store Building~~	~~0.90~~
~~School Building~~	~~0.60~~
~~Sports Arena Building~~	~~0.75~~
~~All other buildings~~	~~0.40~~

601.3.1.3.2 *[Section 140.6(c)2A-F]* **Area Category Method for Nonresidential Occupancies Excluding Group R occupancies.**

Under the Area Category Method, the Allowed Indoor *Lighting* Power is the sum of the Allowed Baseline *Lighting* Power calculated in accordance with Section 601.3.1.3.2.1 and the Allowed Additional *Lighting* Power calculated in accordance with Section 601.3.1.3.2.2. Requirements for using the Area Category Method include all of the following:

1. The Area Category Method shall be used only for primary function areas, as defined in Section 200 *[Section 100.1]*, that are *listed* in Table 601.3-~~C~~(3) *[Table 140.6-C]*. For primary function areas not listed, selection of a reasonably equivalent type shall be permitted.
2. Primary function areas in Table 601.3-~~C~~(3) *[Table 140.6-C]* shall not apply to a complete *building*. Each primary function area shall be determined as a separate area.
3. For purposes of compliance with Section 601.3.1.3.2 *[Section 140.6(c)2]*, an "area" shall be defined as all contiguous areas that accommodate or are associated with a single primary function area listed in Table 601.3-C(3) *[Table 140.6-C]*.
4. Where areas are bounded or separated by interior partitions, the floor area occupied by those interior partitions may be included in primary function area.

601.3.1.3.2.1 *[Section 140.6(c)2E&F]* **Area Category Method – Allowed Baseline Lighting Power**

The Allowed Baseline *Lighting* Power for the *building* is the sum of the Allowed Baseline *Lighting* Power for all areas in the *building* as follows:

~~1. If at the time of permitting for a *newly constructed building*, a tenant is not identified for a multitenant area, a maximum of 0.4 watts per square foot shall be allowed for the *lighting* in each area in which a tenant has not been identified. The area shall be classified as unleased tenant area.~~

2. Under the Area Category Method, the Allowed Baseline *Lighting* Power~~allowed indoor lighting power~~ for each primary function area is the baseline *lighting* power density allowance~~value~~ in Table 601.3-~~C~~(3) *[Table 140.6-C]* ~~times~~ multiplied by the square feet of the primary function area. ~~The total allowed indoor lighting power density for the *building* is the sum of all allowed indoor lighting powers densities for all areas in the *building*.~~

3. If at the time of permitting for a *newly constructed building*, a tenant ~~is~~ has not been identified for a multitenant area, a maximum of 0.4 watts per square foot shall be allowed for the *lighting* in each area in which a tenant has not been identified. The area shall be classified as *unleased tenant area*.

601.3.1.3.2.2

~~601.3.1.3.3~~ *[Section 140.6(c)2G]* **Area Category Method - Allowed Additional Lighting Power ~~lighting power allowances~~ for qualifying lighting systems.**

In addition to the allowed indoor *lighting* power calculated according to Section ~~601.3.1.3.2~~601.3.1.3.2.1 *[Sections 140.6(c)2A through F]*, the *building* may add Allowed Additional *Lighting* Power~~additional lighting power allowances~~ for qualifying *lighting* systems as specified in the Qualifying *Lighting* Systems column in Table 601.3-~~C~~(3) *[Table 140.6-C]* under the following conditions:

1. **Qualifying *lighting* systems.** Only primary function areas having a *lighting* system as specified in the Qualifying *Lighting* Systems column in Table 601.3-~~C~~(3) *[Table 140.6-C]* and in accordance with the corresponding footnote of the Table shall qualify for the additional *lighting* power allowances; and

2. **Task areas and *lighting* equipment shown on plans.** The additional *lighting* power allowances shall be used only if the plans clearly identify all applicable task areas and the *lighting equipment* designed to illuminate these tasks; and

3. **Tasks not eligible.** Tasks that are performed less than two hours per day or poor quality tasks that can be improved are not eligible for the additional *lighting* power allowances; and

4. ***Luminaire* types not eligible.** The additional *lighting* power allowances shall not utilize ~~any type of~~ *luminaires* that are used for *general lighting* and where there is no *general lighting* system in the ~~area~~space, the *lighting* system used

to illuminate the area shall not qualify for additional *lighting* power allowances~~in the *building*~~; and

5. **Area Category Method only.** The additional *lighting* power allowances shall not be used when using the Complete *Building* Method; and

6. **Additional *lighting* power allowed.** The additional *lighting* power allowed in each space is the smaller of:

   6.1. the *lighting* power density listed in the "Allowed Additional *Lighting* LPD" column in Table 601.3-~~C~~(3) *[Table 140.6-C]*, times the square feet of the primary function area, or

   6.2. the adjusted indoor *lighting* power of the applicable *lighting* in the space; and

7. ***Videoconferencing studios*.** Additional *lighting* power for videoconferencing as specified in Table 601.3-~~C~~(3) *[Table 140.6-C]* shall be allowed in a *videoconferencing studio*, as defined in Section 200 *[Section 100.1]*, provided the following conditions are met:

   7.1. A completed and signed installation certificate is prepared and submitted in accordance with Section 601.2.5.2 *[Section 130.4(b)]*, specifically detailing compliance with the applicable requirements of ~~Section 601.3.1.3.3~~Section 601.3.1.2.2.7 *[Section 140.6(c)2Gvii]*; and

   7.2. The *videoconferencing studio* is a room with permanently installed videoconferencing cameras, audio *equipment*, and playback *equipment* for both audio-based and video-based two-way communication between local and remote sites; and

   7.3. *General lighting* in *Group R occupancies* is switched in accordance with the requirements of Section 601.2.2.2 *[Section 130.1(b)]. General lighting in other nonresidential buildings is switched in accordance with the requirements of Section 601.2.2.1.4 [Section 130.1(a)4]*; and

   7.4. Wall wash *lighting* is separately switched from the *general lighting* system; and

   7.5. All of the *lighting* in the studio, including *general lighting* and additional videoconferencing *lighting* power allowed by Section 601.3.1.2.2.7~~Section 601.3.1.3.3~~ *[Section 140.6(c)2Gvii]* is controlled by a *multi-scene programmable control* system (also known as a scene preset control system).

8. **Floor Decorative/display~~s~~ allowance.** ~~Floor displays shall not qualify for wall display allowances.~~ The additional allowed decorative/display power in a space shall be the lesser of the installed decorative/display *lighting* in the space or the product of square feet of the primary function area multiplied by the decorative/display allowance specified in Table 601.3-(3) *[Table 140.6-C]*. The installed *luminaire* wattage allocated to the wall decorative/display

allowance in section 601.3.1.3.2.2 shall not be allocated as installed *luminaire* wattage for space area floor decorative/display.

9. **Wall decorative/displays allowances.** Additional allowed power for *wall decorative/display lighting* in a space is available only for *lighting* the lesser of the installed decorative/display *lighting* that is within 10 feet of that illuminates walls having wall displays in the space and the length of walls multiplied by the wall decorative/display allowance in units of Watts per linear feet of wall specified in Table 601.3-(3) *[Table 140.6-C]*. The length of display walls shall include the length of the perimeter walls, including but not limited to closable openings, and permanent full-height interior partitions, and perimeter illuminated *ceiling bulkhead walls* formed by a vertical offset in ceiling heights of three feet and greater. Permanent full-height interior partitions are those that (I) extend from the floor to within two feet of the ceiling or are taller than ten feet and (II) are permanently anchored to the floor. Qualifying wall *lighting* shall:

   9.1. Be mounted within 10 feet of walls, the wall having the wall display. When *track lighting* is used for wall display, and where portions of that *lighting* track are more than 10 feet from the wall and other portions are within 10 feet of the wall, portions of track more than 10 feet from the wall shall not be used for the wall decorative/display allowance; and

   9.2. Be a *lighting* system type appropriate for wall *lighting*. *Lighting* systems appropriate for wall *lighting* are *lighting* track adjacent to the wall, wall-washer *luminaires*, *luminaires* behind a wall valance or wall cove, or accent *light*. (Accent *luminaires* are adjustable or fixed *luminaires* providing directional display *light*.)

10.

11. **Mounting Ceiling Height.** Mounting Ceiling height shall be the *luminaire* mounting height measured from the finished floor to the bottom of the *luminaire*. If *luminaires* are mounted at different mounting height within the same space, the average mounting height of the ceiling of the primary function area. *luminaires* qualified for the additional *lighting* power allowances in Table 601.3-C(3) *[Table 140.6-C]* can be used to establish the mounting height of the qualified *luminaires* for calculations of the additional *lighting* power allowances of the qualified *luminaires*.

12.

13. ***Very valuable display case lighting*.** The allowed additional *lighting* power for *very valuable display case lighting*, is the lesser of the installed *lighting* power located within the very valuable display case and the product of the area of the top of the display case and the very valuable display case interior *lighting* allowance specified in Table 601.3-(3) *[Table 140.6-C]*.

14. ~~TABLE 601.3-C(3)~~ [TABLE 140.6-C] AREA CATEGORY METHOD – LIGHTING POWER DENSITY VALUES (WATTS/FT^2) **FOR NONRESIDENTIAL BUILDINGS EXCLUDING *GROUP R OCCUPANCIES***

TABLE 601.3-(3) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR NONRESIDENTIAL USE DESIGNATIONS EXCLUDING GROUP R OCCUPANCIES

~~*TABLE 601.3(3) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR NONRESIDENTIAL BUILDINGS* EXCLUDING GROUP R OCCUPANCIES~~

PRIMARY FUNCTION AREA	BASELINE LPD ALLOWANCE (W/SF)	ADDITIONAL QUALIFIED *LIGHTING* SYSTEM 1	ADDITIONAL ALLOWANCE 1 (W/FT2 UNLESS OTHER UNITS)	ADDITIONAL QUALIFIED *LIGHTING* SYSTEM 2	ADDITIONAL ALLOWANCE 2 (W/FT2 UNLESS OTHER UNITS)
Aging Eye/Low-vision ~~[aj]~~ *Corridor Area*	0.60	Decorative/Display	0.30	NA	NA
Aging Eye/Low-vision ~~[aj]~~ Dining	0.80	Decorative/Display	0.40	*Tunable white* or dim-to-warm~~[bi]~~	0.10
Aging Eye/Low-vision ~~[aj]~~ *Main Entry Lobby*	0.80	Decorative/Display	1.10	Transition *Lighting* OFF at night~~[ck]~~	0.80
Aging Eye/Low-vision ~~[aj]~~ Lounge/*Waiting Area*	0.80	Decorative/Display	0.40	*Tunable white* or dim-to-warm~~[bi]~~	0.10
Aging Eye/Low-vision ~~[aj]~~ *Multipurpose Room*	0.80	Decorative/Display	0.40	*Tunable white* or dim-to-warm~~[bi]~~	0.10
Aging Eye/Low-vision ~~[aj]~~ *Religious Worship Area*	0.80	Decorative/Display	0.50	*Tunable white* or dim-to-warm~~[bi]~~	0.10
Aging Eye/Low-vision: ~~[aj]~~ *Restroom*	0.90	Decorative/Display	0.30	NA	NA
Aging Eye/Low-vision ~~[aj]~~ *Stairwell*	0.80	Decorative/Display	0.30	NA	NA
Atria < 20 ft tall	0.30	Decorative/Display	0.20	NA	NA
Atria 20 to < 40 ft	0.40	Decorative/Display	0.25	NA	NA
Atria > 40 ft	0.50	Decorative/Display	0.30	NA	NA
Audience Seating Area	0.30	Display/decorative	0.35	NA	NA
Auditorium Area	0.50	Display/decorative	0.45	NA	NA
Auto Repair / *Maintenance Area*	0.55	Detailed Task~~[df]~~	0.20	NA	NA
Barber, *Beauty Salon* and *Spa Area*	0.65	Detailed Task~~[df]~~	0.30	Decorative/Display	0.20
Civic Meeting Place Area	0.70	Decorative/Display	0.30	NA	NA
Concourse	0.45	Decorative/Display	0.25	NA	NA
Convention Center: Ballroom	0.45	Decorative/Display	0.40	NA	NA

~~*TABLE 601.3(3) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR NONRESIDENTIAL BUILDINGS* EXCLUDING GROUP R OCCUPANCIES~~

PRIMARY FUNCTION AREA	BASELINE LPD ALLOWANCE (W/SF)	ADDITIONAL QUALIFIED *LIGHTING* SYSTEM 1	ADDITIONAL ALLOWANCE 1 (W/FT2 UNLESS OTHER UNITS)	ADDITIONAL QUALIFIED *LIGHTING* SYSTEM 2	ADDITIONAL ALLOWANCE 2 (W/FT2 UNLESS OTHER UNITS)
Convention: Exhibit Space	0.45	Decorative/Display	0.30	NA	NA
Convention: Meeting Room	0.65	Decorative/Display	0.25	NA	NA
Control room	0.50	Decorative/Display	0.00	NA	NA
Copy Room	0.45	Decorative/Display	0.00	NA	NA
Corridor Area	0.35	Decorative/Display	0.30	NA	NA
Data center: Computer room	0.45	Detailed Task[4df]	0.25	NA	NA
Dining Area: Bar/Lounge and Fine Dining	0.40	Decorative/Display	0.45	Task	0.30
Dining Area: Cafeteria/Fast Food	0.40	Decorative/Display	0.25	NA	NA
Dining Area: Family and Leisure	0.35	Decorative/Display	0.25	NA	NA
Education/Business: Classroom, Training,	0.55	Whiteboard or chalkboard[7ga]	0.00	NA	NA
Educational, civic: Multipurpose room (art, music etc)	0.60	Decorative/Display	0.30	NA	NA
Electrical/~~,~~ Mechanical/~~,~~ Telephone Rooms	0.40	Detailed Task[4df]	0.20	NA	NA
Exercise/Fitness Center and Gymnasium Area	0.55	NA	NA	NA	NA
Financial Transaction Area	0.53	Decorative/Display	0.30	NA	NA
Healthcare: Corridor	0.55	Decorative/Display	0.25	NA	NA
Healthcare: Exam/Treatment Room	1.10	NA	NA	NA	NA
Healthcare: Imaging Room	0.55	Decorative/Display	0.35	Tunable white or dim-to-warm[2bi]	0.10
Healthcare: Medical Supply Room	0.50	NA	NA	NA	NA

~~*TABLE 601.3(3) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR NONRESIDENTIAL BUILDINGS* EXCLUDING GROUP R OCCUPANCIES~~

PRIMARY FUNCTION AREA	BASELINE LPD ALLOWANCE (W/SF)	ADDITIONAL QUALIFIED *LIGHTING* SYSTEM 1	ADDITIONAL ALLOWANCE 1 (W/FT2 UNLESS OTHER UNITS)	ADDITIONAL QUALIFIED *LIGHTING* SYSTEM 2	ADDITIONAL ALLOWANCE 2 (W/FT2 UNLESS OTHER UNITS)
Healthcare: Nursery	0.80	NA	NA	Tunable white or dim-to-warm[2bi]	0.10
Healthcare: Nurse's Station	0.75	Detailed Task[4bf]	0.20	Tunable white or dim-to-warm[2bi]	0.10
Healthcare: Operating Room	1.90	NA	0.00	NA	NA
Healthcare: Patient Room - Critical care	0.90	Decorative/Display	0.35	Tunable white or dim-to-warm[2bi]	0.10
Healthcare: Patient Room	0.70	Decorative/Display	0.35	Tunable white or dim-to-warm[2bi]	0.10
Healthcare: Physical Therapy Room	0.65	Decorative/Display	0.10	NA	NA
Healthcare: Recovery Room	0.85	Decorative/Display	0.20	Tunable white or dim-to-warm[2bi]	0.10
Kitchen/Food Preparation Area	0.85	NA	NA	NA	NA
Laboratory: Scientific and Teaching	0.80	Specialized Task[5eg]	0.35	NA	NA
Laundry Area	0.43	NA	NA	NA	NA
Library : Reading Area	0.70	Decorative/Display	0.25	NA	NA
Library : Stacks Area	0.91	NA	NA	NA	NA
Lobby: Main entry	0.60	Decorative/Display	0.40	NA	NA
Locker Room	0.40	NA	NA	NA	NA
Lounge, Breakroom, or Waiting Area	0.45	Decorative/Display	0.35	NA	NA
Manufacturing & Commercial Work Area: Low Bay	0.63	Detailed Task[4df]	0.20	NA	NA
Manufacturing & Commercial Work Area: High Bay	0.65	Detailed Task[4df]	0.20	NA	NA

~~*TABLE 601.3(3) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR NONRESIDENTIAL BUILDINGS* EXCLUDING GROUP R OCCUPANCIES~~

PRIMARY FUNCTION AREA	BASELINE LPD ALLOWANCE (W/SF)	ADDITIONAL QUALIFIED *LIGHTING* SYSTEM 1	ADDITIONAL ALLOWANCE 1 (W/FT2 UNLESS OTHER UNITS)	ADDITIONAL QUALIFIED *LIGHTING* SYSTEM 2	ADDITIONAL ALLOWANCE 2 (W/FT2 UNLESS OTHER UNITS)
Manufacturing & Commercial Work Area: Precision	0.80	Precision Specialized[6fh]	0.70	NA	NA
Motion picture: Theater area	0.32	Decorative/Display	0.25	NA	NA
Museum: Exhibition/Display	0.60	Decorative/Display	0.50	NA	NA
Museum Area: Restoration Room	0.65	Detailed task	0.35	NA	NA
Office Area: ≤ 250 square feet	0.55	Decorative/Display and portable[10je]	0.25	NA	NA
Office Area: > 250 square feet	0.50	Decorative/Display and portable[10je]	0.25	NA	NA
Office: Conference Room	0.60	Decorative/Display	0.25	NA	NA
Parking Garage Area: Parking Zone and Ramps	0.08	ATM or Ticket Machine	50 W/each	NA	NA
Parking Garage Area: Daylight Adaptation Zones[8hb]	0.08	Transition Lighting OFF at night[8hk]	0.70	NA	NA
Performance : Theater area	0.50	Decorative/Display	0.40	NA	NA
Performance : Dressing room	0.50	External illuminated mirror[9id]	40 W/ mirror	Internal illuminated mirror[9id]	120 W/ mirror
Pharmacy Area	1.00	Specialized Task[5eg]	0.35		
Retail Grocery Sales	0.85	Decorative/Display	0.65	NA	NA
Retail: Merchandise Ceiling Height ≤10'4"	0.70	Decorative/Display	0.85	Wall decorative/display	6 W/ft
Retail: Merchandise Sales Ceiling Height - 10'5"-14'	0.75	Decorative/Display	0.90	Wall decorative/display	10 W/ft
Retail: Merchandise Sales Ceiling Height >14'	0.80	Decorative/Display	0.95	Wall decorative/display	12 W/ft

~~*TABLE 601.3(3) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR NONRESIDENTIAL BUILDINGS* EXCLUDING GROUP R OCCUPANCIES~~

PRIMARY FUNCTION AREA	BASELINE LPD ALLOWANCE (W/SF)	ADDITIONAL QUALIFIED *LIGHTING* SYSTEM 1	ADDITIONAL ALLOWANCE 1 (W/FT2 UNLESS OTHER UNITS)	ADDITIONAL QUALIFIED *LIGHTING* SYSTEM 2	ADDITIONAL ALLOWANCE 2 (W/FT2 UNLESS OTHER UNITS)
Retail: Merchandise Sales: very valuable display case lighting, W/sf of display case	N/A	Very valuable display case interior lighting	5 W/ sf	NA	NA
Retail: Fitting Room	0.50	External illuminated mirror[9id]	40 W/mirror	Internal illuminated mirror[9d]	120 W/mirror
Religious Worship Area	0.75	Decorative/Display	0.25	NA	NA
Restrooms	0.60	Decorative/Display	0.35	NA	NA
Stairwell	0.57	Decorative/Display	0.35	NA	NA
Sports Arena – Playing Area: Class I Facility[11kl]	2.25	NA	NA	NA	NA
Sports Arena – Playing Area: Class II Facility[11kl]	1.45	NA	NA	NA	NA
Sports Arena – Playing Area: Class III Facility[11kl]	1.05	NA	NA	NA	NA
Sports Arena – Playing Area: Class IV Facility[11kl]	0.71	NA	NA	NA	NA
Transportation: Baggage Area	0.30	N/A	0.10	NA	NA
Transportation : Ticketing Area	0.40	Decorative/Display	0.20	NA	NA
Transportation: Waiting area	0.45	Decorative/Display	0.20	NA	NA
Unleased tenant area[12k]	0.40	NA	NA	NA	NA
Videoconferencing Studio[13m]	0.70	Decorative/Display	1.00	NA	NA
Warehouse: Storage	0.40	NA	0.00	NA	NA
Warehouse: Shipping and Handling	0.60	NA	0.00	NA	NA

BUILDING TYPE/USE	PRIMARY FUNCTION AREA	ALLOWED LIGHTING POWER DENSITY FOR GENERAL LIGHTING (W/FT^2)	ADDITIONAL LIGHTING POWER QUALIFIED LIGHTING SYSTEMS	ADDITIONAL LIGHTING POWER ADDITIONAL ALLOWANCE [3] (W/FT^2, UNLESS NOTED OTHERWISE)
Aging Eye/Low-vision[10]	Corridor Area	0.70	Decorative/Display	0.30
Aging Eye/Low-vision[10]	Dining	0.80	Decorative/Display	0.30
Aging Eye/Low-vision[10]	NA	0.80	Tunable white or dim-to-warm[9]	0.10
Aging Eye/Low-vision[10]	Lobby, Main Entry	0.85	Decorative/Display	0.30
Aging Eye/Low-vision[10]	Lobby, Main Entry	0.85	Transition Lighting OFF at night[11]	0.95
Aging Eye/Low-vision[10]	Lobby, Main Entry	0.85	Tunable white or dim-to-warm[9]	0.10
Aging Eye/Low-vision[10]	Lounge/Waiting Area	0.80	Decorative/Display	0.30
Aging Eye/Low-vision[10]	Lounge/Waiting Area	0.80	Tunable white or dim-to-warm[9]	0.10
Aging Eye/Low-vision[10]	Multipurpose Room	0.85	Decorative/Display	0.30
Aging Eye/Low-vision[10]	Multipurpose Room	0.85	Tunable white or dim-to-warm[9]	0.10
Aging Eye/Low-vision[10]	Religious Worship Area	1.00	Decorative/Display	0.30
Aging Eye/Low-vision[10]	Religious Worship Area	1.00	Tunable white or dim-to-warm[9]	0.10
Aging Eye/Low-vision[10]	Restroom	1.00	Decorative/Display	0.20
Aging Eye/Low-vision[10]	Stairwell	0.80	Decorative/Display	0.30
Audience Seating Area	NA	0.50	Decorative/Display	0.25
Auditorium Area	NA	0.70	Decorative/Display	0.45
Auto Repair / Maintenance Area	NA	0.55	Detailed Task Work[6]	0.20
Barber, Beauty Salon, Spa Area	NA	0.70	Detailed Task Work[6]	0.30
Barber, Beauty Salon, Spa Area	NA	0.70	Decorative/Display	0.25
Civic Meeting Place Area	NA	0.90	Decorative/Display	0.25
Classroom, Lecture, Training, Vocational Area	NA	0.60	White or Chalk Board[1]	7 W/ft
Concourse and Atria Area	NA	0.60	Decorative/Display	0.25
Convention, Conference, Multipurpose and Meeting Area	NA	0.75	Decorative	0.25
Convention, Conference, Multipurpose and Meeting Area	NA	0.75	Wall Display MH <= 10'6"	2 W/ft

BUILDING TYPE/USE	PRIMARY FUNCTION AREA	ALLOWED LIGHTING POWER DENSITY FOR GENERAL LIGHTING (W/FT^2)	ADDITIONAL LIGHTING POWER QUALIFIED LIGHTING SYSTEMS	ADDITIONAL LIGHTING POWER ADDITIONAL ALLOWANCE [3] (W/FT^2, UNLESS NOTED OTHERWISE)
Convention, Conference, Multipurpose and Meeting Area	NA	0.75	Wall Display MH 10'7"- 14'	2.35 W/ft
Convention, Conference, Multipurpose and Meeting Area	NA	0.75	Wall Display MH > 14'	2.66 W/ft

~~(CONTINUED): TABLE 601.3-C(3) [TABLE 140.6-C] AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT^2)~~

~~Building Type/Use~~	~~Primary Function Area~~	~~Allowed Lighting Power Density for General Lighting (W/ft^2)~~		Additional Lighting Power Qualified Lighting Systems	~~Additional Lighting Power Additional Allowance [3] (W/ft^2, unless noted otherwise)~~
~~Convention, Conference, Multipurpose and Meeting Area~~	~~NA~~	~~0.75~~	~~Floor Display and Task MH <= 10'6"~~	~~0.30~~	
~~Convention, Conference, Multipurpose and Meeting Area~~	~~NA~~	~~0.75~~	~~Floor Display and Task MH 10'7"- 14'~~	~~0.35~~	
~~Convention, Conference, Multipurpose and Meeting Area~~	~~NA~~	~~0.75~~	~~Floor Display and Task MH > 14'~~	~~0.40~~	
~~Copy Room~~	~~NA~~	~~0.50~~	~~NA~~	~~NA~~	
~~Corridor Area~~	~~NA~~	~~0.40~~	~~Decorative/Display~~	~~0.25~~	
~~Dining Area~~	~~Bar/Lounge and Fine Dining~~	~~0.45~~	~~Decorative~~	~~0.35~~	
~~Dining Area~~	~~Bar/Lounge and Fine Dining~~	~~0.45~~	~~Wall Display MH <= 10'6"~~	~~1.25 W/ft~~	
~~Dining Area~~	~~Bar/Lounge and Fine Dining~~	~~0.45~~	~~Wall Display MH 10'7"- 14'~~	~~1.5 W/ft~~	
~~Dining Area~~	~~Bar/Lounge and Fine Dining~~	~~0.45~~	~~Wall Display MH > 14'~~	~~1.7 W/ft~~	
~~Dining Area~~	~~Bar/Lounge and Fine Dining~~	~~0.45~~	~~Floor Display and Task MH <= 10'6"~~	~~0.45~~	
~~Dining Area~~	~~Bar/Lounge and Fine Dining~~	~~0.45~~	~~Floor Display and Task MH 10'7"- 14'~~	~~0.52~~	
~~Dining Area~~	~~Bar/Lounge and Fine Dining~~	~~0.45~~	~~Floor Display and Task MH > 14'~~	~~0.60~~	
~~Dining Area~~	~~Bar/Lounge and Fine Dining~~	~~0.45~~	~~General Lighting in the enclosed space of ceiling height > 10'~~	~~0.25~~	
~~Dining Area~~	~~Cafeteria/Fast Food~~	~~0.45~~	~~Decorative/Display~~	~~0.25~~	
~~Dining Area~~	~~Family and Leisure~~	~~0.40~~	~~Decorative/Display~~	~~0.25~~	
~~Electrical, Mechanical, Telephone Rooms~~	~~NA~~	~~0.40~~	~~Detailed Task Work[6]~~	~~0.20~~	
~~Exercise/Fitness Center and Gymnasium Area~~	~~NA~~	~~0.50~~	~~NA~~	~~NA~~	
~~Financial Transaction Area~~	~~NA~~	~~0.70~~	~~Decorative/Display~~	~~0.25~~	

Building Type/Use	Primary Function Area	Allowed Lighting Power Density for General Lighting (W/ft²)		Additional Lighting Power Qualified Lighting Systems
Healthcare Facility and Hospitals	Exam/Treatment Room	1.15	NA	NA
Healthcare Facility and Hospitals	Imaging Room	0.60	Decorative/Display	0.20
Healthcare Facility and Hospitals	Imaging Room	0.60	Tunable white or dim-to-warm[9]	0.10
Healthcare Facility and Hospitals	Medical Supply Room	0.55	NA	NA
Healthcare Facility and Hospitals	Nursery	0.80	Tunable white or dim-to-warm[9]	0.10

~~(CONTINUED): TABLE 601.3-C(3) [TABLE 140.6-C] AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT^2)~~

~~Building Type/Use~~	~~Primary Function Area~~	~~Allowed Lighting Power Density for General Lighting (W/ft^2)~~		~~Additional Lighting Power Qualified Lighting Systems~~	~~Additional Lighting Power Additional Allowance [3] (W/ft^2, unless noted otherwise)~~
~~Healthcare Facility and Hospitals~~	~~Nurse's Station~~	~~0.85~~	~~Tunable white or dim-to-warm[9]~~	~~0.10~~	
~~Healthcare Facility and Hospitals~~	~~Nurse's Station~~	~~0.85~~	~~Detailed Task Work[6]~~	~~0.20~~	
~~Healthcare Facility and Hospitals~~	~~Operating Room~~	~~1.90~~	~~NA~~	~~NA~~	
~~Healthcare Facility and Hospitals~~	~~Patient Room~~	~~0.70~~	~~Decorative/Display~~	~~0.15~~	
~~Healthcare Facility and Hospitals~~	~~Patient Room~~	~~0.70~~	~~Tunable white or dim-to-warm[9]~~	~~0.10~~	
~~Healthcare Facility and Hospitals~~	~~Physical Therapy Room~~	~~0.75~~	~~Tunable white or dim-to-warm[9]~~	~~0.10~~	
~~Healthcare Facility and Hospitals~~	~~Recovery Room~~	~~0.90~~	~~Tunable white or dim-to-warm[9]~~	~~0.10~~	
~~Hotel Function Area~~	~~NA~~	~~0.85~~	~~Decorative/Display~~	~~0.25~~	
~~Kitchen/Food Preparation Area~~	~~NA~~	~~0.95~~	~~NA~~	~~NA~~	
~~Laboratory, Scientific~~	~~NA~~	~~0.90~~	~~Specialized Task Work[8]~~	~~0.35~~	
~~Laundry Area~~	~~NA~~	~~0.45~~	~~-~~	~~-~~	
~~Library~~	~~Reading Area~~	~~0.80~~	~~Decorative/Display~~	~~0.25~~	
~~Library~~	~~Stacks Area~~	~~1.00~~	~~NA~~	~~NA~~	
~~Lobby, Main Entry~~	~~NA~~	~~0.70~~	~~Decorative~~	~~0.25~~	
~~Lobby, Main Entry~~	~~NA~~	~~0.70~~	~~Wall Display MH <= 10'6"~~	~~3 W/ft~~	
~~Lobby, Main Entry~~	~~NA~~	~~0.70~~	~~Wall Display MH 10'7" - 14'~~	~~3.5 W/ft~~	
~~Lobby, Main Entry~~	~~NA~~	~~0.70~~	~~Wall Display MH > 14'~~	~~4 W/ft~~	
~~Locker Room~~	~~NA~~	~~0.45~~	~~NA~~	~~NA~~	
~~Lounge, Breakroom, or Waiting Area~~	~~NA~~	~~0.55~~	~~Decorative/Display~~	~~0.25~~	
~~Manufacturing, Commercial and Industrial Work Area~~	~~Low Bay~~	~~0.60~~	~~Detailed Task Work[6]~~	~~0.20~~	
~~Manufacturing, Commercial and Industrial Work Area~~	~~High Bay~~	~~0.65~~	~~Detailed Task Work[6]~~	~~0.20~~	

Building Type/Use	Primary Function Area	Allowed Lighting Power Density for General Lighting (W/ft²)		Additional Lighting Power Qualified Lighting Systems
Manufacturing, Commercial and Industrial Work Area	Precision	0.85	Precision Specialized Work[8]	0.70
Museum Area	Exhibition/Display	0.60	Decorative/Display	0.45
Museum Area	Restoration Room	0.70	Detailed Task Work[6]	0.35
Office Area	> 250 square feet	0.60	Decorative/Display and Portable lighting for office areas[5]	0.20
Office Area	≤ 250 square feet	0.65	Decorative/Display and Portable lighting for office areas[5]	0.20

(CONTINUED): TABLE 601.3-C(3) [TABLE 140.6-C] AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)

Building Type/Use	Primary Function Area	Allowed Lighting Power Density for General Lighting (W/ft²)		Additional Lighting Power Qualified Lighting Systems	Additional Lighting Power Additional Allowance [3] (W/ft², unless noted otherwise)
Parking Garage Area	Parking Zone and Ramps	0.10	First ATM or Ticket Machine	100 W	
Parking Garage Area	Parking Zone and Ramps	0.10	Additional ATM or Ticket Machine	50 W/each	
Parking Garage Area	Daylight Adaptation Zones[2]	1.00	NA	NA	
Pharmacy Area		1.00	Specialized Task Work[8]	0.35	
Retail Sales Area	Grocery Sales	1.00	Decorative	0.35	
Retail Sales Area	Grocery Sales	1.00	Wall Display MH <= 10'6"	6.6 W/ft	
Retail Sales Area	Grocery Sales	1.00	Wall Display MH 10'7"- 14'	7.76 W/ft	
Retail Sales Area	Grocery Sales	1.00	Wall Display MH > 14'	8.8 W/ft	
Retail Sales Area	Grocery Sales	1.00	Floor Display and Task MH <= 10'6"	0.60	
Retail Sales Area	Grocery Sales	1.00	Floor Display and Task MH 10'7"- 14'	0.70	
Retail Sales Area	Grocery Sales	1.00	Floor Display and Task MH > 14'	0.80	
Retail Sales Area	Grocery Sales	1.00	General Lighting in the enclosed space of ceiling height > 10'	0.10	
Retail Sales Area	Retail Merchandise Sales	0.95	Decorative	0.35	
Retail Sales Area	Retail Merchandise Sales	0.95	Wall Display MH <= 10'6"	9.5 W/ft	
Retail Sales Area	Retail Merchandise Sales	0.95	Wall Display MH 10'7"- 14'	11.2 W/ft	
Retail Sales Area	Retail Merchandise Sales	0.95	Wall Display MH > 14'	12.7 W/ft	
Retail Sales Area	Retail Merchandise Sales	0.95	Floor Display and Task MH <= 10'6"	0.45	
Retail Sales Area	Retail Merchandise Sales	0.95	Floor Display and Task MH 10'7"- 14'	0.52	
Retail Sales Area	Retail Merchandise Sales	0.95	Floor Display and Task MH > 14'	0.60	

(CONTINUED): TABLE 601.3-C(3) [TABLE 140.6-C] AREA CATEGORY METHOD – LIGHTING POWER DENSITY VALUES (WATTS/FT²)

Building Type/Use	Primary Function Area	Allowed Lighting Power Density for General Lighting (W/ft²)		Additional Lighting Power Qualified Lighting Systems
Retail Sales Area	Retail Merchandise Sales	0.95	Valuable Display Case	0.50
Retail Sales Area	Retail Merchandise Sales	0.95	General Lighting in the enclosed space of ceiling height > 10'	0.10
Retail Sales Area	Fitting Room	0.60	External Illuminated Mirror[4]	40 W/ea
Retail Sales Area	Fitting Room	0.60	Internal Illuminated Mirror[4]	120 W/ea
Religious Worship Area		0.95	Decorative/Display	0.25
Restrooms		0.65	Decorative/Display	0.35
Stairwell		0.60	Decorative/Display	0.35
Storage, Commercial/Industrial	Warehouse	0.40	NA	NA

Building Type/Use	Primary Function Area	Allowed Lighting Power Density for General Lighting (W/ft²)	Additional Lighting Power Qualified Lighting Systems	Additional Lighting Power Additional Allowance [3] (W/ft², unless noted otherwise)
Storage, Commercial/Industrial	Shipping and Handling	0.60	NA	NA
Sports Arena – Playing Area	Class I Facility[12]	2.25	NA	NA
Sports Arena – Playing Area	Class II Facility[12]	1.45	NA	NA
Sports Arena – Playing Area	Class III Facility[12]	1.10	NA	NA
Sports Arena – Playing Area	Class IV Facility[12]	0.75	NA	NA
Theater Area	Motion picture	0.50	Decorative/Display	0.25
Theater Area	Performance	0.80	Decorative/Display	0.25
Transportation Function	Baggage Area	0.40	NA	NA
Transportation Function	Ticketing Area	0.45	Decorative/Display	0.20
Videoconferencing Studio	NA	0.90	Videoconferencing[13]	1.00
All other	NA	0.40	NA	NA

Footnotes to TABLE 601.3-(3) *[TABLE 140.6-C]* are listed below:

a. Aging Eye/Low-vision areas can be documented as being designed to comply with the *light* levels in *ANSI*/IES RP-28 and are or will be licensed by local or state authorities for either senior long-term care, adult day care, senior support, and/or people with special visual needs.

b. *Tunable white luminaires* capable of color change greater than or equal to 2000K *CCT*, or *dim-to-warm luminaires* capable of color change greater than or equal to 500K *CCT*, connected to controls that allow color changing of the *luminaires*. Transition *lighting* OFF at night. *Lighting* power controlled by astronomical time clock or other control to shut off *lighting* at night. For aging eye/low vision lobbies: additional allowance only applies to area within 30 feet of an exit and not applicable to *lighting* in *daylit zones*.~~.~~

c. Detailed task work—*Lighting* provides high level of visual acuity required for activities with close attention to small elements and/or extreme close-up work.

d. Specialized task work—*Lighting* provides for small-scale, cognitive or fast performance visual tasks; *lighting* required for operating specialized equipment associated with pharmaceutical/laboratorial activities.

e. Precision specialized work—*Lighting* for work performed within a commercial or industrial environment that entails working with low contrast, finely detailed, or fast-moving objects.

f. White board or chalk board~~.~~—Directional *lighting* dedicated to a white board or chalk board.

g. *Daylight Adaptation Zones* shall be no longer than 66 feet from the entrance to the parking garage. For parking garages: additional allowance only applicable to *Daylight Adaptation Zones* with *lighting* power controlled by astronomical time clock or other control to shut off *lighting* at night.

h. Illuminated mirrors. — *Lighting* shall be dedicated to the mirror.

i. *Portable lighting* in *office areas* includes under shelf or furniture-mounted supplemental *task lighting* qualifies when controlled by a time clock or an occupancy sensor.

j. Class I Facility is used for competition play for 5000 or more spectators.

Class II Facility is used for competition play for up to 5000 spectators.

Class III Facility is used for competition play for up to 2000 spectators.

Class IV Facility is normally used for recreational play and there is limited or no provision for spectators.

k. *Unleased tenant areas* in which a tenant has not been identified. See section 601.3.1.3.2.1(2).

l. The additional videoconferencing *lighting* power shall be allowed provided the *videoconferencing studio* meets all the requirements of Section 601.3.1.3.3 [Section 140.6(c)2Gvii].

~~Footnotes for Table 601.3-C *[Table 140.6-C]* are listed below.~~

~~1. White board or chalk board. – Directional *lighting* dedicated to a white board or chalk board.~~

~~2. *Daylight Adaptation Zones* shall be no longer than 66 feet from the entrance to the parking *garage*.~~

~~3. MH denotes the *luminaire* mounting height of the qualified *lighting* systems.~~

4. Illuminated mirrors. *Lighting* shall be dedicated to the mirror.

5. *Portable lighting* in *office areas* includes under shelf or furniture-mounted supplemental *task lighting* qualifies when controlled by a time clock or an *occupancy* sensor.

6. Detailed task work – *Lighting* provides high level of visual acuity required for activities with close attention to small elements and/or extreme close up work.

7. Specialized task work – *Lighting* provides for small-scale, cognitive or fast performance visual tasks; *lighting* required for operating specialized *equipment* associated with pharmaceutical/laboratorial activities.

8. *Precision* specialized work – *Lighting* for work performed within a commercial or industrial environment that entails working with low contrast, finely detailed, or fast moving objects.

9. *Tunable white luminaires* capable of color change greater than or equal to 2000K *CCT*, or *dim-to-warm luminaires* capable of color change greater than or equal to 500K *CCT*, connected to controls that allows color changing of the *luminaires*.

10. Aging Eye/Low-vision areas can be documented as being designed to comply with the light levels in ANSI/IES RP-28 and are or will be licensed by local or state authorities for either senior long-term care, adult day care, senior support, and/or people with special visual needs.

11. Transition *lighting* OFF at night. Lighting power controlled by astronomical time clock or other control to shut off *lighting* at night. Additional LPD only applies to area within 30 feet of an exit. Not applicable to *lighting* in *daylit zones*.

12. Class I Facility is used for competition play for 5000 or more spectators. Class II Facility is used for competition play for up to 5000 spectators. Class III Facility is used for competition play for up to 2000 spectators. Class IV Facility is normally used for recreational play and there is limited or no provision for spectators.

13. The additional videoconferencing lighting power shall be allowed provided the *videoconferencing studio* meets all the requirements of Section 601.3.1.3.3 *[Section 140.6(c)2Gvii]*.

601.3.1.1.3.3 *[Section 140.6(c)2A-~~F~~D]* **Area Category Method for Group R occupancies.**

Under the Area Category Method, the Allowed Indoor *Lighting* Power is the sum of the Allowed Baseline *Lighting* Power calculated in accordance with Section 601.3.1.1.3.3.1 and the Allowed Additional *Lighting* Power calculated in accordance with Section 601.3.1.1.3.3.2. Requirements for using the Area Category Method include all of the following:

1. The Area Category Method shall be used only for primary function areas, as defined in Section 200 *[Section 100.1]*, that are *listed* in Table 601.3-(4) *[Table 140.6-C]*. For primary function areas not listed, selection of a reasonably equivalent type shall be permitted.
2. Primary function areas in Table 601.3-(4) *[Table 140.6-C]* shall not apply to a complete *building*. Each primary function area shall be determined as a separate area.
3. For purposes of compliance with Section 601.3.1.1.3.3 *[Section 140.6(c)2]*, an "area" shall be defined as all contiguous areas that accommodate or are associated with a single primary function area listed in Table 601.3-(4) *[Table 140.6-C]*.
4. Where areas are bounded or separated by interior partitions, the floor area occupied by those interior partitions may be included in primary function area.

601.3.1.1.3.3.1 *[Section 140.6(c)2E&F]* **Area Category Method – Allowed Baseline Lighting Power**

The Allowed Baseline *Lighting* Power for the *building* is the sum of the Allowed Baseline *Lighting* Power for all areas in the *building* as follows:

1. Under the Area Category Method, the Allowed Baseline *Lighting* Power for each primary function area is the baseline *lighting* power density allowance in Table 601.3-(4) *[Table 140.6-C]* times the square feet of the primary function area.
2. If at the time of permitting for a *newly constructed building*, a tenant has not been identified for a multitenant area, a maximum of 0.4 watts per square foot shall be allowed for the *lighting* in each area in which a tenant has not been identified. The area shall be classified as *unleased tenant area*.

601.3.1.1.3.3.2 *[Section 140.6(c)2G]* **Area Category Method - Allowed Additional Lighting Power for qualifying lighting systems.**

In addition to Allowed Baseline *Lighting* Power calculated according to Section 601.3.1.1.3.3.1 *[Sections 140.6(c)2E through F]*, the *building* may add the Allowed Additional *Lighting* Power for qualifying *lighting* systems as specified in the Qualifying *Lighting* Systems column in Table 601.3-(4) *[Table 140.6-C]* under the following conditions:

1. **Qualifying *lighting* systems.** Only primary function areas having a *lighting* system as specified in the Qualifying *Lighting* Systems column in Table 601.3-(4) *[Table 140.6-C]* and in accordance with the corresponding footnote of the Table shall qualify for the additional *lighting* power allowances; and

2. **Task areas and *lighting* equipment shown on plans.** The additional *lighting* power allowances shall be used only if the plans clearly identify all applicable task areas and the *lighting equipment* designed to illuminate these tasks; and

3. **Tasks not eligible.** Tasks that are performed less than two hours per day or poor quality tasks that can be improved are not eligible for the additional *lighting* power allowances; and

4. ***Luminaire* types not eligible.** The additional *lighting* power allowances shall not utilize *luminaires* that are used for *general lighting* and where there is no *general lighting* system in the space, the *lighting* system used to illuminate the area shall not qualify for additional *lighting* power allowances; and

5. **Area Category Method only.** The additional *lighting* power allowances shall not be used when using the Complete *Building* Method; and

6. **Additional *lighting* power allowed.** The additional *lighting* power allowed in each space is the smaller of:

   6.1. the *lighting* power density listed in the "Allowed Additional *Lighting* LPD" columns in Table 601.3-(4) *[Table 140.6-C]*, times the square feet of the primary function area, or

   6.2. the adjusted indoor *lighting* power of the applicable *lighting* in the space; and

7. ***Videoconferencing studios*.** Additional *lighting* power for videoconferencing as specified in Table 601.3-(4) *[Table 140.6-C]* shall be allowed in a *videoconferencing studio*, as defined in Section 200 *[Section 100.1]*, provided the following conditions are met:

   7.1. A completed and signed installation certificate is prepared and submitted in accordance with Section 601.2.5.2 *[Section 130.4(b)]*, specifically detailing compliance with the applicable requirements of Section 601.3.1.3.3.2.7 *[Section 140.6(c)2Gvii]*; and

   7.2. The *videoconferencing studio* is a room with permanently installed videoconferencing cameras, audio *equipment*, and playback *equipment* for both audio-based and video-based two-way communication between local and remote sites; and

   7.3. *General lighting* is switched in accordance with the requirements of Section 601.2.2.2 *[Section 130.1(b)]*; and

   7.4. Wall wash *lighting* is separately switched from the *general lighting* system; and

7.5. All of the *lighting* in the studio, including *general lighting* and additional videoconferencing *lighting* power allowed by Section 601.3.1.3.3.2.7 *[Section 140.6(c)2Gvii]* is controlled by a *multi-scene programmable control* system (also known as a scene preset control system).

8. **Floor displays.** Floor displays shall not qualify for wall display allowances.

9. **Wall displays.** Additional allowed power for *wall display lighting* is available only for *lighting* illuminates walls having wall displays. The length of walls shall include the length of the perimeter walls, including but not limited to closable openings and permanent full-height interior partitions. Permanent full-height interior partitions are those that (I) extend from the floor to within two feet of the ceiling or are taller than ten feet and (II) are permanently anchored to the floor. Qualifying wall *lighting* shall:

   9.1. Be mounted within 10 feet of the wall having wall display. When *track lighting* is used for wall display, and where portions of *lighting* track are more than 10 feet from the wall and other portions are within 10 feet of the wall, portions of track more than 10 feet from the wall shall not be used for the wall decorative/display allowance; and

   9.2. Be a *lighting* system type appropriate for wall *lighting*. *Lighting* systems appropriate for wall *lighting* are *lighting* track adjacent to the wall, wall-washer *luminaires*, *luminaires* behind a wall valance or wall cove, or accent *light*. (Accent *luminaires* are adjustable or fixed *luminaires* providing directional display *light*.)

10. **Mounting Height.** Mounting height shall be *luminaire* mounting height measured from the finished floor to the bottom of the *luminaire*. If *luminaires* are mounted at different mounting height within the same space, the average mounting height of the *luminaires* qualified for the additional *lighting* power allowances in Table 601.3-(4) *[Table 140.6-C]* can be used to establish the mounting height of the qualified *luminaires* for calculations of the additional *lighting* power allowances of the qualified *luminaires*.

TABLE 601.3-(4) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR GROUP R OCCUPANCIES

~~**TABLE 601.3(5) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT² FOR *GROUP R OCCUPANCIES***~~

***BUILDING* TYPE/USE**	**PRIMARY FUNCTION AREA**	**BASELINE ALLOWED *LIGHTING* POWER DENSITY FOR *GENERAL LIGHTING* (W/FT²)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**
Aging Eye/Low-vision[10j]	*Corridor Area*	0.70	Decorative/Display	0.30		
Aging Eye/Low-vision[10j]	Dining	0.80	Decorative/Display	0.30	*Tunable white* or dim-to-warm[9i]	0.10
Aging Eye/Low-vision[10j]	Lobby, Main Entry	0.85	Decorative/Display	0.30	Transition *Lighting* OFF at night[11k]	0.95
Aging Eye/Low-vision[10j]	Lobby, Main Entry	0.85	*Tunable white* or dim-to-warm[9i]	0.10	NA	NA
Aging Eye/Low-vision[10j]	Lounge/*Waiting Area*	0.80	Decorative/Display	0.30	*Tunable white* or dim-to-warm9	0.10
Aging Eye/Low-vision[10j]	*Multipurpose Room*	0.85	Decorative/Display	0.30	*Tunable white* or dim-to-warm[9i]	0.10
Aging Eye/Low-vision[10j]	*Religious Worship Area*	1.00	Decorative/Display	0.30	*Tunable white* or dim-to-warm[9i]	0.10
Aging Eye/Low-vision[10j]	*Restroom*	1.00	Decorative/Display	0.20	NA	NA
Aging Eye/Low-vision[10j]	*Stairwell*	0.80	Decorative/Display	0.30	NA	NA
Audience Seating Area	NA	0.50	Decorative/Display	0.25	NA	NA
Auditorium Area	NA	0.70	Decorative/Display	0.45	NA	NA
Auto Repair / *Maintenance Area*	NA	0.55	Detailed Task Work[6f]	0.20	NA	NA

~~TABLE 601.3(5) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR GROUP R OCCUPANCIES~~

***BUILDING* TYPE/USE**	**PRIMARY FUNCTION AREA**	**BASELINE ALLOWED *LIGHTING* POWER DENSITY FOR *GENERAL LIGHTING* (W/FT²)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**
Barber, Beauty Salon, Spa Area	NA	0.70	Detailed Task Work[6f]	0.30	Decorative/Display	0.25
Civic Meeting Place Area	NA	0.90	Decorative/Display	0.25	NA	NA
Classroom, Lecture, Training, *Vocational Area*	NA	0.60	White or Chalk Board[1a]	7 W/ft	NA	NA
Concourse and Atria Area	NA	0.60	Decorative/Display	0.25	NA	NA
Convention, Conference, Multipurpose and *Meeting Area*	NA	0.75	Decorative	0.25	Wall Display MH <= 10’6”	2 W/ft
Convention, Conference, Multipurpose and *Meeting Area*	NA	0.75	Wall Display MH 10’7”-14’	2.35 W/ft	Wall Display MH > 14’	2.66 W/ft
Convention, Conference, Multipurpose and *Meeting Area*	NA	0.75	Floor Display and Task MH <= 10’6”	0.30	Floor Display and Task MH 10’7”- 14’	0.35
Convention, Conference, Multipurpose and *Meeting Area*	NA	0.75	Floor Display and Task MH > 14’	0.40	NA	NA
Copy Room	NA	0.50	NA	NA	NA	NA
Corridor Area	NA	0.40	Decorative/Display	0.25	NA	NA
Dining Area	Bar/Lounge and *Fine Dining*	0.45	Decorative	0.35	Wall Display MH <= 10’6”	1.25 W/ft

~~TABLE 601.3(5) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR GROUP R OCCUPANCIES~~

***BUILDING* TYPE/USE**	**PRIMARY FUNCTION AREA**	**BASELINE ALLOWED *LIGHTING* POWER DENSITY FOR *GENERAL LIGHTING* (W/FT²)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**
Dining Area	Bar/Lounge and *Fine Dining*	0.45	Wall Display MH 10'7"-14'	1.5 W/ft	Wall Display MH > 14'	1.7 W/ft
Dining Area	Bar/Lounge and *Fine Dining*	0.45	Floor Display and Task MH <= 10'6"	0.45	Floor Display and Task MH 10'7"- 14'	0.52
Dining Area	Bar/Lounge and *Fine Dining*	0.45	Floor Display and Task MH > 14'	0.60	*General Lighting* in the *enclosed space* of ceiling height > 10'	0.25
Dining Area	*Cafeteria*/*Fast Food*	0.45	Decorative/Display	0.25	NA	NA
Dining Area	Family and Leisure	0.40	Decorative/Display	0.25	NA	NA
Electrical/~~,~~ Mechanical/~~,~~ *Telephone Rooms*	NA	0.40	Detailed Task Work[6f]	0.20	NA	NA
Exercise/*Fitness Center* and *Gymnasium Area*	NA	0.50	NA	NA	NA	NA
Financial Transaction Area	NA	0.70	Decorative/Display	0.25	NA	NA
Healthcare Facility and Hospitals	Exam/*Treatment Room*	1.15	NA	NA	NA	NA
Healthcare Facility and Hospitals	*Imaging Room*	0.60	Decorative/Display	0.20	*Tunable white* or dim-to-warm[9i]	0.10
Healthcare Facility and Hospitals	*Medical Supply Room*	0.55	NA	NA	NA	NA
Healthcare Facility and Hospitals	*Nursery*	0.80	*Tunable white* or dim-to-warm[9i]	0.10	NA	NA

~~TABLE 601.3(5) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR *GROUP R OCCUPANCIES*~~

***BUILDING* TYPE/USE**	**PRIMARY FUNCTION AREA**	**BASELINE ALLOWED *LIGHTING* POWER DENSITY FOR *GENERAL LIGHTING* (W/FT²)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**
Healthcare Facility and Hospitals	*Nurse's Station*	0.85	*Tunable white* or dim-to-warm[9i]	0.10	Detailed Task Work[6f]	0.20
Healthcare Facility and Hospitals	*Operating Room*	1.90	NA	NA	NA	NA
Healthcare Facility and Hospitals	*Patient Room*	0.70	Decorative/Display	0.15	*Tunable white* or dim-to-warm[9i]	0.10
Healthcare Facility and Hospitals	*Physical Therapy Room*	0.75	*Tunable white* or dim-to-warm[9i]	0.10	NA	NA
Healthcare Facility and Hospitals	*Recovery Room*	0.90	*Tunable white* or dim-to-warm[9i]	0.10	NA	NA
Hotel Function Area	NA	0.85	Decorative/Display	0.25	NA	NA
Kitchen/Food Preparation Area	NA	0.95	NA	NA	NA	NA
Laboratory, Scientific	NA	0.90	Specialized Task Work[8h]	0.35	NA	NA
Laundry Area	NA	0.45	-	-	NA	NA
Library	*Reading Area*	0.80	Decorative/Display	0.25	NA	NA
Library	Stacks Area	1.00	NA	NA	NA	NA
Lobby, Main Entry	NA	0.70	Decorative	0.25	Wall Display MH <= 10'6"	3 W/ft
Lobby, Main Entry	NA	0.70	Wall Display MH 10'7"-14'	3.5 W/ft	Wall Display MH > 14'	4 W/ft
Locker Room	NA	0.45	NA	NA	NA	NA

~~TABLE 601.3(5) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR *GROUP R OCCUPANCIES*~~

***BUILDING* TYPE/USE**	**PRIMARY FUNCTION AREA**	**BASELINE ALLOWED *LIGHTING* POWER DENSITY FOR *GENERAL LIGHTING* (W/FT²)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**
Lounge, *Breakroom*, or *Waiting Area*	NA	0.55	Decorative/Display	0.25	NA	NA
Manufacturing, Commercial and Industrial Work Area	*Low Bay*	0.60	Detailed Task Work[6f]	0.20	NA	NA
Manufacturing, Commercial and Industrial Work Area	*High Bay*	0.65	Detailed Task Work[6f]	0.20	NA	NA
Manufacturing, Commercial and Industrial Work Area	Precision	0.85	Precision Specialized Work[8h]	0.70	NA	NA
Museum Area	Exhibition/Display	0.60	Decorative/Display	0.45	NA	NA
Museum Area	*Restoration Room*	0.70	Detailed Task Work[6f]	0.35	NA	NA
Office Area	> 250 square feet	0.60	Decorative/Display and *Portable lighting* for office areas[5e]	0.20	NA	NA
Office Area	≤ 250 square feet	0.65	Decorative/Display and *Portable lighting* for office areas[5e]	0.20	NA	NA
Parking Garage Area	*Parking Zone and Ramps*	0.10	First *ATM* or Ticket Machine	100 W	Additional *ATM* or Ticket Machine	50 W/each
Parking Garage Area	Daylight Adaptation Zones[2b]	1.00	NA	NA	NA	NA
Pharmacy Area		1.00	Specialized Task Work[8h]	0.35	NA	NA
Retail Sales Area	*Grocery Sales*	1.00	Decorative	0.35	Wall Display MH <= 10'6"	6.6 W/ft

~~TABLE 601.3(5) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR *GROUP R OCCUPANCIES*~~

***BUILDING* TYPE/USE**	**PRIMARY FUNCTION AREA**	**BASELINE ALLOWED *LIGHTING* POWER DENSITY FOR *GENERAL LIGHTING* (W/FT²)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**
Retail Sales Area	*Grocery Sales*	1.00	Wall Display MH 10'7"-14'	7.76 W/ft	Wall Display MH > 14'	8.8 W/ft
Retail Sales Area	*Grocery Sales*	1.00	Floor Display and Task MH <= 10'6"	0.60	Floor Display and Task MH 10'7"- 14'	0.70
Retail Sales Area	*Grocery Sales*	1.00	Floor Display and Task MH > 14'	0.80	*General Lighting* in the *enclosed space* of ceiling height > 10'	0.10
Retail Sales Area	*Retail Merchandise Sales*	0.95	Decorative	0.35	Wall Display MH <= 10'6"	9.5 W/ft
Retail Sales Area	*Retail Merchandise Sales*	0.95	Wall Display MH 10'7"-14'	11.2 W/ft	Wall Display MH > 14'	12.7 W/ft
Retail Sales Area	*Retail Merchandise Sales*	0.95	Floor Display and Task MH <= 10'6"	0.45	Floor Display and Task MH 10'7"- 14'	0.52
Retail Sales Area	*Retail Merchandise Sales*	0.95	Floor Display and Task MH > 14'	0.60	Valuable Display Case	0.50
Retail Sales Area	*Retail Merchandise Sales*	0.95	*General Lighting* in the *enclosed space* of ceiling height > 10'	0.10	NA	NA
Retail Sales Area	*Fitting Room*	0.60	External Illuminated Mirror[4d]	40 W/ea	Internal Illuminated Mirror[4d]	120 W/ea
Religious Worship Area		0.95	Decorative/Display	0.25	NA	NA
Restrooms		0.65	Decorative/Display	0.35	NA	NA
Stairwell		0.60	Decorative/Display	0.35	NA	NA

~~TABLE 601.3(5) [TABLE 140.6-C] AREA CATEGORY METHOD—LIGHTING POWER DENSITY VALUES (WATTS/FT²) FOR GROUP R OCCUPANCIES~~

***BUILDING* TYPE/USE**	**PRIMARY FUNCTION AREA**	**BASELINE ALLOWED *LIGHTING* POWER DENSITY FOR *GENERAL LIGHTING* (W/FT²)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**	**ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS**	**ADDITIONAL *LIGHTING* POWER ADDITIONAL ALLOWANCE [3c] (W/FT², UNLESS NOTED OTHERWISE)**
Storage, Commercial/Industrial	*Warehouse*	0.40	NA	NA	NA	NA
Storage, Commercial/Industrial	*Shipping and Handling*	0.60	NA	NA	NA	NA
Sports Arena—Playing Area	Class I Facility[~~12l~~]	2.25	NA	NA	NA	NA
Sports Arena—Playing Area	Class II Facility[~~12l~~]	1.45	NA	NA	NA	NA
Sports Arena—Playing Area	Class III Facility[~~12l~~]	1.10	NA	NA	NA	NA
Sports Arena—Playing Area	Class IV Facility[~~12l~~]	0.75	NA	NA	NA	NA
Theater Area	Motion picture	0.50	Decorative/Display	0.25	NA	NA
Theater Area	Performance	0.80	Decorative/Display	0.25	NA	NA
Transportation Function	*Baggage Area*	0.40	NA	NA	NA	NA
Transportation Function	*Ticketing Area*	0.45	Decorative/Display	0.20	NA	NA
Videoconferencing Studio	NA	0.90	Videoconferencing[~~13m~~]	1.00	NA	NA
All other	NA	0.40	NA	NA	NA	NA

Footnotes for Table 601.3-(~~4~~5) *[Table 140.6-C2]* are listed below:

a. White board or chalk board.—Directional *lighting* dedicated to a white board or chalk board.

b. *Daylight Adaptation Zones* shall be no longer than 66 feet from the entrance to the parking *garage*.

c. MH denotes the *luminaire* mounting height of the qualified *lighting* systems.

d. Illuminated mirrors. *Lighting* shall be dedicated to the mirror.

e. *Portable lighting* in *office areas* includes under shelf or furniture-mounted supplemental *task lighting* qualifies when controlled by a time clock or an *occupancy* sensor.

f. Detailed task work—*Lighting* provides high level of visual acuity required for activities with close attention to small elements and/or extreme close-up work.

g. Specialized task work—*Lighting* provides for small-scale, cognitive or fast performance visual tasks; *lighting* required for operating specialized *equipment* associated with pharmaceutical/laboratorial activities.

h. *Precision* specialized work—*Lighting* for work performed within a commercial or industrial environment that entails working with low contrast, finely detailed, or fast-moving objects.

i. *Tunable white luminaires* capable of color change greater than or equal to 2000K *CCT*, or *dim-to-warm luminaires* capable of color change greater than or equal to 500K *CCT*, connected to controls that allow color changing of the *luminaires*.

j. Aging Eye/Low-vision areas can be documented as being designed to comply with the *light* levels in *ANSI*/IES RP-28 and are or will be licensed by local or state authorities for either senior long-term care, adult day care, senior support, and/or people with special visual needs.

k. Transition *lighting* OFF at night. *Lighting* power controlled by astronomical time clock or other control to shut off *lighting* at night. Additional LPD only applies to area within 30 feet of an exit. Not applicable to *lighting* in *daylit zones*.

l. Class I Facility is used for competition play for 5000 or more spectators. Class II Facility is used for competition play for up to 5000 spectators. Class III Facility is used for competition play for up to 2000 spectators. Class IV Facility is normally used for recreational play and there is limited or no provision for spectators.

m. The additional videoconferencing *lighting* power shall be allowed provided the *videoconferencing studio* meets all the requirements of Section 601.3.1.4.3 *[Section 140.6(c)2Gvii].*

~~Footnotes for Table 601.3(5) *[Table 140.6-C2]* are listed below.~~

~~14. White board or chalk board.—Directional *lighting* dedicated to a white board or chalk board.~~

~~15. *Daylight Adaptation Zones* shall be no longer than 66 feet from the entrance to the parking *garage*.~~

~~16. MH denotes the *luminaire* mounting height of the qualified *lighting* systems.~~

~~17. Illuminated mirrors. *Lighting* shall be dedicated to the mirror.~~

18. *Portable lighting* in *office areas* includes under shelf or furniture-mounted supplemental *task lighting* qualifies when controlled by a time clock or an *occupancy* sensor.
19. Detailed task work—*Lighting* provides high level of visual acuity required for activities with close attention to small elements and/or extreme close-up work.
20. Specialized task work—*Lighting* provides for small-scale, cognitive or fast performance visual tasks; *lighting* required for operating specialized *equipment* associated with pharmaceutical/laboratorial activities.
21. *Precision* specialized work—*Lighting* for work performed within a commercial or industrial environment that entails working with low contrast, finely detailed, or fast-moving objects.
22. *Tunable white luminaires* capable of color change greater than or equal to 2000K *CCT*, or *dim-to-warm luminaires* capable of color change greater than or equal to 500K *CCT*, connected to controls that allow color changing of the *luminaires*.
23. Aging Eye/Low-vision areas can be documented as being designed to comply with the light levels in ANSI/IES RP-28 and are or will be licensed by local or state authorities for either senior long-term care, adult day care, senior support, and/or people with special visual needs.
24. Transition *lighting* OFF at night. Lighting power controlled by astronomical time clock or other control to shut off *lighting* at night. Additional LPD only applies to area within 30 feet of an exit. Not applicable to *lighting* in *daylit zones*.
25. Class I Facility is used for competition play for 5000 or more spectators. Class II Facility is used for competition play for up to 5000 spectators. Class III Facility is used for competition play for up to 2000 spectators. Class IV Facility is normally used for recreational play and there is limited or no provision for spectators.
26. The additional videoconferencing lighting power shall be allowed provided the *videoconferencing studio* meets all the requirements of Section 601.3.1.4.3 *[Section 140.6(c)2Gvii]*.

601.3.2 *[Section 140.7(a)]* **Outdoor lighting.**

An *outdoor lighting* installation complies with this section if it meets the requirements in Sections 601.3.2.1 and Section 601.3.2.2, and the actual *outdoor lighting* power installed is no greater than the allowed *outdoor lighting* power calculated under Section 601.3.2.3. The allowed *outdoor lighting* shall be calculated according to *outdoor lighting zone* in Section 601.3.2.3.5 *[Title 24, Part 1, Section 10-114]*.

Exceptions to Section 601.3.2: When more than 50 percent of the *light* from a *luminaire* falls within one or more of the following applications, the *lighting* power for that *luminaire* shall not be required to comply with Section 601.3.2:

1. Temporary *outdoor lighting*.
2. *Lighting* required and regulated by the Federal Aviation Administration, and the Coast Guard.
3. *Lighting* for public streets, roadways, highways, and *traffic sign*age *lighting*, including *lighting* for driveway entrances occurring in the public right-of-way.
4. *Lighting* for sports and athletic fields, and children's playgrounds.
5. *Lighting* for industrial sites, including but not limited to, rail yards, maritime shipyards and docks, piers and marinas, chemical and petroleum processing plants, and aviation facilities.
6. *Lighting* of *public monuments*.
7. *Lighting* of *signs* complying with the requirements of Section 601.2.4 *[Section 130.3]* and Section 601.3.3 *[Section 140.8]*.
8. *Lighting* of tunnels, bridges, *stairs*, wheelchair elevator lifts for American with Disabilities Act (ADA) compliance, and ramps that are other than parking *garage* ramps.
9. *Landscape lighting*.
10. In theme parks: *outdoor lighting* only for themes and special effects.
11. *Lighting* for outdoor theatrical and other outdoor live performances, provided that these *lighting* systems are *additions* to area *lighting* systems and are controlled by a multi-scene or theatrical cross-fade control station *accessible* only to authorized operators.
12. *Outdoor lighting* systems for qualified historic *buildings*, as defined in the California Historic *Building* Code (Title 24, Part 8), if they consist solely of historic *lighting* components or replicas of historic *lighting* components. If *lighting* systems for qualified historic *buildings* contain some historic *lighting* components or replicas of historic components, combined with other *lighting* components, only those historic or historic replica components are exempt. All other *outdoor lighting* systems for qualified historic *buildings* shall comply with Section 601.3.2 *[Section 140.7]*.

601.3.2.1 *[Section 140.7(b)]* **Outdoor lighting power trade-offs.**

Outdoor lighting power trade-offs shall be determined as follows:

1. Allowed *lighting* power determined according to Sections 601.3.2.3.1 through 601.3.2.3.3 *[Section 140.7(d)1]* for general *hardscape lighting* allowance may be traded to specific applications in Section 601.3.2.3.4 *[Section 140.7(d)2]*, provided the *hardscape* area from which the *lighting* power is traded continues to be illuminated in accordance with Section 601.3.2.3.1 *[Section 140.7(d)1A]*.
2. Allowed *lighting* power determined according to Section 601.3.2.3.4 *[Section 140.7(d)2]* for additional *lighting* power allowances for specific applications shall not be traded between specific applications, or to general *hardscape lighting* in Sections 601.3.2.3.1 through 601.3.2.3.3 *[Section 140.7(d)1]*.
3. Trading of *lighting* power allowances between outdoor and in*door areas* shall not be permitted.

601.3.2.2 *[Section 140.7(c)]* **Calculation of actual lighting power.**

The wattage of outdoor *luminaires* shall be determined in accordance with Section 601.2.1 *[Section 130.0(c)]*.

601.3.2.3 *[Section 140.7(d)]* **Calculation of allowed lighting power.**

The allowed *lighting* power shall be the combined total of the sum of the general *hardscape lighting* allowance and the sum of the additional *lighting* power allowance for specific applications.

The general *hardscape lighting* allowance shall be the sum of the allowed watts determined from Sections 601.3.2.3.1, 601.3.2.3.2, and 601.3.2.3.3 *[Section 140.7(d)1A-C]*.

The additional *lighting* power allowance for specific applications shall be determined in accordance with Section 601.3.2.3.4 *[Section 140.7(d)2]*.

601.3.2.3.1 *[Section 140.7(d)1A]* **Illuminated hardscape area allowance.**

The general *hardscape* area of a site shall include *parking lot*(s), roadway(s), driveway(s), sidewalk(s), walkway(s), bikeway(s), plaza(s), bridge(s), tunnel(s), and other improved area(s) that are illuminated.

In plan view of the site, determine the illuminated *hardscape* area, which is defined as any *hardscape* area that is within a square pattern around each *luminaire* or pole that is ten times the *luminaire* mounting height with the *luminaire* in the middle of the pattern, less any areas that are within a *building*, beyond the *hardscape* area, beyond property lines or obstructed by a structure.

The illuminated *hardscape* area shall include portions of planters and landscaped areas that are within the *lighting* application and are less than or equal to 10 feet wide in the short dimensions and are enclosed by *hardscape* or other improvement on at least three sides.

Multiply the illuminated *hardscape* area by the area wattage allowance (AWA) from Table 601.3-~~D~~(4) *[Table 140.7-A]* for the appropriate *lighting* zone.

601.3.2.3.2 *[Section 140.7(d)1B]* **Hardscape perimeter allowance.**

Determine the perimeter length of the general *hardscape* area. The total perimeter shall not include portions of *hardscape* that are not illuminated according to Section 601.3.2.3.1 *[Section 140.7(d)1A]*.

Multiply the *hardscape* perimeter by the linear wattage allowance (LWA) for *hardscape* from Table 601.3-~~D~~(4) *[Table 140.7-A]* for the appropriate *lighting* zone.

The perimeter length for *hardscape* around landscaped areas and permanent planters shall be determined as follows:

1. Landscaped areas completely enclosed within the *hardscape* area, and which have a width or length less than 10 feet wide, shall not be added to the *hardscape* perimeter length.
2. Landscaped areas completely enclosed within the *hardscape* area, and which width or length is a minimum of 10 feet wide, the perimeter of the landscaped areas or permanent planter shall be added to the *hardscape* perimeter length.
3. Landscaped edges that are not abutting the *hardscape* shall not be added to the *hardscape* perimeter length.

601.3.2.3.3 *[Section 140.7(d)1C]* **Initial Wattage Allowance (IWA).**

Determine the Initial Wattage Allowance (IWA) for general *hardscape lighting* from Table 601.3-~~D~~(54) *[Table 140.7-A]* for the appropriate *lighting* zone. The *hardscape* area shall be permitted one IWA per site.

TABLE 601.3-~~D~~(~~46~~5) [TABLE 140.7-A] GENERAL HARDSCAPE LIGHTING POWER ALLOWANCE

TYPE OF POWER ALLOWANCE	LIGHTING ZONE ~~0~~2[0][b]	LIGHTING ZONE ~~1~~2[1][b]	LIGHTING ZONE ~~2~~2[2][b]	LIGHTING ZONE ~~3~~2[3][b]	LIGHTING ZONE ~~4~~2[4][b]
Area Wattage Allowance (AWA)	No ~~allowance~~[1]allowance[a]	0.016 W/ft²	0.019 W/ft²	0.021 W/ft²	0.024 W/ft²
Linear Wattage Allowance (LWA)	No ~~allowance~~[1]allowance[a]	0.13 W/lf	0.15 W/lf	0.20 W/lf	0.29 W/lf
Initial Wattage Allowance (IWA)	No ~~allowance~~[1]allowance[a]	150 W	200 W	250 W	320 W

Footnotes for Table 601.3-(~~465~~) *[Table 140.7-A]*:

a. Continuous *lighting* is explicitly prohibited in *Lighting* Zone 0. A single *luminaire* of 15 Watts or less may be installed at an entrance to a parking area, trail head, fee payment kiosk, outhouse, or toilet facility, as required to provide safe navigation of the site infrastructure. *Luminaires* installed shall meet the maximum *zonal* lumen limits as specified in Section 601.2.3.1 *[Section 130.2(b)]*.

b. *Narrow band spectrum light sources* with a dominant peak wavelength greater than 580 nm – as mandated by local, state, or federal agencies to minimize the impact on local, active professional astronomy or nocturnal habitat of specific local fauna – shall be allowed a 2.0 *lighting* power allowance multiplier.

~~Footnotes for Table 601.3-D *[Table 140.7-A]*:~~

~~1. Continuous *lighting* is explicitly prohibited in Lighting Zone 0. A single *luminaire* of 15 Watts or less may be installed at an entrance to a parking area, trail head, fee payment kiosk, outhouse, or toilet facility, as required to provide safe navigation of the site infrastructure. *Luminaires* installed shall meet the maximum *zonal* lumen limits as specified in Section 601.2.3.1 *[Section 130.2(b)]*.~~

~~2. *Narrow band spectrum light sources* with a dominant peak wavelength greater than 580 nm – as mandated by local, state, or federal agencies to minimize the impact on local, active professional astronomy or nocturnal habitat of specific local fauna – shall be allowed a 2.0 lighting power allowance multiplier.~~

601.3.2.3.4 *[Section 140.7(d)2]* **Additional lighting power allowance for specific applications.**

Additional *lighting* power for specific applications shall be the smaller of the additional *lighting* allowances for specific applications determined in accordance with Table 601.3-~~E~~(65~~)~~ *[Table 140.7-B]* for the appropriate *lighting* zone, or the actual installed *lighting* power meeting the requirements for the allowance.

TABLE 601.3-E~~5~~(56) [TABLE 140.7-B] ADDITIONAL LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS

ALL AREA AND DISTANCE MEASUREMENTS IN PLAN VIEW UNLESS OTHERWISE NOTED.

PER APPLICATION: WATTAGE ALLOWANCE PER APPLICATION. Use all that apply as appropriate.

***LIGHTING* APPLICATION**	***LIGHTING* ZONE 0**	***LIGHTING* ZONE 1**	***LIGHTING* ZONE 2**	***LIGHTING* ZONE 3**	***LIGHTING* ZONE 4**
***Building* Entrances or Exits.** Allowance per *door*. *Luminaires* qualifying for this allowance shall be within 20 feet of the *door*.	Not applicable	9 watts	15 watts	19 watts	21 watts
Primary Entrances to Senior Care Facilities, Police Stations, *Healthcare Facilities*, Fire Stations, and Emergency Vehicle Facilities. Allowance per primary entrance(s) only. Primary entrances shall provide access for the general public and shall not be used exclusively for staff or service personnel. This allowance shall be in addition to the *building* entrance or exit allowance above. *Luminaires* qualifying for this allowance shall be within 100 feet of the primary entrance.	Not applicable	20 watts	40 watts	57 watts	60 watts
Drive Up *Windows*. Allowance per customer service location. *Luminaires* qualifying for this allowance shall be within 2 mounting heights of the sill of the *window*.	Not applicable	16 watts	30 watts	50 watts	75 watts
***Vehicle Service Station* Uncovered Fuel Dispenser.** Allowance per fueling dispenser. *Luminaires* qualifying for this allowance shall be within 2 mounting heights of the dispenser.	Not applicable	55 watts	77 watts	81 watts	135 watts
***ATM Lighting*.** Allowance per *ATM*. *Luminaires* qualifying for this allowance shall be within 50 feet of the dispenser.	Not applicable	100 watts for first *ATM*, 35 watts for each additional *ATM*.	100 watts for first *ATM*, 35 watts for each additional *ATM*.	100 watts for first *ATM*, 35 watts for each additional *ATM*.	100 watts for first *ATM*, 35 watts for each additional *ATM*.

(CONTINUED): TABLE 601.3-E~~5~~(56) [TABLE 140.7-B] ADDITIONAL LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS

All area and distance measurements in plan view unless otherwise noted.

PER APPLICATION: WATTAGE ALLOWANCE PER UNIT LENGTH (w/linear ft). May be used for one or two frontage side(s) per site.

***LIGHTING* APPLICATION**	***LIGHTING* ZONE 0**	***LIGHTING* ZONE 1**	***LIGHTING* ZONE 2**	***LIGHTING* ZONE 3**	***LIGHTING* ZONE 4**
***Outdoor Sales Frontage*.** Allowance for frontage immediately adjacent to the *principal viewing location*(s) and unobstructed for its viewing length. A corner sales lot may include two adjacent sides provided that a different *principal viewing location* exists for each side. *Luminaires* qualifying for this allowance shall be located between the *principal viewing location* and the frontage outdoor sales area.	Not applicable	No Allowance	11 W/linear ft	19 W/linear ft	25 W/linear ft

(CONTINUED): TABLE 601.3-E~~(5)~~6) [TABLE 140.7-B] ADDITIONAL LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS

All area and distance measurements in plan view unless otherwise noted.

PER APPLICATION: WATTAGE ALLOWANCE PER *HARDSCAPE* AREA (W/ft²). May be used for any illuminated *hardscape* area on the site.

***Lighting* Application**	***Lighting* Zone 0**	***Lighting* Zone 1**	***Lighting* Zone 2**	***Lighting* Zone 3**	***Lighting* Zone 4**
***Hardscape* Ornamental *Lighting*.** Allowance for the total site illuminated *hardscape* area. *Luminaires* qualifying for this allowance shall be rated for 50 watts or less as determined in accordance with Section 601.2.1 *[Section 130.0(c)]*, and shall be post-top *luminaires*, *lanterns*, *pendant luminaires*, or *chandeliers*.	Not applicable	No Allowance	0.007 W/ft²	0.013 W/ft²	0.019 W/ft²

(CONTINUED): TABLE 601.3-E~~(5)~~6) [TABLE 140.7-B] ADDITIONAL LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS

All area and distance measurements in plan view unless otherwise noted.

PER APPLICATION: WATTAGE ALLOWANCE PER SPECIFIC AREA (W/ft²). Use as appropriate provided that none of the following specific applications shall be used for the same area.

***Lighting* Application**	***Lighting* Zone 0**	***Lighting* Zone 1**	***Lighting* Zone 2**	***Lighting* Zone 3**	***Lighting* Zone 4**
***Building* Facades.** Only areas of *building façade* that are illuminated shall qualify for this allowance. *Luminaires* qualifying for this allowance shall be aimed at the *façade* and shall be capable of illuminating it without obstruction or interference by permanent *building* features or other objects.	Not applicable	No Allowance	0.100 W/ft²	0.170 W/ft²	0.225 W/ft²
***Outdoor Sales Lots*.** Allowance for uncovered sales lots used exclusively for the display of vehicles or other merchandise for sale. Driveways, *parking lots* or other non-sales areas shall be considered *hardscape* areas even if these areas are completely surrounded by sales lot on all sides. *Luminaires* qualifying for this allowance shall be within 5 mounting heights of the sales lot area.	Not applicable	0.060 W/ft²	0.210 W/ft²	0.280 W/ft²	0.485 W/ft²
***Vehicle Service Station Hardscape*.** Allowance for the total illuminated *hardscape* area less area of *buildings*, under *canopies*, off property, or obstructed by signs or structures. *Luminaires* qualifying for this allowance shall be illuminating the *hardscape* area and shall not be within a *building*, below a *canopy*, beyond property lines, or obstructed by a sign or other structure.	Not applicable	0.006 W/ft²	0.068 W/ft²	0.138 W/ft²	0.200 W/ft²
***Vehicle Service Station Canopies*.** Allowance for the total area within the drip line of the *canopy*. *Luminaires* qualifying for this allowance shall be located under the *canopy*.	Not applicable	0.220 W/ft²	0.430 W/ft²	0.580 W/ft²	1.010 W/ft²

(CONTINUED): TABLE 601.3-~~E~~(~~56~~) [TABLE 140.7-B] ADDITIONAL LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS

All area and distance measurements in plan view unless otherwise noted.

PER APPLICATION: WATTAGE ALLOWANCE PER SPECIFIC AREA (W/ft²). Use as appropriate provided that none of the following specific applications shall be used for the same area.

***Lighting* Application**	***Lighting* Zone 0**	***Lighting* Zone 1**	***Lighting* Zone 2**	***Lighting* Zone 3**	***Lighting* Zone 4**
Sales *Canopies*. Allowance for the total area within the drip line of the *canopy*. *Luminaires* qualifying for this allowance shall be located under the *canopy*.	Not applicable	No Allowance	0.470 W/ft²	0.622 W/ft²	0.740 W/ft²
Non-sales *Canopies* and Tunnels. Allowance for the total area within the drip line of the *canopy* or inside the tunnel. *Luminaires* qualifying for this allowance shall be located under the *canopy* or tunnel.	Not applicable	0.057 W/ft²	0.137 W/ft²	0.270 W/ft²	0.370 W/ft²
Guard Stations. Allowance up to 1,000 square feet per vehicle lane. Guard stations provide access to secure areas controlled by security personnel who stop and may inspect vehicles and vehicle occupants, including identification, documentation, vehicle license plates, and vehicle contents. Qualifying *luminaires* shall be within 2 mounting heights of a vehicle lane or the guardhouse.	Not applicable	0.081 W/ft²	0.176 W/ft²	0.325 W/ft²	0.425 W/ft²
Student Pick-up/Drop-off zone. Allowance for the area of the student pick-up/drop-off zone, with or without *canopy*, for preschool through 12th grade school campuses. A student pick-up/drop off zone is a curbside, controlled traffic area on a school campus where students are picked-up and dropped off from vehicles. The allowed area shall be the smaller of the actual width or 25 feet, times the smaller of the actual length or 250 feet. Qualifying *luminaires* shall be within 2 mounting heights of the student pick-up/drop-off zone.	Not applicable	No Allowance	0.056 W/ft²	0.200 W/ft²	No Allowance
Outdoor Dining. Allowance for the total illuminated *hardscape* of outdoor dining. Outdoor dining areas are *hardscape* areas used to serve and consume food and beverages. Qualifying *luminaires* shall be within 2 mounting heights of the *hardscape* area of outdoor dining.	Not applicable	0.004 W/ft²	0.030 W/ft²	0.050 W/ft²	0.075 W/ft²

(CONTINUED): TABLE 601.3-~~E~~(~~56~~) [TABLE 140.7-B] ADDITIONAL LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS

All area and distance measurements in plan view unless otherwise noted.

PER SITE: WATTAGE ALLOWANCE PER *HARDSCAPE* AREA (W/ft²). May be used as additional allowance for applicable illuminated *hardscape* area on the site.

***Lighting* Application**	***Lighting* Zone 0**	***Lighting* Zone 1**	***Lighting* Zone 2**	***Lighting* Zone 3**	***Lighting* Zone 4**
Special Security *Lighting* for Retail Parking and Pedestrian *Hardscape*. This additional allowance is for illuminated retail parking and pedestrian *hardscape* identified as having special security needs. This allowance shall be in addition to the *building* entrance or exit allowance.	Not applicable	0.004 W/ft²	0.005 W/ft²	0.010 W/ft²	No Allowance

(CONTINUED): TABLE 601.3-~~E~~(65) [TABLE 140.7-B] ADDITIONAL LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS

All area and distance measurements in plan view unless otherwise noted.

PER SITE: WATTAGE ALLOWANCE PER *HARDSCAPE* AREA (W/ft²). May be used as additional allowance for applicable illuminated *hardscape* area on the site.

***Lighting* Application**	***Lighting* Zone 0**	***Lighting* Zone 1**	***Lighting* Zone 2**	***Lighting* Zone 3**	***Lighting* Zone 4**
***Security Cameras*.** This additional allowance is for illuminated general *hardscape* area. This allowance shall apply when a security camera is installed within 2 mounting heights of the general *hardscape* area and mounted more than 10 feet away from a *building*.	Not applicable	No Allowance	0.018 W/ft²	0.018 W/ft²	0.018 W/ft²

601.3.2.3.5 *[Part 1, 10-114]* **Determination of Outdoor Lighting Zones and Administrative Rules for Use.**

This section establishes rules for implementing *outdoor lighting zones* to show compliance with Section 601.3.2 *[140.7]* of Title 24, California Code of Regulations, *Part 6*.

1. ***Lighting* Zones.** Exterior *lighting* allowances in California vary by *Lighting* Zones (LZ).
2. ***Lighting* Zone Characteristics.** Table 601.3(7) *[TABLE 10-114-A]* specifies the relative ambient *illumination* level and the statewide default location for each *lighting* zone.
3. **Amending the *Lighting* Zone Designation.** A local jurisdiction may officially adopt changes to the *lighting* zone designation of an area by following a public process that allows for formal public notification, review, and comment about the proposed change. The local jurisdiction may determine areas where *Lighting* Zone 4 is applicable and may increase or decrease the *lighting* zones for areas that are in State Default *Lighting* Zones 1, 2 and 3, as specified in Table 601.3(7) *[TABLE 10-114-A]*.

TABLE 601.3(7) [TABLE 10-114-A] LIGHTING ZONE CHARACTERISTICS AND RULES FOR AMENDMENTS BY LOCAL JURISDICTIONS

ZONE	AMBIENT *ILLUMINATION*	STATEWIDE DEFAULT LOCATION	MOVING UP TO HIGHER ZONES	MOVING DOWN TO LOWER ZONES
LZ0	Very Low	Undeveloped areas of government designated parks, recreation areas, and wildlife preserves.	Undeveloped areas of government designated parks, recreation areas, and wildlife preserves can be designated as LZ1 or LZ2 if they are contained within such a zone.	Not applicable
LZ1	Low	Rural areas, as defined by the 2020 U.S. Census. These areas include: single or dual family residential areas, parks, and agricultural zone districts, developed portion of government designated parks, recreation areas, and wildlife preserves. Those that are wholly contained within a higher *lighting* zone may be considered by the local government as part of that *lighting* zone.	Developed portion of a government designated park, recreation area, or wildlife preserve, can be designated as LZ2 or LZ3 if they are contained within such a zone. Retail stores, located in a residential neighborhood, and rural town centers can be designated as LZ2 if the business operates during hours of darkness.	Not applicable.
LZ2	Moderate	Urban areas, as defined by the 2020 U.S. Census. The following *building* types may occur here: multifamily housing, *mixed use* residential neighborhoods, religious facilities, schools, and light commercial business districts or industrial zoning districts.	Special districts within a default LZ2 zone may be designated as LZ3 or LZ4 by a local jurisdiction. Examples include special commercial districts or areas with special security considerations located within a mixed-use residential area or city center.	Special districts may be designated as LZ1 by the local jurisdiction, without any size limits.
LZ3	Moderately High	Urban areas, as defined by the 2020 U.S. Census. The following *building* types may occur here: high intensity commercial corridors, entertainment centers, and heavy industrial or manufacturing zone districts.	Special districts within a default LZ3 may be designated as a LZ4 by local jurisdiction for high intensity nighttime use, such as entertainment or commercial districts or areas with special security considerations requiring very high *light* levels.	Special districts may be designated as LZ1 or LZ2 by the local jurisdiction, without any size limits.
LZ4	High	None.	Not applicable.	Not applicable.

601.3.3 *[Section 140.8]* **Sign lighting.**

This section applies to all *internally illuminated and externally illuminated signs*, unfiltered *light emitting diodes* (*LEDs*), and unfiltered neon, both indoor and outdoor. Each *sign* shall comply with either Section 601.3.3.1 or Section 601.3.3.2, as applicable.

Exception 1 to Section 601.3.3: Unfiltered incandescent *lamps* that are not part of an *electronic message center (EMC)*, an *internally illuminated sign* or an *externally illuminated sign*.

Exception 2 to Section 601.3.3: Exit *signs*. Exit *signs* shall meet the requirements of the *Appliance Efficiency Regulations*.

Exception 3 to Section 601.3.3: *Traffic Signs*. *Traffic signs* shall meet the requirements of the *Appliance Efficiency Regulations*.

601.3.3.1 *[Section 140.8(a)]* **Maximum allowed lighting power.**

1. For *internally illuminated signs*, the maximum allowed *lighting* power shall not exceed the product of the illuminated *sign* area and 12 watts per square foot. For *double-faced signs*, only the area of a single face shall be used to determine the allowed *lighting* power.
2. For *externally illuminated signs*, the maximum allowed *lighting* power shall not exceed the product of the illuminated *sign* area and 2.3 watts per square foot. Only areas of an externally lighted *sign* that are illuminated without obstruction or interference, by one or more *luminaires*, shall be used.
3. *Lighting* for unfiltered *light emitting diodes* (*LEDs*) and unfiltered neon shall comply with Section 601.3.3.2 *[Section 140.8(b)]*.

601.3.3.2 *[Section 140.8(b)]* **Alternate lighting sources.**

The *sign* shall be equipped with one or more of the following *light sources*:

601.3.3.2.1 *[Section 140.8(b)1]* **Neon or cold cathode lamps.**

Neon or cold cathode *lamps* with transformer or power supply efficiency greater than or equal to the following when the ratio of the output wattage to the input wattage is at 100 percent tubing load:

1. A minimum efficiency of 75 percent when the transformer or power supply rated output current is less than 50 mA; or
2. A minimum efficiency of 68 percent when the transformer or power supply rated output current is 50 mA or greater.

601.3.3.2.2 *[Section 140.8(b)2]* **Light emitting diodes (LEDs).**

Light emitting diodes (*LEDs*) with a power supply having an efficiency of 80 percent or greater.

Exception to Section 601.3.3.2.2: Single voltage external power supplies that are designed to convert 120 volt AC input into lower voltage DC or AC output and have a nameplate output power less than or equal to 250 watts, shall comply with the

applicable requirements of the *appliance efficiency regulations Appliance Efficiency Regulations* (Title 20).

601.4 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

601.5 *[Section 141.0]* **Additions and alterations to existing buildings.**

601.5.1 *[Section 141.0]* **Additions.**

Additions to existing *nonresidential*, and *hotel/motel* ~~*buildings*~~*use designations*, existing *outdoor lighting* for these *occupancies*, and *internally and externally illuminated signs*, shall meet the mandatory requirements of Section 601.5.1.1 that are applicable to the *use designations*~~*building*~~ project scope, and either the performance compliance approach (*energy budgets*) in Section 601.5.1.3 or the prescriptive compliance approach in Section 601.5.1.2 for the Climate Zone in which the *building* is located. *Climate zones* are shown in Figure 102.2-A *[FIGURE 100.1-A]*.

Covered process requirements for *additions* to existing *nonresidential*, and *hotel/motel use designations*~~*buildings*~~ are specified in Subchapter 9 *[Section 141.1]*.

601.5.1.1 *[Section 141.0(a)]* **Mandatory requirements (Additions).**

The *lighting* of the *addition*; any newly installed *electrical power distribution system*; any *addition* to an *outdoor lighting* system; and any new *sign* installed in conjunction with an indoor or outdoor *addition* shall meet the applicable requirements of the sections listed below:

101.1, 101.2, 101.3 *[Section 100.0(h), 110.0, 110.1]* Systems and Equipment

600.2, 600.3, 601.2 *[Section 110.9, 110.11, 130.0 through 130.5]* Mandatory Requirements for Electrical and *Lighting* Systems

600.4 *[Section 110.12]* Mandatory Requirements for Demand Management

601.5.1.2 *[Section 141.0(a)1]* **Prescriptive requirements (Additions).**

The *lighting* of the *addition*; any *addition* to an *outdoor lighting* system; and any new *sign* installed in conjunction with an indoor or outdoor *addition* shall meet the applicable requirements of the sections listed below:

102.4 *[Section 140.2]* Prescriptive Requirements for *Newly Constructed Buildings*

601.3 *[Section 140.6, 140.7, 140.8]* Prescriptive Requirements for *Lighting* Systems

601.5.1.3 *[Section 141.0(a)2]* **Performance requirements (Additions).**

The indoor *lighting* in the *conditioned space* of the *addition* shall meet the applicable requirements of Section 102 and either the *addition* alone shall comply or the existing *building* plus *addition* plus *alteration* shall comply.

601.5.2 *[Section 141.0(b)]* **Alterations.**

Alterations to components of existing *nonresidential*, *hotel/motel* *use designations*, ~~or~~ *relocatable public school buildings*, or *HCAI facilities*, including *alterations* made in conjunction with a change in *building occupancy* to a *nonresidential,* ~~*high-rise residential,*~~ or *hotel/motel occupancy* shall meet mandatory requirements of Section 601.5.2.1, and either prescriptive requirements of Section 601.5.2.2 or performance requirements of Section 601.5.2.3.

~~**Exception to Section 601.5.2:** *Alterations to healthcare facilities* are not required to comply with this Section.~~

601.5.2.1 *[Section 141.0(b)1]* **Mandatory requirements (Alterations).**

Altered components in a *nonresidential*, ~~or~~ *hotel/motel* *use designations*~~*building*~~, or *HCAI facilities* shall meet the requirements specified in the sections *listed* below that are applicable to the ~~*building*~~ project scope.

Covered process requirements for *alterations*, and *repairs* to existing *nonresidential*, and *hotel/motel* *use designations*~~*buildings*~~ are specified in Subchapter 9 *[Section 141.1]*.

101.1, 101.2, 101.3 *[Section 100.0(h), 110.0, 110.1]* Systems and Equipment

600.2, 601.2 *[Section 110.9, 130.0 through 130.5]* Mandatory Requirements for Electrical and *Lighting* Systems

601.5.2.2 *[Section 141.0(b)2]* **Prescriptive requirements (Alterations).**

601.5.2.2.1 *[Section 141.0(b)2F]* **Spaces with lighting systems installed for the first time.**

Spaces with *lighting* systems installed for the first time shall meet the requirements of Sections 600.2.1 *[Section 110.9]*, 601.1.1 through 601.2.3 *[Sections 130.0, 130.1, 130.2]*, 601.2.5 *[Section 130.4]*, 301.3.10 *[Section 140.3(c)]*, 601.3.1 *[Section 140.6]* and 601.3.2 *[Section 140.7]*.

Exception to Section 601.5.2.2.1: *Alterations* to *healthcare facilities* other than *HCAI facilities*.

601.5.2.2.2 *[Section 141.0(b)2G]* **Addition of skylights to an existing building.**

When the requirements of Section 601.2.2.4 *[Section 130.1(d)]* are triggered by the addition of *skylights* to an existing *building* and the *lighting* system is not recircuited, the daylighting control need not meet the multilevel requirements in Section 601.2.2.4 *[Section 130.1(d)]*.

Exception to Section 601.5.2.2.2: *Alterations* to *healthcare facilities* other than *HCAI facilities*.

601.5.2.2.3 *[Section 141.0(b)2H]* **New illuminated signs.**

New *internally and externally illuminated signs* shall meet the requirements of Sections 600.2.1 *[Section 110.9]*, 601.2.4 *[Section 130.3]* and 601.3.3 *[Section 140.8]*.

Exception to Section 601.5.2.2.3: *Alterations* to *healthcare facilities*.

601.5.2.2.4 *[Section 141.0(b)2I]* **Altered indoor lighting systems.**

Alterations to indoor *lighting* systems that include 10% or more of the *luminaires* serving an *enclosed space* shall meet the requirements of items 1, 2, 3, or ~~3~~ 4 below:

1. **Comply with Section 601.3.1 and Table 601.5-~~A~~(1).** The *alteration* shall comply with the indoor *lighting* power requirements specified in Section 601.3.1 *[Section 140.6]* and the *lighting* control requirements specified in Table 601.5-~~A~~(1) *[Table 141.0-F]*;
2. **80% of power requirements and Table 601.5-~~A~~(1).** The *alteration* shall not exceed 80% of the indoor *lighting* power requirements specified in Section 601.3.1 *[Section 140.6]*, and shall comply with the *lighting* control requirements specified in Table 601.5-~~A~~(1) *[Table 141.0-F]*; or
3. ***One-to-one alterations* for *Nonresidential Buildings* excluding *Group R occupancies*.** The *alteration* shall be a *one-to-one alteration*, the total wattage of the altered *luminaires* shall be no greater than 3,000 watts per *alteration* project, and the total wattage of the altered *luminaires* shall be at least 40% lower compared to their total pre-alteration wattage, and the *alteration* shall comply with the *lighting* control requirements specified in Table 601.5-~~A~~(1) [*Table 141.0-F*].
4. ~~**One-for-one luminaire alteration**~~***One-to-one alterations* for *Group R occupancies*.** The *alteration* shall be a ~~one-for-one *luminaire alteration*~~ *one-to-one alteration* within a *building* or *tenant space* of 5,000 square feet or less, the total wattage of the altered *luminaires* shall be at least 40% lower compared to their total pre-alteration wattage, and the *alteration* shall comply with the *lighting* control requirements specified in Table 601.5-~~A~~(1) *[Table 141.0-F]*.

Alterations to indoor *lighting* systems shall not prevent the operation of existing, unaltered controls, and shall not alter controls to remove functions specified in Section 601.2.2 *[Section 130.1]*.

Alterations to *lighting* wiring are considered *alterations* to the *lighting* system. *Alterations* to indoor *lighting* systems are not required to separate existing general, floor, wall, display, or *decorative lighting* on shared circuits or controls. New or completely replaced *lighting* circuits shall comply with the control separation requirements of Section 601.2.2.1.3 *[Section 130.1(a)3]*.

Exception 1 to Section 601.5.2.2.4: *Alteration* of portable *luminaires*, *luminaires* affixed to moveable partitions, or *lighting* excluded as specified in Section 601.3.1.1.3 *[Section 140.6(a)3]*.

Exception 2 to Section 601.5.2.2.4: Any *enclosed space* with only one *luminaire*.

Exception 3 to Section 601.5.2.2.4: Any *alteration* that would directly cause the disturbance of asbestos unless the *alteration* is made in conjunction with asbestos abatement.

Exception 4 to Section 601.5.2.2.4: Acceptance testing requirements of Section 601.2.5 *[Section 130.4]* are not required for *alterations* where *lighting* controls are added to control 20 or fewer *luminaires*.

Exception 5 to Section 601.5.2.2.4: Any *alteration* limited to adding *lighting* controls or replacing *lamps*, ballasts, or *drivers*.

Exception 6 to Section 601.5.2.2.4: One-for-one *luminaire alteration* of up to 50 *luminaires* either per complete floor of the *building* or per complete *tenant space*, per annum.

Exception 7 to Section 601.5.2.2.4: *Alterations* to *healthcare facilities* other than *HCAI facilities*.

TABLE 601.5-~~A~~(1) [TABLE 141.0-F] – CONTROL REQUIREMENTS FOR INDOOR LIGHTING SYSTEM ALTERATIONS

CONTROL SPECIFICATIONS	CODED SECTION	PROJECTS COMPLYING WITH SECTION 601.5.2.2.4 ITEM 1	PROJECTS COMPLYING WITH 601.5.2.2.4. ITEM 2 3, OR ~~4~~3
Manual Area Controls	601.2.2.1.1 *[130.1(a)1]*	Required	Required
Manual Area Controls	601.2.2.1.2 *[130.1(a)2]*	Required	Required
Manual Area Controls	601.2.2.1.3 *[130.1(a)3]*	Only required for new or completely replaced circuits	Only required for new or completely replaced circuits
Manual Area Controls	601.2.2.1.4 *[New section]*	Required	Not Required
Multilevel Controls	601.2.2.2 *[130.1(b)]*	Required[a]	Not Required[a]
Automatic Shut-Off Controls	601.2.2.3.1 *[130.1(c)1]*	Required[a]	Required[a]
Automatic Shut-Off Controls	601.2.2.3.2 *[130.1(c)2]*	Required[a]	Required[a]
Automatic Shut-Off Controls	601.2.2.3.3 *[130.1(c)3]*	Required[a]	Required[a]
Automatic Shut-Off Controls	601.2.2.3.4 *[130.1(c)4]*	Required[a]	Required[a]
Automatic Shut-Off Controls	601.2.2.3.5 *[130.1(c)5]*	Required[a]	Required[a]
Automatic Shut-Off Controls	601.2.2.3.6 *[130.1(c)6]*	Required[a]	Required; except for 601.2.2.3.6.4 *[130.1(c)6D]* [a]
Automatic Shut-Off Controls	601.2.2.3.7 *[130.1(c)8]*	Required[a]	Required[a]
Daylight Responsive Controls	601.2.2.4 *[130.1(d)]*	Required[a]	Not Required[a]
Demand Responsive Controls	600.4.1 *[110.12(a)]* and 600.4.2 *[110.12(c)]*	Required[a]	Not Required[a]

Footnotes for Table 601.5-(1):

a. Not required for projects in *HCAI facilities.*

601.5.2.2.5 *[Section 141.0(b)2L]* **Altered outdoor lighting systems.**

Alterations to existing *outdoor lighting* systems in a *lighting* application listed in Table 601.3-~~D~~(4) or Table 601.3-~~E~~(5) *[TABLE 140.7-A or 140.7-B]* shall meet the applicable requirements of Section 601.1, Section 601.2.1 and 601.2.2 *[Section 130.0]*, Section 601.2.3.1 *[Section 130.2(b)]*, and Section 601.2.5 *[130.4]*.

Exception 1 to Section 601.5.2.2.5: Acceptance testing requirements of Section 601.2.5 *[130.4]* are not required for *alterations* where controls are added to 20 or fewer *luminaires*.

Exception 2 to Section 601.5.2.2.5: *Alterations* to ***healthcare facilities***.

601.5.2.2.5.1- *Alterations* that increase the connected *lighting* load.

In *alterations* that increase the connected *lighting* load, the added or altered *luminaires* shall meet the applicable requirements of Section 601.2.3.2 *[Section 130.2(c)]* and the requirements of Section 601.3.2 *[Section 140.7]* for general *hardscape lighting* or for the specific *lighting* applications containing the *alterations*.

601.5.2.2.5.2- *Alterations* that do not increase the connected *lighting* load-replacement of 10%-49% of existing *luminaires*.

In *alterations* that do not increase the connected *lighting* load, where 10 percent or more of the existing *luminaires* are replaced in a general *hardscape* or a specific *lighting* application, the *alterations* shall meet the following requirements:

1. In *parking lots* and *outdoor sales lots* where the bottom of the *luminaire* is mounted 24 feet or less above the ground, the replacement *luminaires* shall comply with Section 601.2.3.2.1 *[Section 130.2(c)1]* AND Section 601.2.3.2.3 *[Section 130.2(c)3]*; and
2. For *parking lots* and *outdoor sales lots* where the bottom of the *luminaire* is mounted greater than 24 feet above the ground and for all other *lighting* applications, the replacement *luminaires* shall comply with Section 601.2.3.2.1 *[Section 130.2(c)1]* AND EITHER comply with Section 601.2.3.2.2 *[Section 130.2(c)2]* or be controlled by *lighting control systems*, including motion sensors, that automatically reduce *lighting* power by at least 40 percent in response to the area being vacated of occupants.

Exception to Section 601.5.2.2.5.2: *Alterations* where less than 5 existing *luminaires* are replaced.

601.5.2.2.5.3- *Alterations* that do not increase the connected *lighting* load-replacement of 50% or more of existing *luminaires*.

In *alterations* that do not increase the connected *lighting* load, where 50 percent or more of the existing *luminaires* are replaced in general *hardscape* or a specific application, the replacement *luminaires* shall meet the requirements of Section 601.5.2.2.5.2 above and the requirements of Section 601.3.2 *[Section 140.7]* for

general *hardscape lighting* or specific *lighting* applications containing the *alterations*.

Exception 1 to Section 601.5.2.2.5.3: *Alterations* where the replacement *luminaires* have at least 40 percent lower power consumption compared to the original *luminaires* are not required to comply with the *lighting* power allowances of Section 601.3.2 *[Section 140.7]*.

Exception 2 to Section 601.5.2.2.5.3: *Alterations* where less than 5 existing *luminaires* are replaced.

601.5.2.2.6 *[Section 141.0(b)2M]* **Altered illuminated signs.**

Alterations to existing *internally and externally illuminated signs* that increase the connected *lighting* load, replace and rewire more than 50 percent of the ballasts, or relocate the *sign* to a different location on the same site or on a different site shall meet the requirements of Section 601.3.3 *[Section 140.8]*.

Exception 1 to Section 601.5.2.2.6: Replacement of parts of an existing *sign*, including replacing *lamps*, the *sign* face or ballasts, that do not require rewiring or that are done at a time other than when the *sign* is relocated, is not an *alteration* subject to the requirements of Section 601.5.2.2.6 *[Section 141.0(b)2M]*.

Exception 2 to Section 601.5.2.2.6: *Alterations* to *healthcare facilities*.

601.5.2.2.7 *[Section 141.0(b)2P]* **Altered electrical power distribution systems.**

Alterations to *electrical power distribution systems* shall meet the applicable requirements of Section 601.2.6 *[Section 130.5]* as follows:

601.5.2.2.7.1- *Service electrical metering*. New or replacement electrical *service equipment* shall meet the requirements of Section 601.2.6.1 *[Section 130.5(a)]* applicable to the *electrical power distribution system* altered.

601.5.2.2.7.2- Separation of electrical circuits for electrical energy monitoring. For entirely new or complete replacement of *electrical power distribution systems*, the entire system shall meet the applicable requirements of Section 601.2.6.2 *[Section 130.5(b)]*.

601.5.2.2.7.3- Voltage drop. *Alterations* of feeders and branch circuits where the *alteration* includes *addition*, modification, or replacement of both feeders and branch circuits, the altered circuits shall meet the requirements of Section 601.2.6.3 *[Section 130.5(c)]*.

Exception to Section 601.5.2.2.7.3: Voltage drop permitted by California Electrical Code Sections 647.4, 695.6 and 695.7.

601.5.2.2.7.4- Circuit controls for 120-Volt receptacles and controlled receptacles. For entirely new or complete replacement of *electrical power distribution systems*, the entire system shall meet the applicable requirements of Section 601.2.6.4 *[Section 130.5(d)]* and Section 600.4.4 *[Section 130.5(e)]*.

Exception to 601.5.2.2.7: *Alterations* to *healthcare facilities*.

601.5.2.3 *[Section 141.0(b)3]* **Performance requirements (Alterations).**

The altered *lighting* components, and any newly installed *equipment* serving the *alteration*, shall meet the applicable requirements of Section 102.

Exception to Section 601.5.2.3: *Alteration* to *healthcare facilities*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 602

SINGLE-FAMILY RESIDENTIAL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

602.1 *[Section 150.0]* **General.**

Section 602 establishes requirements for the design and installation of all *lighting* systems and equipment in *single-family* *use designations* ~~residential buildings~~, *outdoor lighting*, and electrical power distribution within the scope of Section 100.3 *[Section 100.1(a)]*.

NOTE: The requirements of Sections 602.2 through 602.4 apply to *newly constructed buildings*. Sections 602.2 and 602.5 apply to *additions* or *alterations*.

602.2 *[Section 150.0]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

602.2.1 *[Section 150.0(k)]* ~~**Residential**~~ **Single-family lighting.**

602.2.1.1 *[Section 150.0(k)1A]* **Luminaire efficacy.**

All installed *luminaires* and *light sources* shall comply with Reference Joint Appendix JA8 and shall be certified and marked as required by JA8.

Exception 1 to Section 602.2.1.1: *Lighting* integral to exhaust fans, *kitchen* range hoods, bath vanity mirrors, *garage door* openers, and *ceiling fan* kits that are subject to DOE's Appliance and Equipment Standards Program.

Exception 2 to Section 602.2.1.1: Navigation *lighting* rated less than five watts, such as night *lights*, step *lights*, and path *lights*.

Exception 3 to Section 602.2.1.1: *Lighting* with an efficacy of 45 lumens per watt or greater and located internal to drawers, cabinetry, or linen *closets*.

Exception 4 to Section 602.2.1.1: *Light sources* as follows:

1. *LED light sources* installed outdoors;
2. *Inseparable solid state lighting (SSL) luminaires* containing *colored light sources* that are installed to provide *decorative lighting*;
3. High intensity discharge (HID) *light sources* including pulse start metal halide and high pressure sodium *light sources*; and
4. *Luminaires* with hardwired high frequency generator and induction *lamp*.

602.2.1.2 *[Section 150.0(k)1C]* **Recessed downlight luminaires in ceilings.**

Luminaires recessed into ceilings shall meet all of the following requirements:

602.2.1.2.1- Shall not contain screw base *lamp* sockets; and

602.2.1.2.2- Have a label that certifies the *luminaire* is airtight with air leakage less than 2.0 cfm at 75 Pascals when tested in accordance with *ASTM E283*. An exhaust fan housing with integral *light* shall not be required to be certified airtight; and

Exception to Sections 602.2.1.2.2: *Recessed luminaires* marked for use in fire-rated installations extruded into ceiling space and *recessed luminaires* installed in noninsulated ceilings.

602.2.1.2.3- Be sealed with a gasket or caulk between the *luminaire* housing and ceiling, and have all air leak paths between conditioned and *unconditioned spaces* sealed with a gasket or caulk, or be installed per manufacturer's instructions to maintain airtightness between the *luminaire* housing and ceiling; and

Exception to Sections 602.2.1.2.3: *Recessed luminaires* marked for use in fire-rated installations extruded into ceiling space and *recessed luminaires* installed in noninsulated ceilings.

602.2.1.2.4- Meet the clearance and installation requirements of California Electrical Code Article 410.116 for *recessed luminaires*.

602.2.1.3 *[Section 150.0(k)1D]* **Light sources in enclosed or recessed luminaires.**

Lamps and other separable *light sources* in enclosed or *recessed luminaires* shall be in compliance with the JA8 elevated temperature requirements, including marking requirements.

602.2.1.4 *[Section 150.0(k)1E]* **Blank electrical boxes.**

The number of electrical boxes that are more than five feet above the finished floor and do not contain a *luminaire* or other device shall be no greater than the number of bedrooms. These electrical boxes shall be served by a *dimmer*, vacancy sensor control, *low voltage* wiring, or fan speed control.

602.2.1.5 *[Section 150.0(k)2]* **Indoor lighting controls.**

Lighting controls shall comply with the applicable requirements of Section 600.2 *[Section 110.9]*.

An *energy management control system (EMCS)* or a *multi-scene programmable control* may be used to comply with dimming, *occupancy*, and *lighting* control requirements in Section 602.2.1.5 *[Section 150.0(k)2]* if it provides the functionality of the specified controls in accordance with Section 600.2 *[Section 110.9]* and the physical *manual* ON/OFF controls specified in Section 602.2.1.5.1 *[Section 150.0(k)2A]*.

No controls shall bypass control functions of a *dimmer*, occupant sensor, or vacancy sensor where the *dimmer* or sensor has been installed to comply with Section 602.2.1.5 *[Section 150.0(k)2]*.

602.2.1.5.1- *Manual* ON/OFF controls. *Lighting* shall have *readily accessible* wall-mounted controls that allow the *lighting* to be manually turned ON and OFF.

Exception to Section 602.2.1.5.1: *Ceiling fans* may provide control of integrated *lighting* via a remote control.

602.2.1.5.2- Automatic-off controls. In *bathrooms*, *garages*, *laundry* rooms, *utility rooms* and walk-in *closets*, at least one installed *luminaire* shall be controlled by an *occupancy* or vacancy sensor providing automatic-off functionality.

For *lighting* internal to drawers and cabinetry with opaque fronts or *doors*, controls that turn the *light* off when the drawer or *door* is closed shall be provided.

602.2.1.5.3- Dimming controls. *Lighting* in *habitable spaces*, including living rooms, *dining* rooms, *kitchens*, and bedrooms, shall have *readily accessible* wall-mounted dimming controls that allow the *lighting* to be manually adjusted up and down. *Forward phase cut dimmers* controlling *LED light sources* in these spaces shall comply with *NEMA SSL 7A*.

Exception 1 to Section 602.2.1.5.3: *Ceiling fans* may provide control of integrated *lighting* via a remote control. *Lighting* integral to *kitchen* range hoods and *bathroom* exhaust fans.

Exception 2 to Section 602.2.1.5.3: *Luminaires* connected to a circuit with controlled *lighting* power less than 20 watts or controlled by an *occupancy* or vacancy sensor providing automatic-off functionality.

Exception 3 to Section 602.2.1.5.3: Navigation *lighting* rated less than five watts**,** such as night *lights*, step *lights*, and path *lights*. *Lighting* controlled by automatic-off controls and located internal to drawers, cabinetry with opaque fronts, or cabinetry with *doors*.

602.2.1.5.4- Independent controls. *Lighting* integral to exhaust fans shall be controlled independently from the fans. The following shall be controlled separately from ceiling-installed *lighting* such that one can be turned on without turning on the other:

1. Undercabinet *lighting*.
2. Undershelf *lighting*.
3. Interior *lighting* of display cabinets.
4. Switched outlets.

602.2.1.6 *[Section 150.0(k)3]* **Outdoor lighting controls.**

In addition to meeting the requirements of Section 602.2.1.1 *[Section 150.0(k)1A]*, *luminaires* providing ~~residential~~ *single-family outdoor lighting* shall meet the requirements of this section, as applicable.

1. *Outdoor lighting* permanently mounted to a *residential building* or to other *buildings* on the same lot shall meet the following requirements:
   1.1. Controlled by a *manual* ON and OFF control switch that permits the *automatic* actions of item 1.2 or 1.3 below; and
   1.2. Controlled by one of the following controls:
      1.2.1. a photocell and a motion sensor; or
      1.2.2. a photocell and an *automatic time switch control*; or
   1.3. controlled by an astronomical time clock control.
2. Controls that override to ON shall not be allowed unless the override automatically returns the *automatic* control to its normal operation within six hours.

3. An *energy management control system* (*EMCS*) or other controls that provides the specified *lighting* control functionality and complies with all requirements applicable to the specified controls may be used to meet these requirements.

602.2.1.7 *[Section 150.0(k)4]* **Internally illuminated address signs.**

Internally illuminated address *signs* shall either:

1. Comply with Section 601.3.3 *[Section 140.8]*; or
2. Consume no more than five watts of power.

602.2.1.8 *[Section 150.0(k)5]* **Residential garages for eight or more vehicles.**

Lighting for residential parking *garages* for eight or more vehicles shall comply with the applicable requirements for nonresidential *garages* in Sections 600.2 *[Section 110.9]*, 601.2.1 *[Section 130.0(c)]*, 601.2.2 *[Section 130.0(d) and (e), Section 130.1]*, 601.2.5 *[Section 130.4]*, 601.3.1 *[Section 140.6]*, and 601.5 *[Section 141.0]*.

602.2.2 Electric ready buildings.

602.2.2.1 *[Section 150.0(n)1]* **Heat pump water heater ready.**

Systems using gas or propane *water heaters* to serve individual *dwelling units* shall designate a space at least 2.5 feet by 2.5 feet wide and 7 feet tall suitable for the future installation of a *heat pump water heater (HPWH)* by meeting either Section 602.2.2.1.1 or Section 602.2.2.1.2 below.

All electrical components shall be installed in accordance with the *California Electrical Code*.

602.2.2.1.1- Designated space is within 3 feet from the water heater. If the designated space is within 3 feet from the *water heater*, then this space shall include the following:

1. A dedicated 125 volt, 20 amp electrical receptacle that is connected to the electric panel with a 120/240 volt 3 conductor, branch circuit rated at 30 amps minimum, within 3 feet from the *water heater* and *accessible* to the *water heater* with no obstructions; and
2. Both ends of the unused conductor shall be labeled with the word “spare” and be electrically isolated; and
3. A reserved single pole circuit breaker space in the electrical panel adjacent to the circuit breaker for the branch circuit in A above and labeled with the words “Future 240V Use”; and
4. A condensate drain that is no more than 2 inches higher than the base of the installed *water heater*, and allows natural draining without pump assistance.

602.2.2.1.2- Designated space is more than 3 feet from the water heater. If the designated space is more than 3 feet from the *water heater*, then this space shall include the following:

1. A dedicated 240 volt branch circuit shall be installed within 3 feet from the designated space. The branch circuit shall be rated at 30 amps minimum. The blank cover shall be identified as “240V ready”; and

2. The main electrical *service* panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future *HPWH* installation. The reserved space shall be permanently marked as "For Future 240V use"; and
3. Either a dedicated cold water supply, or the cold water supply shall pass through the designated *HPWH* location just before reaching the gas or propane *water heater*; and
4. The hot water supply pipe coming out of the gas or propane *water heater* shall be routed first through the designated *HPWH* location before serving any fixtures; and
5. The hot and cold water piping at the designated *HPWH* location shall be exposed and *readily accessible* for future installation of an *HPWH*; and
6. A condensate drain that is no more than 2 inches higher than the base of the installed *water heater*, and allows natural draining without pump assistance.

602.2.2.2 *[Section 150.0(t)]* **Heat pump space heater ready.**

Systems using gas or propane furnace to serve individual *dwelling units* shall include the following:

1. A dedicated 240 volt branch circuit wiring shall be installed within 3 feet from the furnace and *accessible* to the furnace with no obstructions. The branch circuit conductors shall be rated at 30 amps minimum. The blank cover shall be identified as "240V ready." All electrical components shall be installed in accordance with the *California Electrical Code*.
2. The main electrical *service* panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future *heat pump* space heater installation. The reserved space shall be permanently marked as "For Future 240V use."

602.2.2.3 *[Section 150.0(u)]* **Electric cooktop ready.**

Systems using gas or propane cooktop to serve individual *dwelling units* shall include the following:

1. A dedicated 240 volt branch circuit wiring shall be installed within 3 feet from the cooktop and *accessible* to the cooktop with no obstructions. The branch circuit conductors shall be rated at 50 amps minimum. The blank cover shall be identified as "240V ready." All electrical components shall be installed in accordance with the *California Electrical Code*.
2. The main electrical *service* panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future electric cooktop installation. The reserved space shall be permanently marked as "For Future 240V use."

602.2.2.4 *[Section 150.0(v)]* **Electric clothes dryer ready.**

Clothes dryer locations with gas or propane plumbing to serve individual *dwelling units* shall include the following:

1. A dedicated 240 volt branch circuit wiring shall be installed within 3 feet from the clothes dryer location and *accessible* to the clothes dryer location with no obstructions. The branch circuit conductors shall be rated at 30 amps minimum. The blank cover shall be identified as "240V ready." All electrical components shall be installed in accordance with the *California Electrical Code*.

2. The main electrical *service* panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future electric clothes dryer installation. The reserved space shall be permanently marked as "For Future 240V use."

602.3 Prescriptive requirements (Newly Constructed).

RESERVED.

602.4 Performance requirements (Newly Constructed).

RESERVED.

602.5 *[Section 150.2]* **Additions and alterations to existing buildings.**

602.5.1 *[Section 150.2(a)]* **Additions.**

Additions to existing *single-family* *use designations* ~~*residential buildings*~~ shall meet the mandatory requirements of Section 602.5.1.1, and either prescriptive requirements of Section 602.5.1.2 or performance requirements of Section 602.5.1.3 *[Section 150.2(a)1 or 2]*.

602.5.1.1 *[Section 150.2(a)]* **Mandatory requirements (Additions).**

Lighting and electrical systems and *equipment* shall meet the requirements of the sections listed below:

101.2, 101.3 *[Section 110.0, 110.1]* Systems and Equipment

600.2, 602.2.1, 602.2.2.1 *[Section 110.9, 150.0(k), 150.0(n)1]* Mandatory Requirements for *Lighting* Controls and Electric Ready

602.5.1.2 Prescriptive requirements (Additions).

RESERVED.

602.5.1.3 Performance requirements (Additions).

RESERVED.

602.5.2 *[Section 150.2(b)]* **Alterations.**

Alterations to existing *single-family* ~~*residential buildings*~~*use designations* or *alterations* in conjunction with a change in *building occupancy* to a *single-family* ~~*residential*~~ *occupancy* shall meet mandatory requirements of Section 602.5.2.1, and either prescriptive requirements of Section 602.5.2.2 or performance requirements of Section 602.5.2.3.

602.5.2.1 *[Section 150.2(b)1]* **Mandatory requirements (Alterations).**

The *altered component* and any newly installed *equipment* serving the *alteration* shall meet the applicable requirements of. the sections listed below :

101.2, 101.3 *[Section 110.0, 110.1]* Systems and Equipment

600.2, 602.2.1 *[Section 110.9, 150.0(k)]* Mandatory Requirements for *Lighting* Controls

602.5.2.2 *[Section 150.2(b)1]* **Prescriptive requirements (Alterations).**

Where existing screw base sockets are present in ceiling-recessed *luminaires*, removal of these sockets is not required provided that new JA8 compliant trim kits or *lamps* designed for use with recessed downlights or *luminaires* are installed.

602.5.2.3 *[Section 150.2(b)2]* **Performance requirements (Alterations).**

RESERVED.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 603

MULTIFAMILY OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

603.1 *[Section 160.0]* **General.**

Section 603 establishes requirements for the design and installation of all *lighting* systems and equipment in multifamily *use designations*~~buildings~~, *outdoor lighting*, and electrical power distribution within the scope of Section 100.3 *[Section 100.1(a)]*. Section 603 applies to *dwelling units* and *common use areas* in *multifamily use designations*~~*buildings*~~. All functional areas except *dwelling units* and common living areas shall comply with the applicable requirements of Sections 603.2.2 *[Sections 160.5(b) through 160.5(e)].*

Nonresidential *use designations*~~occupancies~~ in a mixed *occupancy building* shall comply with nonresidential requirements in Section 601.

NOTE: The requirements of Sections 603.2 through 603.4 apply to *newly constructed buildings*. Sections 603.2 and 603.5 apply to *additions* or *alterations*.

603.2 Mandatory requirements (Newly Constructed, Additions, Alterations).

603.2.1 *[Section 160.5(a)]* **Dwelling unit lighting.**

The design and installation of all *lighting* systems and *equipment* in multifamily *dwelling units* shall comply with Section 603.2.1 *[Section 160.5(a)]*. Multifamily *dwelling units* include dormitory and senior housing *dwelling* accommodations.

Outdoor lighting attached to *multifamily use designations*~~*buildings*~~ and controlled from the inside of a *dwelling unit* shall comply with the *lighting* requirements of Section 603.2.1 *[Section 160.5(a)]*.

603.2.1.1 *[Section 160.5(a)1]* **Luminaire and light source requirements.**

The *building* shall comply with the applicable requirements of Section 602.2.1.1 through 602.2.1.4.

603.2.1.2 *[Section 160.5(a)2]* **Indoor lighting controls.**

The *building* shall comply with the applicable requirements of Section 602.2.1.5.

603.2.1.3 *[Section 160.5(a)3]* **Outdoor lighting controls.**

The *building* shall comply with the applicable requirements of Section 602.2.1.6 with the following modification:

1. *Outdoor lighting* attached to a *building* and separately controlled from the inside of a *dwelling unit* shall meet the following requirements:

1.1. Controlled by a *manual* ON and OFF control switch that permits the *automatic* actions of item 1.2 or 1.3 below; and

1.2. Controlled by one of the following controls:

1.2.1. a photocell and a motion sensor; or

1.2.2. a photocell and an *automatic time switch control*; or

1.3. controlled by an astronomical time clock control.

603.2.2 *[Section 160.5(b)]* **Common services area lighting.**

Lighting systems and *equipment* in multifamily common services areas shall comply with the applicable provisions of Sections 603.2.2.1 and 603.2.2.2 *[Sections 160.5(b)1 through 160.5(b)4]*.

Exception to Section 603.2.2: *Lighting* systems in *common use areas* providing shared provisions for living, eating, cooking or sanitation to *dwelling units* that would otherwise lack these provisions may instead comply with Section 603.2.1 *[Section 160.5(a)]*.

603.2.2.1 *[Section 160.5(b)1]* **Luminaire classification and power.**

The *building* shall comply with the applicable requirements of Section 601.2.1 with the following modifications:

Exception to Section 601.2.1.2: *Luminaires* with a single *lamp* and an integrated ballast or transformer may use a peel-down label provided that they are layered such that the rated wattage reduces as successive layers are removed.

1. Low-voltage *luminaires* (except *low voltage* track systems), ≤ 24 volts, with a maximum relamping rated wattage of 50 watts.
2. Compact fluorescent *luminaires*, having an integral electronic ballast, with a maximum relamping rated wattage of 42 watts.
3. High intensity discharge *luminaires*, having an integral electronic ballast, with a maximum relamping rated wattage of 150 watts.

601.2.1.3- For *luminaires* with line voltage *lamps* not served by *drivers*, ballasts or transformers, the wattage of such *luminaires* shall be determined as the maximum rated wattage as labeled in accordance with Sections 601.2.1.1 and 601.2.1.2.

603.2.2.2 *[Section 160.5(b)2-4]* **Indoor lighting controls.**

The *building* shall comply with the applicable requirements of Section 601.2.2 with the following modification:

601.2.2.4.6- Interaction with other *lighting* controls in a space where *manual* controls are required, the *manual* controls shall be capable of turning off or decreasing *light* levels below the *light* level set by the *daylight responsive controls*.

603.2.2.3 *[Section 160.5(c)]* **Outdoor lighting and control equipment.**

Multifamily *use designations* ~~*buildings*~~ shall comply with the applicable requirements of Section 603.2.2.3.1 and Section 603.2.2.3.2 *[Sections 160.5(c)1 through 160.5(c)2]*.

603.2.2.3.1 *[Section 160.5(c)1]* **Luminaire shielding requirements.**

The *building* shall comply with the applicable requirements of Section 601.2.3.1 with the following modification:

Exception 7 to Section 601.2.3.1: *Outdoor lighting* attached to a *multifamily building* and separately controlled from the inside of a *dwelling unit*.

603.2.2.3.2 *[Section 160.5(c)2]* **Outdoor lighting controls.**

The *building* shall comply with the applicable requirements of Section 601.2.3.2.

603.2.2.4 *[Section 160.5(d)]* **Sign lighting controls.**

The *building* shall comply with the applicable requirements of Section 601.2.4.

603.2.2.5 *[Section 160.5(e)]* **Lighting control acceptance and installation certificate requirement.**

Multifamily *common use areas* shall comply with the applicable requirements of Section 601.2.5.

603.2.3 *[Section 160.6]* **Electrical power distribution systems.**

Multifamily *use designations*~~*buildings*~~ shall comply with the applicable requirements of Sections 603.2.3.1 through 603.2.3.5 *[Sections 160.6(a) through 160.6(e)]*.

603.2.3.1 *[Section 160.6(a)]* **Service electrical metering.**

Each electrical *service* or feeder that provides power to the *common use areas* (interior and exterior) shall have a permanently installed metering system that measures electrical energy use in accordance with Table 603.2-~~A~~(1) *[Table 160.6-A]*.

Exception to Section 603.2.3.1: *Service* or feeder for which the utility company provides a metering system for the *multifamily building* that indicates instantaneous kW demand and kWh for a utility-defined period.

TABLE 603.2-~~A~~(1) [TABLE 160.6-A] MINIMUM REQUIREMENTS FOR METERING OR SUBMETERING OF ELECTRICAL LOAD

METERING FUNCTIONALITY	ELECTRICAL ~~SERVICES~~[1] SERVICES[a] RATED 50 KVA OR LESS	ELECTRICAL ~~SERVICES~~[1] SERVICES[a] RATED MORE THAN 50KVA AND LESS THAN OR EQUAL TO 250 KVA	ELECTRICAL ~~SERVICES~~[1] SERVICES[a] RATED MORE THAN 250 KVA AND LESS THAN OR EQUAL TO 1000KVA	ELECTRICAL ~~SERVICES~~[1] SERVICES[a] RATED MORE THAN 1000KVA
Instantaneous (at the time) kW demand	Required	Required	Required	Required
Historical peak demand (kW)	Not required	Not required	Required	Required
Tracking kWh for a user-definable period.	Required	Required	Required	Required
kWh per rate period	Not required	Not required	Not required	Required

Footnote to Table 603.2-(1) *[Table 160.6-A]*:

a. "Electrical *Services*" applies to the *building service*-entrance rating or to the submetering *service*. For a *building* with submetering, this applies to the submetering *service* size to the *common use areas*.

~~Footnote to Table 603.2-A *[Table 160.6-A]*:~~

~~1. "Electrical Services" applies to the building *service* entrance rating or to the submetering *service*. For a *building* with submetering, this applies to the submetering *service* size to the common use areas.~~

603.2.3.2 *[Section 160.6(b)]* **Separation of electrical circuits for electrical energy monitoring.**

Electrical power distribution systems shall be designed so that measurement devices can monitor the electrical energy usage of load types according to Table 603.2-~~B~~(2) *[Table 160.6-B]*.

Exception 1 to Section 603.2.3.2: For each separate load type, up to 10 percent of the connected load may be of any type.

Exception 2 to Section 603.2.3.2: Submetered *electrical power distribution systems* that provide power to *dwelling units*.

TABLE 603.2-~~B~~(2) [TABLE 160.6-B] MINIMUM REQUIREMENTS FOR SEPARATION OF ELECTRICAL LOAD

ELECTRICAL LOAD TYPE	ELECTRICAL ~~SERVICES~~[1] SERVICES[a] RATED 50 KVA OR LESS	ELECTRICAL ~~SERVICES~~[1] SERVICES[a] RATED MORE THAN 50KVA AND LESS THAN OR EQUAL TO 250 KVA	ELECTRICAL ~~SERVICES~~[1] SERVICES[a] RATED MORE THAN 250 KVA AND LESS THAN OR EQUAL TO 1000KVA	ELECTRICAL ~~SERVICES~~[1] SERVICES[a] RATED MORE THAN 1000KVA
Lighting including exit and egress *lighting* and exterior *lighting*	Not required	All *lighting* in aggregate	All *lighting* disaggregated by floor, type or area	All *lighting* disaggregated by floor, type or area
HVAC systems and components including chillers, fans, heaters, furnaces, package units, cooling towers, and circulation pumps associated with HVAC	Not required	All HVAC in aggregate	All HVAC in aggregate and each HVAC load rated at least 50 kVA	All HVAC in aggregate and each HVAC load rated at least 50kVA
Domestic and service water system pumps and related systems and components	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Plug load including appliances rated less than 25 kVA	Not required	All *plug load* in aggregate Groups of *plug loads* exceeding 25 kVA connected load in an area less than 5000 sf	All *plug load* separated by floor, type or area Groups of *plug loads* exceeding 25 kVA connected load in an area less than 5000 sf	All *plug load* separated by floor, type or area All groups of *plug loads* exceeding 25 kVA connected load in an area less than 5000 sf
Elevators, escalators, moving walks, and transit systems	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Renewable power source (net or total)	Each group	Each group	Each group	Each group
Loads associated with renewable power source	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Charging stations for electric vehicles	All loads in aggregate	All loads in aggregate	All loads in aggregate	All loads in aggregate

Footnotes to Table 603.2-(2) *[Table 160.6-B]*:

a. "Electrical *Services*" applies to the *building service*-entrance rating or to the submetering *service*. For a *building* with submetering, this applies to the submetering *service* size to the common use area.

~~Footnotes to Table 603.2-B [Table 160.6-B]:~~

~~1. "Electrical Services" applies to the *building service* entrance rating or to the submetering *service*. For a *building* with submetering, this applies to the submetering *service* size to the common use area.~~

603.2.3.3 *[Section 160.6(c)]* **Voltage drop.**

The *building* shall comply with Section 601.2.6.3.

603.2.3.4 *[Section 160.6(d)]* **Circuit controls for 120-volt receptacles and controlled receptacles.**

The *building* shall comply with the applicable requirements of Section 601.2.6.4 for receptacles in all common areas, including *office areas*, lobbies, conference rooms, *kitchen* areas in office spaces, and *copy rooms*, except to receptacles in *common use areas* providing shared provisions for living, eating, cooking or sanitation to *dwelling units* that would otherwise lack these provisions.

603.2.3.5 *[Section 160.6(e)]* **Demand responsive controls and equipment.**

The *building* shall comply with the applicable requirements of Section 600.4 *[Section 110.12]* for *demand responsive controls* and *equipment*, including *demand responsive controls* for controlled receptacles.

603.2.4 *[Section 160.9]* **Electric ready buildings.**

Multifamily *use designations* ~~*buildings*~~shall comply with the applicable requirements of this section.

The *building* electrical system shall be sized to meet the future electric requirements of the electric ready *equipment* specified in Sections 603.2.4.1 through 603.2.4.5 *[Sections 160.9(b) through (f)]*.

The *building* main *service* conduit, the electrical system to the point specified in each subsection, and any on-site distribution transformers shall have sufficient capacity to supply full rated amperage at each electric ready appliance in accordance with the California Electrical Code.

603.2.4.1 *[Section 160.9(f)]* **Central heat pump water heater ready.**

Central water heating systems using gas or propane to serve multiple *dwelling units* shall meet the following requirements:

1. **System input capacity.** The system input capacity of the gas or propane water heating system shall be determined as the sum of the input gas or propane capacity of all water heating devices associated with each gas or propane water heating system.
2. **Reserved space for *heat pump*.** The minimum space reserved shall include space for service clearances and air flow clearances and shall meet one of the following:
   2.1. The space reserved shall be the space required for a *heat pump water heater* system that meets the total *building* hot water demand as calculated and documented by the responsible person associated with the project; or

2.2. The space reserved shall meet the requirements specified in Joint Appendix JA15.2.1.

3. **Reserved space for tanks.** The minimum space reserved shall include space for service clearances and shall meet one of the following:

   3.1. The space reserved shall be the space required for a *heat pump water heater* system that meets the total *building* hot water demand as calculated and documented by the responsible person associated with the project; or

   3.2. The space reserved shall meet the requirements specified in Joint Appendix JA15.2.2.

4. **Ventilation.** Ventilation shall be provided by meeting one of the following:

   4.1. Physical space reserved for the *heat pump* shall be located outside; or

   4.2. A pathway shall be reserved for future routing of supply and exhaust air via ductwork from the reserved *heat pump* location to a suitable outdoor location. Penetrations through the *building envelope* for louvers and ducts shall be planned and identified for future use. The reserved pathway and penetrations through the *building envelope* shall be sized to meet one of the following:

      4.2.1. The reserved pathway and penetrations shall be sized to serve a *heat pump water heater* system that meets the total *building* hot water demand as calculated and documented by the responsible person associated with the project.

      4.2.2. The reserved pathway and penetrations shall be sized to meet the requirements specified in Joint Appendix JA15.2.3.

5. **Condensate drainage piping.** An approved receptacle that is sized per the California Plumbing Code for condensate drainage shall be installed within 3 feet of the reserved *heat pump* location, or piping shall be installed from within 3 feet of the reserved *heat pump* location to an approved discharge location that is sized in accordance with the California Plumbing Code, and meet one of the following:

   5.1. Condensate drainage shall be sized to serve a *heat pump water heater* system that meets the total *building* hot water demand as calculated and documented by the responsible person associated with the project.

   5.2. Condensate drainage piping shall be sized to meet the requirements specified in Joint Appendix JA15.2.4.

6. **Electrical.** Physical space shall be reserved on the bus system of the main switchboard or on the bus system of a distribution board to serve the future *heat pump water heater* system including the *heat pump* and temperature maintenance tanks. In addition, the physical space reserved shall be capable of providing adequate power to the future *heat pump water heater* in accordance with the following:

   6.1. ***Heat Pump*.** Meet one of the following:

6.1.1. The electrical power required to power a *heat pump water heater* system *heat pump* that meets the total *building* hot water demand as calculated and documented by the responsible person associated with the project.

6.1.2. The electrical power required that meets the requirements specified for the *heat pump* in Joint Appendix JA15.2.5.

6.2. **Temperature Maintenance Tank.** Meet one of the following:

6.2.1. The electrical power required to power a *heat pump water heater* system temperature maintenance tank that meets the total *building* hot water demand as calculated and documented by the responsible person associated with the project.

6.2.2. The electrical power required that meets the requirements specified for the temperature maintenance tank in Joint Appendix JA15.2.5N.

603.2.4.2 *[Section 160.9(e)]* **Individual heat pump water heater ready.**

Systems using gas or propane *water heaters* to serve individual *dwelling units* shall include the following components for each gas or propane *water heater*:

1. **Reserved space for *heat pump*.** The construction drawings shall designate a space at least 39 inches by 39 inches and 96 inches tall for the future location of *heat pump water heater*.
2. **Ventilation.** A ventilation method meeting one of the following:

2.1. The designated space for the future *heat pump water heater* shall have a minimum volume of 700 cubic feet; or

2.2. If the future *HPWH* space is designed to vent indoors, the designated space for the future *heat pump water heater* shall vent to a *communicating space* in the same *pressure boundary*. The total combined volume connected shall be 700 cubic feet or larger and vent to the interior via:

2.2.1. Fully louvered *doors* with fixed louvers consisting of a single layer of fixed flat slats and a minimum total *NFA* of 250 square inches; or

2.2.2. Two permanent openings of equal area with a minimum total *NFA* of 250 square inches located within 12 inches from the enclosure top and bottom; or

2.2.3. Two 8-inch ducts to a *communicating space*.

2.3. If the future *HPWH* space is designed to vent to the *building* exterior, the designated space for the future *heat pump water heater* shall vent to the exterior via:

2.3.1. Fully louvered *doors* with fixed louvers consisting of a single layer of fixed flat slats and a minimum total *NFA* of 250 square inches; or

2.3.2. Two permanent openings of equal area with a minimum total *NFA* of 250 square inches located within 12 inches from the enclosure top and bottom; or

2.3.3. Two 8 inches capped ducts. All ducts that cross the *pressure boundary* shall be insulated to a minimum insulation level of R-6 and the ducts, connections, and *building* penetrations shall be sealed.

3. **Condensate drain.** A condensate drain that is no more than 2 inches higher than the base of the installed *water heater*, and allows natural draining without pump assistance.

4. **Electrical.** A dedicated 125 volt, 20 amp electrical receptacle that is connected to the electric panel with a 120/240 volt 3 conductor branch circuit rated to 30 amps minimum, within 3 feet from the *water heater* and *accessible* to the *water heater* with no obstructions. In addition, all the following:

4.1. Both ends of the unused conductor shall be labeled with the word “spare” and be electrically isolated; and

4.2. A reserved single pole circuit breaker space in the electrical panel adjacent to the circuit breaker for the branch circuit in A above and labeled with the words “Future 240V Use”.

603.2.4.3 *[Section 160.9(b)]* **Heat pump space heater ready.**

The *building* shall comply with the applicable requirements of Section 602.2.2.2.

603.2.4.4 *[Section 160.9(c)]* **Electric cooktop ready.**

The *building* shall comply with the applicable requirements of Section 602.2.2.3.

603.2.4.5 *[Section 160.9(d)]* **Electric clothes dryer ready.**

Clothes dryer locations with gas or propane plumbing shall include the following:

1. Systems serving individual *dwelling units* shall comply with Section 602.2.2.4.

2. Systems in *common use areas* shall include:

2.1. Conductors or raceway shall be installed with termination points at the main electrical panel, via subpanels panels if applicable, to a location no more than 3 feet from each gas outlet or a designated location of future electric replacement *equipment*. Both ends of the conductors or raceway shall be labelled “Future 240V Use.”

2.2. Gas flow rates shall be determined in accordance with the California Plumbing Code. Capacity shall be one of the following:

2.2.1. 24 amps at 208/240 volts per clothes dryer;

2.2.2. 2.6 kVA for each 10,000 Btu per hour of rated gas input or gas pipe capacity; or

2.2.3. The electrical power required to provide equivalent functionality of the gas-powered *equipment* as calculated and documented by the responsible person associated with the project.

603.3 *[Section 170.2]* **Prescriptive requirements (Newly Constructed)**

603.3.1 Dwelling unit lighting.

RESERVED.

603.3.2 *[Section 170.2(e)1]* **Common use area lighting.**

Common use area *lighting* shall meet the requirements of this section.

Common use area *lighting* complies with this section if:

1. The calculation of adjusted indoor *lighting* power of all proposed *building* areas combined, calculated under Section 603.3.2.1 *[Subsection 170.2(e)2]*, is no greater than the calculation of allowed indoor *lighting* power, specific methodologies calculated under Section 603.3.2.3 *[Subsection 170.2(e)4]*; and
2. The calculation of allowed indoor *lighting* power, general rules comply with Section 603.3.2.2 *[Section 170.2(e)3]*.

The prescriptive limits on indoor *lighting* power are the smaller of the actual and allowed indoor *lighting* power values determined in accordance with this section.

Exception to Section 603.3.2: *Common use areas* providing shared provisions for living, eating, cooking or sanitation to *dwelling units* that would otherwise lack these provisions may instead comply with Section 603.2.1 *[Section 160.5(a)]*.

603.3.2.1 *[Section 170.2(e)2]* **Calculation of Adjusted Indoor Lighting Power.**

Shall comply with the applicable requirements of Section 601.3.1.1 with the following modifications:

603.3.2.1.1 *[Section 170.2(e)2A]* **Two interlocked lighting systems.**

Shall comply with the applicable requirements of Section 601.3.1.1.1.

603.3.2.1.2 *[Section 170.2(e)2B]* **Reduction of wattage through controls.**

Shall comply with the applicable requirements of Section 601.3.1.1.2 with the following modifications:

1. **Permanent installation.** The controlled *lighting* is permanently installed *general lighting* systems and the controls are permanently installed nonresidential-rated *lighting* controls. When used for determining PAFs for *general lighting* in offices, furniture mounted *luminaires* that comply with all of the following conditions shall qualify as permanently installed *general lighting* systems:
   1.1. The furniture mounted *luminaires* shall be permanently installed no later than the time of *building* permit inspection; and
   1.2. The furniture mounted *luminaires* shall be permanently hardwired; and

1.3. The furniture mounted *lighting* system shall be designed to provide indirect *general lighting*; and

1.4. Before multiplying the installed watts of the furniture mounted *luminaire* by the applicable PAF, 0.3 watts per square foot of the area illuminated by the furniture mounted *luminaires* shall be subtracted from installed watts of the furniture mounted *luminaires*; and

1.5. The *lighting* control for the furniture mounted *luminaire* complies with all other applicable requirements in Section 601.3.1.1.2 *[Section 140.6(a)2]*.

603.3.2.1.3 *[Section 170.2(e)2C]* **Lighting wattage excluded.**

The watts of the following indoor *lighting* applications may be excluded from Adjusted Indoor *Lighting* Power:

1. *Lighting* installed by the manufacturer in walk-in *coolers* or *freezers*, *vending machines* and *food preparation equipment*.
2. *Lighting* that is required for exit *signs* subject to the *CBC*. Exit *signs* shall meet the requirements of the *Appliance Efficiency Regulations*.
3. Exit way or egress *illumination* that is normally off and that is subject to the *CBC*.
4. *Temporary lighting* systems.
5. *Lighting* systems in qualified historic *buildings*, as defined in the *California Historical Building Code* (Title 24, Part 8), are exempt from the *lighting* power density allowances if they consist solely of historic *lighting* components or replicas of historic *lighting* components. If *lighting* systems in qualified *buildings* contain some historic *lighting* components or replicas of historic components, combined with other *lighting* components, only those historic or historic replica components are exempt. All other *lighting* systems in qualified historic *buildings* shall comply with the *lighting* power density allowances.
6. *Lighting* for *signs* shall comply with Section 603.3.2.5 *[Section 170.2(e)7]*.
7. *Lighting* in elevators where the *lighting* meets the requirements in Section 906.1 *[Section 120.6(f)]*.
8. *Lighting* connected to a Life Safety Branch or Critical Branch, as specified in Section 517 of the California Electrical Code.

603.3.2.1.4 *[Section 170.2(e)2D]* **Luminaire classification and power adjustment.**

Shall comply with the applicable requirements of Section 601.3.1.1.4 with the following modification:

Small aperture tunable-white and *dim-to-warm luminaires lighting* power adjustment. For qualifying small aperture tunable-white and *dim-to-warm LED luminaires*, the adjusted indoor *lighting* power of these *luminaires* shall be calculated by multiplying their maximum rated wattage by 0.75.

603.3.2.2 *[Section 170.2(e)3]* **Calculation of allowed indoor lighting power: general rules.**

Shall comply with the applicable requirements of Section 601.3.1.2 with the following modifications:

603.3.2.2.1 *[Section 170.2(e)3C]* **Calculation methodologies: general lighting.**

The allowed indoor *lighting* power allotment for *general lighting* shall be calculated as follows:

Area Category Method. The Area Category Method, as described in Section 601.3.1.3.2 *[Section 140.6(c)2]*, shall be used for all areas in the *building*. Under the ~~area~~ Area ~~category~~ Category ~~method~~ Method as described more fully in Section 601.3.1.3.2 *[Section 140.6(c)2]*, and subject to the adjustments listed there, the allowed indoor *lighting* power allotment for *general lighting* shall be calculated for each area in the *building* as follows:

1. For conditioned areas, by multiplying the conditioned square feet of the area times the applicable allotment of watts per square foot for the area shown in Table 601.3-~~C~~(3) *[Table 140.6-C]*.
2. For unconditioned areas, by multiplying the unconditioned square feet of the area times the applicable allotment of watts per square foot for the area shown in Table 601.3-~~C~~(3) *[Table 140.6-C]*.
3. The allowed indoor *lighting* power allotment for *general lighting* for one area for which the area category method was used may be increased up to the amount that the allowed indoor *lighting* power allotment for *general lighting* for another area using the Area Category Method is decreased, except that such increases and decreases shall not be made between conditioned and *unconditioned space*.

603.3.2.2.2 *[Section 170.2(e)3D]* **Calculation methodologies: lighting other than general lighting.**

Additional *lighting* power allowances other than *general lighting* power allowances shall be restricted when using the Area Category Method. Additional *lighting* power allowances for display; *decorative*, wall display, floor display, or task, may not be increased as a result of, or otherwise traded off against, decreasing any other allotment.

603.3.2.3 *[Section 170.2(e)4]* **Calculation of allowed indoor lighting power: specific methodologies.**

The allowed indoor *lighting* power for each common use primary function area shall be calculated using the following method.

Area Category Method. Requirements for using the Area Category Method include all of the following:

1. The Area Category Method shall be used only for primary function areas, as defined in Section 200 *[Section 100.1]*, that are listed in Table 603.3-~~A~~(1) *[Table 170.2-M]*. For

primary function areas not listed, selection of a reasonably equivalent type shall be permitted.

2. For purposes of compliance with Section 603.3.2.3 *[Section 170.2(e)4A]*, an "area" shall be defined as all contiguous areas that accommodate or are associated with a single primary function area listed in Table 603.3-~~A~~(1) *[Table 170.2-M]*.

3. Where areas are bounded or separated by interior partitions, the floor area occupied by those interior partitions may be included in a primary function area.

4. The allowed indoor *lighting* power for each primary function area is the *Lighting* Power Density value in Table 603.3-~~A~~(1) *[Table 170.2-M]* times the square feet of the primary function area. The total allowed indoor *lighting* power for the *building* is the sum of all allowed indoor *lighting* power for all areas in the *building*.

603.3.2.3.1 *[Section 170.2(e)4Av]* **Additional lighting power allowances for qualifying lighting systems.**

In addition to the allowed indoor *lighting* power calculated according to Section 603.3.2.3 *[Sections 170.2(e)4Ai through iv]*, the *building* may add additional *lighting* power allowances for qualifying *lighting* systems as specified in the Qualifying *Lighting* Systems column in Table 603.3-~~A~~(1) *[Table 170.2-M]* under the following conditions:

1. **Qualifying *lighting* systems.** Only primary function areas having a *lighting* system as specified in the Qualifying *Lighting* Systems column in Table 603.3-~~A~~(1) *[Table 170.2-M]* and in accordance with the corresponding footnote of the table shall qualify for the additional *lighting* power allowances; and

2. **Task areas and *lighting* equipment shown on plans.** The additional *lighting* power allowances shall be used only if the plans clearly identify all applicable task areas and the *lighting equipment* designed to illuminate these tasks; and

3. **Tasks not eligible.** Tasks that are performed less than two hours per day or poor quality tasks that can be improved are not eligible for the additional *lighting* power allowances; and

4. ***Luminaire* types not eligible.** The additional *lighting* power allowances shall not utilize any type of *luminaires* that are used for *general lighting* in the *building*; and

5. **Additional *lighting* power allowed.** The additional *lighting* power allowed is the smaller of:

   5.1. the *lighting* power density listed in the "Allowed Additional *Lighting* LPD" column in Table 603.3-~~A~~(1) *[Table 170.2-M]*, times the square feet of the primary function, or

   5.2. the adjusted indoor *lighting* power of the applicable *lighting*; and

6. **Floor displays.** Floor displays shall not qualify for wall display allowances.

7. **Wall displays.** Qualifying wall *lighting* shall:

7.1. Be mounted within 10 feet of the wall having the wall display. When *track lighting* is used for wall display, and where portions of that *lighting* track are more than 10 feet from the wall and other portions are within 10 feet of the wall, portions of track more than 10 feet from the wall shall not be used for the wall display allowance; and

7.2. Be a *lighting* system type appropriate for wall *lighting*. *Lighting* systems appropriate for wall *lighting* are *lighting* track adjacent to the wall, wall-washer *luminaires*, *luminaires* behind a wall valance or wall cove, or accent *light*. (Accent *luminaires* are adjustable or *fixed luminaires* providing directional display *light*).

8. **Mounting Height.** Mounting height shall be the *luminaire* mounting height measured from the finished floor to the bottom of the *luminaire*. If *luminaires* are mounted at different mounting height within the same space, the average mounting height of the *luminaires* qualified for the additional *lighting* power allowances in Table 603.3-~~A~~(1) *[Table 170.2-M]* can be used to establish the mounting height of the qualified *luminaires* for calculations of the additional *lighting* power allowances of the qualified *luminaires*.

TABLE 603.3-(1) [TABLE 170.2-M] AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)

~~TABLE 603.3(1) [TABLE 170.2-M] AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)~~

PRIMARY FUNCTION AREA	ALLOWED *LIGHTING* POWER DENSITY FOR *GENERAL LIGHTING* (W/FT²)	ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS	ADDITIONAL *LIGHTING* POWER ALLOWANCE (W/FT², UNLESS NOTED OTHERWISE)	ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS	ADDITIONAL *LIGHTING* POWER ALLOWANCE (W/FT², UNLESS NOTED OTHERWISE)
Storage	0.40	NA	NA	NA	NA
Conference, Multipurpose and *Meeting Area*	0.75	Display	0.25	Wall Display MH <= 10'6"	2 W/ft
Conference, Multipurpose and *Meeting Area*	NA	Wall Display MH 10'7"-14'	2.35 W/ft	Wall Display MH > 14'	2.66 W/ft
Conference, Multipurpose and *Meeting Area*	NA	Floor Display and Task MH <= 10'6"	0.30	Floor Display and Task MH 10'7"- 14'	0.35
Conference, Multipurpose and *Meeting Area*	NA	Floor Display and Task MH > 14'	0.40	NA	NA
Copy Room	0.50	NA	NA	NA	NA
Corridor Area	0.40	Decorative/Display	0.25	NA	NA
Dining Area: Bar/Lounge and *Fine Dining*	0.45	Display	0.35	Wall Display MH <= 10'6"	1.25 W/ft
Dining Area: Bar/Lounge and *Fine Dining*	N/A	Wall Display MH 10'7"-14'	1.5 W/ft	Wall Display MH > 14'	1.7 W/ft
Dining Area: Bar/Lounge and *Fine Dining*	N/A	Floor Display and Task MH <= 10'6"	0.45	Floor Display and Task MH 10'7"- 14'	0.52
Dining Area: Bar/Lounge and *Fine Dining*	N/A	Floor Display and Task MH > 14'	0.60	*General Lighting* in the *enclosed space* of ceiling height > 10'	0.25
Dining Area: *Cafeteria*/*Fast Food*	0.45	Display/Decorative	0.25	NA	NA
Dining Area: Family and Leisure	0.40	Display/Decorative	0.25	NA	NA

~~TABLE 603.3(1) [TABLE 170.2-M] AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)~~

PRIMARY FUNCTION AREA	ALLOWED *LIGHTING* POWER DENSITY FOR *GENERAL LIGHTING* (W/FT²)	ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS	ADDITIONAL *LIGHTING* POWER ALLOWANCE (W/FT², UNLESS NOTED OTHERWISE)	ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS	ADDITIONAL *LIGHTING* POWER ALLOWANCE (W/FT², UNLESS NOTED OTHERWISE)
Health Care / Assisted Living: Nurse's Station	0.85	*Tunable white* or dim-to-warm[8g]	0.10	NA	NA
Health Care / Assisted Living: *Physical Therapy Room*	0.75	*Tunable white* or dim-to-warm[7g]	0.10	NA	NA
Kitchen/*Food Preparation Area*	0.95	NA	NA	NA	NA
Electrical/,-Mechanical/,-*Telephone Rooms*	0.40	Detailed Task Work[1a]	0.20	NA	NA
Exercise/*Fitness Center* and *Gymnasium Area*	0.50	NA	NA	NA	NA
Lobby, Main Entry	0.70	Display	0.25	Wall Display MH <= 10'6"	3 W/ft
Lobby, Main Entry	0.70	Wall Display MH 10'7"-14'	3.5 W/ft	Wall Display MH > 14'	4 W/ft
Locker Room	0.45	NA	NA	NA	NA
Lounge, *Breakroom*, or *Waiting Area*	0.55	Display/Decorative	0.25	NA	NA
Concourse and Atria Area	0.60	Display/Decorative	0.25	NA	NA
Office Area: > 250 square feet	0.60	Decorative/Display and *Portable lighting* for office areas[4d]	0.20	NA	NA
Office Area ≤ 250 square feet	0.65	Decorative/Display and *Portable lighting* for office areas[4d]	0.20	NA	NA
Parking Garage Area: *Parking Zone and Ramps*	0.10	First *ATM* or Ticket Machine	100 W	Additional *ATM* or Ticket machine	50 W each
Parking Garage Area: Daylight Adaptation Zones[3]	1.00	NA	NA	NA	NA

~~TABLE 603.3(1) [TABLE 170.2-M] AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)~~

PRIMARY FUNCTION AREA	ALLOWED *LIGHTING* POWER DENSITY FOR *GENERAL LIGHTING* (W/FT²)	ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS	ADDITIONAL *LIGHTING* POWER ALLOWANCE (W/FT², UNLESS NOTED OTHERWISE)	ADDITIONAL *LIGHTING* POWER QUALIFIED *LIGHTING* SYSTEMS	ADDITIONAL *LIGHTING* POWER ALLOWANCE (W/FT², UNLESS NOTED OTHERWISE)
Laundry Area	0.45	NA	NA	NA	NA
Restrooms	0.65	Decorative/ Display	0.35	NA	NA
Stairwell	0.60	Decorative/ Display	0.35	NA	NA
All other	0.40	NA	NA	NA	NA
Aging Eye/Low-vision[5e]: Lobby, Main Entry	0.85	Display/Decorative	0.30	Transition *Lighting* OFF at night[6f]	0.95
Aging Eye/Low-vision[5e]: *Stairwell*	0.80	Display/Decorative	0.30	NA	NA
Aging Eye/Low-vision[5e]: *Corridor Area*	0.70	Display/Decorative	0.30	NA	NA
Aging Eye/Low-vision[5e]: Lounge/*Waiting Area*	0.80	Display/Decorative	0.30	NA	NA
Aging Eye/Low-vision[5e]: *Multipurpose Room*	0.85	Display/Decorative	0.30	NA	NA
Aging Eye/Low-vision[5e]: Dining	0.80	Display/Decorative	0.30	NA	NA
Aging Eye/Low-vision[5e]: *Restroom*	1.00	Display/Decorative	0.20	NA	NA

~~*TABLE 603.3-A(1) [TABLE 170.2-M] AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)*~~

PRIMARY FUNCTION AREA	ALLOWED LIGHTING POWER DENSITY FOR GENERAL LIGHTING (W/FT²)	ADDITIONAL LIGHTING POWER QUALIFIED LIGHTING SYSTEMS	ADDITIONAL LIGHTING POWER ADDITIONAL ALLOWANCE (W/FT², UNLESS NOTED OTHERWISE)
Storage	0.4	NA	NA
Conference, Multipurpose and Meeting Area	0.75	Display	0.25
Conference, Multipurpose and Meeting Area	0.75	Wall Display MH <= 10'6"	2 W/ft
Conference, Multipurpose and Meeting Area	0.75	Wall Display MH 10'7"- 14'	2.35 W/ft
Conference, Multipurpose and Meeting Area	0.75	Wall Display MH > 14'	2.66 W/ft
Conference, Multipurpose and Meeting Area	0.75	Floor Display and Task MH <= 10'6"	0.30
Conference, Multipurpose and Meeting Area	0.75	Floor Display and Task MH 10'7"- 14'	0.35
Conference, Multipurpose and Meeting Area	0.75	Floor Display and Task MH > 14'	0.40
Copy Room	0.50	NA	NA
Corridor Area	0.40	Decorative/Display	0.25
Dining Area Bar/Lounge and Fine Dining	0.45	Display	0.35
Dining Area Bar/Lounge and Fine Dining	0.45	Wall Display MH <= 10'6"	1.25 W/ft
Dining Area Bar/Lounge and Fine Dining	0.45	Wall Display MH 10'7"- 14'	1.5 W/ft
Dining Area Bar/Lounge and Fine Dining	0.45	Wall Display MH > 14'	1.7 W/ft
Dining Area Bar/Lounge and Fine Dining	0.45	Floor Display and Task MH <= 10'6"	0.45

PRIMARY FUNCTION AREA	ALLOWED LIGHTING POWER DENSITY FOR GENERAL LIGHTING (W/FT²)	ADDITIONAL LIGHTING POWER QUALIFIED LIGHTING SYSTEMS	ADDITIONAL LIGHTING POWER ADDITIONAL ALLOWANCE (W/FT², UNLESS NOTED OTHERWISE)
Dining Area Bar/Lounge and Fine Dining	0.45	Floor Display and Task MH 10'7"- 14'	0.52
Dining Area Bar/Lounge and Fine Dining	0.45	Floor Display and Task MH > 14'	0.60
Dining Area Bar/Lounge and Fine Dining	0.45	General Lighting in the enclosed space of ceiling height > 10'	0.25

(CONTINUED) TABLE 603.3-A(1) [TABLE 170.2-M] AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)

PRIMARY FUNCTION AREA	ALLOWED LIGHTING POWER DENSITY FOR GENERAL LIGHTING (W/FT^2)	ADDITIONAL LIGHTING POWER QUALIFIED LIGHTING SYSTEMS	ADDITIONAL LIGHTING POWER ADDITIONAL ALLOWANCE (W/FT^2, UNLESS NOTED OTHERWISE)
Dining Area Cafeteria/Fast Food	0.45	Display/Decorative	0.25
Dining Area Family and Leisure	0.40	Display/Decorative	0.25
Health Care / Assisted Living Nurse's Station	0.85	Tunable white or dim-to-warm[8]	0.10
Health Care / Assisted Living Physical Therapy Room	0.75	Tunable white or dim-to-warm[7]	0.10
Kitchen/Food Preparation Area	0.95	NA	NA
Electrical, Mechanical, Telephone Rooms	0.40	Detailed Task Work[1]	0.20
Exercise/Fitness Center and Gymnasium Area	0.50	NA	NA
Lobby, Main Entry	0.70	Display	0.25
Lobby, Main Entry	0.70	Wall Display MH <= 10'6"	3 W/ft
Lobby, Main Entry	0.70	Wall Display MH 10'7" - 14'	3.5 W/ft
Lobby, Main Entry	0.70	Wall Display MH > 14'	4 W/ft
Locker Room	0.45	NA	NA
Lounge, Breakroom, or Waiting Area	0.55	Display/Decorative	0.25
Concourse and Atria Area	0.60	Display/Decorative	0.25
Office Area > 250 square feet	0.60	Decorative/Display and Portable lighting for office areas[4]	0.20

~~Office Area ≤ 250 square feet~~	~~0.65~~	~~Decorative/Display and Portable lighting for office areas[4]~~	~~0.20~~
~~Parking Garage Area Parking Zone and Ramps~~	~~0.10~~	~~First ATM or Ticket Machine~~	~~100 W~~
~~Parking Garage Area Parking Zone and Ramps~~	~~0.10~~	~~Additional ATM or Ticket machine~~	~~50 W each~~

~~*(CONTINUED) TABLE 603.3-A(1) [TABLE 170.2-M] AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)*~~

PRIMARY FUNCTION AREA	ALLOWED LIGHTING POWER DENSITY FOR GENERAL LIGHTING (W/FT^2)	ADDITIONAL LIGHTING POWER QUALIFIED LIGHTING SYSTEMS	ADDITIONAL LIGHTING POWER ADDITIONAL ALLOWANCE (W/FT^2, UNLESS NOTED OTHERWISE)
Parking Garage Area Daylight Adaptation Zones[3]	1.00	-	-
Laundry Area	0.45	-	-
Restrooms	0.65	Decorative/ Display	0.35
Stairwell	0.60	Decorative/ Display	0.35
All other	0.40	-	-
Aging Eye/Low-vision[5] Lobby, Main Entry	0.85	Display/Decorative	0.30
Aging Eye/Low-vision[5] Lobby, Main Entry	0.85	Transition Lighting OFF at night6	0.95
Aging Eye/Low-vision[5] Stairwell	0.80	Display/Decorative	0.30
Aging Eye/Low-vision[5] Corridor Area	0.70	Display/Decorative	0.30
Aging Eye/Low-vision[5] Lounge/Waiting Area	0.80	Display/Decorative	0.30
Aging Eye/Low-vision[5] Multipurpose Room	0.85	Display/Decorative	0.30
Aging Eye/Low-vision[5] Dining	0.80	Display/Decorative	0.30
Aging Eye/Low-vision[5] Restroom	1.00	Display/Decorative	0.20

Footnotes for Table 603.3-(1) *[Table 170.2-M]*:

a. Detailed task work – *Lighting* provides high level of visual acuity required for activities with close attention to small elements and/or extreme close up work.

b. MH denotes the *luminaire* mounting height of the qualified *lighting* systems.

c. *Daylight Adaptation Zones* shall be no longer than 66 feet from the entrance to the parking *garage*.

d. *Portable lighting* in *office areas* includes under shelf or furniture-mounted supplemental *task lighting* qualifies when controlled by a time clock or an *occupancy* sensor.

e. Aging Eye/Low-vision areas can be documented as being designed to comply with the *light* levels in *ANSI*/IES RP-28 and are or will be licensed by local or state authorities for either senior long-term care, adult day care, senior support, and/or people with special visual needs.

f. Transition *lighting* OFF at night. *Lighting* power controlled by astronomical time clock or other control to shut off *lighting* at night. Additional LPD only applies to area within 30 feet of an exit. Not applicable to *lighting* in *daylit zones*.

g. *Tunable white luminaires* capable of color change greater than or equal to 2000K *CCT*, or *dim-to-warm luminaires* capable of color change greater than or equal to 500K *CCT*, connected to controls that allows color changing of the *luminaires.*

~~Footnotes for Table 603.3-A *[Table 170.2-M]*:~~

~~1. Detailed task work – *Lighting* provides high level of visual acuity required for activities with close attention to small elements and/or extreme close up work.~~

~~2. MH denotes the *luminaire* mounting height of the qualified *lighting* systems.~~

~~3. *Daylight Adaptation Zones* shall be no longer than 66 feet from the entrance to the parking *garage*.~~

~~4. *Portable lighting* in *office areas* includes under shelf or furniture-mounted supplemental *task lighting* qualifies when controlled by a time clock or an *occupancy* sensor.~~

~~5. Aging Eye/Low-vision areas can be documented as being designed to comply with the *light* levels in ANSI/IES RP-28 and are or will be licensed by local or state authorities for either senior long-term care, adult day care, senior support, and/or people with special visual needs.~~

~~6. Transition *lighting* OFF at night. Lighting power controlled by astronomical time clock or other control to shut off *lighting* at night. Additional LPD only applies to area within 30 feet of an exit. Not applicable to *lighting* in *daylit zones*.~~

~~7. *Tunable white luminaires* capable of color change greater than or equal to 2000K *CCT*, or *dim-to-warm luminaires* capable of color change greater than or equal to 500K *CCT*, connected to controls that allows color changing of the *luminaires*.~~

603.3.2.4 *[Section 170.2(e)6A]* **Outdoor lighting.**

A multifamily or mixed *occupancy outdoor lighting* installation complies with this section if it meets the requirements in Sections 603.3.2.4.1 and 603.3.2.4.2 *[Sections 170.2(e)6B and C]*, and the actual *outdoor lighting* power installed is no greater than the allowed *outdoor lighting* power calculated under Section 603.3.2.4.3 *[Section 170.2(e)6D]*. The allowed *outdoor lighting* shall be calculated according to *outdoor lighting zone* in Section 601.3.2.3.5 *[Title 24, Part 1, Section 10-114]*.

Exceptions to Section 603.3.2.4: When more than 50 percent of the *light* from a *luminaire* falls within one or more of the following applications, the *lighting* power for that *luminaire* shall not be required to comply with Section 603.3.2.4 *[Section 170.2(e)6]*:

1. Temporary *outdoor lighting*.
2. *Lighting* required and regulated by the Federal Aviation Administration and the Coast Guard.
3. *Lighting* for public streets, roadways, highways and *traffic signage lighting*, including *lighting* for driveway entrances occurring in the public right-of-way owned or maintained by a local municipality or utility.
4. *Lighting* for sports and athletic fields, and children's playgrounds.
5. *Lighting* of *public monuments*.
6. *Lighting* of *signs* complying with the requirements of Section 603.2.2.4 *[Section 160.5(d)]* and Section 603.3.2.5 *[Section 170.2(e)7]*.
7. *Lighting* of *stairs*, wheelchair elevator lifts for American with Disabilities Act (ADA) compliance, and ramps that are other than parking *garage* ramps.
8. *Landscape lighting*.
9. *Lighting* for outdoor theatrical and other outdoor live performances, provided that these *lighting* systems are *additions* to area *lighting* systems and are controlled by a multi-scene or theatrical cross-fade control station *accessible* only to authorized operators.
10. *Outdoor lighting* systems for qualified historic *buildings*, as defined in the California Historic *Building* Code (Title 24, Part 8), if they consist solely of historic *lighting* components or replicas of historic *lighting* components. If *lighting* systems for qualified historic *buildings* contain some historic *lighting* components or replicas of historic components, combined with other *lighting* components, only those historic or historic replica components are exempt. All other *outdoor lighting* systems for qualified historic *buildings* shall comply with Section 603.3.2.4 *[Section 170.2(e)6]*.

603.3.2.4.1 *[Section 170.2(e)6B]* **Outdoor lighting power trade-offs.**

Outdoor lighting power trade-offs shall be determined as follows:

1. Allowed *lighting* power determined according to Sections 603.3.2.4.3.1 and 603.3.2.4.3.2 *[Section 170.2(e)6Di]* for general *hardscape lighting* allowance may

be traded to specific applications in Section 603.3.2.4.3.3 *[Section 170.2(e)6Dii]*, provided the *hardscape* area from which the *lighting* power is traded continues to be illuminated in accordance with Section 603.3.2.4.3.1 *[Section 170.2(e)6Dia]*.

2. Allowed *lighting* power determined according to Section 603.3.2.4.3.3 *[Section 170.2(e)6Dii]* for additional *lighting* power allowances for specific applications shall not be traded between specific applications, or to general *hardscape lighting* in Sections 603.3.2.4.3.1 and 603.3.2.4.3.2 *[Section 170.2(e)6Di]*.
3. Trading off *lighting* power allowances between outdoor and indoor areas shall not be permitted.

603.3.2.4.2 *[Section 170.2(e)6C]* **Calculation of actual lighting power.**

The wattage of outdoor *luminaires* shall be determined in accordance with Section 603.2.2.1 *[Section 160.5(b)1]*.

603.3.2.4.3 *[Section 170.2(e)6D]* **Calculation of allowed lighting power.**

The allowed *lighting* power shall be the combined total of the sum of the general *hardscape lighting* allowance and the sum of the additional *lighting* power allowance for specific applications.

The general *hardscape lighting* allowance shall be the sum of the allowed watts determined from Sections 603.3.2.4.3.1 and 603.3.2.4.3.2 *[Sections 170.2(e)6Dia and b]*.

The additional *lighting* power allowance for specific applications shall be determined in accordance with Section 603.3.2.4.3.3 *[Section 170.2(e)6Dii]*.

603.3.2.4.3.1- Illuminated *hardscape* area allowance. The general *hardscape* area of a site shall include *parking lot*(s), roadway(s), driveway(s), sidewalk(s), walkway(s), bikeway(s), plaza(s), bridge(s), tunnel(s) and other improved area(s) that are illuminated. Public roadway(s) that are illuminated by a *lighting* system owned or maintained by the local municipality or utility shall not be included in the area calculations. In plan view of the site, determine the illuminated *hardscape* area, which is defined as any *hardscape* area that is within a square pattern around each *luminaire* or pole that is ten times the *luminaire* mounting height with the *luminaire* in the middle of the pattern, less any areas that are within a *building*, beyond the *hardscape* area, beyond property lines or obstructed by a structure. The illuminated *hardscape* area shall include portions of planters and landscaped areas that are within the *lighting* application and are less than or equal to 10 feet wide in the short dimensions and are enclosed by *hardscape* or other improvement on at least three sides. Multiply the illuminated *hardscape* area by the Area Wattage Allowance (AWA) from Table 603.3-~~B~~(2) *[Table 170.2-R]* for the appropriate *lighting* zone.

603.3.2.4.3.2- Initial Wattage Allowance (IWA). Determine the Initial Wattage Allowance (IWA) for general *hardscape lighting* from Table 603.3-~~B~~(2) *[Table 170.2-R]* for the appropriate *lighting* zone. The *hardscape* area shall be permitted one IWA per site.

TABLE 603.3-~~B~~(2) [TABLE 170.2-R] GENERAL HARDSCAPE MULTIFAMILY LIGHTING POWER ALLOWANCE

TYPE OF POWER ALLOWANCE	*Lighting* Zone 0[2 b]	*Lighting* Zone 1[2 b]	*Lighting* Zone 2[2 b]	*Lighting* Zone 3[2 b]	*Lighting* Zone 4[2 b]
Area Wattage Allowance (AWA)	No allowance[1a]	0.026 W/ft²	0.030 W/ft²	0.038 W/ft²	0.055 W/ft²
Initial Wattage Allowance (IWA)	No allowance[1a]	300 W	350 W	400 W	450 W

Footnotes to Table 603.3-(2) *[TABLE 170.2-R]*:

a. Continuous *lighting* is explicitly prohibited in *Lighting* Zone 0. A single *luminaire* of 15 Watts or less may be installed at an entrance to a parking area, trail head, fee payment kiosk, outhouse, or toilet facility, as required to provide safe navigation of the site infrastructure. *Luminaires* installed shall meet the maximum *zonal* lumen limits as specified in Section 603.2.2.3.1 *[Section 160.5(c)1]*.

b. *Narrow band spectrum light sources* with a dominant peak wavelength greater than 580 nm – as mandated by local, state, or federal agencies to minimize the impact on local, active professional astronomy or nocturnal habitat of specific local fauna – shall be allowed a 2.0 *lighting* power allowance multiplier.

~~Footnotes to Table 603.3-B *[TABLE 170.2-R]*:~~

~~1. Continuous *lighting* is explicitly prohibited in Lighting Zone 0. A single *luminaire* of 15 Watts or less may be installed at an entrance to a parking area, trail head, fee payment kiosk, outhouse, or toilet facility, as required to provide safe navigation of the site infrastructure. *Luminaires* installed shall meet the maximum *zonal* lumen limits as specified in Section 603.2.2.3.1 *[Section 160.5(c)1]*.~~

~~2. *Narrow band spectrum light sources* with a dominant peak wavelength greater than 580 nm – as mandated by local, state, or federal agencies to minimize the impact on local, active professional astronomy or nocturnal habitat of specific local fauna – shall be allowed a 2.0 lighting power allowance multiplier.~~

603.3.2.4.3.3- Additional *lighting* power allowance for specific applications. Additional *lighting* power for specific applications shall be the smaller of the additional *lighting* allowances for specific applications determined in accordance with Table 603.3-~~C~~(3) *[Table 170.2-S]* for the appropriate *lighting* zone, or the actual installed *lighting* power meeting the requirements for the allowance.

TABLE 603.3-~~C~~(3) [TABLE 170.2-S] ADDITIONAL MULTIFAMILY LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS

ALL AREA AND DISTANCE MEASUREMENTS IN PLAN VIEW UNLESS OTHERWISE NOTED.

PER APPLICATION: WATTAGE ALLOWANCE PER APPLICATION. Use all that apply as appropriate.

***LIGHTING* APPLICATION**	***LIGHTING* ZONE 0**	***LIGHTING* ZONE 1**	***LIGHTING* ZONE 2**	***LIGHTING* ZONE 3**	***LIGHTING* ZONE 4**
***Building* Entrances or Exits.** Allowance per *door*. *Luminaires* qualifying for this allowance shall be within 20 feet of the *door*.	Not applicable	9 watts	15 watts	19 watts	21 watts
Primary Entrances to Senior Care Facilities Allowance per primary entrance(s) only. Primary entrances shall provide access for the general public and shall not be used exclusively for staff or service personnel. This allowance shall be in addition to the *building* entrance or exit allowance above. *Luminaires* qualifying for this allowance shall be within 100 feet of the primary entrance.	Not applicable	20 watts	40 watts	57 watts	60 watts
***ATM Lighting*.** Allowance per *ATM*. *Luminaires* qualifying for this allowance shall be within 50 feet of the dispenser.	Not applicable	100 watts for first *ATM*, 35 watts for each additional *ATM*.	100 watts for first *ATM*, 35 watts for each additional *ATM*	100 watts for first *ATM*, 35 watts for each additional *ATM*	100 watts for first *ATM*, 35 watts for each additional *ATM*

TABLE 603.3-~~C~~(3) [TABLE 170.2-S] ADDITIONAL MULTIFAMILY LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS (continued)

All area and distance measurements in plan view unless otherwise noted.

PER APPLICATION: WATTAGE ALLOWANCE PER *HARDSCAPE* AREA (W/ft²). May be used for any illuminated *hardscape* area on the site.

***LIGHTING* APPLICATION**	***LIGHTING* ZONE 0**	***LIGHTING* ZONE 1**	***LIGHTING* ZONE 2**	***LIGHTING* ZONE 3**	***LIGHTING* ZONE 4**
***Hardscape* Ornamental *Lighting*.** Allowance for the total site illuminated *hardscape* area. *Luminaires* qualifying for this allowance shall be rated for 50 watts or less as determined in accordance with Section 603.2.2.1 *[Section 160.5(b)1]* and shall be post-top *luminaires*, *lanterns*, *pendant luminaires*, or *chandeliers*.	Not applicable	No Allowance	0.007 W/ft²	0.013 W/ft²	0.019 W/ft²

TABLE 603.3-~~C~~(3) [TABLE 170.2-S] ADDITIONAL MULTIFAMILY LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS (continued)

All area and distance measurements in plan view unless otherwise noted.

PER APPLICATION: WATTAGE ALLOWANCE PER SPECIFIC AREA (W/ft²). Use as appropriate provided that none of the following specific applications shall be used for the same area.

LIGHTING APPLICATION	*LIGHTING* ZONE 0	*LIGHTING* ZONE 1	*LIGHTING* ZONE 2	*LIGHTING* ZONE 3	*LIGHTING* ZONE 4
***Building* Facades.** Only areas of *building façade* that are illuminated shall qualify for this allowance. *Luminaires* qualifying for this allowance shall be aimed at the *façade* and shall be capable of illuminating it without obstruction or interference by permanent *building* features or other objects. This allowance calculation shall not include portions of the *building* facades within 20 feet of residence bedroom *windows*.	Not applicable	No Allowance	0.100 W/ft²	0.170 W/ft²	0.225 W/ft²
***Canopies* and Tunnels.** Allowance for the total area within the drip line of the *canopy* or inside the tunnel. *Luminaires* qualifying for this allowance shall be located under the *canopy* or tunnel.	Not applicable	0.057 W/ft²	0.137 W/ft²	0.270 W/ft²	0.370 W/ft²
Student Pick-up/Drop-off zone. Allowance for the area of the student pick-up/drop-off zone, with or without *canopy*, for preschool through 12th grade school campuses. A student pick-up/drop off zone is a curbside, controlled traffic area on a school campus where students are picked-up and dropped off from vehicles. The allowed area shall be the smaller of the actual width or 25 feet, times the smaller of the actual length or 250 feet. Qualifying *luminaires* shall be within 2 mounting heights of the student pick-up/drop-off zone.	Not applicable	No Allowance	0.056 W/ft²	0.200 W/ft²	No Allowance
Outdoor Dining. Allowance for the total illuminated *hardscape* of outdoor dining. Outdoor dining areas are *hardscape* areas used to serve and consume food and beverages. Qualifying *luminaires* shall be within 2 mounting heights of the *hardscape* area of outdoor dining.	Not applicable	0.004 W/ft²	0.030 W/ft²	0.050 W/ft²	0.075 W/ft²

TABLE 603.3-~~C~~(3) [TABLE 170.2-S] ADDITIONAL MULTIFAMILY LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS (continued)

All area and distance measurements in plan view unless otherwise noted.

PER SITE: WATTAGE ALLOWANCE PER *HARDSCAPE* AREA (W/ft²). May be used as additional allowance for applicable illuminated *hardscape* area on the site.

LIGHTING APPLICATION	*LIGHTING* ZONE 0	*LIGHTING* ZONE 1	*LIGHTING* ZONE 2	*LIGHTING* ZONE 3	*LIGHTING* ZONE 4
Special Security *Lighting* for Retail Parking and Pedestrian *Hardscape*. This additional allowance is for illuminated retail parking and pedestrian *hardscape* identified as having special security needs. This allowance shall be in addition to the *building* entrance or exit allowance.	Not applicable	0.004 W/ft²	0.005 W/ft²	0.010 W/ft²	No Allowance

TABLE 603.3-~~C~~(3) [TABLE 170.2-S] ADDITIONAL MULTIFAMILY LIGHTING POWER ALLOWANCE FOR SPECIFIC APPLICATIONS (continued)

All area and distance measurements in plan view unless otherwise noted.

PER SITE: WATTAGE ALLOWANCE PER *HARDSCAPE* AREA (W/ft²). May be used as additional allowance for applicable illuminated *hardscape* area on the site.

LIGHTING APPLICATION	*LIGHTING* ZONE 0	*LIGHTING* ZONE 1	*LIGHTING* ZONE 2	*LIGHTING* ZONE 3	*LIGHTING* ZONE 4
Security Camera. This additional allowance is for the illuminated general *hardscape* area. This allowance shall apply when a security camera is installed within 2 mounting heights of the general *hardscape* area and mounted more than 10 feet away from a *building*.	Not applicable	No Allowance	0.018 W/ft²	0.018 W/ft²	0.018 W/ft²

603.3.2.5 *[Section 170.2(e)7]* **Sign lighting.**

All *internally illuminated and externally illuminated signs*, unfiltered *light emitting diodes* (*LEDs*), and unfiltered neon, both indoor and outdoor shall comply with Section 601.3.3.

603.4 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as specified in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

603.5 *[Sections 180.1, 180.2]* **Additions and alterations to existing buildings.**

603.5.1 *[Section 180.1]* **Additions.**

Additions to existing *multifamily use designations~~buildings~~* shall meet the mandatory requirements of Section 603.5.1.1, and either prescriptive requirements of Section 603.5.1.2 *[Section 180.1(a)]* or performance requirements of Section 603.5.1.3 *[Section 180.1(b)]*.

603.5.1.1 *[Section 180.1]* **Mandatory requirements (Additions).**

The *lighting* of the *addition*; any newly installed *electrical power distribution systems,* any *addition* to an *outdoor lighting* system; and any new *sign* installed in conjunction with an indoor or outdoor *addition* shall meet the applicable requirements of the sections listed below:

101.1, 101.2, 101.3 *[Section 110.0, 110.1]* Systems and Equipment

600.2, 600.3, 601.2 *[Section 110.9, 160.0, 160.5, 160.6]* Mandatory Requirements for Electrical and *Lighting* Systems

600.4 Mandatory Requirements for Demand Management

603.5.1.2 *[Section 180.1(a)]* **Prescriptive requirements (Additions).**

The *lighting* of the *addition*; any *addition* to an *outdoor lighting* system; and any new *sign* installed in conjunction with an indoor or outdoor *addition* shall meet the applicable requirements of the sections listed below:

102.4 [Section 140.2] Prescriptive Requirements for *Newly Constructed Buildings*

603.3 *[Section 170.0, 170.2(e)]* Prescriptive Requirements for *Lighting* Systems

603.5.1.3 *[Section 180.1(b)]* **Performance requirements (Additions).**

The indoor *lighting* in the *conditioned space* of the *addition* shall meet the applicable requirements of Section 102 and either the *addition* alone shall comply or the existing *building* plus *addition*.

603.5.2 *[Section 180.2]* **Alterations.**

Alterations to components of existing *multifamily* *use designations*~~*buildings*~~, including *alterations* made in conjunction with a change in *building occupancy* to a multifamily *occupancy*, shall meet mandatory requirements of Section 603.5.2.1, and either prescriptive requirements of Section 603.5.2.2 or performance requirements of Section 603.5.2.3.

603.5.2.1 *[Sections 180.0, 180.2(a)]* **Mandatory requirements (Alterations).**

Altered components in a *multifamily* *use designations*~~*building*~~shall meet the requirements specified in the sections listed below that are applicable to the ~~*building*~~ project scope and the minimum requirements in this section.

101.1, 101.2, 101.3 *[Section 110.0, 110.1]* Systems and Equipment

600.2, 603.1, 603.2.1 through 603.2.2 *[Section 110.9, 160.0, 160.5]* Mandatory Requirements for *Lighting* Systems

Exception to Section 603.5.2.1: *Dwelling unit luminaire* requirements. Where existing screw base sockets are present in ceiling-recessed *luminaires*, removal of these sockets is not required, provided that new JA8 compliant trim kits or *lamps* designed for use with recessed downlights or *luminaires* are installed.

603.5.2.2 *[Sections 180.2(b)]* **Prescriptive requirements (Alterations).**

603.5.2.2.1 Dwelling units.

RESERVED.

603.5.2.2.2 *[Sections 180.2(b)4B]* **Common use areas.**

603.5.2.2.2.1- Spaces with *lighting* systems installed for the first time. Spaces with *lighting* systems installed for the first time shall meet the applicable requirements of Sections 600.2 *[Section 110.9]*, 603.2.2.1 *[Section 160.5(b)1]*, 603.2.2.2 *[Sections 160.5(b)2, 160.5(b)3, 160.5(b)4]*, 603.2.2.3 *[Section 160.5(c)]*, 603.2.3 *[Section 160.5(e)]*, 303.3.3 *[Section 170.2(b)]*, and 603.3.2 *[Sections 170.2(e)1 through 170.2(e)6].*

603.5.2.2.2.2- Addition of *skylights* to an existing *building*. When the requirements of Section 601.2.2.4 *[Section 160.5(b)4D]* are triggered by the addition of *skylights* to an existing *building* and the *lighting* system is not recircuited, the daylighting control need not meet the multi-level requirements in Section 601.2.2.4 *[Section 160.5(b)4D]*.

603.5.2.2.2.3- New illuminated signs. New *internally and externally illuminated signs* shall meet the requirements of Sections 600.2.1 *[Sections 110.9]*, 601.2.4 *[160.5(d)]* and 601.3.3 *[170.2(e)7]*.

603.5.2.2.2.4- Altered indoor *lighting* systems. *Alterations* to indoor *lighting* systems that include 10% or more of the *luminaires* serving an *enclosed space* shall comply with Section 601.5.2.2.4.

603.5.2.2.2.5- Altered *outdoor lighting* systems. Shall comply with Section 601.5.2.2.5.

603.5.2.2.2.6- Altered illuminated signs. *Alterations* to existing *internally and externally illuminated signs* that increase the connected *lighting* load, replace and rewire more than 50 percent of the ballasts, or relocate the *sign* to a different location on the same site or on a different site shall meet the requirements of Section 601.3.3 *[Section 170.2(e)7]*.

Exception to Section 603.5.2.2.2.6: Replacement of parts of an existing *sign*, including replacing *lamps*, the *sign* face or ballasts, that do not require rewiring or that are done at a time other than when the *sign* is relocated, is not an *alteration* subject to the requirements of Section 603.5.2.2.2.6.

603.5.2.2.2.7- *Service electrical metering*. New or replacement electrical *service equipment* shall meet the requirements of Section 603.2.3.1 *[Section 160.6(a)]* applicable to the *electrical power distribution system* altered.

603.5.2.2.2.8- Separation of electrical circuits for electrical energy monitoring. For entirely new or complete replacement of *electrical power distribution systems*, the entire system shall meet the applicable requirements of Section 603.2.3.2 *[Section 160.6(b)]*.

603.5.2.2.2.9- Voltage drop. For *alterations* of feeders and branch circuits where the *alteration* includes *addition*, modification or replacement of both feeders and

branch circuits, the altered circuits shall meet the requirements of Section 601.2.6.3 *[Section 160.6(c)]*.

Exception to Section 603.5.2.2.2.9: Voltage drop permitted by California Electrical Code Sections 647.4, 695.6 and 695.7.

603.5.2.2.2.10- Circuit controls for 120-volt receptacles and controlled receptacles. For entirely new or complete replacement of *electrical power distribution systems*, the entire system shall meet the applicable requirements of Section 603.2.3.4 *[Section 160.6(d)]*.

603.5.2.3 *[Sections 180.2(c)]* **Performance requirements (Alterations).**

The *altered component*(*s*) and any newly installed *equipment* serving the *alteration* shall meet the applicable requirements of Section 102.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SUBCHAPTER 7
PHOTOVOLTAIC ~~RENEWABLES~~ AND BATTERY ENERGY STORAGE SYSTEMS

SECTION 700

MANDATORY REQUIREMENTS FOR ALL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS)

700.1 *[Section 100.0(h)]* **Systems and equipment.**

Part 6 limits the installation of *manufactured equipment*, *products, and devices* to those that have been certified as specified by sections 101.2 *[Section 110.0]* and 101.3 *[Section 110.1]*. Requirements for *manufactured equipment*, *products, and devices*, when not specified in Title 24 *Part 6*, are specified in California Code of Regulations, Title 20, Sections 1601-1609.

700.2 *[Section 110.4(c)]* **Pool heating source sizing.**

Solar heating systems or equipment for *pool* and/or *spa* shall meet Section 800.3 *[Section 110.4(c)]*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 701

NONRESIDENTIAL AND HOTEL/MOTEL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

701.1 *[Section 120.0]* **General.**

Section 701 establishes requirements for the design and installation of ~~renewables~~ *photovoltaic (PV) systems* and *Battery Energy Storage Systems* (*BESS*) in *nonresidential* and *hotel/motel buildings* that are within the scope of Section 100.3 *[Section 100.0(a)]*.

NOTE: The requirements of Sections 701.2 through 701.4 apply to *newly constructed buildings*. Sections 701.2 and 701.5.1 apply to *additions* to existing *buildings* and Section 701.5.2 applies to *alterations* to existing *buildings*.

701.2 Mandatory requirements (Newly Constructed, Additions).

701.2.1 *[Section 110.10(a)]* **Solar readiness.**

Nonresidential buildings with three ~~habitable~~ stories or fewer, other than *buildings* classified as I-2 ~~and I-2.1~~ *occupancy* ~~*buildings*~~, that do not have a *photovoltaic system* installed, shall comply with the requirements of this section.

Hotel/motel occupancies with ten *habitable stories* or fewer, that do not have a *photovoltaic system* installed, shall comply with the requirements of this section.

701.2.1.1 *[Section 110.10(b)1]* **Solar zone.**

The *solar zone* shall comply with access, pathway, smoke ventilation, and spacing requirements as specified in Title 24, Part 9 or other Parts of Title 24 or in any requirements adopted by a local jurisdiction.

The *solar zone* total area shall be comprised of areas that meet the conditions of either subsection 1. or 2.:

1. ~~For~~ *buildings* with *roof* areas less than or equal to 10,000 square feet, ~~have~~ include no areas of the *roof* with a dimension less than five feet and that are no less than 80 square feet each ~~for buildings with roof areas less than or equal to 10,000 square feet~~, or
2. For *buildings* with *roof* areas greater than 10,000 square feet, include no areas of the *roof* with a dimension less than five feet and that are no less than 160 square feet each ~~for buildings with roof areas greater than 10,000 square feet~~.

701.2.1.1.1 *[Section 110.10(b)1B]* **Solar zone location and minimum area.**

The *solar zone* shall be located on the *roof* or *overhang* of the *building* or on the *roof* or *overhang* of another structure located within 250 feet of the *building* or on covered parking installed with the *building* project, and shall have a total area no less than 15 percent of the total *roof* area of the *building* excluding any *skylight area*. The *solar zone* requirement is applicable to the *entire building*, including mixed *occupancy*.

Exception 1 to Section 701.2.1.1.1: ~~High-rise *multifamily buildings, hotel*~~*Hotel/motel occupancies*, and *nonresidential buildings* with a permanently installed solar electric system having a nameplate DC power rating, measured under Standard Test Conditions, of no less than one watt per square foot of *roof* area.

Exception 2 to Section 701.2.1.1.1: ~~High-rise *multifamily buildings, hotel*~~*Hotel/motel occupancies* with a permanently installed domestic solar water-heating system complying with Section 502.3.1.3 *[Section 150.1(c)8C]*.

Exception 3 to Section 701.2.1.1.1: *Buildings* with a designated *solar zone* area that is no less than 50 percent of the potential *solar zone* area. The potential *solar zone* area is the total area of any *low-sloped roofs* where the annual solar access is 70 percent or greater and any *steep-sloped roofs* oriented between 90 degrees and 300 degrees of true north where the annual solar access is 70 percent or greater. Solar access is the ratio of solar insolation including shade to the solar insolation without shade. *Shading* from obstructions located on the *roof* or any other part of the *building* shall not be included in the determination of annual solar access.

Exception 4 to Section 701.2.1.1.1: *Buildings* where the *roof* is designed and approved to be used for vehicular traffic or parking or for a heliport.

701.2.1.1.2 *[Section 110.10(b)2]* **Azimuth range.**

All sections of the *solar zone* located on *steep-sloped roofs* shall have an *azimuth* range between 90 degrees and 300 degrees of true north.

701.2.1.1.3 *[Section 110.10(b)3]* **Shading.**

No obstructions, including but not limited to, vents, chimneys, architectural features and *roof* mounted equipment, shall be located in the *solar zone*.

Any obstruction, located on the *roof* or any other part of the *building* that projects above a *solar zone* shall be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the *solar zone*, measured in the vertical plane.

Exception to Section 701.2.1.1.3: Any *roof* obstruction, located on the *roof* or any other part of the *building*, that is oriented north of all points on the *solar zone*.

701.2.1.1.4 *[Section 110.10(b)4]* **Structural design loads on construction documents**.

For areas of the *roof* designated as *solar zone*, the structural design loads for *roof* dead load and *roof* live load shall be clearly indicated on the construction documents.

NOTE: Section 701.2.1.1.4 *[Section 110.10(b)4]* does not require the inclusion of any collateral loads for future solar energy systems.

701.2.1.2 *[Section 110.10(c)]* **Interconnection pathways.**

The construction documents shall indicate a location reserved for inverters and metering equipment and a pathway reserved for routing of conduit from the *solar zone* to the point of interconnection with the electrical *service*.

For central water-heating systems, the construction documents shall indicate a pathway for routing of plumbing from the *solar zone* to the *water-heating system*.

701.2.1.3 *[Section 110.10(d)]* **Documentation.**

A copy of the construction documents or a comparable document indicating the information from Section 701.2.1.1 and Section 701.2.1.2 *[Sections 110.10(b) through 110.10(c)]* shall be provided to the occupant.

701.3 *[Section 140.10]* **Prescriptive requirements (Newly Constructed).**

A *building* complies with this section by determining the applicability of photovoltaic (PV) system requirements specified in Section 701.3.1; considering the *solar access roof area (SARA)* specified in Section 701.3.2; determining the PV capacity requirements as specified in Section 701.3.3; determining the applicability of *battery energy storage system (BESS)* requirements specified in Section 701.3.4; and determining the *BESS* capacity requirements specified in Section 701.3.5.

701.3.1 *[Section 140.10(a)]* **Photovoltaic (PV) applicability**

All *newly constructed buildings* where at least 80 percent of the floor area of the *building* serves one or more of the *Use Designations* specified in Table 701.3-(1) *[Table 140.10-A]* or Table 701.3-(2) *[NEW TABLE]* shall have a newly installed photovoltaic (PV) system meeting the minimum qualification requirements of Reference Joint Appendix JA11.

~~**where:**~~

~~**kWPVdc = Minimum rated PV system capacity in kW.**~~

~~**CFA = Conditioned floor area in square feet.**~~

~~**A = PV capacity factor in W/square foot as specified in Table 701.3-A [Table 140.10-A] for the building type.**~~

Exception 1 to Section 701.3.1. No PV system is required where the total of all available *SARA* is less than three percent of the *conditioned floor area*.

~~Exception 2 to Section 701.3.1. No PV system is required where the required PV system capacity as determined in Section 701.3.4 is less than 4 kWdc.~~

~~Exception 3 to Section 701.3.1. No PV system is required if the SARA contains less than 80 contiguous square feet.~~

~~**Exception 4 to Section 701.3.1:** Buildings with enforcement-authority-approved roof designs, where the enforcement authority determines it is not possible for the PV system, including panels, modules, components, supports and attachments to the roof structure, to meet ASCE 7-16, Chapter 7, Snow Loads.~~

~~**Exception 5 to Section 701.3.1:** For *nonresidential* and *hotel/motel* multitenant *buildings*, the PV capacity determined by Equation 701.3-A *[Equation 140.10-A]* shall be calculated without including *tenant spaces* meeting all of the following:~~

1. ~~The *tenant space* is less than or equal to 2,000 square feet of *conditioned space*;~~
2. ~~The *tenant space* is served by an *HVAC system* that does not serve other *tenant spaces* in the *building*; and~~
3. ~~The tenant space has an individual utility meter to track electricity consumption that does not include the electricity consumption of other tenant spaces in the building.~~

~~This exception does not apply where the Commission has approved a community solar program for showing compliance as specified in Title 24, Part 1, Section 10-115, or where a load-serving entity provides a program where PV generation is compensated through virtual energy bill credits for occupants of nonresidential and hotel/motel tenant spaces to receive energy bill benefits from netting of energy generation and consumption.~~

Exception 2 to Section 701.3.1: *Buildings* with enforcement-authority-approved *roof* designs, where the enforcement authority determines it is not possible for the PV system, including panels, modules, components, supports and attachments to the *roof* structure, to meet *ASCE 7-16*, Chapter 7, Snow Loads.

Exception 3 to Section 701.3.1: *Buildings* located in *climate zones* and with *Use Designations* where the entry in Table 701.3-(1) *[Table 140.10-A]* or Table 701.3-(2) *[NEW TABLE]* is "NR."

TABLE 701.3-A [Table 140.10-A] – PV CAPACITY FACTORS (W/ft² of conditioned floor area)

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Events and Exhibits	3.48	4.28	3.66	4.32	3.77	4.05	4.28	4.83	4.63	4.80	5.04	4.44	4.95	4.36	5.48	3.38
Library	0.39	3.23	2.59	3.25	2.48	2.74	3.04	3.49	3.32	3.69	3.79	3.32	3.79	3.37	4.49	2.84
Hotel/Motel	1.69	1.90	1.66	1.97	1.69	1.87	1.94	2.22	2.09	2.20	2.30	2.05	2.30	2.02	2.72	1.73
Office, Financial Institution, Unleased Tenant Space, Medical Office Building/Clinic	2.59	3.13	2.59	3.13	2.59	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.80	2.59
Restaurants	8.55	9.32	8.16	9.65	8.21	8.73	9.11	10.18	9.75	10.28	10.85	9.73	10.69	9.73	12.25	8.47
Retail, Grocery	3.14	3.49	3.01	3.61	3.05	3.27	3.45	3.83	3.65	3.81	4.09	3.64	3.99	3.71	4.60	3.21
School	1.27	1.63	1.27	1.63	1.27	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	2.46	1.27
Warehouse	0.39	0.44	0.39	0.44	0.39	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.58	0.39
Religious Worship	4.25	4.65	3.49	4.52	3.72	4.29	4.64	5.89	5.30	5.67	5.89	4.99	5.78	4.63	7.57	3.90
Sports and Recreation	2.47	1.97	1.54	2.03	1.60	1.84	1.98	2.63	2.47	2.60	2.75	2.20	2.72	2.15	4.03	1.81
Multifamily > 3 stories	1.82	2.21	1.82	2.21	1.82	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.77	1.82

701.3.1~~1~~2 *[Section 140.10(a)1 and 2]* **Solar Access Roof Area (SARA).**

SARA includes the area of the *building*'*s roof* space ~~capable of structurally supporting a PV system,~~ and the area of all *roof* space on covered parking areas, *carports* and all other newly constructed structures on the site that ~~are compatible with supporting a PV system per Title 24, Part 2, Section 1511.10.~~meet all the following conditions:

~~SARA does not include:~~

1. ~~Any~~*Roof* area that has ~~less than~~ 70 percent annual solar access or more. Annual solar access is determined by dividing the total annual solar insolation (accounting for *shading* obstructions) by the total annual solar insolation if the same areas were unshaded by those obstructions. For all *roofs*, all obstructions, including those that are external to the *building*, and obstructions that are part of the *building* design and elevation features shall ~~may~~ be considered for the annual solar access calculations.
2. ~~Occupied roofs as specified by CBC Section 503.1.4.~~ *Roof* area compatible with supporting a PV system as specified by Title 24, Part 2, Section 1511.10.
3. ~~Roof area that is otherwise not available due to compliance with other state building code requirements, or local building code requirements if the local building code requirements are confirmed by the Executive Director.~~ *Roof* areas ~~withno s~~ less than that are no less than 80 contiguous square feet each. For *use designations* other than *Group R occupancies*, those *roof* areas shall also have no plan dimension less than five feet.
4.

Exception 1 to Section 701.3.2.~~.~~: *Occupiable roofs* as specified by *CBC* Section 503.1.4 are excluded from *SARA*.

Exception 2 to Section 701.3.2.~~.~~: *Roof* area that is otherwise not available due to compliance with other state *building* code requirements, or local *building* code requirements are excluded from *SARA* if the local *building* code requirements are confirmed by the *Executive Director*.

701.3.3 *[New Section]* **Photovoltaic capacity.**

Where PV systems are required by Section 701.3.1, the PV capacity in kW_{dc} shall be no less than the smaller of the following:

1. *Use Designation* Capacity determined by Section 701.3.3.1.
2. *SARA* Capacity determined by Section 701.3.3.2.

Exception ~~2~~ to Section 701.3.3~~1~~: No PV system is required where the required PV system capacity is less than 4 kWdc.

701.3.3.1 *[New Section]* **Use-Designation-Based Photovoltaic Capacity**

The PV capacity in kW_{dc} shall be determined by Equation 701.3-A *[Equation 140.10-A]*. *PV capacity* factor A shall be determined by Section 701.3.3.1.3 or Section 701.3.3.1.4, whichever is applicable.

PHOTOVOLTAIC DIRECT CURRENT CAPACITY (EQUATION 701.3-A) [EQUATION 140.10-A]

$kW_{PVdc} = (CFA \times A)/1000$

where:

kW_{PVdc}	=	Minimum rated PV system capacity in kW.
CFA	=	*Conditioned floor area* in square feet.
A	=	PV capacity factor in W/square foot as specified by Section 701.3.3.1.

701.3.3.1.1 *[New Section]* **Mixed Use, including Group R Occupancies.**

The minimum rated PV system capacity for the *building* shall be calculated by applying Equation 701.3-A *[Equation 140.10-A]* to the *conditioned floor area* associated with each applicable *use designation*. When a multifamily *use designation* is included in a *mixed use building*, the PV Capacity Factors specified for multifamily use in Section 703.3 shall be applied. The capacities calculated for each *use designation* shall be summed to determine the minimum required PV system capacity for the *building*.

701.3.3.1.2 *[New Section]* **Multitenant Buildings.**

For nonresidential and hotel/motel multitenant *buildings that do not satisfy the conditions of Section 701.3.3.1.2.1*, the *conditioned floor area* used to determine PV capacity in Equation 701.3-A *[Equation 140.10-A]* shall not include the *conditioned floor area* of *tenant spaces* meeting all of the following:

1. The *tenant space* is no greater than 2,000 square feet of *conditioned floor area*;
2. The *tenant space* is served by an *HVAC system* that does not serve other *tenant spaces* in the *building*; and
3. The *tenant space* has an individual utility meter to track electricity consumption that does not include the electricity consumption of other *tenant spaces* in the *building*.

701.3.3.1.2.1 [New Section] Special Circumstances for Multitenant Buildings.

The PV capacity for nonresidential multitenant *buildings* shall be based on all *tenant spaces* when either of the following conditions is met:

1. The *Energy CCommission* has approved a community solar program for showing compliance as specified in Title 24, *Part 1*, Section 10-115.
2. A load-serving entity provides a program where a PV system is designed and operated to serve multiple *tenant spaces*, and consumption charges to each *tenant space* are reduced by virtually netting that system's PV generation against the energy consumption of the *tenant spaces* served.

701.3.3.1.3 *[New Section]* **PV Capacity where BESS is required**

Where *BESS* is required by Section 701.3.4, PV capacity factor A in Equation 701.3-A *[Equation 140.10-A]* shall be as specified in Table 701.3-(1) *[Table 140.10-A]* for each applicable *Use Designation*.

701.3.3.1.4 *[New Section]* **PV Capacity where BESS is not required**

Where *BESS* is not required by Section 701.3.4, PV capacity factor A in Equation 701.3-A *[Equation 140.10-A]* shall be as specified in Table 701.3-(2) *[NEW TABLE]* for each applicable *Use Designation*.

701.3.3.2 *[New Section]* **SARA-Based Photovoltaic Capacity**

The PV capacity shall be determined by Equation 701.3-B *[NEW EQUATION].*

PHOTOVOLTAIC DIRECT CURRENT CAPACITY, SARA-BASED –(EQUATION 701.3-B) [NEW EQUATION]

$$kW_{PVdc,\ SARA} = SARA \times S$$

where:

$kW_{PVdc,\ SARA}$	=	SARA-based minimum rated PV system capacity in kW.
SARA	=	The *SARA* in square feet as determined in Section 701.3.2.
S	=	18 W/square foot for *steep-sloped roofs* or 14 W/square foot for *low-sloped roofs*.

TABLE 701.3-(1) [TABLE 140.10-A] – PV CAPACITY FACTORS WHEN BESS IS REQUIRED (W/FT² OF CONDITIONED FLOOR AREA)

USE DESIGNATION	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Exhibits And Events	2.12	1.65	1.34	1.71	1.62	1.40	1.94	1.67	1.64	2.06	1.78	1.43	2.50	1.61	2.11	1.43
Library	2.23	2.82	2.50	2.68	2.52	3.32	3.07	3.91	3.45	3.27	2.89	3.49	3.17	3.31	3.96	2.40
Office, Financial Institution, Medical/Clinic Office, Unleased *Tenant Space*	4.78	4.08	3.38	4.28	3.70	3.99	3.94	4.30	3.82	4.16	4.74	3.80	5.15	4.24	4.78	4.35
Religious Worship	1.72	2.53	1.85	1.97	1.95	2.13	2.12	3.33	3.07	2.23	3.51	4.08	3.05	1.80	4.56	2.44
Restaurant	6.49	6.63	7.90	7.14	6.15	6.23	7.31	7.31	8.43	7.04	8.80	8.19	8.97	7.15	8.66	7.99
Retail, Grocery Store	3.70	3.29	2.96	4.25	3.94	3.64	4.05	4.45	3.67	4.29	4.09	4.74	4.82	4.62	4.18	3.70
School, Higher Learning	1.95	1.86	1.74	2.05	1.71	2.17	2.23	2.39	2.12	2.78	2.33	2.31	2.54	2.08	2.44	1.90
School, K - 12	0.60	0.55	0.55	0.79	0.64	0.65	0.65	1.07	1.16	1.45	1.56	0.77	1.69	1.85	2.89	0.31
Sports And Recreation	1.90	2.24	1.71	2.43	2.08	2.43	2.86	2.19	3.09	2.31	2.11	2.38	3.57	1.66	3.42	2.14
Warehouse	0.94	0.95	0.68	0.79	0.78	0.82	0.93	1.23	0.86	1.23	0.93	1.07	0.95	1.10	1.27	0.76
Group R *occupancy*, Hotel/Motel[a]	1.69	1.90	1.66	1.97	1.69	1.87	1.94	2.22	2.09	2.20	2.30	2.05	2.30	2.02	2.72	1.73

Footnote to Table 701.3-(1) *[TABLE 140.10-A]*:

a. The PV Capacity Factors (W/ft^2) of *conditioned floor area* for Hotel/Motel are unchanged from the 2025 California Energy Code.

NOTE : The PV Capacity Factors (W/ft^2) of *conditioned floor area* for multifamily *use designations* can be found in Section 703.3.

TABLE 701.3-(2) [NEW TABLE] – PV CAPACITY FACTORS WHEN BESS IS NOT REQUIRED (W/FT² OF CONDITIONED FLOOR AREA)

USE DESIGNATION	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Exhibits And Events	1.68	1.61	1.15	1.62	1.31	1.25	1.52	1.63	1.36	1.86	1.45	1.39	2.40	1.33	2.01	1.29
Library	1.92	2.14	2.06	2.10	1.83	2.26	2.55	2.84	2.69	2.88	2.02	2.66	2.27	2.33	3.31	2.11
Office, Financial Institution, Medical/Clinic Office, Unleased *Tenant Space*	4.14	2.97	2.95	3.45	3.32	3.50	3.41	3.77	3.25	3.51	3.70	3.31	4.33	3.37	3.91	3.79
Religious Worship	0.84	1.33	1.04	1.08	1.03	0.60	1.01	1.18	0.69	1.18	3.10	1.97	1.17	0.98	3.18	0.81
Restaurant	5.16	5.31	5.97	5.62	5.06	4.85	5.78	5.51	6.43	5.76	7.29	6.54	6.97	5.90	6.98	6.43
Retail, Grocery Store	2.72	2.75	2.40	3.03	3.31	3.03	3.25	3.31	2.84	3.43	3.17	3.36	3.86	3.31	3.24	2.94
School, Higher Learning	1.66	1.58	1.44	1.59	1.40	1.86	1.94	1.95	1.82	2.37	1.96	2.02	2.19	1.82	2.10	1.60
School, K - 12	0.48	0.48	0.48	0.71	0.52	0.64	0.56	1.02	1.10	1.16	1.39	0.61	1.47	1.73	2.38	0.26
Sports And Recreation	1.41	1.58	1.23	1.70	1.20	1.77	1.87	1.88	2.07	2.01	1.30	1.44	2.86	1.04	2.46	1.46
Warehouse	0.77	0.80	0.57	0.66	0.68	0.69	0.73	0.90	0.85	0.93	0.74	0.89	0.74	0.88	1.27	0.64
Group R *occupancy*, Hotel/Motel[a]	1.69	1.90	1.66	1.97	1.69	1.87	1.94	2.22	2.09	2.20	2.30	2.05	2.30	2.02	2.72	1.73

Footnote to Table 701.3-(2) *[TABLE 140.10-B]*:

a. The PV Capacity Factors (W/ft²) of *conditioned floor area* for Hotel/Motel are unchanged from the 2025 California Energy Code.

NOTE : The PV Capacity Factors (W/ft²) of *conditioned floor area* for multifamily *use designations* can be found in Section 703.3.

701.3.~~2~~4 *[Section 140.10(b)]* **Battery energy storage system (BESS) ~~requirements~~ applicability.**

All *buildings* that are required by Section 701.3.1 *[Section 140.10(a)]* to have a PV system shall also have a *BESS* meeting the minimum qualification requirements of Reference Joint Appendix JA12.

Exception 1 to Section 701.3.4: *Buildings* located in *climate zones* and with *Use Designations* where the entry in Table 701.3~~-~~(3) *[Table 140.10-B]* is "NR."

Exception 2 to Section 701.3.4: Single-tenant *buildings* with less than 5,000 square feet of *conditioned floor area*.

Exception ~~3~~1 to Section 701.3.~~2~~4: No *BESS* is required if the installed PV system capacity is less than 15 percent of the capacity determined by Equation 701.3-A *[Equation 140.10-A]*.

~~The rated energy capacity shall be not less than the Minimum Rated Useable Energy Capacity determined using Equation 701.3-B [Equation 140.10-B] or 701.3-C [Equation 140.10-C] if SARA was used to determine the PV capacity in Section 701.3.1 [Section 140.10(a)].~~

~~The rated power capacity shall be not less than the Minimum Power Capacity determined using Equation 701.3-D [Equation 140.10-D].~~

~~In mixed occupancy buildings, the total battery system capacity for the building shall be determined by applying the Minimum Rated Usable Energy Capacity to each of the listed building types and summing the capacities determined for each.~~

701.3.5 *[New Section]* **Battery energy storage system (BESS) Energy Capacity.**

Where *BESS* are required by Section 701.3.4, the rated energy capacity shall be not less than the Minimum Rated Usable Energy Capacity determined by Section 701.3.5.1 if the PV capacity is based on the *Use Designation* or by Section 701.3.5.2 if the PV capacity is based on *SARA*.

The rated power capacity shall be no less than the Minimum Power Capacity determined using Equation 701.3-E *[Equation 140.10-D]*.

701.3.5.1 *[New Section]* **Use-Designation-Based Usable Energy Capacity**

The Minimum Rated Usable Energy Capacity in kWh_{batt} shall be determined by Equation 701.3-C *[Equation 140.10-B]. BESS capacity* factor B in Wh/square foot shall be as specified in Table 701.3-(3) *[Table 140.10-B]* for each applicable *Use Designation*.

701.3.5.1.1 *[New Section]* **Mixed Use, including Group R Occupancies.**

The *BESS* Minimum Rated Usable Energy Capacity for the *building* shall be calculated by applying Equation 701.3-C *[Equation 140.10-B]* to the *conditioned floor area* associated with each applicable *use designation*. When a multifamily *use designation* is included in a *mixed use building*, the *BESS* Capacity Factors specified for multifamily use in Section 703.3.2 shall be applied. The capacities calculated for each

use designation shall be summed to determine the *BESS* Minimum Rated Usable Energy Capacity for the *building*.

701.3.5.1.2 *[New Section]* **Multitenant Buildings.**

For multitenant *buildings*, the Minimum Rated Usable Energy Capacity of the *BESS* shall be based on the *tenant spaces* with more than 5,000 square feet of *conditioned floor area*.

701.3.5.2 *[New Section]* **SARA-Based Usable Energy Capacity**

The Minimum Rated Usable Energy Capacity shall be no less than the Minimum Rated Usable Energy Capacity determined using Equation 701.3-D *[Equation 140.10-C].*

BESS ~~BATTERY ENERGY STORAGE SYSTEM~~ MINIMUM RATED USABLE ENERGY CAPACITY (EQUATION 701.3-C~~B~~) [EQUATION 140.10-B]

$kWh_{batt} = [(CFA \times B)/(1{,}000 \times C^{0.5})]$

where:

kWh_{batt} = Minimum Rated Usable Energy Capacity of the *BESS* in kWh.

CFA = *Conditioned floor area* that is subject to the PV system requirements of Section 701.3.1 *[Section 140.10(a)]* in square feet.

B = *BESS* Capacity Factor in Wh/square foot as specified in Table 701.3-(3) *[Table 140.10-B]* for each *Use Designation*.

C = Rated single charge-discharge cycle AC to AC (round-trip) efficiency of the *BESS*.

BESS ~~BATTERY ENERGY STORAGE SYSTEM~~ MINIMUM RATED USABLE ENERGY CAPACITY, SARA-~~ADJUSTED~~ BASED ~~————~~(EQUATION 701.3-C~~D~~) [EQUATION 140.10-C]

$kWh_{batt} = kWh_{701.3\text{-}C}$ ~~$((CFA \times B)/(1{,}000 \times C^{0.5}))$~~ $\times (kW_{PVdc,SARA}/kW_{PVdc})$

where:

kWh_{batt} = Minimum Rated Usable Energy Capacity of the *BESS* in kWh.

$kWh_{701.3\text{-}C}$ = ~~—~~Minimum Rated Usable Energy Capacity from Equation ~~-~~701.3-C ~~-~~in kWh.

~~*CFA* = *Conditioned floor area* that is subject to the PV system requirements of Section 701.3.1 *[Section 140.10(a)]* in square feet.~~

kW_{PVdc} = Minimum Rated PV System Capacity in kW from ~~Equation 701.3-A *[Equation 140.10-A]*~~Section 701.3.3.1.

$kW_{PVdc, SARA}$ = Minimum Rated PV System Capacity in kW from ~~the SARA calculation~~Section 701.3.3.2.

~~B = *BESS* Capacity Factor in Wh/square foot as specified in Table 701.3(3) *[Table 140.10-B]* for the building type~~

~~C = Rated single charge-discharge cycle AC to AC (round-trip) efficiency of the *BESS*.~~

BESS MINIMUM RATED POWER CAPACITY (EQUATION 701.3-~~D~~E) [EQUATION 140.10-D]

$kW_{batt} = C^{0.5} \times kWh_{batt} / 4$

where:

kW_{batt} = Minimum Rated Power Capacity of the *BESS* in kW_{dc}~~dc~~.

kWh_{batt} = Minimum Rated Useable Energy Capacity of the *BESS* in kWh.

C = ~~—~~Rated single charge-discharge cycle AC to AC (round-trip) efficiency of the *BESS*.

Exception ~~2~~ to Section 701.3.2~~5~~: No *BESS* is required if the Minimum Rated Usable Energy Capacity ~~rated usable energy capacity~~ determined by Equation 701.3-~~B~~C [Equation 140.10-*B]* or Equation 701.3-~~C~~D *[Equation 140.10-C]* is less than 30 ~~10~~ kWh.

~~**Exception 3 to Section 701.3.2:** For multitenant *buildings*, the energy capacity of the *BESS* shall be based on the *tenant spaces* with more than 5,000 square feet of *conditioned floor area*. For single-tenant *buildings* with less than 5,000 square feet of *conditioned floor area*, no *BESS* is required.~~

TABLE 701.3-B [TABLE 140.10-B] – BESS CAPACITY FACTORS (WH/FT² OF CONDITIONED FLOOR AREA)

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Events and Exhibits	1.82	1.95	1.74	2.12	1.91	2.13	2.24	2.30	2.36	2.47	2.62	2.16	2.64	2.68	3.22	1.89
Library	0.37	7.17	5.97	6.75	5.64	6.08	6.19	7.13	7.18	7.56	7.17	6.93	6.88	6.81	7.93	6.40
Hotel/Motel	0.86	0.84	0.77	0.92	0.81	0.89	0.90	1.01	1.00	1.11	1.14	0.96	1.18	1.18	1.49	0.85
Office, Financial Institution, Unleased *Tenant Space*, Medical Office *Building*/Clinic	NR[1]	5.26	4.35	5.26	4.35	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	6.39	4.35
Restaurants	4.36	4.11	3.78	4.37	3.89	4.02	4.11	4.49	4.47	4.82	5.05	4.43	5.05	5.24	6.23	4.11
Retail, Grocery	1.89	1.82	1.71	1.82	1.72	1.80	1.76	1.92	1.97	2.05	2.22	1.95	2.16	2.29	2.66	1.91
School	NR[1]	3.05	2.38	3.05	2.38	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	4.60	2.38
Warehouse	NR[1]	0.41	0.37	0.41	0.37	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.54	0.37
Religious Worship	2.21	2.25	1.74	2.42	2.08	2.75	2.94	3.37	3.17	3.37	3.58	2.72	3.62	3.21	4.89	2.37
Sports and Recreation	1.26	0.98	0.76	1.14	0.86	1.20	1.23	1.57	1.53	1.65	1.83	1.27	1.86	1.57	3.02	1.13
Multifamily > 3 stories	1.88	2.27	1.88	2.27	1.88	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.85	1.88

Footnote to Table 701.3-B *[TABLE 140.10-B]*:

1. NR = Not Required.

TABLE 701.3-(3) [TABLE 140.10-B] – BESS CAPACITY FACTORS (WH/FT² OF CONDITIONED FLOOR AREA)

USE DESIGNATION	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
Exhibits And Events	1.83	1.29	1.25	1.64	1.85	1.30	2.21	1.46	1.53	1.59	2.62	1.53	2.30	1.90	2.40	1.50
Library	1.39	2.94	1.65	2.56	3.04	3.62	1.63	2.77	3.81	2.29	2.99	3.33	2.95	3.18	3.28	1.66
Office, Financial Institution, Medical/Clinic Office, Unleased *Tenant Space*	2.14	4.93	2.04	3.04	1.96	2.09	2.30	2.54	2.60	2.86	3.78	2.49	3.08	3.11	3.11	2.27
Religious Worship	3.96	3.62	3.86	4.12	3.94	5.23	5.15	5.20	6.00	4.23	3.12	5.46	6.38	4.29	6.42	5.79
Restaurant	6.09	5.76	6.49	6.26	5.64	6.52	7.77	7.77	7.06	6.09	6.45	10.63	6.54	6.27	9.28	5.92
Retail, Grocery Store	3.89	2.62	2.85	4.57	3.80	3.27	3.23	4.69	4.07	4.67	4.43	3.98	4.20	5.29	4.88	3.42
School, Higher Learning	1.13	1.42	1.47	1.25	1.53	1.34	1.46	1.52	1.26	1.76	1.42	1.64	1.47	1.30	1.26	1.74
School, K - 12	0.56	0.40	0.39	0.48	0.56	0.27	0.49	0.44	0.61	1.95	1.75	0.90	2.00	1.14	2.17	0.29
Sports And Recreation	2.85	3.17	2.92	3.10	3.45	3.00	2.94	2.88	4.44	2.90	3.38	3.28	4.75	2.88	4.93	3.65
Warehouse	0.62	0.51	0.45	0.48	0.50	0.42	0.54	0.80	0.27	0.85	0.66	0.58	0.61	0.45	0.43	0.49
Group R *occupancy*, Hotel/Motel[a]	0.86	0.84	0.77	0.92	0.81	0.89	0.90	1.01	1.00	1.11	1.14	0.96	1.18	1.18	1.49	0.85

Footnote to Table 701.3-(3) *[TABLE 140.10-BC]*:

a. The *BESS* Capacity Factors (W/ft²) of *conditioned floor area* for Hotel/Motel are unchanged from the 2025 California Energy Code.

NOTE : The *BESS* Capacity Factors (W/ft²) of *conditioned floor area* for multifamily *use designations* can be found in Section 703.3.

701.4 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

701.5 Additions and alterations to existing buildings.

701.5.1 *[Section 141.0]* **Additions.**

Additions to existing *nonresidential*, and *hotel/motel buildings* shall meet the mandatory requirements of Section 701.5.1.1 that are applicable to the *building* project.

701.5.1.1 *[Section 141.0(a)]* **Mandatory requirements (Additions).**

Any *addition* shall meet the applicable requirements of the sections listed below:

701.2.1 *[Section 110.10]* Mandatory Requirements for Solar Readiness

Exception to Section 701.5.1.1: *Additions* that increase the area of the *roof* by 2,000 square feet or less are not required to comply with Section 701.2.1 *[Section 110.10]*.

701.5.1.2 Prescriptive requirements (Additions).

RESERVED.

701.5.1.3 Performance requirements (Additions).

RESERVED.

701.5.2 Alterations.

RESERVED.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*; Section 18930, *Health and Safety Code*.

SECTION 702

SINGLE-FAMILY RESIDENTIAL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

702.1 *[Section 150.0]* **General.**

Single-family residential buildings shall comply with the applicable requirements of Section 702.

NOTE: The requirements of Sections 702.2 through 702.4 apply to *newly constructed buildings*. Section 702.5 applies to *additions* or *alterations*.

702.2 *[Section 150.0]* **Mandatory requirements (Newly Constructed).**

702.2.1 *[Section 110.10(a)1]* **Solar readiness.**

Single-family residences located in subdivisions with ten or more single-family residences and where the application for a tentative subdivision map for the residences has been deemed complete or approved by the *enforcement agency*, which do not have a *photovoltaic system* installed, shall comply with the requirements of this section.

702.2.1.1 *[Section 110.10(b)1]* **Solar zone.**

The *solar zone* shall comply with access, pathway, smoke ventilation, and spacing requirements as specified in Title 24, Part 9 or other Parts of Title 24 or in any requirements adopted by a local jurisdiction.

The *solar zone* total area shall be comprised of areas that have no dimension less than five feet and are no less than 80 square feet each for *buildings* with *roof* areas less than or equal to 10,000 square feet or no less than 160 square feet each for *buildings* with *roof* areas greater than 10,000 square feet.

702.2.1.1.1 *[Section 110.10(b)1A]* **Solar zone location and minimum area.**

The *solar zone* shall be located on the *roof* or *overhang* of the *building* and have a total area no less than 250 square feet.

Exception 1 to Section 702.2.1.1.1: Single-family residences with a permanently installed domestic solar water-heating system meeting the installation criteria specified in the Reference Residential Appendix RA4 and with a minimum *solar savings fraction* of 0.50.

Exception 2 to Section 702.2.1.1.1: Single-family residences with three *habitable stories* or more and with a total floor area less than or equal to 2000 square feet and having a *solar zone* total area no less than 150 square feet.

Exception 3 to Section 702.2.1.1.1: Single-family residences located in the Wildland-Urban Interface Fire Area as defined in Title 24, Part 2 and having a whole house fan and having a *solar zone* total area no less than 150 square feet.

Exception 4 to Section 702.2.1.1.1: *Buildings* with a designated *solar zone* area that is no less than 50 percent of the potential *solar zone* area. The potential *solar zone* area is the total area of any *low-sloped roofs* where the annual solar access is 70 percent or greater and any *steep-sloped roofs* oriented between 90 degrees and 300 degrees of true north where the annual solar access is 70 percent or greater. Solar access is the ratio of solar insolation including shade to the solar insolation without shade. *Shading* from obstructions located on the *roof* or any other part of the *building* shall not be included in the determination of annual solar access.

Exception 5 to Section 702.2.1.1.1: Single-family residences having a *solar zone* total area no less than 150 square feet and where all *thermostats* are *demand responsive controls* and comply with Section 400.6.1 *[Section 110.12(a)]*, and are capable of receiving and responding to *Demand Response Signals* prior to granting of an *occupancy* permit by the enforcing agency.

Exception 6 to Section 702.2.1.1.1: Single-family residences meeting the following conditions:

1. All *thermostats* are *demand responsive controls* that comply with Section 400.6.1 *[Section 110.12(a)]*, and are capable of receiving and responding to *Demand Response Signals* prior to granting of an *occupancy* permit by the enforcing agency.
2. Comply with one of the following measures:
    2.1. Install a dishwasher that meets or exceeds the ENERGY STAR® Program requirements with a refrigerator that meets or exceeds the ENERGY STAR Program requirements, a whole house fan driven by an electronically commutated motor, or an *SAE J1772* Level 2 *Electric Vehicle Supply Equipment* (*EVSE* or EV charger) with a minimum of 40 amperes; or
    2.2. Install a home automation system capable of, at a minimum, controlling the appliances and *lighting* of the *dwelling* and responding to *demand response signals*; or
    2.3. Install alternative plumbing piping to permit the discharge from the clothes washer and all showers and bathtubs to be used for an irrigation system in compliance with the *California Plumbing Code* and any applicable local ordinances; or
    2.4. Install a rainwater catchment system designed to comply with the *California Plumbing Code* and any applicable local ordinances, and that uses rainwater flowing from at least 65 percent of the available *roof* area.

702.2.1.1.2 *[Section 110.10(b)2]* **Azimuth range.**

All sections of the *solar zone* located on *steep-sloped roofs* shall have an *azimuth* range between 90 degrees and 300 degrees of true north.

702.2.1.1.3 *[Section 110.10(b)3]* **Shading.**

No obstructions, including but not limited to, vents, chimneys, architectural features and *roof* mounted *equipment*, shall be located in the *solar zone*.

Any obstruction, located on the *roof* or any other part of the *building* that projects above a *solar zone* shall be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the *solar zone*, measured in the vertical plane.

Exception to Section 702.2.1.1.3: Any *roof* obstruction, located on the *roof* or any other part of the *building*, that is oriented north of all points on the *solar zone*.

702.2.1.1.4 *[Section 110.10(b)4]* **Structural design loads on construction documents.**

For areas of the *roof* designated as *solar zone*, the structural design loads for *roof* dead load and *roof* live load shall be clearly indicated on the construction documents.

NOTE: Section 702.2.1.1.4 *[Section 110.10(b)4]* does not require the inclusion of any collateral loads for future solar energy systems.

702.2.1.2 *[Section 110.10(c)]* **Interconnection pathways.**

The construction documents shall indicate a location reserved for inverters and metering equipment and a pathway reserved for routing of conduit from the *solar zone* to the point of interconnection with the electrical *service*.

For single-family residences the construction documents shall indicate a pathway for routing of plumbing from the *solar zone* to the water-heating system.

702.2.1.3 *[Section 110.10(d)]* **Documentation.**

A copy of the construction documents or a comparable document indicating the information from Section 702.2.1.1 and Section 702.2.1.2 *[Sections 110.10(b) through 110.10(c)]* shall be provided to the occupant.

702.2.1.4 *[Section 110.10(e)]* **Main electrical service panel.**

The main electrical *service* panel shall have a minimum busbar rating of 200 amps.

The main electrical *service* panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation. The reserved space shall be permanently marked as “For Future Solar Electric”.

702.2.2 *[Section 150.0(s)]* **Battery Energy Storage Systems (BESS) ready.**

All single-family residences that include one or two *dwelling units*, which a load serving entity provides with electrical *service* for the *dwelling unit* that is greater than 125 amps, shall meet the requirements of this section.

Exception to Section 702.2.2: *Buildings* which have a *BESS* installed.

702.2.2.1 *[Section 150.0(s)1]* **Electrical infrastructure.**

At least one of the following shall be provided:

1. *BESS ready interconnection equipment* with a minimum backed-up capacity of 60 amps and a minimum of four *BESS*-supplied branch circuits specified in Section 702.2.2.2 *[Section 150.0(s)2]*, or
2. A dedicated raceway from the main *service* to a panelboard (subpanel) that supplies the branch circuits in Section 702.2.2.2 *[Section 150.0(s)2]*. All branch circuits are permitted to

be supplied by the main *service* panel prior to the installation of a *BESS*. The trade size of the raceway shall be not less than one inch. The panelboard that supplies the branch circuits (subpanel) must be labeled "Subpanel shall include all backed-up load circuits."

702.2.2.2 *[Section 150.0(s)2]* **Branch circuits.**

A minimum of four branch circuits shall be identified and have their source of supply collocated at a single panelboard suitable to be supplied by the *BESS*. At least one circuit shall supply the refrigerator, one *lighting* circuit shall be located near the primary egress, and at least one circuit shall supply a sleeping room receptacle outlet.

702.2.2.3 *[Section 150.0(s)3]* **Busbar rating.**

The main panelboard shall have a minimum busbar rating of 225 amps.

702.2.2.4 *[Section 150.0(s)4]* **Reserved space and raceways.**

Sufficient space shall be reserved to allow future installation of a system isolation equipment/transfer switch within 3 feet of the main panelboard. Raceways shall be installed between the panelboard and the system isolation equipment/transfer switch location to allow the connection of backup power source.

702.2.3 *[Section 150.0(n)2]* **Solar water-heating systems and collectors.**

Solar water-heating systems and collectors shall be certified and rated by the Solar Rating and Certification Corporation (SRCC), the International Association of Plumbing and Mechanical Officials, Research and Testing (IAPMO R and T), or by a listing agency that is approved by the *Executive Director*.

702.2.3.1 *[Section 150.0(j)]* **Solar water-heating system collector loop piping.**

Shall comply with Section 501.2.1.1.

702.2.3.2 *[Section 110.3(c)3]* **Backup tank insulation.**

Backup tanks for solar water-heating systems shall comply with Section 500.3.3.3.

702.3 *[Section 150.1]* **Prescriptive requirements (Newly Constructed).**

702.3.1 *[Section 150.1(c)14]* **Photovoltaic requirements.**

All *single-family residential buildings* shall have a newly installed *photovoltaic (PV) system* or newly installed PV modules meeting the minimum qualification requirements specified in Reference Joint Appendix JA11.

The annual electrical output of the *PV system* shall be no less than the smaller of a PV system size determined using Equation 702.3-A *[Equation 150.1-C]*, or the total *Solar Access Roof Area* (*SARA*) multiplied by 18 for *steep-sloped roofs* or multiplied by 14 for *low-sloped roofs*.

ANNUAL PHOTOVOLTAIC ELECTRICAL OUTPUT *(EQUATION 702.3-A) [EQUATION 150.1-C]*

$$kW_{PV} = (CFA \times A)/1000 + (N_{DU} \times B)$$

where:

kW_{PV} = kW_{dc} size of the PV system

CFA = *Conditioned floor area*

N_{DU} = Number of *dwelling units*

A = *CFA* adjustment factor from Table 702.3-~~A~~(1) *[Table 150.1-C]*

B = *Dwelling unit* adjustment factor from Table 702.3-~~A~~(1) *[Table 150.1-C]*

TABLE 702.3-~~A~~(1) [TABLE 150.1-C] – CFA AND DWELLING UNIT ADJUSTMENT FACTORS

CLIMATE ZONE	A - *CFA*	B - *DWELLING UNITS*
1	0.793	1.27
2	0.621	1.22
3	0.628	1.12
4	0.586	1.21
5	0.585	1.06
6	0.594	1.23
7	0.572	1.15
8	0.586	1.37
9	0.613	1.36
10	0.627	1.41
11	0.836	1.44
12	0.613	1.40
13	0.894	1.51
14	0.741	1.26
15	1.56	1.47
16	0.59	1.22

Exception 1 to Section 702.3.1: No PV system is required if the *SARA* is less than 80 contiguous square feet.

Exception 2 to Section 702.3.1: No PV system is required when the minimum PV system size specified by Section 702.3.1 *[Section 150.1(c)14]* is less than 1.8 kW_{dc}.

Exception 3 to Section 702.3.1: *Buildings* with enforcement-authority-approved *roof* designs, where the enforcement authority determines it is not possible for the PV system, including panels, modules and components and supports and attachments to the *roof* structure, to meet the requirements of the American Society of Civil Engineers (ASCE), Standard 7-16, Chapter 7, Snow Loads.

Exception 4 to Section 702.3.1: For *buildings* that are approved by the local planning department prior to January 1, 2020, with mandatory conditions for approval:

1. *Shading* from *roof* designs and configurations for *steep-sloped roofs*, which are required by the mandatory conditions for approval, shall be considered for the annual solar access calculations; and

2. *Roof* areas that are not allowed by the mandatory conditions for approval to have PVs, shall not be considered in determining the *SARA*.

Exception 5 to Section 702.3.1: PV system sizes determined using Equation 702.3-A *[Equation 150.1-C]* may be reduced by 25 percent if installed in conjunction with a *BESS*. The *BESS* shall meet the qualification requirements specified in Reference Joint Appendix JA12 and have a minimum cycling capacity of 7.5 kWh as defined in Reference Joint Appendix JA12.

702.3.1.1 *[Section 150.1(c)14A and B]* **Solar Access Roof Area (SARA).**

SARA includes the area of the *building*'*s roof* space capable of structurally supporting a PV system, and the area of all *roof* space on covered parking areas, *carports*, and all other newly constructed structures on the site that are compatible with supporting a PV system per Title 24, Part 2, Section 1511.10 .

SARA does NOT include:

1. For steep slope *roofs*, *roof* areas with a northerly *azimuth* that lie between 300 degrees and 90 degrees from true north.
2. Any *roof* area that has less than 70 percent annual solar access. Annual solar access is determined by dividing the total annual solar insolation, accounting for *shading* obstructions, by the total annual solar insolation if the same areas were unshaded by obstructions. For steep slope *roofs* only *shading* from existing permanent natural or manmade obstructions that are external to the *dwelling*, including but not limited to trees, hills, and adjacent structures, shall be considered for annual solar access calculations. For low slope *roofs*, all obstructions including those that are external to the *dwelling unit*, and obstructions that are part of the *building* design and elevation features shall be considered for the annual solar access calculations.
3. Occupied *roof* areas as specified by *CBC* Section 503.1.4.
4. *Roof* area that is otherwise not available due to compliance with other state *building* code requirements, or local *building* code requirements if local *building* code requirements are confirmed by the *Executive Director*.

702.4 *[Section 100.2]* Performance requirements (Newly Constructed).

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

702.5 Additions and alterations to existing buildings.

702.5.1 Additions.

RESERVED.

702.5.2 Alterations.

RESERVED.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code;* Section 18930, *Health and Safety Code*.

SECTION 703

MULTIFAMILY OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

703.1 *[Section 160.0]* **General.**

Multifamily buildings shall comply with the applicable requirements of Section 703. Section 703 applies to *dwelling units* and *common use areas* in *multifamily buildings*. Nonresidential ~~occupancies~~ *use designations* in a mixed *occupancy building,* and any nonresidential spaces not considered subordinate or accessory to the *Group R occupancies* shall comply with the nonresidential requirements in Section 701.

NOTE: The requirements of Sections 703.2 through 703.4 apply to *newly constructed buildings*. Section 703.5 applies to *additions* or *alterations*.

703.2 Mandatory requirements (Newly Constructed, Additions).

703.2.1 *[Section 160.8, 110.10(a)]* **Solar readiness.**

Low-rise multifamily buildings, and *high-rise multifamily buildings* with ten *habitable stories* or fewer, that do not have a *photovoltaic system* installed shall comply with the requirements of this section.

703.2.1.1 *[Section 110.10(b)1B]* **Solar zone.**

~~Shall comply with Section 701.2.1.1~~

The *solar zone* shall comply with access, pathway, smoke ventilation, and spacing requirements as specified in Title 24, Part 9 or other Parts of Title 24 or in any requirements adopted by a local jurisdiction.

The *solar zone* total area shall be comprised of areas that have no dimensions less than five feet and are no less than 80 square feet each for *buildings* with *roof* areas less than or equal to 10,000 square feet or no less than 160 square feet each for *buildings* with *roof* areas greater than 10,000 square feet.

Exception to Section 703.2.1.1: *Low-rise and high-rise multifamily buildings* meeting the following conditions:

1. All *thermostats* in each *dwelling unit* are *demand response* controls that comply with Section 400.6.1 *[Section 110.12(a)]*, and are capable of receiving and responding to *Demand Response Signals* prior to granting of an *occupancy* permit by the enforcing agency.
2. In addition, meet the Title 24, Part 11, Section A4.106.8.2 requirements for electric vehicle charging spaces, or in each *dwelling unit*, comply with one of the following measures:

2.1. Install a dishwasher that meets or exceeds the ENERGY STAR Program requirements with either a refrigerator that meets or exceeds the ENERGY STAR Program requirements or a whole house fan driven by an electronically commutated motor; or

2.2. Install a home automation system that complies with Section 400.6.1 *[Section 110.12(a)]* and is capable of, at a minimum, controlling the appliances and *lighting* of the *dwelling* and responding to *demand response signals*; or

2.3. Install alternative plumbing piping to permit the discharge from the clothes washer and all showers and bathtubs to be used for an irrigation system in compliance with the *California Plumbing Code* and any applicable local ordinances; or

2.4. Install a rainwater catchment system designed to comply with the *California Plumbing Code* and any applicable local ordinances, and that uses rainwater flowing from at least 65 percent of the available *roof* area.

703.2.1.1.1 *[Section 110.10(b)1B]* **Solar zone location and minimum area.**

~~Shall comply with Section 701.2.1.1~~

The *solar zone* shall be located on the *roof* or *overhang* of the *building* or on the *roof* or *overhang* of another structure located within 250 feet of the *building* or on covered parking installed with the *building* project, and shall have a total area no less than 15 percent of the total *roof* area of the *building* excluding any *skylight area*. The *solar zone* requirement is applicable to the *entire building*, including mixed *occupancy*.

Exception 1 to Section 703.2.1.1.1: High-rise *multifamily buildings* with a permanently installed solar electric system having a nameplate DC power rating, measured under Standard Test Conditions, of no less than one watt per square foot of *roof* area.

Exception 2 to Section 703.2.1.1.1: High-rise *multifamily buildings* with a permanently installed domestic solar water-heating system complying with Section 502.3.1.3 *[Section 150.1(c)8C]*.

Exception 3 to Section 703.2.1.1.1: *Buildings* with a designated *solar zone* area that is no less than 50 percent of the potential *solar zone* area. The potential *solar zone* area is the total area of any *low-sloped roofs* where the annual solar access is 70 percent or greater and any *steep-sloped roofs* oriented between 90 degrees and 300 degrees of true north where the annual solar access is 70 percent or greater. Solar access is the ratio of solar insolation including shade to the solar insolation without shade. *Shading* from obstructions located on the *roof* or any other part of the *building* shall not be included in the determination of annual solar access.

Exception 4 to Section 703.2.1.1.1: *Buildings* where the *roof* is designed and approved to be used for vehicular traffic or parking or for a heliport.

703.2.1.1.2 *[Section 110.10(b)2]* **Azimuth range.**

~~Shall comply with Section 701.2.1.1.2.~~

All sections of the *solar zone* located on *steep-sloped roofs* shall have an *azimuth* range between 90 degrees and 300 degrees of true north.

703.2.1.1.3 *[Section 110.10(b)3]* **Shading.**

~~Shall comply with Section 701.2.1.1.3~~

No obstructions, including but not limited to, vents, chimneys, architectural features and *roof* mounted *equipment*, shall be located in the *solar zone*.

Any obstruction, located on the *roof* or any other part of the *building* that projects above a *solar zone* shall be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the *solar zone*, measured in the vertical plane.

Exception to Section 703.2.1.1.3: Any *roof* obstruction, located on the *roof* or any other part of the *building*, that is oriented north of all points on the *solar zone*.

703.2.1.1.4 ***[Section 110.10(b)4]*** **Structural design loads on construction documents.**

~~Shall comply with Section 701.2.1.1.4~~

For areas of the *roof* designated as *solar zone*, the structural design loads for *roof* dead load and *roof* live load shall be clearly indicated on the construction documents.

NOTE: Section 703.2.1.1.4 *[Section 110.10(b)4]* does not require the inclusion of any collateral loads for future solar energy systems.

703.2.1.2 *[Section 110.10(c)]* **Interconnection pathways.**

~~Shall comply with Section 701.2.1.2~~

The construction documents shall indicate a location reserved for inverters and metering equipment and a pathway reserved for routing of conduit from the *solar zone* to the point of interconnection with the *electrical service*.

For central water-heating systems, the construction documents shall indicate a pathway for routing of plumbing from the *solar zone* to the water-heating system.

703.2.1.3 *[Section 110.10(d)]* **Documentation.**

~~Shall comply with Section 701.2.1.3~~

A copy of the construction documents or a comparable document indicating the information from Section 703.2.1.1 and Section 703.2.1.2 *[Sections 110.10(b) through 110.10(c)]* shall be provided to the occupant.

703.2.2 *[Section 160.4(b)]* **Solar water-heating systems and collectors.**

~~Shall comply with Section 702.2.3~~

Solar water-heating systems and collectors shall be certified and rated by the Solar Rating and Certification Corporation (SRCC), the International Association of Plumbing and Mechanical Officials, Research and Testing (IAPMO R and T), or by a listing agency that is approved by the *Executive Director*.

703.2.2.1 *[Section 160.3(b)6]* **Solar water-heating system collector loop piping.**

Shall comply with Section 503.2.3 ~~Section 501.2.1~~.

703.2.2.2 *[Section 110.3(c)3]* **Backup tank insulation.**

Backup tanks for solar water-heating systems shall comply with Section 500.3.3.3.

703.3 *[Section 170.2]* **Prescriptive requirements (Newly Constructed).**

703.3.1 Photovoltaic requirements.

703.3.1.1 *[Section 170.2(g)]* **More than three habitable stories.**

All *multifamily buildings* with more than three *habitable stories*, or mixed *occupancy buildings* where at least 80 percent of the floor area of the *building* serves *multifamily occupancies* with more than three *habitable stories* or one or more of the *use designations* in Table 701.3-(1) shall have a newly installed photovoltaic (PV) system meeting the minimum qualification requirements of Reference Joint Appendix JA11. ~~comply with Section 701.3.1~~.

The PV capacity in kW_{dc} shall not be less than the smaller of the minimum rated PV system capacity determined by Equation 703.3-A *[Equation 170.2-D]*, or the total of all available *Solar Access Roof Areas* (*SARA*) multiplied by 18 for *steep-sloped roofs* or multiplied by 14 for *low-sloped roofs*.

In mixed *occupancy buildings*, the minimum rated PV system capacity for the *building* shall be determined by applying Equation 703.3-A *[Equation 170.2-D]* to the *conditioned floor area* of each of the *multifamily occupancies* with more than three *habitable stories*.

PHOTOVOLTAIC DIRECT CURRENT CAPACITY (EQUATION 703.3-A) *[EQUATION 170.2-D]*

$$kW_{PVdc} = (CFA \times A)/1000$$

where:

kW_{PVdc}	=	Minimum rated PV system capacity in kW.
CFA	=	*Conditioned floor area* in square feet.
A	=	PV capacity factor in W/square foot as specified in Table 703.3-(1) *[Table 170.2-U]*.

Exception 1 to Section 703.3.1.1: No PV system is required where the total of all available *SARA* is less than 3 percent of the *conditioned floor area*.

Exception 2 to Section 703.3.1.1: No PV system is required where the required PV system capacity is less than 4 kW_{dc}.

Exception 3 to Section 703.3.1.1: No PV system is required if the *SARA* contains less than 80 contiguous square feet.

Exception 4 to Section 703.3.1.1: *Buildings* with *enforcement-authority*-approved *roof* designs, where the *enforcement authority* determines it is not possible for the PV system, including panels, modules, components, supports and attachments to the *roof* structure, to meet *ASCE 7-16*, Chapter 7, Snow Loads.

Exception 5 to Section 703.3.1.1: *Multifamily buildings* with more than three *habitable stories* in areas where a load serving entity does not provide a program where PV generation is compensated through virtual energy bill credits. This exception does not apply where the *Energy C~~c~~ommission* has approved a community solar program for showing compliance as specified in Title 24, *Part 1*, Section 10-115, or where a load-serving entity provides a program where PV generation is compensated through virtual energy bill credits for occupants of ~~nonresidential and *hotel/motel tenant spaces*~~multi-tenant *buildings* to receive energy bill benefits from netting of energy generation and consumption.

TABLE 703.3-(1) [TABLE 170.2-U ~~140.10-A~~] – PV CAPACITY FACTORS (W/FT² OF CONDITIONED FLOOR AREA)

***Building* Type**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
~~Events and Exhibits~~	~~3.48~~	~~4.28~~	~~3.66~~	~~4.32~~	~~3.77~~	~~4.05~~	~~4.28~~	~~4.83~~	~~4.63~~	~~4.80~~	~~5.04~~	~~4.44~~	~~4.95~~	~~4.36~~	~~5.48~~	~~3.38~~
~~Library~~	~~0.39~~	~~3.23~~	~~2.59~~	~~3.25~~	~~2.48~~	~~2.74~~	~~3.04~~	~~3.49~~	~~3.32~~	~~3.69~~	~~3.79~~	~~3.32~~	~~3.79~~	~~3.37~~	~~4.49~~	~~2.84~~
~~Hotel/Motel[a]~~	~~1.69~~	~~1.90~~	~~1.66~~	~~1.97~~	~~1.69~~	~~1.87~~	~~1.94~~	~~2.22~~	~~2.09~~	~~2.20~~	~~2.30~~	~~2.05~~	~~2.30~~	~~2.02~~	~~2.72~~	~~1.73~~
~~Office, Financial Institution, Unleased Tenant Space, Medical Office Building/Clinic~~	~~2.59~~	~~3.13~~	~~2.59~~	~~3.13~~	~~2.59~~	~~3.13~~	~~3.13~~	~~3.13~~	~~3.13~~	~~3.13~~	~~3.13~~	~~3.13~~	~~3.13~~	~~3.13~~	~~3.80~~	~~2.59~~
~~Restaurants~~	~~8.55~~	~~9.32~~	~~8.16~~	~~9.65~~	~~8.21~~	~~8.73~~	~~9.11~~	~~10.18~~	~~9.75~~	~~10.28~~	~~10.85~~	~~9.73~~	~~10.69~~	~~9.73~~	~~12.25~~	~~8.47~~
~~Retail, Grocery~~	~~3.14~~	~~3.49~~	~~3.01~~	~~3.61~~	~~3.05~~	~~3.27~~	~~3.45~~	~~3.83~~	~~3.65~~	~~3.81~~	~~4.09~~	~~3.64~~	~~3.99~~	~~3.71~~	~~4.60~~	~~3.21~~
~~School~~	~~1.27~~	~~1.63~~	~~1.27~~	~~1.63~~	~~1.27~~	~~1.63~~	~~1.63~~	~~1.63~~	~~1.63~~	~~1.63~~	~~1.63~~	~~1.63~~	~~1.63~~	~~1.63~~	~~2.46~~	~~1.27~~
~~Warehouse~~	~~0.39~~	~~0.44~~	~~0.39~~	~~0.44~~	~~0.39~~	~~0.44~~	~~0.44~~	~~0.44~~	~~0.44~~	~~0.44~~	~~0.44~~	~~0.44~~	~~0.44~~	~~0.44~~	~~0.58~~	~~0.39~~
~~Religious Worship~~	~~4.25~~	~~4.65~~	~~3.49~~	~~4.52~~	~~3.72~~	~~4.29~~	~~4.64~~	~~5.89~~	~~5.30~~	~~5.67~~	~~5.89~~	~~4.99~~	~~5.78~~	~~4.63~~	~~7.57~~	~~3.90~~
~~Sports and Recreation~~	~~2.47~~	~~1.97~~	~~1.54~~	~~2.03~~	~~1.60~~	~~1.84~~	~~1.98~~	~~2.63~~	~~2.47~~	~~2.60~~	~~2.75~~	~~2.20~~	~~2.72~~	~~2.15~~	~~4.03~~	~~1.81~~
Multifamily > 3 stories	1.82	2.21	1.82	2.21	1.82	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.77	1.82

703.3.1.1.1 *[New Section]* **Solar Access Roof Area (SARA).**

SARA includes the area of the *building's roof* space capable of structurally supporting a *PV system*, and the area of all *roof* space on covered parking areas, *carports* and all other newly constructed structures on the site that are compatible with supporting a *PV system* per Title 24, Part 2, Section 1511.10.

SARA does not include:

1. Any area that has less than 70 percent annual solar access. Annual solar access is determined by dividing the total annual solar insolation (accounting for *shading* obstructions) by the total annual solar insolation if the same areas were unshaded by those obstructions. For all *roofs*, all obstructions including those that are external to the *building*, and obstructions that are part of the *building* design and elevation features, may be considered for the annual solar access calculations.
2. Occupied *roofs* as specified by *CBC* Section 503.1.4.
3. *Roof* area that is otherwise not available due to compliance with other state *building* code requirements, or local *building* code requirements if the local *building* code requirements are confirmed by the *Executive Director*.

703.3.1.2 *[Section 170.2(f)]* **Three habitable stories or fewer.**

All *multifamily buildings* up to three *habitable stories* shall comply with Section 702.3.1 with the following modification:

Exception 2 to Section 702.3.1: No PV system is required when the minimum PV system size specified by Section 702.3.1 is less than 4 kW_{dc}.

703.3.2 Battery Energy Storage System (BESS) requirements.

703.3.2.1 *[Section 170.2(h)]* **More than three habitable stories.**

~~All multifamily buildings with more than three habitable stories shall comply with Section 701.3.2 with the following modifications:~~

~~Exception 3 to Section 701.3.2 does not apply.~~

~~Table 703.3-A shall be used in lieu of Table 701.3-B.~~

All *buildings* that are required by Section 703.3.1.1 *[Section 170.2(g)]* to have a *PV system* shall also have a *BESS* meeting the minimum qualification requirements of Reference Joint Appendix JA12.

The rated energy capacity shall be not less than the Minimum Rated Useable Energy Capacity determined using Equation 703.3-B *[Equation 170.2-E]* or 703.3-C *[Equation 170.2-F]* if *SARA* was used to determine the PV capacity in Section 703.3.1.1 *[Section 170.2(g)]*.

The rated power capacity shall be not less than the Minimum Power Capacity determined using Equation 703.3-D *[Equation 170.2-G]*.

In mixed *occupancy buildings*, the total battery system capacity for the *building* shall be determined by applying the Minimum Rated Usable Energy Capacity to each of the multifamily *occupancies* and summing the capacities determined for each.

BATTERY ENERGY STORAGE SYSTEM MINIMUM RATED USABLE ENERGY CAPACITY (EQUATION 703.3-B) *[EQUATION 170.2-E]*

$kWh_{batt} = [(CFA \times B)/(1{,}000 \times C^{0.5})]$

BATTERY ENERGY STORAGE SYSTEM MINIMUM RATED USABLE ENERGY CAPACITY, SARA-ADJUSTED (EQUATION 703.3-C) *[EQUATION 170.2-F]*

$kWh_{batt} = ((CFA \times B)/(1000 \times C^{0.5})) \times (kW_{PVdc,SARA}/kW_{PVdc})$

where:

kWh_{batt} = Minimum Rated Usable Energy Capacity of the *BESS* in kWh.

$kW_{PVdc,}$ = Minimum Rated PV System Capacity in kW from Equation 703.3-A *[Equation 170.2-D]*

$kW_{PVdc, SARA}$ = Minimum Rated PV System Capacity in kW from the *SARA* calculation.

CFA = *Conditioned floor area* that is subject to the PV system requirements of Section 703.3.1.1 *[Section 170.2(g)]* in square feet.

B = *BESS* Capacity Factor in Wh/square foot as specified in Table 703.3-(2) *[Table 170.2-V]*.

C = Rated single charge-discharge cycle AC to AC (round-trip) efficiency of the *BESS*.

BATTERY ENERGY STORAGE SYSTEM MINIMUM RATED POWER CAPACITY (EQUATION 703.3-D) [EQUATION 170.2-G]

$kW_{batt} = kWh_{batt} / 4$

where:

kW_{batt} = Minimum Rated Power Capacity of the *BESS* in kWdc.

kWh_{batt} = Minimum Rated Usable Energy Capacity of the *BESS* in kWh.

Exception 1 to Section 703.3.2.1: No *BESS* is required if the installed PV system capacity is less than 15 percent of the capacity determined by Equation 703.3-A *[Equation 170.2-D]*.

Exception 2 to Section 703.3.2.1: No *BESS* is required if the rated usable energy capacity determined by Equation 703.3-B*[Equation 170.2-E]* or Equation 703.3-C*[Equation 170.2-F]* is less than 10 kWh.

TABLE 703.3-(2) [TABLE 170.2-V] – BESS CAPACITY FACTORS (WH/FT² OF CONDITIONED FLOOR AREA)

***BUILDING* TYPE**	**CZ 1**	**CZ 2**	**CZ 3**	**CZ 4**	**CZ 5**	**CZ 6**	**CZ 7**	**CZ 8**	**CZ 9**	**CZ 10**	**CZ 11**	**CZ 12**	**CZ 13**	**CZ 14**	**CZ 15**	**CZ 16**
~~Events and Exhibits~~	~~1.82~~	~~1.95~~	~~1.74~~	~~2.12~~	~~1.91~~	~~2.13~~	~~2.24~~	~~2.30~~	~~2.36~~	~~2.47~~	~~2.62~~	~~2.16~~	~~2.64~~	~~2.68~~	~~3.22~~	~~1.89~~
~~Library~~	~~0.37~~	~~7.17~~	~~5.97~~	~~6.75~~	~~5.64~~	~~6.08~~	~~6.19~~	~~7.13~~	~~7.18~~	~~7.56~~	~~7.17~~	~~6.93~~	~~6.88~~	~~6.81~~	~~7.93~~	~~6.40~~
~~Hotel/Motel[a]~~	~~0.86~~	~~0.84~~	~~0.77~~	~~0.92~~	~~0.81~~	~~0.89~~	~~0.90~~	~~1.01~~	~~1.00~~	~~1.11~~	~~1.14~~	~~0.96~~	~~1.18~~	~~1.18~~	~~1.49~~	~~0.85~~
~~Office, Financial Institution, Unleased Tenant Space, Medical Office Building/Clinic~~	~~NR[1a]~~	~~5.26~~	~~4.35~~	~~5.26~~	~~4.35~~	~~5.26~~	~~5.26~~	~~5.26~~	~~5.26~~	~~5.26~~	~~5.26~~	~~5.26~~	~~5.26~~	~~5.26~~	~~6.39~~	~~4.35~~
~~Restaurants~~	~~4.36~~	~~4.11~~	~~3.78~~	~~4.37~~	~~3.89~~	~~4.02~~	~~4.11~~	~~4.49~~	~~4.47~~	~~4.82~~	~~5.05~~	~~4.43~~	~~5.05~~	~~5.24~~	~~6.23~~	~~4.11~~
~~Retail, Grocery~~	~~1.89~~	~~1.82~~	~~1.71~~	~~1.82~~	~~1.72~~	~~1.80~~	~~1.76~~	~~1.92~~	~~1.97~~	~~2.05~~	~~2.22~~	~~1.95~~	~~2.16~~	~~2.29~~	~~2.66~~	~~1.91~~
~~School~~	~~NR[1]~~	~~3.05~~	~~2.38~~	~~3.05~~	~~2.38~~	~~3.05~~	~~3.05~~	~~3.05~~	~~3.05~~	~~3.05~~	~~3.05~~	~~3.05~~	~~3.05~~	~~3.05~~	~~4.60~~	~~2.38~~
~~Warehouse~~	~~NR[1]~~	~~0.41~~	~~0.37~~	~~0.41~~	~~0.37~~	~~0.41~~	~~0.41~~	~~0.41~~	~~0.41~~	~~0.41~~	~~0.41~~	~~0.41~~	~~0.41~~	~~0.41~~	~~0.54~~	~~0.37~~
~~Religious Worship~~	~~2.21~~	~~2.25~~	~~1.74~~	~~2.42~~	~~2.08~~	~~2.75~~	~~2.94~~	~~3.37~~	~~3.17~~	~~3.37~~	~~3.58~~	~~2.72~~	~~3.62~~	~~3.21~~	~~4.89~~	~~2.37~~
~~Sports and Recreation~~	~~1.26~~	~~0.98~~	~~0.76~~	~~1.14~~	~~0.86~~	~~1.20~~	~~1.23~~	~~1.57~~	~~1.53~~	~~1.65~~	~~1.83~~	~~1.27~~	~~1.86~~	~~1.57~~	~~3.02~~	~~1.13~~
Multifamily > 3 stories	1.88	2.27	1.88	2.27	1.88	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.85	1.88

~~Footnote to Table 703.3(12) *[TABLE 170.2-V]*:~~

~~a. NR = Not Required.~~

~~Footnote to Table 703.3-A *[TABLE 170.2-V]*:~~

~~1. NR = Not Required~~

703.4 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

703.5 *[Sections 180.1, 180.2]* **Additions and alterations to existing buildings.**

703.5.1 *[Section 180.1]* Additions.

Additions to existing *multifamily buildings* shall meet the mandatory requirements of Section 703.5.1.1.

703.5.1.1 *[Section 180.1]* **Mandatory requirements (Additions).**

Any *addition* shall meet the applicable requirements of the sections listed below:

703.2.1 *[Section 110.10]* Mandatory Requirements for Solar Readiness

Exception to Section 703.5.1.1: *Additions* that increase the area of the *roof* by 2,000 square feet or less are not required to comply with Section 703.2.1 *[Section 110.10]*.

703.5.1.2 Prescriptive requirements (Additions).

RESERVED.

703.5.1.3 Performance requirements (Additions).

RESERVED.

703.5.2 Alterations.

RESERVED.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code;* Section 18930, *Health and Safety Code*.

SUBCHAPTER 8
POOL AND SPA

SECTION 800

MANDATORY REQUIREMENTS FOR ALL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

800.1 *[Section 100.0(h)]* **Systems and equipment.**

Part 6 limits the installation of manufactured equipment, products, and devices to those that have been certified as specified by Sections 101.2 *[Section 110.0]* and 101.3 *[Section 110.1]*. Requirements for *manufactured equipment, products, and devices,* when not specified in Title 24 *Part 6*, are specified in California Code of Regulations, Title 20, Sections 1601-1609.

800.1.1 *[Section 110.4(a)]* **Certification by manufacturers.**

Any pool heater for a *pool*, *spa*, or a *pool* and *spa* combination shall be installed only if the manufacturer has certified that the system or equipment has all of the following:

1. **Efficiency.** Equipment subject to State or federal appliance efficiency standards shall comply with the applicable provisions of Section 101.3 *[Section 110.1]*; and
2. **On-off switch.** A *readily accessible* on-off switch, mounted on the outside of the heater that allows shutting off the heater without adjusting the *thermostat* setting; and
3. **Instructions.** A permanent, easily readable and weatherproof plate or card that provides the energy efficiency rating and instruction for the energy efficient operation of the pool and/or *spa* heater.

800.2 *[Section 110.4(b)]* **Installation.**

Any *pool* and/or *spa* system or equipment shall meet the following requirements:

1. **Heating Equipment.** Equipment installed to heat water for *pools* and/or *spas* shall be selected from equipment meeting the standards shown in Table 800.2-~~A~~(1) *[Table 110.4-A]*.

TABLE 800.2-~~A~~(1) [Table 110.4-A] HEATING EQUIPMENT STANDARDS

HEATING ENERGY SOURCE	STANDARD
Electric Resistance	*UL* 1261
Gas-fired	*ANSI* Z21.56/CSA 4.7a
Heat Pump	*AHRI* 1160 and one of the following: CSA C22.2 No. 236, *UL* 1995, or *UL*/CSA 60335-2-40
Solar	ICC/APSP 902/SRCC 400 for solar pool heaters, ICC 901/SRCC 100 for solar collectors

2. **Piping.** At least 18 inches of horizontal or vertical pipe shall be installed between the filter and the heater or dedicated suction and return lines, or built-in or built-up connections shall be installed to allow for the future addition of solar heating equipment;
3. **Covers.** Outdoor *pools* and/or *spa* with electric or gas heating equipment shall be installed with a pool cover.
4. **Directional inlets and time switches for *pools*.** If the system or equipment is for a *pool*:
   4.1. The *pool* shall have directional inlets that adequately mix the pool water; and
   4.2. A time switch or similar control mechanism shall be permanently installed as part of a pool water circulation control system that will allow all pumps to be set or programmed to run only during off-peak electric demand period, and for the minimum time necessary to maintain the water in the condition required by applicable public health standards.

800.3 *[Section 110.4(c)]* **Heating source sizing.**

Heating systems or equipment for *pool*s and/or *spa*s shall meet one of the sizing requirements of 1 through 5 below:

1. ***Solar pool heating system*.** A *solar pool heating system* as the primary heating system ~~and~~ with a ~~may have a. T~~ supplemental heater ~~can be~~ of any energy source. ~~with a~~The solar collector surface area ~~that is~~shall be equivalent to the following:
   1.1. For *nonresidential* and *multifamily buildings*, 65 percent or greater of the pool and/or *spa* surface area.
   1.2. For *single-family buildings*, 60 percent or greater of the pool and/or *spa* surface area.
2. ***Heat pump* pool heater.** A *heat pump* pool heater as the primary heating system that meets the sizing requirements of Reference Joint Appendix JA16.3. The supplementary heater can be of any energy source; or
3. **On-site renewable or *recovered energy*.** A heating system that derives at least 60 percent of the annual heating energy from on-site renewable energy or *on-site recovered energy*. The supplemental heater can be of any energy source; or
4. **Solar and *heat pump* combination system.** A combination of a *solar pool heating system* and *heat pump* pool heater without any additional supplementary heater; or

5. **Alternative system approved by *Executive Director*.** A pool heating system determined by the *Executive Director* to use no more energy than the systems specified in Items 1, 2, 3, or 4 above.

Exception 1 to Section 800.3: *Portable electric spas* compliant with 20 *CCR* § 1605.3(g)(7) of the *Appliance Efficiency Regulations*.

Exception 2 to Section 800.3: *Alterations* to existing *pools* and/or *spas* with existing heating systems or *equipment*.

Exception 3 to Section 800.3: A *pool* and/or *spa* that is heated solely by a *solar pool heating system* without any backup heater.

Exception 4 to Section 800.3: Heating systems which are used exclusively for permanent *spa* applications in existing *buildings* with gas availability.

Exception 5 to Section 800.3: Heating systems which are used exclusively for permanent *spa* applications where there is inadequate *Solar Access Roof Area* (*SARA*) as specified in Section 702.3.1 *[Section 150.1(c)14]* for a *solar pool heating system* to be installed.

800.4 *[Section 110.4(d)]* **Controls for Heat Pump Pool Heaters with Supplementary Heating.**

Heat pump pool heaters with supplementary heaters shall have controls that meet the following:

1. Supplementary heater shall not operate when the heating load can be met by the *heat pump* pool heater alone; and
2. The cut-on temperature for *heat pump* heating is higher than the cut-on temperature for supplementary heating, and the cut-off temperature for *heat pump* heating is higher than the cut-off temperature for supplementary heating.

800.5 *[Section 110.5]* **Natural gas pool and spa heaters: pilot lights prohibited.**

Any natural gas system or equipment listed below may be installed only if it does not have a continuously burning pilot light:

1. *Pool* heaters.
2. *Spa* heaters.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 801

NONRESIDENTIAL AND HOTEL/MOTEL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

~~RESERVED.~~

801.1 General.

Nonresidential and *hotel/motel use designations* shall comply with the applicable requirements of Section 801.

NOTE: The requirements of Sections 801.2 through 801.4 apply to newly constructed *pools* and *spas*. Section 801.5 applies to *additions*~~. Section 801.6 applies to~~ and *alterations*.

801.2 Mandatory requirements (Newly Constructed).

Pool and *spa* systems shall meet the requirements of the sections listed below:

1. Sections 101.2, 101.4 *[Section 110.0, 110.5]* Systems and Equipment
2. Sections 800.1, 800.2, 800.3, 800.4 *[Section 110.4)]* Mandatory Requirements for *Pool* and *Spa* Systems

801.3 Prescriptive requirements (Newly Constructed).

RESERVED.

801.4 Performance requirements (Newly Constructed).

RESERVED.

801.5 Additions and alterations to existing pools and spas.

801.5.1 Additions.

RESERVED.

801.~~6~~5.2 Alterations ~~to existing pools and spas.~~

801.~~6~~5.2.1 Mandatory requirements (Alterations).

~~Any *alteration* shall meet the applicable requirements of Sections 101.2, 101.4, 800.1, 800.2, 800.4, 800.5.~~The *altered component* and any newly installed equipment serving the *alteration* shall meet the applicable requirements of the sections listed below:

101.2, 101.4, *[Section 110.0, 110.5]* Systems and Equipment

800.1, 800.2, 800.4, 800.5 *[Section 110.4, 110.5]* Mandatory Requirements for Pool and *Spa* Systems

801.~~6~~5.2.1.1 Heating source requirements.

Heating systems or equipment for *pools* and/or *spas* located in *climate zones* 2 through 16, shall meet one of the requirements of 1 through 6 below:

1. ***Solar pool heating system*.** A *solar pool heating system* with a solar collector surface area that is equivalent to 40 percent or greater than the *pool* and/or *spa* surface area as the primary heating system. The supplemental heater can be of any energy source; or
2. ***Heat pump* pool heater.** A *heat pump* pool heater as the primary heating system that meets the sizing requirements of Reference Joint Appendix JA16.3. The supplementary heater can be of any energy source; or
3. **On-site renewable or recoverable energy.** A heating system that derives at least 60 percent of the annual heating energy from onsite renewable energy or *on-site recovered energy*. The supplemental heater can be of any energy source; or
4. **High efficiency gas or propane pool heater.** A *pool* heating system with a minimal thermal efficiency of 90 percent. Systems with multiple units can meet this requirement with an input capacity-weighted average thermal efficiency of at least 90 percent; or
5. **Solar and *heat pump* combination system.** A combination of a *solar pool heating system* and *heat pump* pool heater without any additional supplementary heater; or
6. **Alternative system approved by *Executive Director*.** A pool heating system determined by the *Executive Director* to use no more energy than the systems specified in Items 1, 2, 3, 4, or 5 above.

Exception 1 to Section 801.~~6~~5.2.1.1: *Portable electric spas* compliant with 20 *CCR* §1605.3(g)(7) of the *Appliance Efficiency Regulations*.

Exception 2 to Section 801.~~6~~5.2.1.1: A *pool* and/or *spa* that is heated solely by a *solar pool heating system* without any supplemental heater.

Exception 3 to Section 801.~~6~~5.2.1.1: Heating systems which are used exclusively for permanent *spa* applications in existing *buildings* with *natural gas availability*.

Exception 4 to Section 801.~~6~~5.2.1.1: Heating systems which are used exclusively for permanent *spa* applications where there is inadequate *SARA* as specified in Section 701.3.1.1 for a *solar pool heating system* to be installed.

Exception 5 to Section 801.~~6~~5.2.1.1: *Pool* and/or *spa alterations* for *buildings* with *Group R occupancies*.

Exception 6 to Section 801.~~6~~5.2.1.1: If the *alteration* includes circumstances that constitute hardship or infeasibility, the applicant may request an exception from the *enforcement agency*. The applicant shall bear the burden of demonstrating to the *enforcement agency* that hardship or infeasibility exists and that no reasonable alternative is available that complies with the intent of Section 801.6.1. Circumstances that constitute hardship or infeasibility shall include one or more of the following:

1. The cost of infrastructure upgrade to meet Section 801.6.1 exceeds 20 percent of the total cost of the project. Infrastructure upgrades include but are not limited to an electrical panel upgrade, physical space modification, and venting upgrade~~, etc~~. Cost of infrastructure upgrades does not include the cost of equipment;
2. It is technically infeasible to meet any of the options in Section 801.6.1.1 due to physical space limitation or electrical *service* constraint, including any alternatives considered but not feasible due to conditions specific to the project;
3. Compliance with Section 801.6.1 would create or maintain a hazardous condition(s) and present a life safety risk to the occupants.

801.~~6~~5.2.2 Prescriptive requirements (Alterations).

RESERVED

801.~~6~~5.2.3 Performance requirements (Alterations).

RESERVED

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*; Section 18930, *Health and Safety Code*.

SECTION 802

SINGLE-FAMILY RESIDENTIAL OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

802.1 *[Section 150.0]* **General.**

Single-family ~~*residential buildings*~~*use designation* shall comply with the applicable requirements of Section 802.

NOTE: The requirements of Sections 802.2 through 802.4 apply to *newly constructed buildings*. Section 802.5 applies to *additions* or *alterations*.

802.2 *[Section 150.0]* **Mandatory requirements (Newly Constructed).**

802.2.1 *[Section 150.0(p)]* **Pool systems and equipment installation.**

Pool system or *equipment* shall comply with the requirements listed in this section.

802.2.1.1 *[Section 150.0(p)1]* **Pump sizing and flow rate.**

1. **Appliance standards.** *Dedicated-purpose pool pumps* and replacement dedicated-purpose pump motors subject to State or federal appliance standards shall be listed in the *Energy C*~~*c*~~*ommission's* directory of certified *equipment*. *Dedicated-purpose pool pumps* shall meet the applicable standards set forth in 20 *CCR* § 1605.1(g)(7) of the *Appliance Efficiency Regulations*. Replacement *dedicated-purpose pool pump* motors shall meet the applicable standards set forth in 20 *CCR* § 1605.3 of the *Appliance Efficiency Regulations*.
2. **Pump flow rate.** All pump flow rates shall be calculated using Equation 802.2-A:

   PUMP FLOW RATE *(EQUATION 802.2-A)*

   $H = C \times F^2$

   where:

   H – is the total system head in feet of water.

   F – is the flow rate in gallons per minute (gpm).

   C – is a coefficient based on the volume of the *pool*:

   0.0167 for *pools* less than or equal to 17,000 gallons.

   0.0082 for *pools* greater than 17,000 gallons.
3. **Filtration flow rate.** Filtration pumps shall be sized, or if programmable shall be programmed, so that the filtration flow rate is not greater than the rate needed to turn over the pool water volume in 6 hours or 36 gpm, whichever is greater; and

4. **Controls.** *Dedicated-purpose pool pumps* with more than one speed shall have controls which default to the filtration flow rate when no *auxiliary pool loads* are operating and shall default to the filtration flow rate setting within 24 hours and shall have an override capability for servicing.

802.2.1.2 *[Section 150.0(p)2]* **System piping.**

1. A length of straight pipe that is greater than or equal to at least 4 pipe diameters shall be installed before the pump; and
2. Pool piping shall be sized so that the velocity of the water at maximum flow for *auxiliary pool loads* does not exceed 8 feet per second in the return line and 6 feet per second in the suction line; and
3. All elbows shall be sweep elbows or of an elbow-type that has a pressure drop of less than the pressure drop of straight pipe with a length of 30 pipe diameters.

802.2.1.3 *[Section 150.0(p)3]* **Filters.**

Filters shall be at least the size specified in NSF/*ANSI* 50 for *public pool* intended applications.

802.2.1.4 *[Section 150.0(p)4]* **Valves.**

Minimum diameter of *backwash valves* shall be 2 inches or the diameter of the return pipe, whichever is greater.

802.3 Prescriptive requirements (Newly Constructed).

RESERVED.

802.4 Performance requirements (Newly Constructed).

RESERVED.

802.5 Additions and alterations to existing buildings.

802.5.1 *[Section 150.2(a)]* **Additions.**

Additions to existing *single-family* ~~*residential buildings*~~*use designations* shall meet the mandatory requirements of Section 802.5.1.1.

802.5.1.1 *[Section 150.2(a)]* **Mandatory requirements (Additions).**

Pool and *spa* systems shall meet the requirements of the sections listed below:

101.2, 101.4, *[Section 110.0, 110.5]* Systems and Equipment

800.1, 800.2, 800.3, 800.4, 802.2 *[Section 110.4, 150.0(p)]* Mandatory Requirements for *Pool* and *Spa* Systems

802.5.1.2 Prescriptive requirements (Additions).

RESERVED.

802.5.1.3 Performance requirements (Additions).

RESERVED.

802.5.2 Alterations.

Alterations to existing *single-family* *use designations* ~~*residential buildings*~~ or *alterations* in conjunction with a change in *building occupancy* to a single-family ~~residential~~ *occupancy* shall meet mandatory requirements of Section 802.5.2.1.

802.5.2.1 *[Section 150.2(b)1]* **Mandatory requirements (Alterations).**

The *altered component* and any newly installed equipment serving the *alteration* shall meet the applicable requirements of the sections listed below:

101.2, 101.4, *[Section 110.0, 110.5]* Systems and Equipment

800.1, 800.2, 800.3, 800.4, 802.2 *[Section 110.4, 150.0(p)]* Mandatory Requirements for Pool and *Spa* Systems

802.5.2.2 Prescriptive requirements (Alterations).

RESERVED.

802.5.2.3 Performance requirements (Alterations).

RESERVED.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 803

MULTIFAMILY OCCUPANCIES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

803.1 *[Section 160.0]* **General.**

Multifamily use designations~~buildings~~ shall comply with the applicable requirements of Section 803. Section 803 applies to *dwelling units* and *common use areas* in *multifamily use designations~~buildings~~*. Nonresidential *occupancies* in a mixed *occupancy building* shall comply with nonresidential requirements in Section 801.

NOTE: The requirements of Sections 803.2 through 803.4 apply to *newly constructed buildings*. Sections 803.2 and 803.5 apply to *additions* and Section 803.5 applies to *alterations*.

803.2 Mandatory requirements (Newly Constructed, Additions).

803.2.1 *[Section 160.7(b)]* **Pool and spa systems.**

Pool and *spa* systems available to multiple tenants shall comply with the applicable requirements of Section 800 *[Sections 110.0, 110.4 and 110.5]*.

Pool and *spa* systems installed for public use shall comply with the applicable requirements of Section 800 *[Sections 110.0, 110.4 and 110.5]* and shall comply with Sections 802.2.1.2 through 802.2.1.4 *[Section 150.0(p)2, Section 150.0(p)3, and Section 150.0(p)4]*.

Pool and *spa* systems installed for exclusive use by a single tenant shall comply with the applicable requirements of Section 800 *[Sections 110.0, 110.4 and 110.5]* and Section 802.2.1 *[Section 150.0(p)]*.

803.3 Prescriptive requirements (Newly Constructed).

RESERVED.

803.4 Performance requirements (Newly Constructed).

RESERVED.

803.5 *[Sections 180.1, 180.2]* **Additions and alterations to existing buildings.**

803.5.1 *[Section 180.1]* **Additions.**

Additions to existing *multifamily* *use designations*~~*buildings*~~ shall meet the mandatory requirements of Section 803.5.1.1.

803.5.1.1 *[Section 180.1]* **Mandatory requirements (Additions).**

Additions to existing *multifamily* *use designations*~~*buildings*~~ shall meet the applicable requirements of Section 803.2.1 *[Section 160.7(b)]*.

803.5.1.2 Prescriptive requirements (Additions).

RESERVED.

803.5.1.3 Performance requirements (Additions).

RESERVED.

803.5.2 Alterations.

RESERVED.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SUBCHAPTER 9
PROCESS SYSTEMS AND EQUIPMENT

SECTION 900
NONRESIDENTIAL, HOTEL/MOTEL, AND MULTIFAMILY OCCUPANCIES
(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

900.1 *[Section 120.6, 141.1]* **General for nonresidential and hotel/motel occupancies.**

Covered processes in newly constructed *nonresidential* *buildings* and ~~*hotel/motel buildings*~~ *buildings* of *Group R occupancies* shall comply with the applicable requirements of Subchapter 9.

Covered processes in *additions* or *alterations* to existing *buildings* that ~~will be~~are *nonresidential*, and ~~*hotel/motel occupancies*~~*buildings of Group R occupancies* shall comply with the applicable requirements of Subchapter 9.

NOTE: For *alterations* that change the *occupancy* classification of the *building*, the requirements of this section apply to the *occupancy* that will exist after the *alterations*.

900.2 *[Section 160.7(a), 160.0, 180.0]* **General for multifamily occupancies.**

Elevators shall meet the requirements of Section 906 *[Section 120.6(f)]*.

Covered process requirements for *additions*, *alterations* and *repairs* to existing *multifamily* *use designations*~~*buildings*~~ shall comply with the applicable requirements of Section 400.5.1 *[Section 110.2(a)]*.

Nonresidential *use designations*~~occupancies~~ in a mixed *occupancy building* shall comply with nonresidential requirements in Section 900.1.

NOTE: For *alterations* that change the *occupancy* classification of the *building*, the requirements of this section apply to the *occupancy* after the *alterations*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 901

REFRIGERATED WAREHOUSES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

901.1 *[Section 120.6(a)]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

Refrigerated warehouses that are greater than or equal to 3,000 square feet and *refrigerated spaces* with a sum total of 3,000 square feet or more that are served by the same refrigeration system shall meet the requirements of Section 901.1 *[Section 120.6(a)]*.

Refrigerated spaces that are less than 3,000 square feet shall meet the requirements of the *Appliance Efficiency Regulations* for walk-in *coolers* or *freezers* contained in the *Appliance Efficiency Regulations* (California Code of Regulations, Title 20, Sections 1601 through 1608).

901.1.1 *[Section 120.6(a)1]* **Insulation requirements.**

Exterior surfaces of *refrigerated warehouses* shall be insulated at least to the *R-values* in Table 901.1-(1) *[Table 120.6-A-1]*.

TABLE 901.1-(1) [TABLE 120.6-A-1] REFRIGERATED WAREHOUSE INSULATION

SPACE	SURFACE	MINIMUM *R-VALUE* (ºF·HR·SF/BTU)
Freezers	*Roof*/Ceiling	R-40
Freezers	Wall	R-36
Freezers	Floor	R-35
Freezers	Floor with all heating from productive refrigeration capacity[1a]	R-20
Coolers	*Roof*/Ceiling	R-28
Coolers	Wall	R-28

Footnote to Table 901.1-(1) *[TABLE 120.6-A-1]*:

a. All underslab heating is provided by a heat exchanger that provides refrigerant subcooling or other means that result in productive refrigeration capacity on the associated refrigerated system.

~~Footnote to Table 901.1-A *[TABLE 120.6-A-1]*:~~

~~1. All underslab heating is provided by a heat exchanger that provides refrigerant subcooling or other means that result in productive refrigeration capacity on the associated refrigerated system.~~

901.1.2 *[Section 120.6(a)6]* **Infiltration barriers.**

Passageways between *freezers* and higher-temperature spaces, and passageways between *coolers* and non*refrigerated spaces*, shall have an *infiltration* barrier consisting of strip

curtains, an automatically-closing *door* or an air curtain designed by the manufacturer for use in the passageway and temperature for which it is applied.

Exception 1 to Section 901.1.2: Openings with less than 16 square feet of opening area.

Exception 2 to Section 901.1.2: Dock doorways for trailers.

901.1.3 *[Section 120.6(a)9]* **Automatic *door* closers.**

Doors designed for the passage of people that are between *freezers* and higher-temperature spaces, or between *coolers* and non*refrigerated spaces*, shall have *automatic door* closers.

901.1.4 *[Section 120.6(a)2]* **Underslab heating.**

Electric resistance heat shall not be used for the purposes of underslab heating.

Exception to Section 901.1.4: Underslab heating systems controlled such that the electric resistance heat is thermostatically controlled and disabled during the summer on-peak period defined by the local electric utility.

901.1.5 *[Section 120.6(a)3]* **Evaporators.**

New fan-powered evaporators used in *coolers* and *freezers* shall conform to the requirements of this section.

901.1.5.1 *[Section 120.6(a)3A]* **Motor efficiency.**

Single phase fan motors less than 1 hp and less than 460 Volts in newly installed evaporators shall be *electronically-commutated motors* or shall have a minimum motor efficiency of 70 percent when rated in accordance with NEMA Standard MG 1-2006 at full load rating conditions.

901.1.5.2 *[Section 120.6(a)3B]* **Variable speed fans and fan controls.**

Evaporator fans served either by a suction group with multiple compressors or by a single compressor with variable capacity capability shall be variable speed and the speed shall be controlled in response to space temperature or humidity.

Exception 1 to Section 901.1.5.2: *Coolers* within *refrigerated warehouses* that maintain a *controlled atmosphere* for which a licensed engineer has certified that the types of products stored will require constant operation at 100 percent of the design airflow.

Exception 2 to Section 901.1.5.2: Areas within *refrigerated warehouses* that are designed solely for the purpose of quick chilling/freezing of products, including but not limited to spaces with design cooling capacities of greater than 240 Btu/hr-ft^2 (2 tons per 100 square feet).

901.1.5.3 *[Section 120.6(a)3C]* **Single-speed fan controls.**

Evaporator fans served by a single compressor that does not have variable capacity shall utilize controls to reduce airflow by at least 40 percent for at least 75 percent of the time when the compressor is not running.

Exception to Section 901.1.5.3: Areas within *refrigerated warehouses* that are designed solely for the purpose of quick chilling/freezing of products (space with design cooling capacities of greater than 240 Btu/hr-ft^2 (2 tons per 100 ft^2)).

901.1.5.4 *[Section 120.6(a)3E]* **Applied static pressure drop.**

The applied static pressure drop for evaporators shall not exceed 0.5 in. water.

Exception to Section 901.1.5.4: Evaporators designed solely for the purpose of quick chilling/freezing of products, including but not limited to spaces with design cooling capacities of greater that 240 Btu/hr-ft^2 (2 tons per 100ft^2).

901.1.5.5 *[Section 120.6(a)3D]* **Specific efficiency.**

Fan-powered evaporators utilizing volatile refrigerants shall meet the applicable efficiency requirements listed in Table 901.1-(2) *[Table 120.6-A-2]*.

Evaporator specific efficiency is defined as the gross total refrigeration capacity (Btu/h) divided by the electrical input power at 100 percent fan speed at rating conditions listed in Table 901.1-(2) *[Table 120.6-A-2]* ~~following the test procedure listed in Table 901.1-(2) *[Table 120.6-A-2]*~~.

Exception to Section 901.1.5.5: Evaporators designed solely for the purpose of quick chilling/freezing of products, including but not limited to spaces with design cooling capacities of greater than 240 Btu/hr-ft^2 (2 tons per 100ft^2).

TABLE 901.1-(2) [TABLE 120.6-A-2] FAN-POWERED EVAPORATORS – MINIMUM SPECIFIC EFFICIENCY REQUIREMENTS

EVAPORATOR TYPE [1a, b2]	REFRIGERANT TYPE	RATING CONDITION [c, d, e, f]	MINIMUM SPECIFIC EFFICIENCY (BTUH/WATT)
Direct Expansion, ~~Ammonia Refrigerant,~~ *Cooler*/Dock	Ammonia	Dry Coil +25°F saturated evaporating temperature +35°F entering dry-bulb temperature 0 in. water static pressure	35
Direct Expansion, ~~Ammonia Refrigerant,~~ *Freezer*	Ammonia	Dry Coil -20°F saturated evaporating temperature -10°F entering dry-bulb temperature 0 in. water static pressure	25
Liquid Overfeed, ~~Ammonia Refrigerant,~~ *Cooler*/Dock	Ammonia	Dry Coil +25°F saturated evaporating temperature +35°F entering dry-bulb temperature 0 in. water static pressure	50
Liquid Overfeed, ~~Ammonia Refrigerant,~~ *Freezer*	Ammonia	Dry Coil -20°F saturated evaporating temperature -10°F entering dry-bulb temperature 0 in. water static pressure	45
Direct Expansion, ~~CO_2 Refrigerant,~~ *Cooler*/Dock	CO_2	Dry Coil +25°F saturated evaporating temperature +35°F entering dry-bulb temperature 0 in. water static pressure	35
Direct Expansion, ~~CO_2 Refrigerant,~~ *Freezer*	CO_2	Dry Coil -20°F saturated evaporating temperature -10°F entering dry-bulb temperature 0 in. water static pressure	25
Liquid Overfeed, ~~CO_2 Refrigerant,~~ *Cooler*/Dock	CO_2	Dry Coil +25°F saturated evaporating temperature +35°F entering dry-bulb temperature 0 in. water static pressure	50
Liquid Overfeed, ~~CO_2 Refrigerant,~~ *Freezer*	CO_2	Dry Coil -20°F saturated evaporating temperature -10°F entering dry-bulb temperature 0 in. water static pressure	45

EVAPORATOR TYPE ~~[1]~~[a], ~~[2]~~[b]	REFRIGERANT TYPE	RATING CONDITION [c, d, e, f]	MINIMUM SPECIFIC EFFICIENCY (BTUH/WATT)
Direct Expansion, ~~Halocarbon Refrigerant,~~ *Cooler*/Dock	Halocarbon	Dry Coil +25°F saturated evaporating *dew point temperature* +35°F entering dry-bulb temperature 0 in. water static pressure	45
Direct Expansion, ~~Halocarbon Refrigerant,~~ *Freezer*	Halocarbon	Dry Coil -20°F saturated evaporating *dew point temperature* -10°F entering dry-bulb temperature 0 in. water static pressure	40

Footnotes to Table 901.1-(2) *[Table 120.6-A-2]*:

a. Direct expansion: Evaporator in which leaving refrigerant vapor is superheated.

b. Liquid overfeed: Evaporator in which refrigerant liquid is supplied at a recirculation rate greater than 1.

c. Dry coil is the condition in which no condensate or frost forms on the coil.

d. Saturated evaporating temperature is the saturation temperature corresponding to the refrigerant pressure at the evaporator coil outlet.

e. Saturated evaporating *dew point temperature* is the *dew point temperature* corresponding to the refrigerant pressure at the evaporator coil outlet.

f. Entering dry-bulb temperature is the dry-bulb temperature at the evaporator coil inlet.

~~Applicable test procedure and reference year are provided under the definitions.~~

~~Footnotes to Table 901.1-B *[Table 120.6-A-2]*:~~

~~1. Direct expansion: Evaporator in which leaving refrigerant vapor is superheated.~~

~~2. Liquid overfeed: Evaporator in which refrigerant liquid is supplied at a recirculation rate greater than 1.~~

~~3. Applicable test procedure and reference year are provided under the definitions.~~

901.1.6 *[Section 120.6(a)4]* **Condensers.**

New fan-powered *condensers* on new refrigeration systems shall conform to the requirements of this section.

Exception to Section 901.1.6: *Transcritical CO_2 refrigeration systems*.

901.1.6.1 *[Section 120.6(a)4A]* **Design saturated condensing temperatures - evaporative-cooled condensers and water-cooled condensers.**

Design *saturated condensing temperatures* for evaporative-cooled *condensers* and water-cooled *condensers* served by *fluid coolers* or cooling towers shall be less than or equal to:

1. The design wet-bulb temperature plus 20°F in locations where the design wet-bulb temperature is less than or equal to 76°F; or
2. The design wet-bulb temperature plus 19°F in locations where the design wet-bulb temperature is between 76°F and 78°F; or

3. The design wet-bulb temperature plus 18°F in locations were the design wet-bulb temperature is greater than or equal to 78°F.

Exception 1 to Section 901.1.6.1: Compressors and *condensers* on a refrigeration system for which more than 20 percent of the total design refrigeration cooling load is for quick chilling/freezing of products (space with design cooling capacities of greater than 240 Btu/hr-ft^2), or *process* refrigeration cooling for other than a *refrigerated space*.

Exception 2 to Section 901.1.6.1: Condensing units that are components of walk-in *coolers* or walk-in *freezers* within the scope of the *Appliance Efficiency Regulations*.

901.1.6.2 *[Section 120.6(a)4B]* **Design saturated condensing temperatures - air-cooled condensers.**

Design *saturated condensing temperatures* for air-cooled *condensers* shall be less than or equal to:

1. The design dry-bulb temperature plus 10°F for systems serving *freezers*;
2. The design dry-bulb temperature plus 15°F for systems serving *coolers*.

Exception 1 to Section 901.1.6.2: Condensing units that are components of walk-in *coolers* or walk-in *freezers* within the scope of the *Appliance Efficiency Regulations*.

Exception 2 to Section 901.1.6.2: Compressors and *condensers* on a refrigeration system for which more than 20 percent of the total design refrigeration cooling load is for quick chilling/freezing of products (space with design cooling capacities of greater than 240 Btu/hr-ft^2), or *process* refrigeration cooling for other than a *refrigerated space*.

901.1.6.3 *[Section 120.6(a)4C]* **Saturated condensing temperatures - adiabatic condensers.**

The *saturated condensing temperature* necessary for *adiabatic condensers* to reject the design *total heat of rejection* of a refrigeration system assuming *dry mode* performance shall be less than or equal to:

1. The design dry-bulb temperature plus 20°F for systems serving *freezers*;
2. The design dry-bulb temperature plus 30°F for systems serving *coolers*.

Exception 1 to Section 901.1.6.3: Compressors and *condensers* on a refrigeration system for which more than 20 percent of the total design refrigeration cooling load is for quick chilling/freezing of products (space with design cooling capacities of greater than 240 Btu/hr-ft^2 (2 tons per 100 ft^2)), or *process* refrigeration cooling for other than a *refrigerated space*.

Exception 2 to Section 901.1.6.3: Condensing units that are components of walk-in *coolers* or walk-in *freezers* within the scope of the *Appliance Efficiency Regulations*.

901.1.6.4 *[Section 120.6(a)4D]* **Variable speed fans and fan controls.**

All *condenser* fans for air-cooled *condensers*, evaporative-cooled *condensers*, *adiabatic condensers*, *gas coolers*, air or water *fluid coolers* or cooling towers shall be continuously

variable speed, with the speed of all fans serving a common *condenser* high side controlled in unison.

901.1.6.5 *[Section 120.6(a)4E]* **Condensing temperature setpoint.**

The minimum *condensing temperature* setpoint shall be less than or equal to 70°F for systems utilizing air-cooled *condensers*, evaporative-cooled *condensers*, *adiabatic condensers*, *gas coolers*, air or water-cooled *fluid coolers* or cooling towers for heat rejection.

901.1.6.6 *[Section 120.6(a)4F]* **Condensing temperature reset.**

The *condensing temperature* set point of systems served by air-cooled *condensers* shall be reset in response to ambient dry-bulb temperature. The *condensing temperature* set point of systems served by evaporative-cooled *condensers* or water-cooled *condensers* (via cooling towers or *fluid coolers*) shall be reset in response to ambient wet-bulb temperatures. The *condensing temperature* set point for systems served by *adiabatic condensers* shall be reset in response to ambient dry-bulb temperature while operating in *dry mode*.

Exception 1 to Section 901.1.6.6: *Condensing temperature* control strategies approved by the *Executive Director* that have been demonstrated to provide at least equal energy savings.

Exception 2 to Section 901.1.6.6: Systems served by *adiabatic condensers* in *Climate Zones* 1, 3, 5, 12, 14 and 16.

901.1.6.7 *[Section 120.6(a)4G]* ~~**Condenser**~~ **Specific efficiency.**

Fan-powered *condensers* shall meet the ~~*condenser*~~ specific efficiency requirements listed in Table 901.1-(3) *[Table 120.6-B]*. *Condenser specific efficiency* is defined as the *total heat of rejection* (THR) capacity divided by all electrical input power including ~~fan~~ power of all fans at 100 percent rated fan speed, and power of spray pumps for evaporative *condensers*.

Exception 1 to Section 901.1.6.7: *Adiabatic condensers* with ammonia as refrigerant.

Exception 2 to Section 901.1.6.7: Condensing units that are components of walk-in *coolers* or walk-in *freezers* within the scope of the *Appliance Efficiency Regulations*.

TABLE 901.1-(3) [TABLE 120.6-B] FAN-POWERED CONDENSERS – MINIMUM EFFICIENCY REQUIREMENTS

***CONDENSER* TYPE**	**REFRIGERANT TYPE**	**MINIMUM EFFICIENCY**	**RATING CONDITION**
Outdoor Evaporative-Cooled with THR Capacity > 8,000 MBH	All	350 Btuh/watt	100°F *Saturated Condensing Temperature* (SCT), 70°F Outdoor Wet-bulb Temperature
Outdoor Evaporative-Cooled with THR Capacity < 8,000 MBH and Indoor Evaporative-Cooled	All	160 Btuh/watt	100°F *Saturated Condensing Temperature* (SCT), 70°F Outdoor Wet-bulb Temperature
Outdoor Air-Cooled	Ammonia	75 Btuh/watt	105°F *Saturated Condensing Temperature* (SCT), 95°F Outdoor Dry-bulb Temperature
Outdoor Air-Cooled	Halocarbon	65 Btuh/watt	105°F *Saturated Condensing Temperature* (SCT), 95°F Outdoor Dry-bulb Temperature
Adiabatic *Dry Mode*	Halocarbon	45 Btuh/watt	105°F *Saturated Condensing Temperature* (SCT), 95°F Outdoor Dry-bulb Temperature
Indoor Air-Cooled	All	No requirement	No requirement

901.1.6.8 *[Section 120.6(a)4H]* **Fin density.**

Air-cooled *condensers* shall have a *fin* density no greater than 10 *fins* per inch.

Exception 1 to Section 901.1.6.8: Micro-channel *condensers*.

Exception 2 to Section 901.1.6.8: Condensing units that are components of walk-in *coolers* or walk-in *freezers* within the scope of the *Appliance Efficiency Regulations*.

901.1.7 *[Section 120.6(a)5]* **Compressors.**

Compressor systems utilized in *refrigerated warehouses* shall conform to the requirements of this section.

901.1.7.1 *[Section 120.6(a)5A]* **Condensing temperature – other than transcritical CO_2 systems.**

Compressors serving refrigeration systems that are not transcritical CO_2 shall be designed to operate at a minimum *condensing temperature* of 70°F or less.

901.1.7.2 *[Section 120.6(a)5B]* **Condensing temperature – transcritical CO_2 systems.**

Compressors for *transcritical CO_2 refrigeration systems* shall be designed to operate at a minimum *condensing temperature* of 60°F or less.

Exception to Section 901.1.7.2: Compressors with a design saturated suction temperature greater than or equal to 30°F shall be designed to operate at a minimum *condensing temperature* of 70°F or less.

901.1.7.3 *[Section 120.6(a)5C]* **Compressor speed control.**

New open-drive screw compressors in new refrigeration systems with a design saturated suction temperature (SST) of 28°F or lower that discharges to the system *condenser* pressure shall control compressor speed in response to the refrigeration load.

Exception 1 to Section 901.1.7.3: Refrigeration plants with more than one dedicated compressor per suction group.

Exception 2 to Section 901.1.7.3: Compressors and *condensers* on a refrigeration system for which more than 20 percent of the total design refrigeration cooling load is for quick chilling/ freezing of products (space with design cooling capacities of greater than 240 Btu/hr-ft^2 (2 tons per 100 ft^2)) or *process* refrigeration cooling for other than a *refrigerated space*.

901.1.7.4 *[Section 120.6(a)5D]* **Compressor volume ratio control.**

New screw compressors with ~~nominal electric motor power greater than 150 HP~~nominal electric motor power greater than 150 HP in *nonresidential buildings* with *Group R occupancies* and compressor displacement of 450 cfm or greater in *nonresidential buildings* except *buildings* with *Group R occupancies*, shall include the ability to automatically vary the compressor volume ratio (Vi) in response to operating pressures.

Exception to Section 901.1.7.4: *Transcritical CO_2 refrigeration systems*.

901.1.8 *[Section 120.6(a)8]* **Transcritical CO_2 gas coolers.**

New fan-powered *gas coolers* on all new *transcritical CO_2 refrigeration systems* shall conform to the requirements of this section.

901.1.8.1 *[Section 120.6(a)8A]* **Air-cooled gas cooler prohibition.**

Air-cooled *gas coolers* are prohibited in *Climate Zones* 9 through 15.

Exception to Section 901.1.8.1: In non-residential *buildings*, except *buildings* with *Group R occupancies,* a~~A~~ir-cooled *gas coolers* on systems with a total heat rejection of 20 tons (240,000 Btu/h) or less for systems serving *freezers*, or 40 tons (480,000 Btu/h) or less for systems serving *coolers*.

901.1.8.2 *[Section 120.6(a)8B]* **Design leaving gas temperature – air-cooled gas cooler.**

Design leaving gas temperature for air-cooled *gas coolers* shall be less than or equal to the design dry-bulb temperature plus 6°F.

Exception to Section 901.1.8.2: Design leaving gas temperature for air-cooled *gas coolers* in *Climate Zones* 2, 4 and 8 shall be less than or equal to the design dry-bulb temperature plus 8°F.

901.1.8.3 *[Section 120.6(a)8C]* **Design leaving gas temperature – adiabatic gas cooler.**

Design leaving gas temperature for adiabatic *gas coolers* necessary to reject the design *total heat of rejection* of a refrigeration system assuming *dry mode* performance shall be less than or equal to the design dry-bulb temperature plus 15°F.

901.1.8.4 *[Section 120.6(a)8D]* **Variable speed fans and fan controls.**

All *gas cooler* fans shall be continuously variable speed, with the speed of all fans serving a common *condenser* high side controlled in unison.

901.1.8.5 *[Section 120.6(a)8E]* **Gas cooler pressure control.**

While operating below the critical point, the *gas cooler* pressure shall be controlled in accordance with Section 901.1.6.6 *[Section 120.6(a)4F]*.

901.1.8.6 *[Section 120.6(a)8F]* **Gas cooler pressure reset.**

While operating above the critical point, the *gas cooler* pressure setpoint shall be reset based on ambient conditions such that the system efficiency is maximized.

901.1.8.7 *[Section 120.6(a)8G]* **Condensing temperature setpoint.**

The minimum *condensing temperature* setpoint shall be less than or equal to 60°F for systems utilizing air-cooled *gas coolers*, evaporative-cooled *gas coolers*, adiabatic *gas coolers*, air or water-cooled *fluid coolers* or cooling towers for heat rejection.

Exception to Section 901.1.8.7: *Transcritical CO_2 refrigeration systems* with a design intermediate saturated suction temperature greater than or equal to 30°F shall have a minimum *condensing temperature* setpoint of 70°F or less.

901.1.8.8 *[Section 120.6(a)8H]* **Gas cooler efficiency.**

Fan-powered *gas coolers* shall meet the *gas cooler* efficiency requirements *listed* in Table 901.1-(4) *[Table 120.6-C]*. *Gas cooler* efficiency is defined as the *Total Heat of Rejection* (THR) capacity divided by all electrical input power (fan power at 100 percent fan speed).

TABLE 901.1-(4) [TABLE 120.6-C] TRANSCRITICAL CO_2 FAN-POWERED GAS COOLERS – MINIMUM EFFICIENCY REQUIREMENTS

***CONDENSER* TYPE**	**REFRIGERANT TYPE**	**MINIMUM EFFICIENCY**	**RATING CONDITION**
Outdoor Air-Cooled	Transcritical CO_2	160 Btuh/watt	1400 psig, 100°F Outlet Gas Temperature, 90°F Outdoor Dry-bulb Temperature
Adiabatic *Dry Mode*	Transcritical CO_2	90 Btuh/watt	1100 psig, 100°F Outlet Gas Temperature, 90°F Outdoor Dry-bulb Temperature

901.1.9 *[Section 120.6(a)7]* **Refrigerated warehouse acceptance.**

Before an *occupancy* permit is granted for a new *refrigerated warehouse*, or before a new refrigeration system serving a *refrigerated warehouse* is operated for normal use, the

following *equipment* and systems shall be certified as meeting the *acceptance requirements for code compliance*, as specified by the Reference Nonresidential Appendix NA7.

A certificate of acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements:

1. Electric resistance underslab heating systems shall be tested in accordance with NA7.10.1.
2. Evaporators fan motor controls shall be tested in accordance with NA7.10.2.
3. Evaporative *condensers* shall be tested in accordance with NA7.10.3.1.
4. Air-Cooled *condensers* shall be tested in accordance with NA7.10.3.2.
5. *Adiabatic condensers* shall be tested in accordance with NA7.10.3.3.
6. Variable speed compressors shall be tested in accordance with NA7.10.4.
7. *Transcritical CO_2 refrigeration systems* shall be tested in accordance with NA7.20.1.

901.2 Prescriptive requirements (Newly Constructed).

RESERVED.

901.3 Performance requirements (Newly Constructed).

RESERVED.

901.4 *[Section 141.1]* Additions and alterations to existing buildings.

Covered processes in *additions* or *alterations* to existing *buildings* that will be *nonresidential*, *hotel/motel*, or *multifamily occupancies* shall comply with the applicable requirements of Section 901, and the applicable requirements of Section 400.5.1 *[Section 110.2(a)]* and Section 913 *[Section 120.3]*.

Exception to Section 901.4: *Addition*, *alteration* or replacement of less than all of the evaporators in an existing *refrigerated space* that does not have speed-controlled evaporators does not need to comply with variable speed fans and fan control requirements in Section 901.1.5.2.

NOTE: For *alterations* that change the *occupancy* classification of the *building*, the requirements of this section apply to the *occupancy* that will exist after the *alterations*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 902

COMMERCIAL REFRIGERATION

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

902.1 *[Section 120.6(b)]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

Retail food or beverage stores with 8,000 square feet or more of *conditioned floor area*, and that utilize either refrigerated display cases, or walk-in *coolers* or *freezers* shall meet all applicable state and federal appliance and equipment standards consistent with Section 101.2 *[Section 110.0]* and Section 101.3 *[Section 110.1]* or, for equipment not subject to such standards, the requirements of Sections 902.1.1 through 902.1.4.

902.1.1 *[Section 120.6(b)1]* **Condensers serving refrigeration systems.**

Fan-powered *condensers* shall conform to the requirements of this section.

902.1.1.1 *[Section 120.6(b)1A]* **Variable speed fans and fan controls.**

All *condenser* fans for air-cooled *condensers*, evaporative-cooled *condensers*, *adiabatic condensers*, *gas coolers*, air- or water-cooled *fluid coolers* or cooling towers shall be continuously variable speed, with the speed of all fans serving a common *condenser* high side controlled in unison.

902.1.1.2 *[Section 120.6(b)1B]* **Condensing temperature reset – air-cooled condensers.**

The refrigeration system *condenser* controls for systems with air-cooled *condensers* shall use variable- setpoint control logic to reset the *condensing temperature* setpoint in response to ambient dry-bulb temperature.

Exception 1 to Section 902.1.1.2: *Condensing temperature* control strategies approved by the *executive director* that have been demonstrated to provide equal energy savings.

Exception 2 to Section 902.1.1.2: *Transcritical CO_2 refrigeration systems*.

902.1.1.3 *[Section 120.6(b)1C]* **Condensing temperature reset – evaporative-cooled condensers.**

The refrigeration system *condenser* controls for systems with evaporative-cooled *condensers* shall use variable-setpoint control logic to reset the *condensing temperature* setpoint in response to ambient wet-bulb temperature.

Exception 1 to Section 902.1.1.3: *Condensing temperature* control strategies approved by the *executive director* that have been demonstrated to provide equal energy savings.

Exception 2 to Section 902.1.1.3: *Transcritical CO_2 refrigeration systems*.

902.1.1.4 *[Section 120.6(b)1D]* **Condensing temperature reset – adiabatic condensers.**

The refrigeration system *condenser* controls for systems with *adiabatic condensers* shall use variable setpoint control logic to reset the *condensing temperature* setpoint in response to ambient dry-bulb temperature while operating in *dry mode*.

Exception 1 to Section 902.1.1.4: *Condensing temperature* control strategies approved by the *executive director* that have been demonstrated to provide equal energy savings.

Exception 2 to Section 902.1.1.4: Systems served by *adiabatic condensers* in Climate Zone 16.

Exception 3 to Section 902.1.1.4: *Transcritical CO_2 refrigeration systems*.

902.1.1.5 *[Section 120.6(b)1E]* **Saturated condensing temperature – adiabatic condensers.**

The *saturated condensing temperature* necessary for *adiabatic condensers* to reject the design *total heat of rejection* of a refrigeration system assuming *dry mode* performance shall be less than or equal to:

1. The design dry-bulb temperature plus 20°F for systems serving *freezers*;
2. The design dry-bulb temperature plus 30°F for systems serving *coolers*.

Exception to Section 902.1.1.5: *Transcritical CO_2 refrigeration systems*.

902.1.1.6 *[Section 120.6(b)1F]* **Condensing temperature setpoint.**

The minimum *condensing temperature* setpoint shall be less than or equal to 70°F.

Exception to Section 902.1.1.6: *Transcritical CO_2 refrigeration systems*.

902.1.1.7 *[Section 120.6(b)1G]* **Specific efficiency.**

Fan-powered *condensers* shall meet the specific efficiency requirements listed in Table 902.1-(1) *[Table 120.6-D]*.

TABLE 902.1-(1) [TABLE 120.6-D] FAN-POWERED CONDENSERS –SPECIFIC EFFICIENCY REQUIREMENTS

***CONDENSER* TYPE**	**MINIMUM SPECIFIC EFFICIENCY[a]**	**RATING CONDITION**
Evaporative-Cooled	160 Btuh/watt	100°F *Saturated Condensing Temperature* (SCT), 70°F Entering Wet-bulb Temperature
Air-Cooled	65 Btuh/watt	105°F *Saturated Condensing Temperature* (SCT), 95°F Entering Dry-bulb Temperature
Adiabatic *Dry Mode*	45 Btu/watt (halocarbon)	105°F *Saturated Condensing Temperature* (SCT), 95°F Entering Dry-bulb Temperature

Footnotes for Table 902.1-(1) *[Table 120.6-D]*:

a. See Section 200 *[Section 100.1]* for definition of *condenser specific efficiency.*

~~Footnotes for Table 902.1-A *[Table 120.6-D]*:~~

~~a. See Section 200 *[Section 100.1]* for definition of *condenser specific efficiency*.~~

Exception 1 to Section 902.1.1.7: *Condensers* with a total heat rejection capacity of less than 150,000 Btuh at the specific efficiency rating condition.

Exception 2 to Section 902.1.1.7: Stores located in Climate Zone 1.

Exception 3 to Section 902.1.1.7: *Transcritical CO_2 refrigeration systems*.

902.1.1.8 *[Section 120.6(b)1H]* **Fin density.**

Air-cooled *condensers* shall have a *fin* density no greater than 10 *fins* per inch.

Exception to Section 902.1.1.8: *Microchannel condensers*.

902.1.2 *[Section 120.6(b)2]* **Compressor systems.**

Refrigeration compressor systems and condensing units shall conform to the requirements of this section.

902.1.2.1 *[Section 120.6(b)2A]* **Target saturated suction temperature reset.**

Compressors and multiple-compressor suction groups shall include control systems that use floating suction pressure logic to reset the target saturated suction temperature based on the temperature requirements of the attached refrigeration display cases or walk-ins.

Exception 1 to Section 902.1.2.1: Single compressor systems that do not have continuously variable capacity capability.

Exception 2 to Section 902.1.2.1: Suction groups that have a design saturated suction temperature of 30°F or higher, or suction groups that comprise the high stage of a two-stage or cascade system or that primarily serve chillers for secondary cooling fluids.

902.1.2.2 *[Section 120.6(b)2B]* **Liquid subcooling.**

Liquid subcooling shall be provided for all low temperature compressor systems with a design cooling capacity equal or greater than 100,000 Btu/hr with a design saturated suction temperature of -10°F or lower, with the subcooled liquid temperature maintained continuously at 50°F or less at the exit of the subcooler, using compressor economizer port(s) or a separate medium or high temperature suction group operating at a saturated suction temperature of 18°F or higher.

Exception 1 to Section 902.1.2.2: Low temperature cascade systems that condense into another refrigeration system rather than condensing to ambient temperature.

Exception 2 to Section 902.1.2.2: *Transcritical CO_2 refrigeration systems*.

902.1.2.3 *[Section 120.6(b)2C]* **Condensing temperature - transcritical CO_2 systems.**

Compressors for *transcritical CO_2 refrigeration systems* shall be designed to operate at a minimum *condensing temperature* of 60°F or less.

Exception to Section 902.1.2.3: Compressors with a design saturated suction temperature greater than or equal to 30°F shall be designed to operate at a minimum *condensing temperature* of 70°F or less.

902.1.3 *[Section 120.6(b)3]* **Refrigerated display cases.**

Lighting in refrigerated display cases, and lights on glass *doors* installed on walk-in *coolers* and *freezers* shall be controlled by one of the following:

1. *Automatic time switch controls* to turn off *lights* during nonbusiness hours. Timed overrides for any line-up or walk-in case may only be used to turn the lights on for up to one hour. *Manual* overrides shall time-out automatically to turn the lights off after one hour.
2. *Motion sensor controls* on each case that reduce display case *lighting* power by at least 50 percent within 30 minutes after the area near the case is vacated.

902.1.4 *[Section 120.6(b)4]* **Refrigeration heat recovery.**

902.1.4.1 *[Section 120.6(b)4A]* **Heat recovery for space heating.**

HVAC systems shall utilize heat recovery from refrigeration system(s) for space heating, using no less than 25 percent of the sum of the design *total heat of rejection* of all refrigeration systems that have individual *total heat of rejection* values of 150,000 Btu/h or greater at *design conditions*.

Exception 1 to Section 902.1.4.1: Stores located in *Climate Zone* 15.

Exception 2 to Section 902.1.4.1: Stores where the design *total heat of rejection* of all refrigeration systems is less than or equal to 500,000 Btu/h.

902.1.4.2 *[Section 120.6(b)4B]* **Hydrofluorocarbon refrigerant charge.**

The increase in hydrofluorocarbon refrigerant charge associated with refrigeration heat recovery *equipment* and piping shall be no greater than 0.35 lbs per 1,000 Btu/h of heat recovery heating capacity.

902.1.5 *[Section 120.6(b)5]* **Transcritical CO_2 Gas Coolers.**

New fan-powered *gas coolers* on all new *transcritical CO_2 refrigeration systems* shall conform to the requirements of this section.

902.1.5.1 *[Section 120.6(b)5A]* **Air-cooled gas cooler prohibition.**

Air-cooled *gas coolers* are prohibited in *Climate Zones* 10 through 15.

Exception to Section 902.1.5.1: In non-residential *building*, except *buildings* with *Group R occupancies*, air-cooled *gas coolers* on systems with a total heat rejection of 20 tons (240,000 Btu/h) or less for systems serving *freezers*, or 40 tons (480,000 Btu/h) or less for systems serving *coolers*.

902.1.5.2 *[Section 120.6(b)5B]* **Design leaving gas temperature - air-cooled gas coolers.**

Design leaving gas temperature for air-cooled *gas coolers* shall be less than or equal to the design dry-bulb temperature plus 6°F.

902.1.5.3 *[Section 120.6(b)5C]* **Design leaving gas temperature - adiabatic gas coolers.**

Design leaving gas temperature for adiabatic *gas coolers* necessary to reject the design *total heat of rejection* of a refrigeration system assuming *dry mode* performance shall be less than or equal to the design dry-bulb temperature plus 15°F.

902.1.5.4 *[Section 120.6(b)5D]* **Variable speed fans and fan controls.**

All *gas cooler* fans shall be continuously variable speed, with the speed of all fans serving a common *condenser* high side controlled in unison.

902.1.5.5 *[Section 120.6(b)5E]* **Gas cooler pressure control.**

While operating below the critical point, the *gas cooler* pressure shall be controlled in accordance with Section 902.1.1.2, 902.1.1.3, or 902.1.1.4 *[Section 120.6(b)1B, 120.6(b)1C, or 120.6(b)1D]*.

902.1.5.6 *[Section 120.6(b)5F]* **Gas cooler pressure reset.**

While operating above the critical point, the *gas cooler* pressure setpoint shall be reset based on ambient conditions such that the system efficiency is maximized.

902.1.5.7 *[Section 120.6(b)5G]* **Condensing temperature setpoint.**

The minimum *condensing temperature* setpoint shall be less than or equal to 60°F for air-cooled *gas coolers*, evaporative-cooled *gas coolers*, adiabatic *gas coolers*, air or water-cooled *fluid coolers* or cooling towers.

Exception to Section 902.1.5.7: *Transcritical CO_2 refrigeration systems* with a design intermediate saturated suction temperature greater than or equal to 30°F shall have a minimum *condensing temperature* setpoint of 70°F or less.

902.1.5.8 *[Section 120.6(b)5H]* **Condenser efficiency.**

Fan-powered *gas coolers* shall meet the *condenser* efficiency requirements listed in Table 902.1-(2) *[Table 120.6-E]*. *Gas cooler* efficiency is defined as the *total heat of rejection* (THR) capacity divided by all electrical input power (fan power at 100-percent fan speed).

TABLE 902.1-(2) [TABLE 120.6-E] TRANSCRITICAL CO_2 FAN-POWERED GAS COOLERS – MINIMUM EFFICIENCY REQUIREMENTS

***CONDENSER* TYPE**	**REFRIGERANT TYPE**	**MINIMUM EFFICIENCY**	**RATING CONDITION**
Outdoor Air-Cooled	Transcritical CO_2	160 Btuh/watt	1400 psig, 100°F Outlet Gas Temperature, 90°F Outdoor Dry-bulb Temperature
Adiabatic *Dry Mode*	Transcritical CO_2	90 Btuh/watt	1100 psig, 100°F Outlet Gas Temperature, 90°F Outdoor Dry-bulb Temperature

902.1.6 *[Section 120.6(b)6]* **Commercial refrigeration acceptance.**

Before an occupancy permit is granted for a new retail food or beverage store, or before a new refrigeration system serving a retail food or beverage store is operated for normal use, the following *equipment* and systems shall be certified as meeting the *Acceptance Requirements for Code Compliance*, as specified by the Reference Nonresidential Appendix NA7.

A Certificate of Acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements:

1. *Transcritical CO_2 refrigeration systems* shall be tested in accordance with NA7.20.1.

902.2 Prescriptive requirements (Newly Constructed).

RESERVED.

902.3 Performance requirements (Newly Constructed).

RESERVED.

902.4 *[Section 141.1]* Additions and alterations to existing buildings.

Covered processes in *additions* or *alterations* to existing *buildings* that will be *nonresidential*, *hotel/motel*, or *multifamily occupancies* shall comply with the applicable requirements of Section 902, and the applicable requirements of Section 400.5.1 *[Section 110.2(a)]* and Section 913 *[Section 120.3]*.

Exception 1 to Section 902.4: New *condensers* replacing existing *condensers* when the attached compressor system *total heat of rejection* does not increase and less than 25 percent of both the attached compressors and the attached display cases are new do not need to comply with *condenser* requirements in Section 902.1.1.

Exception 2 to Section 902.4: Existing *condensers* that are reused for an *addition* or *alteration* do not need to comply with *condenser specific efficiency* requirements in Section 902.1.1.7.

Exception 3 to Section 902.4: Existing *condensers* that are reused for an *addition* or *alteration* do not need to comply with *condenser fin* density requirements in Section 902.1.1.8.

Exception 4 to Section 902.4: Existing compressor systems that are reused for an *addition* or *alteration* do not need to comply with compressor system requirements in Section 902.1.2.

Exception 5 to Section 902.4: *HVAC systems* or refrigeration systems that are reused for an *addition* or *alteration* do not need to comply with heat recovery for space heating requirements in Section 902.1.4.1.

NOTE: For *alterations* that change the *occupancy* classification of the *building*, the requirements of this section apply to the *occupancy* that will exist after the *alterations*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.8, and 25943, Public Resources Code

SECTION 903

ENCLOSED PARKING GARAGES

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

903.1 *[Section 120.6(c)]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

Mechanical ventilation systems for enclosed parking *garages* where the total design exhaust rate for the *garage* is greater than or equal to 10,000 cfm shall conform to the requirements of this section.

Exception to Section 903.1: Any *garage*, or portion of a *garage*, where more than 20 percent of the vehicles expected to be stored have non-gasoline combustion engines.

903.1.1 *[Section 120.6(c)2]* **Fan motor demand.**

Have controls and/or devices that will result in fan motor demand of no more than 30 percent of design wattage at 50 percent of design airflow.

903.1.2 *[Section 120.6(c)1]* **Detection.**

Automatically detect contaminant levels and stage fans or modulate fan airflow rates to 50 percent or less of design capacity, provided acceptable contaminant levels are maintained.

903.1.3 *[Section 120.6(c)7]* **CO sensor.**

CO sensors shall be:

1. Certified by the manufacturer to be accurate within plus or minus 5 percent of measurement.
2. Factory calibrated.
3. Certified by the manufacturer to drift no more than 5 percent per year.
4. Certified by the manufacturer to require calibration no more frequently than once a year.
5. Monitored by a control system. The system shall have logic that automatically checks for sensor failure by the following means. Upon detection of a failure, the system shall reset to design ventilation rates and transmit an alarm to the facility operators.
   5.1. If any sensor has not been calibrated according to the manufacturer's recommendations within the specified calibration period, the sensor has failed.
   5.2. During unoccupied periods the system compares the readings of all sensors to a single sensor. ~~, e.g., i~~ If ~~any~~ the sensor is more than ~~15 ppm~~30% above or below the average of all sensors for longer than four hours, the sensor has failed.

5.3. During occupied periods the system compares the readings of sensors in the same proximity zone to a single sensor in the proximity zone., ~~e.g., i~~ If the sensor~~30 minute rolling average for any sensor in a proximity zone~~ is more than ~~15 ppm~~30% above or below the ~~30 minute rolling~~ average for ~~other~~ all sensor(s) in that proximity zone for longer than four hours, the sensor has failed.

903.1.4 *[Section 120.6(c)3]* **CO sensor location.**

CO shall be monitored with at least one sensor per 5,000 square feet, with the sensor located in the highest expected concentration locations, with at least two sensors per proximity zone. A proximity zone is defined as an area that is isolated from other areas either by floor or other impenetrable obstruction.

903.1.5 *[Section 120.6(c)4]* **CO concentration.**

CO concentration at all sensors is maintained at ≤ 25 ppm or less at all times.

903.1.6 *[Section 120.6(c)5]* **Ventilation rate.**

The ventilation rate shall be at least 0.15 cfm/ft^2 when the *garage* is scheduled to be occupied.

903.1.7 *[Section 120.6(c)6]* **Pressure.**

The system shall maintain the *garage* at negative or neutral pressure relative to other *occupiable spaces* when the *garage* is scheduled to be occupied.

903.1.8 *[Section 120.6(c)8]* **Parking garage ventilation acceptance.**

Before an occupancy permit is granted for a parking *garage* system subject to Section 903.1 *[Section 120.6(c)]*, the following *equipment* and systems shall be certified as meeting the *acceptance requirements for code compliance*, as specified by the Reference Nonresidential Appendix NA7.

A certificate of acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements specified in NA7.12.

903.2 Prescriptive requirements (Newly Constructed).

RESERVED.

903.3 Performance requirements (Newly Constructed).

RESERVED.

903.4 *[Section 141.1]* **Additions and alterations to existing buildings.**

Covered processes in *additions* or *alterations* to existing *buildings* that will be *nonresidential*, *hotel/motel*, or *multifamily occupancies* shall comply with the applicable requirements of Section 903.

Exception to Section 903.4: *Additions* and *alterations* to existing *garages* where less than 10,000 cfm of new exhaust capacity is being added do not need to comply with requirements in Section 903.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 904

PROCESS BOILERS

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

904.1 *[Section 120.6(d)]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

904.1.1 *[Section 120.6(d)1]* **Combustion air positive shut-off.**

Combustion air positive shut-off shall be provided on all newly installed *process boilers* as follows:

1. All *process boilers* with an input capacity of 2.5 MMBtu/h (2,500,000 Btu/h) and above, in which the boiler is designed to operate with a nonpositive vent static pressure.
2. All *process boilers* where one stack serves two or more boilers with a total combined input capacity per stack of 2.5 MMBtu/h (2,500,000 Btu/h).

904.1.2 *[Section 120.6(d)2]* **Combustion air fans.**

Process boiler combustion air fans with motors 10 horsepower or larger shall meet one of the following for newly installed boilers:

1. The fan motor shall be driven by a variable speed drive; or.
2. The fan motor shall include controls that limit the fan motor demand to no more than 30 percent of the total design wattage at 50 percent of design air volume.

904.1.3 *[Section 120.6(d)3]* **Stack-gas oxygen.**

Newly installed *process boilers* with an input capacity greater than 5 MMBtu/h (5,000,000 Btu/h) shall ~~maintain stack-gas oxygen concentrations at less than or equal to 3.0 percent by volume on a dry basis over firing rates of 20 to 100 percent.~~ Maintain stack-gas oxygen concentrations at less than or equal to 3.0 percent by volume on a dry basis over firing rates of 20 to 100 percent when in a *nonresidential building* with *Group R occupancies*, and shall meet the following requirements at 25% (or at the boiler's lowest firing rate, whichever is higher) to 100% of burner input capacity when in a *nonresidential building*, except *buildings* with *Group R occupancies*:

1. *Process boilers* with burners that that use a premixed air-fuel mixture, with combustion occurring at a fine mesh surface which act as a flame arrestor to stabilize and maintain the flame, shall maintain stack-gas oxygen concentrations at less than or equal to 8.0% by volume on a dry basis.
2. *Process boilers* equipped with a selective catalytic reduction system, which is a boiler emissions control system that injects ammonia or urea into the flue gas over a catalyst to reduce NOx emissions, shall maintain stack-gas oxygen concentrations at less than or equal to 4.0% by volume on a dry basis.

3. All other *process boilers* shall maintain stack-gas oxygen concentrations at less than or equal to 6.0% by volume on a dry basis.

Combustion air volume shall be controlled with respect to measured flue gas oxygen concentration. Use of a common gas and combustion air control linkage or jack shaft is prohibited.

Exception to Section 904.1.3: Boilers with steady state full-load *combustion efficiency*, inclusive of all economizers, 90 percent or higher.

904.1.4 *[New Section]* **Stack economizers.**

Newly installed *process* steam boilers with an input capacity greater than or equal to 10 MMBtu/h shall have a boiler stack economizer, which is a heat exchanger that recovers heat from boiler flue gas and transfers it to boiler feedwater or a combination of boiler feedwater and make-up water. The boiler stack economizer shall:

1. Be designed for a stack temperature drop of 60°F or more across the boiler stack economizer at design condition,
2. Not be bypassed during normal operation.

Exception 1 to Section 904.1.4: Steam boilers where the stack temperature at the lowest firing rate is below 340°F at outlet of the boiler or the outlet of the selective catalytic reduction system if present and connected to the boiler.

Exception 2 to Section 904.1.4: Steam boilers designed to burn biomass from facility *processes* or biomass produced from waste material produced at the facility, such as woody biomass, digester gas, landfill gas, and animal fat.

Exception 3 to Section 904.1.4: Steam boilers employing other methods of stack heat recovery such as a heat exchanger serving a load other than boiler feedwater.

Exception 4 to Section 904.1.4: Indoor replacement steam boilers at existing facilities with *roof* clearance, which is the distance from the boiler stack outlet to the ceiling or the distance to from the outlet of the selective catalytic reduction system to the ceiling, less than 88 inches for steam boilers with an input capacity of 25 MMBtu/h or less and less than 116 inches for steam boilers with an input capacity greater than 25 MMBtu/h.

Exception 5 to 904.1.4: *Process* steam in *buildings* with *Group R occupancies*.

904.1.5 *[New Section]* **Automatic blowdown.**

Newly installed *process* steam boilers with an input capacity greater than or equal to 10 MMBtu/h shall have an *automatic* boiler surface blowdown controller, which is an automated system that optimizes surface-blowdown rates by regulating the volume of water discharged from the boiler in relation to the concentration of dissolved solids present, that is programmed to be controlled by conductivity.

Exception 1 to Section 904.1.5: Steam boilers with returned condensate composed of more than 90 percent boiler feedwater flow.

Exception 2 to Section 904.1.5: Steam boilers with make-up water treated by a reverse osmosis system.

Exception 3 to Section 904.1.5: Steam boilers with a heat exchanger that recovers energy from the blowdown to heat make-up water or another *process* steam, with or without a flash tank.

Exception 4 to 904.1.5: *Process* steam in *buildings* with *Group R occupancies*.

904.1.6 *[New Section]* **Steam supply deaerator line regulator pressure control.**

Newly installed *process* steam boilers with an input capacity greater than or equal to 10 MMBtu/h that use the boiler steam header to pressurize the deaerator, which is a system used to remove oxygen and other dissolved gases from boiler feedwater, shall meet the following requirements.

1. The pressure regulator serving the deaerator shall be set at or under 5 psig.
2. The pressure regulator serving the deaerator shall be set within 2 to 5 psig for boilers with tubes that are not rated for oxidizing conditions.
3. A pressure gauge shall be installed on the deaerator.

Exception 1 to Section 904.1.6: Steam boilers with swings in make-up water flow to feedwater of 20 percent or more of the feedwater flow with description in design documents.

Exception 2 to 904.1.6: *Process* steam in *buildings* with *Group R occupancies*.

904.1.7 ***[New Section]*** **Flash steam recovery.**

All newly installed *process* steam boilers with capacities at or above 10 MMBtu/h that have or are connected to a system with a pressurized deaerator shall recover and route *flash steam* from blowdown to the deaerator or another heating load.

Exception 1 to 904.1.7: Steam *boiler systems* where high-pressure condensate is returned to the deaerator without being flashed (dropped to atmospheric pressure).

Exception 2 to 904.1.7: Steam *boiler systems* where the linear distance (sum of horizontal and vertical) from the boiler to the serving deaerator is greater than or equal to 100 feet.

Exception 3 to 904.1.7: *Process* steam in *buildings* with *Group R occupancies*.

904.2 Prescriptive requirements (Newly Constructed).__

RESERVED.

904.3 Performance requirements (Newly Constructed).

RESERVED.

904.4 *[Section 141.1]* **Additions and alterations to existing buildings.**

904.4.1 Covered processes in additions or alterations to existing buildings

~~*Covered processes* in *additions* or *alterations* to existing *buildings* that will be *nonresidential, hotel/motel*, or *multifamily* occupancies shall~~ Shall comply with the applicable requirements of Section 904, and the applicable requirements of Section 400.5.1 *[Section 110.2(a)]* and Section 913 *[Section 120.3]*.

904.4.2 Covered processes in additions or alterations to existing buildings where process boilers are added or replaced

~~All *additions* or *alterations* to *existing buildings where process boilers* are added or replaced s~~Shall comply with the applicable requirements of Section 904.1 *[Section 120.6(d)3].*

Exception to 904.4.2: *Process boilers* in *buildings* with *Group R occupancies*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 905

COMPRESSED AIR SYSTEMS

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

905.1 *[Section 120.6(e)]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

All new *compressed air systems* where the total combined horsepower (hp) of the compressor(s) is 25 hp or more shall meet the requirements of Sections 905.1.1 through 905.1.6.

These requirements apply to the compressors, air dryers, and related piping systems and related controls that provide compressed air and do not apply to any *equipment* or controls that use ~~or process~~ the compressed air.

Exception 1 to Section 905.1: Medical gas *compressed air systems* serving *healthcare facilities*.

Exception 2 to Section 905.1: Air dryers in *buildings* with *Group R occupancies*.

905.1.1 *[Section 120.6(e)1]* **Trim compressor and storage.**

The *compressed air system* shall be equipped with an appropriately sized *trim compressor* and *primary storage* to provide acceptable performance across the range of the system and to avoid control gaps. The *compressed air system* shall comply with either option below.

1. The *compressed air system* shall include one or more variable speed drive (VSD) compressors. For systems with more than one compressor, the total combined capacity of the VSD compressor(s) acting as *trim compressors* must be at least 1.25 times the *largest net capacity increment* between combinations of compressors. The *compressed air system* shall include *primary storage* of at least one gallon per actual cubic feet per minute (acfm) of the largest *trim compressor*; or
2. The *compressed air system* shall include a compressor or set of compressors with total effective trim capacity at least the size of the *largest net capacity increment* between combinations of compressors, or the size of the smallest compressor, whichever is larger. The total effective trim capacity of single compressor systems shall cover at least the range from 70 to 100 percent of rated capacity. The effective trim capacity of a compressor is the size of the continuous operational range where the specific power of the compressor (kW/100 acfm) is within 15 percent of the specific power at its most efficient operating point. The total effective trim capacity of the system is the sum of the effective trim capacity of the *trim compressors*. The system shall include *primary storage* of at least 2 gallons per acfm of the largest *trim compressor*.

Exception to Section 905.1.1: *Compressed air systems* that have been approved by the *Energy Commission Executive Director* as having demonstrated that the system serves loads for which typical air demand fluctuates less than 10 percent.

905.1.2 *[Section 120.6(e)2]* **Controls.**

Compressed air systems with three or more compressors and a combined horsepower rating of more than 100 hp shall operate with controls that are able to choose the most energy efficient combination and loading of compressors within the system based on the current compressed air demand.

905.1.3 *[Section 120.6(e)3]* **Monitoring.**

Compressed air systems having a combined horsepower rating equal to or greater than 100 hp shall have an energy and air demand monitoring system with the following minimum requirements:

1. Measurement of system pressure.
2. Measurement of amps or power of each compressor.
3. Measurement or determination of total airflow from compressors in cfm.
4. Data logging of pressure, power in kW, airflow in cfm and *compressed air system* specific efficiency in kW/100 cfm at intervals of 5 minutes or less.
5. Maintained data storage of at least the most recent 24 months.
6. Visual trending display of each recorded point, load and specific energy.

905.1.4 *[Section 120.6(e)4]* **Leak testing of compressed air piping.**

Compressed air system piping greater than 50 adjoining feet in length shall be pressure tested after being isolated from the compressed air supply and end uses. The piping shall be pressurized to the design pressure and test pressures shall be held for a length of time at the discretion of the authority having jurisdiction, but in no case for less than 30 minutes, with no perceptible drop in pressure.

If dial gauges are used for conducting this test, these gauges must conform with California Plumbing Code Sections 318.3, 318.4 and 318.5.

Piping less than or equal to 50 adjoining feet in length shall be pressurized and inspected. Connections shall be tested with a noncorrosive leak-detecting fluid or other leak-detecting methods at the discretion of the authority having jurisdiction.

905.1.5 *[Section 120.6(e)5]* **Pipe sizing.**

Compressed air piping greater than 50 adjoining feet in length shall be designed and installed to minimize frictional losses in the distribution network. These piping installations shall meet the requirements of Section 905.1.5.1 *[Section 120.6(e)5A]* and either Section 905.1.5.2 *[Section 120.6(e)5B]* or Section 905.1.5.3 *[Section 120.6(e)5C]*:

905.1.5.1 *[Section 120.6(e)5A]* **Service line piping minimum size.**

Service line piping shall have inner diameters greater than or equal to ¾ inch. Service line piping are pipes that deliver compressed air from distribution piping to end uses.

905.1.5.2 *[Section 120.6(e)5B]* **Piping section average velocity.**

Compressor room interconnection and main header piping shall be sized so that at coincident peak flow conditions, the average velocity in the segment of pipe is no greater than 20 ft/sec. Compressor room interconnection and main header piping are the pipes that deliver compressed air from the compressor outlets to the inlet to the distribution piping. Each segment of distribution and service piping shall be sized so that at coincident peak flow conditions, the average velocity in the segment of pipe is no greater than 30 ft/sec. Distribution piping are pipes that deliver compressed air from the compressor room interconnection piping or main header piping to the service line piping.

905.1.5.3 *[Section 120.6(e)5C]* **Piping total pressure drop.**

Piping shall be designed such that piping frictional pressure loss at coincident peak loads is less than 5 percent of operating pressure between the compressor and end use or end use regulator.

905.1.6 *[New Section]* **Compressed air dryers.**

Compressed air dryers, other than *point-of-use air dryers*, and their controls shall comply with Section 905.1.6.1, Section 905.1.6.2, and Section 905.1.6.3.

905.1.6.1 Refrigerated air dryers.

Where the required facility compressed air dew point is greater than 35°F, *compressed air dryers* shall be *refrigerated air dryers*.

Each *refrigerated air dryer* shall include *automatic* capacity-control features that reduce energy consumption during *part-load operation*. Such features may include:

1. *Thermal mass* cycling;
2. Digital scroll modulation;
3. Variable speed drives; or
4. Other *automatic* capacity-control features that reduce energy consumption in response to varying compressed air load.

Exception 1 to 905.1.6.1: *Refrigerated air dryers* specified for applications with documented *process* requirements requiring precise dew point control across operating conditions.

905.1.6.2 Desiccant air dryers.

All *desiccant air dryers* shall meet one of the following:

1. Each *desiccant air dryer* shall have dew point regeneration controls that maximize use of desiccant drying capacity and delay regeneration cycling based on measurement of the desiccant material moisture load; or
2. Each *desiccant air dryer* shall be a heat-of-compression dryer that uses recovered waste heat from air compressors to aid in regeneration of the desiccant material.

905.1.6.3 Desiccant air dryer heating.

Desiccant air dryers with capacity of 300 cfm or greater shall have internal or external heating to reduce purge air consumption.

Exception 1 to 905.1.6.3: *Compressed air dryers* serving applications requiring dew points less than -40°F.

Exception 2 to 905.1.6.3: Air dryers specified for applications that must maintain a precise dew point across all operating conditions.

905.1.7~~6~~ *[Section 120.6(e)6]* **Compressed air system acceptance.**

Before an occupancy permit is granted for a *compressed air system* subject to Section 905.1 *[Section 120.6(e)]*, the *equipment* and systems shall be certified as meeting the *acceptance requirements for code compliance*, as specified by the Reference Nonresidential Appendix NA7.

A certificate of acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements specified in NA 7.13.

905.2 Prescriptive requirements (Newly Constructed).

RESERVED.

905.3 Performance requirements (Newly Constructed).

RESERVED.

905.4 *[Section 141.1]* Additions and alterations to existing buildings.

All *additions* or *alterations* of *compressed air systems* where the total combined horsepower (hp) of the compressor(s) is 25 hp or more in existing *buildings* that will be *nonresidential*, *hotel/motel*, or *multifamily occupancies* shall comply with the applicable requirements of Section 905.

Exception 1 to Section 905.4: *Alterations* where the total combined added or replaced compressor horsepower is less than the average per-compressor horsepower of all compressors in the system do not need to comply with *trim compressor* and storage requirements in Section 905.1.1.

Exception 2 to Section 905.4: *Alterations* where all added or replaced compressors are variable speed drive (VSD) compressors and *compressed air system* includes *primary storage* of at least one gallon per actual cubic foot per minute (acfm) of the largest *trim compressor* do not need to comply with *trim compressor* and storage requirements in Section 905.1.1.

Exception 3 to Section 905.4: *Alterations* of existing *compressed air systems* that include one or more centrifugal compressors do not need to comply with *trim compressor* and storage requirements in Section 905.1.1.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 906

ELEVATOR VENTILATION, ENERGY RECOVERY, AND LIGHTING

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

906.1 *[Section 120.6(f)]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

Elevators shall meet the requirements of this section.

Exception to Section 906.1: Elevators located in *healthcare facilities*.

906.1.1 Elevator Energy Recovery

New traction elevators with a rated capacity of 2,000 pounds or greater, a rated speed of 150 feet per minute or greater, and with a total rise of 20 feet or greater, shall have a regenerative drive that recovers energy released during motion and supplies electrical energy to the *building* electrical system. Braking resistors or resistive load bank shall be permitted to absorb regenerated energy only during emergency generator operation.

Exception 1 to Section 906.1.1: Stand-alone *parking garages*, where the calculated total *building* electrical load under normal operation is less than the load needed to absorb regenerated power from the elevator system.

Exception 2 to Section 906.1.1: Elevators located in *buildings* with *Group R occupancies*.

906.1.2~~1~~ *[Section 120.6(f)1]* **Lighting power.**

The light power density for the *luminaires* inside the elevator cab shall be no greater than 0.6 watts per square foot.

Exception to Section 906.1.2~~1~~: Interior signal *lighting* and interior display *lighting* are not included in the calculation of *lighting* power density.

906.1.3~~2~~ *[Section 120.6(f)2]* **Unconditioned cab ventilation.**

Elevator cab ventilation fans for cabs without space conditioning shall not exceed 0.33 watts per cfm as measured at maximum speed.

906.1.4~~3~~ *[Section 120.6(f)3]* **Shut-off controls.**

When the elevator cab is stopped and unoccupied with *doors* closed for over 15 minutes, the cab interior *lighting* and ventilation fans shall be switched off until elevator cab operation resumes.

906.1.5~~4~~ *[Section 120.6(f)4]* **Elevator safety.**

Lighting and ventilation shall remain operational in the event that the elevator cabin gets stuck when passengers are in the cabin.

906.1.6~~5~~ *[Section 120.6(f)5]* **Elevator regenerative drive, lighting, and ventilation control acceptance.**

Before an occupancy permit is granted for elevators subject to Section 906.1 *[Section 120.6(f)]*, the following *equipment* and systems shall be certified as meeting the Acceptance Requirement for Code Compliance, as specified by the Reference Nonresidential Appendix NA7.

A Certificate of Acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements specified in NA7.14.

Exception to Section 906.1.6: Elevators located in *Group R occupancies*.

906.2 Prescriptive requirements (Newly Constructed).

RESERVED.

906.3 Performance requirements (Newly Constructed).

RESERVED.

906.4 *[Section 141.1]* **Additions and alterations to existing buildings.**

Covered processes in *additions* or *alterations* to existing *buildings* that will be *nonresidential*, *hotel/motel*, or *multifamily occupancies* shall comply with the applicable requirements of Section 906, and the applicable requirements of Section 400.5.1 *[Section 110.2(a)]*.

906.4.1 Elevator Energy Recovery

Additions to traction elevators with a new *elevator control system* shall meet the requirements of Section 906.1.1.

Exception 1 to Section 906.4.1: Elevator *additions* where the lowest measured or calculated total *building* electrical load under normal operation is less than the load needed to absorb regenerated power.

Exception 2 to Section 906.4.1: Elevators located in *Group R occupancies*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 907

ESCALATORS AND MOVING WALKWAYS

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

907.1 *[Section 120.6(g)]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

907.1.1 *[Section 120.6(g)1]* **Speed control.**

Escalators and moving walkways located in airports, hotels, and *transportation function areas* shall automatically slow to the minimum permitted speed in accordance with *ASME A17.1/CSA B44* when not conveying passengers.

907.1.2 *[Section 120.6(g)2]* **Escalators and moving walkways acceptance.**

Before an occupancy permit is granted for escalators and moving walkways subject to Section 907.1 *[Section 120.6(g)]*, the following *equipment* and systems shall be certified as meeting the Acceptance Requirement for Code Compliance, as specified by the Reference Nonresidential Appendix NA7.

A Certificate of Acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements specified in NA7.15.

907.2 Prescriptive requirements (Newly Constructed).

RESERVED.

907.3 Performance requirements (Newly Constructed).

RESERVED.

907.4 *[Section 141.1]* **Additions and alterations to existing buildings.**

Covered processes in *additions* or *alterations* to existing *buildings* that will be *nonresidential*, *hotel/motel*, or *multifamily occupancies* shall comply with the applicable requirements of Section 907.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 908

CONTROLLED ENVIRONMENT~~AL~~ HORTICULTURE (CEH)

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

908.1 *[Section 120.6(h)]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

908.1.1 *[Section 120.6(h)1]* **Indoor growing, dehumidification.**

Dehumidification *equipment* in *Indoor Growing* spaces in *buildings* with less than 5,000 square feet of total *plant canopy area* served by *horticultural lighting* with *lighting* power density less than 30 Watts per square foot of *plant canopy area* shall be one of the following:

1. *Consumer ~~D~~dehumidifiers* subject to regulation under federal appliance standards tested in accordance with 10 *CFR* 430.23(z) and Appendix ~~X or~~ X1 to Subpart B of 10 *CFR* Part 430 as applicable, and complying with 10 *CFR* 430.32(v)2;
2. *Commercial dehumidifiers* that comply with Reference Joint Appendix JA19 and are certified as required by Reference Joint Appendix JA19.
3. *Integrated DX HVAC/D system* with on-site heat recovery designed to fulfill at least 75 percent of the annual energy for dehumidification *reheat*;
4. Chilled water system with on-site heat recovery designed to fulfill at least 75 percent of the annual energy for dehumidification *reheat*; or
5. Solid or liquid *desiccant dehumidification system* for system designs that require dewpoint of 50°F or less.

908.1.2 *[Section 120.6(h)2]* **Indoor growing and conditioned greenhouse, electrical power distribution systems.**

Electrical power distribution systems serving *CEH spaces* shall ~~be designed so that a measurement device is capable of monitoring the electrical energy usage of aggregate *horticultural lighting* load.~~comply with Section 601.2.6 [*Section 130.5*] and shall be designed so that *horticultural lighting* loads are separately circuited from other loads. This separation enables measurement devices to monitor *horticultural lighting* energy use if desired.

908.1.3 *[Section 120.6(h)3]* **Conditioned greenhouses, building envelope.**

Conditioned greenhouses shall meet the following requirements:

1. Opaque wall and opaque *roof* assembly shall meet the requirements of Section 301.2 *[Section 120.7]*; and
2. Nonopaque *envelopes* shall meet one of the following requirements:

    2.1. ~~have~~ Have two or more *glazings* separated by either air or gas fill; ~~OR~~or.

2.2. Have one *glazing* layer and at least one *internal greenhouse curtain system* meeting all of the following requirements:

2.2.1. The *internal greenhouse curtain system* material shall have an *air permeability* not exceeding 50 L/m²·s when determined in accordance with *ASTM D737* or *ISO 9237* at a pressure differential of 125 Pascal. Compliance shall be demonstrated using either:

2.2.1.1. A single *internal greenhouse curtain system* meeting the *air permeability* requirement of this subsection; or

2.2.1.2. Two or more *internal greenhouse curtain systems* that each comply with subsections b through f, or two or more curtain layers within a single *internal greenhouse curtain system* that complies with subsections b through f, may be evaluated as a combined assembly provided that the equivalent *air permeability* of the combined curtain layers does not exceed 50 L/m²·s. Equivalent *air permeability*, P_{eq}, shall be calculated as follows:

EQUIVALENT AIR PERMEABILITY (EQUATION 908.1-A)

$$1/P_{eq} = 1/P_1 + 1/P_2 + \ldots + 1/P_n$$

~~W~~where:

P_{eq} = equivalent *air permeability* (L/m²·s)

P_i = *air permeability* of curtain layer i, determined in accordance with *ASTM D737* or *ISO 9237* at a pressure differential of 125 Pascal.

2.2.2. The *internal greenhouse curtain system* shall be designed and installed to cover the primary overhead *glazing* area and shall be capable of deploying to cover the primary overhead *glazing* area serving the conditioned growing space.

2.2.3. The *internal greenhouse curtain system* shall be motorized and automatically controlled to deploy during nighttime periods or other periods identified by the *automatic* control strategy when solar gains are unavailable. Acceptable control strategies include time-based, astronomical, sensor-based, or integrated control systems that respond to indoor and/or outdoor environmental conditions.

2.2.4. The controller shall be configured such that, following a *manual* override, the system automatically returns to *automatic* operation after a programmed time period.

2.2.5. Any scheduling device shall have program backup capabilities that prevent the loss of the device's schedule for at least 7 days and the device's date and time for at least 72 hours if power is interrupted.

2.2.6 Before an occupancy permit is granted for a greenhouse using the single layer glass and internal curtain system compliance pathway, the equipment

and systems shall be certified as meeting the Acceptance Requirement for Code Compliance, as specified by the Reference Nonresidential Appendix NA7.21.4. A Certificate of Acceptance shall be submitted to the *enforcement agency* that certifies that the equipment and systems meet the acceptance requirements specified in NA7.21.4.

908.1.4 *[Section 120.6(h)4]* **Conditioned greenhouses, space-conditioning systems.**

Space-conditioning systems used for plant production shall comply with all applicable requirements in Subchapter four.

908.1.5 *[Section 120.6(h)5]* **Horticultural lighting.**

~~In a *building* with CEH spaces or a greenhouse with~~ Where more than 40 kW of aggregate *horticultural lighting* load is installed to serve *indoor growing* spaces or ~~*conditioned*~~ *greenhouses*, the electric *lighting* system used for plant growth and plant maintenance shall meet the following requirements:

1. ***Luminaire PPE* and Dimmability.** The *horticultural lighting* systems shall have a *luminaire photosynthetic photon efficacy (PPE)* of at least 2.5 µmol/J when tested at the manufacturer-designed state with the highest power consumption. *Horticultural lighting* shall be capable of continuous dimming between 100% and 10% of full power in response to a line voltage, *low voltage*, or wireless signal.
2. **Separation of *horticultural lighting* circuits for electrical energy monitoring.** Required in accordance with Section 908.1.2.
3. ***Indoor growing* space *lighting* control.** *Horticultural lighting* systems serving *indoor growing* spaces shall be controlled by an *automatic* scheduling device that complies with all of the following:
   3.1. The control shall be capable of scheduling at least four different control levels per day per control zone, where the scheduled control levels are capable of dimming *lighting* between 100% and 10% of full power and capable of turning *lighting* off.
   3.2. The *lighting* scheduling device shall be configured to control each zone separately.
   3.3. The *lighting* scheduling device shall be configured to control no more than 20 kW of *lighting* separately.
   3.4. The *lighting* scheduling device shall have program backup capabilities that prevent the loss of the device's schedule for at least 7 days and the device's date and time for at least 72 hours if power is interrupted.
4. **Greenhouse *lighting* control.** *Horticultural lighting* systems serving *greenhouse* spaces shall be controlled by ~~s~~Sections 4.1 and 4.2 or by ~~s~~Section 4.3.
   4.1. ***Automatic* greenhouse *lighting* scheduling control.** An *automatic lighting* scheduling device in *greenhouses* must meet the following requirements:
      4.1.1. A scheduling device that can automatically turn lights on and off at least 4 times per day per control zone must be installed.

4.1.2. Each scheduling device shall control no more than 40 kW of connected *lighting* per control zone.

4.1.3. The device must include program backup capabilities that retain the *lighting* schedule for at least 7 days during power loss and preserve the date and time settings for at least 72 hours during a power interruption.

4.2. ***Greenhouse daylight-responsive control*.** The *PAR-sensor* and controller shall:

4.2.1. Control up to 40 kW of connected *lighting* per control zone,

4.2.2. Be capable of automatically dimming *lighting* continuously from 100% to 10% of full power based on available *PPFD*,

4.2.3. Turn off the electric *lighting* when daylight *PPFD* exceeds the crop's target user-defined *PPFD*, and

4.2.4. A single sensor may serve multiple control zones if each zone has separately configured calibration settings.

4.3. ***Greenhouse Daily Light Integral (DLI) control*.** Control shall:

4.3.1. Be capable of dimming electric *lighting* between 100% and 10% of full power and turning *lighting* off.

4.3.2. Automatically dim the electric *lighting* based on user-defined *DLI* from both daylight and electric *light*.

4.3.3. Turn off the electric *lighting* when daylight *PPFD* exceeds the crop's target user-defined *PPFD*; and

4.3.4. A single sensor might serve multiple control zones only if:

4.3.4.1. Each zone has independent calibration setting, and

4.3.4.2. *DLI* is calculated separately for each zone.

908.1.6 *[Section 120.6(h)6]* **Indoor growing space-conditioning systems.**

1. *Indoor Growing space-conditioning systems* spaces shall comply with the applicable requirements of Sections 400.5.1 *[Section 110.2(a)]*, 400.5.3 *[Section 110.2(b)]*, 400.5.5 *[Section 110.2(e)]*, 401.2.1.4 *[Section 120.1(f)]*, 401.2.1.5 *[Section 120.1(g)]*, 401.2.2.1 *[Section 120.2(a)]*, 401.2.2.3 *[Section 120.2(d)]*, 401.2.2.6 *[Section 120.2(f)]*, 401.2.2.7 *[Section 120.2(g)]*, 401.2.2.9 *[Section 120.2(i)]*, 401.2.2.10 *[Section 120.2(j)]*, 401.2.2.12 *[Section 120.2(l)]*, 401.2.4 *[Section 120.4]*, and 501.2.2 *[Section 120.9]*.

2. *Indoor growing space-conditioning systems* serving spaces in *buildings* with greater than or equal to 5,000 square feet of total *plant canopy area* with *lighting* power density greater than or equal to 30 Watts per square foot of *plant canopy area* shall comply with all of the following:

2.1. Sizing. *Indoor growing space-conditioning system(s)* shall be sized to meet the design heating, cooling, and dehumidification loads calculated according to Reference Nonresidential Appendix NA9 and documented in construction documents.

2.2. System characteristics. The *indoor growing space conditioning system* shall meet all requirements of one of the systems in Section 2.2.1 and 2.2.2.

2.2.1. *Integrated space--conditioning system* shall meet all of the following requirements:

2.2.1.1. Construction documents shall identify an *integrated space-conditioning system* capable of providing cooling, dehumidification, and *reheat* using heat recovered from the dehumidification process. The *integrated space--conditioning system* shall be one of the following:

2.2.1.1.1. An *integrated DX HVAC/D system*,

2.2.1.1.2. A four-pipe chilled water system,

2.2.1.1.3. A *desiccant dehumidification system*, or

2.2.1.1.4. Another system meeting the specifications outlined in Section 908.1.6.2.2.1.3.

2.2.1.2. The *integrated space--conditioning system* and any supplemental cooling or dehumidification equipment must be sized to meet peak latent and sensible loads calculated in accordance with Reference Nonresidential Appendix NA9. At least 80% of peak latent and sensible load must be met by the integrated system. Supplemental cooling and dehumidification equipment must meet the requirements in Section 908.1.6.2.2.2.

2.2.1.3. The *integrated space-conditioning system* and controls shall be capable of the following in response to *process* needs, indoor temperatures and humidity conditions:

2.2.1.3.1. Modulate *sensible heat ratio* in response to measured *indoor growing* space conditions and temperature and humidity setpoints, demonstrated through calculations in Reference Nonresidential Appendix NA9;

2.2.1.3.2. Modulate heat recovery between 0% and 90% of heat of rejection of the primary system, as needed to meet *supply air* setpoints;

2.2.1.3.3. Modulate heat rejection outside of the space between 10% and 100% of heat of rejection of the primary system;

2.2.1.3.4. Modulate supply fan speed in response to measured space conditions and temperature and humidity setpoints; and

2.2.1.3.5. The *integrated space conditioning* system shall be controlled in accordance with Section 908.1.6.2.4.

2.2.2. A *coordinated decoupled HVAC/D system* meeting the requirements of Section 2.2.2.1 and either Section 2.2.2.2 or Section 2.2.2.3.

2.2.2.1. *Commercial dehumidifiers* that comply with Reference Joint Appendix JA19 and are certified in accordance with Reference Joint Appendix JA19.

2.2.2.2. Commercial unitary air-conditioning, or *heat pump* equipment with a minimum of two stages of cooling capacity and at least two stages of fan control, tested in accordance with *AHRI* 1340 and meeting minimum IVEC and/or IVHE requirements effective 1/1/2029:

2.2.2.2.1. 65,000 to < 135,000 Btu/h: IVEC 13.8 (AC) or 13.4 (HP).

2.2.2.2.2. 135,000 to < 240,000 Btu/h: IVEC 13.8 (AC).

2.2.2.2.3. 240,000 to < 760,000 Btu/h: Specific efficiency requirements mandated by 10 *CFR* Part 431 Subpart F

2.2.2.3. Variable refrigerant flow systems tested in accordance with *AHRI 1230* and meeting minimum *IEER* requirements:

2.2.2.3.1. Up to < 135,000 Btu/h: 15.5 *IEER* (*Heat Pumps*: 14.6 *IEER*, 3.3 *COP*).

2.2.2.3.2. Up to < 240,000 Btu/h: 14.9 *IEER* (*Heat Pumps*: 14.4 *IEER*, 3.3 *COP*).

2.2.2.3.3. Up to < 760,000 Btu/h: 13.9 *IEER*.

2.3. Heat recovery. *Dehumidifiers* shall be capable of meeting a recovered *reheat capacity* ratio of at least 0.9 as demonstrated through manufacturer data or engineering calculations.

2.4. Supplemental heating. If used, electric resistance heating or combustion heating equipment shall comply with the following:

2.4.1. Equipment shall be sized to meet steady state or transient heating loads that cannot be met with heat recovered from the dehumidification process according to Reference Nonresidential Appendix NA.9.

2.4.2. Equipment shall be controlled to only operate when heating load exceeds available recovered *heat capacity*.

2.5. Integrated temperature and humidity controls. Controls for *indoor growing space-conditioning systems* shall meet all of the following requirements:

2.5.1. One integrated control system shall control both humidity and temperature based on readings from humidity and temperature sensors co-located within the plant canopy.

2.5.2. Controls shall automatically stage or modulate all *indoor growing space-conditioning equipment* to meet temperature and humidity setpoints.

2.5.3. *Commercial dehumidifiers* shall be controlled from a central controller that sequences or modulates operation based on dehumidification load.

2.6. *Commercial dehumidifiers* that reject all heat within the *building envelope*. If used, *commercial dehumidifiers* that reject heat within the *building envelope* shall only be activated during periods when all waste heat can be used in the space or when other *indoor growing space--conditioning systems* cannot satisfy 100% of cooling, heating, and dehumidification loads.

2.7. Field verification. Field verification of specified control function tests shall demonstrate the correct installation and operation of components, systems and system-to-system interfaces in accordance with the test requirements in Reference Nonresidential Appendix NA7.21.2 and be documented on the applicable Certificate of Acceptance. The installer shall certify that diagnostic testing was performed in accordance with the applicable procedures outlined in Section 401.2.7 *[Section 120.5]*.

908.2 Prescriptive requirements (Newly Constructed).

RESERVED.

908.3 Performance requirements (Newly Constructed).

RESERVED.

908.4 *[Section 141.1, 141.1(c)]* **Additions and alterations to existing buildings.**

Covered processes in *additions* or *alterations* to existing *buildings* that ~~will be~~are *nonresidential*, *hotel/motel*, or *multifamily occupancies* shall comply with the applicable requirements of Section 400.5.1 *[Section 110.2(a)]* and Section 913 *[Section 120.3]*.

908.4.1 *[Section 141.1(c)1]* **Indoor Growing, Space-Conditioning Systems and Dehumidification.**

~~All newly~~ The following *additions* or *alterations* ~~installed heating, ventilation, air conditioning systems or dehumidification systems in *buildings* with *indoor growing*~~ shall meet the applicable requirements of Section 908.1.1 *[Section 120.6(h)1]*, ~~and~~ Section 908.1.2 *[Section 120.6(h)2]*, and Section 908.1.6 *[Section 120.6(h)6]*:~~.~~

1. *Additions* or *alterations* that increase *plant canopy area* by at least 5,000 square feet,
2. All *alterations* that replace greater than 50 percent of the total installed capacity of heating, cooling, and dehumidification systems serving at least 5,000 square feet of *plant canopy area* in *buildings* with *indoor growing*, and

3. All *alterations* in *buildings* with *indoor growing* that increase *lighting* power density to greater than or equal to 30 Watts per square foot of canopy.

Alterations that replace *indoor growing space-conditioning system equipment* shall comply with applicable requirements in Section 401.5 *[Section 141.0(b)]*.-

908.4.2 *[Section 141.1(c)2]* **Greenhouses, Building Envelope and Space-Conditioning Systems.**

A greenhouse being converted to a *conditioned greenhouse* or *additions* to a *conditioned greenhouse* shall meet the requirements of Section 908.1.3 *[Section 120.6(h)3]* and Section 908.1.4 *[Section 120.6(h)4]*.

908.4.3 *[Section 141.1(c)3)* **Indoor Growing and Greenhouses, Horticultural Lighting.**

When *alterations* to *horticultural lighting* systems increase *lighting* wattage or include adding, replacing, or altering 10 percent or more of the horticultural *luminaires* serving an *enclosed space*, the newly installed, replaced, or altered *lighting* shall meet the requirements of Section 908.1.5 *[Section 120.6(h)5]*.

Exception to Section 908.4.3: Any *alteration* limited to adding *lighting* controls or replacing *lamps*, ballasts, or *drivers*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 909

~~STEAM TRAPS~~PROCESS STEAM SYSTEMS

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

909.1 ~~*[Section 120.6(i)]*~~ **Mandatory requirements (Newly Constructed, Additions, Alterations).**

909.1.1 *[Section 120.6(i)]* **Mandatory requirements for steam traps.**

Steam traps in ~~new~~ industrial facilities where the installed steam trap operating pressure, which is the steam pressure entering the steam trap during normal design operating conditions, is greater than 15 psig and the total combined connected boiler input rating is greater than 5 million Btu/hr shall meet the requirements of this section.

Exception to Section 909.1.1: Steam traps where steam is diverted to a steam system of lower pressure for use when the steam trap fails open.

909.1.1.1 *[Section 120.6(i)1]* **Central steam trap fault detection and diagnostics monitoring.**

Steam trap systems shall be equipped with a central steam trap monitoring system that:

1. Provides a status update of all steam trap *fault* detection sensors at no greater than 8-hour intervals.
2. Automatically displays an alarm that identifies which steam trap has a *fault* once the system has detected a *fault*.

909.1.1.2 *[Section 120.6(i)2]* **Steam trap fault detection.**

Steam traps shall be equipped with *automatic fault* detection sensors that shall communicate their operational state to the central steam trap monitoring system as described in Section 909.1.1 *[Section 120.6(i)1]*.

909.1.1.3 *[Section 120.6(i)3]* **Steam trap strainer installation.**

Steam traps shall either:

1. Be equipped with an integral strainer and blow-off valve; or
2. Be installed downstream within 3 feet of a strainer and blow-off valve.

909.1.1.4 *[Section 120.6(i)4]* **Steam trap system acceptance.**

Before an occupancy permit is granted for steam trap systems subject to Section 909.1 *[Section 120.6(i)]*, the equipment and systems shall be certified as meeting the Acceptance Requirement for Code Compliance, as specified by the Reference Nonresidential Appendix NA7.19.

A Certificate of Acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements specified in NA7.19.

909.1.2 *[New Section]* **Mandatory requirements for process steam loads.**

909.1.2.1 Condensate return.

All new, non-replacement *process* steam loads that use indirect-contact heat exchangers at new and existing facilities that meet conditions 1 and 2 below shall install a *condensate return system* to return all condensate, including condensate from new drip leg steam traps associated with the load, to the boiler plant for reuse. All *process* steam loads that do not qualify based on the criteria in Table 909.1-(1) shall include linear distance (sum of horizontal and vertical) from the steam trap serving the load to the nearest condensate return tank or the deaerator serving the steam boiler, whichever is closer, in the steam system construction documents.

1. Have one or more connected boilers with an input rating (capacity) of 10 MMBtu/h or greater, and
2. Meet the criteria for linear distances corresponding to the applicable *process* steam load size in Table 909.1-(1). The linear distance shall be measured from the steam trap serving the load to the nearest condensate return tank or the deaerator serving the *process* steam boiler, whichever is closer.

Exception to Section 909.1.2.1: *Process* steam loads in *Group R occupancies*.

TABLE 909.1-(1) STEAM LOAD CONDENSATE RETURN DISTANCE CODE TRIGGER CRITERIA

STEAM FLOW (LB/H)	LINEAR DISTANCE (FT) LESS THAN [a]
<1,000	Exempt
≥1,000, <2,000	400
≥2,000, <3,000	600
≥3,000, <4,000	800
≥4,000, <6,000	1,100
≥6,000	1,300

Footnote to Table 909.1-(1)

a. Linear distance (sum of horizontal and vertical) from the steam trap serving the load to the nearest condensate return tank or the deaerator serving the *process* steam boiler, whichever is closer.

909.2 Prescriptive requirements (Newly Constructed).

RESERVED.

909.3 Performance requirements (Newly Constructed).

RESERVED.

909.4 *[Section 141.1]* **Additions and alterations to existing buildings.**

909.4.1 Steam traps.

New steam traps added to support new, nonreplacement, *process equipment* in existing industrial facilities where the installed steam trap operating pressure, which is the steam pressure entering the steam trap during normal design operating conditions, is greater than 15 psig and the total combined connected boiler input rating is greater than 5 million Btu/hr shall comply with the applicable requirements of Section 909, and the applicable requirements of Section 400.5.1 *[Section 110.2(a)]* and Section 913 *[Section 120.3].*

909.4.2 Steam loads.

New, non-replacement *process* steam loads added to existing industrial facilities as part of an *addition* or *alteration* shall comply with the applicable requirements of Section 909.1.2 *[New Section]* and Section 913 *[Section 120.3].*

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 910

COMPUTER ROOMS AND DATA CENTERS

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

~~The requirements of Section 910 apply to *data centers* in *nonresidential buildings* and in buildings of occupancy group R-1 unless explicitly exempted.~~

910.1 *[Section 120.6(j)]* **Mandatory requirements (Newly Constructed, Additions, Alterations).**

Space-conditioning systems serving a ~~*computer room*~~*data center* shall meet the requirements of Sections 910.1 through 910.4. ~~this section.~~

Exception to Section 910.1: *Covered process* requirements in Sections 910.1.1, 910.1.2, 910.1.3, 910.2.1, 910.2.2, 910.2.3, 910.3, 910.4 and 910.4.1 do not apply to *computer rooms*.

910.1.1 *[Section 120.6(j)1]* **Reheat.**

~~Each~~Systems serving ~~*computer room*~~*data centers* ~~zone~~ shall have controls that prevent *reheating*, *recooling* and simultaneous provisions of heating and cooling to the same zone, such as mixing or simultaneous supply of air that has been previously mechanically heated and air that has been previously cooled, either by *cooling equipment* or by economizer systems.

910.1.2 *[Section 120.6(j)2]* **Humidification.**

Humidification shall be adiabatic. Nonadiabatic humidification, including but not limited to steam and infrared, is prohibited.

910.1.3 *[Section 120.6(j)3]* **Fan control.**

Each unitary *air conditioner* with *mechanical cooling* capacity exceeding ~~60,000~~ 30,000 Btu/hr and each chilled water *fan system* shall be designed to vary the airflow rate as a function of actual load. Fan motor demand shall not exceed 50 percent of design wattage at 66 percent of design fan speed.

Exception to 910.1.3: *Data centers* in *Group R occupancies*.

910.1.4 *[New Section]* **Data Center Heat Recovery.**

Newly constructed buildings with a *data center ITE design load* greater than 100 kW and a non-*data center conditioned floor area* greater than 35,000 square feet shall include a heat recovery system capable of transferring the lesser of the following from the *data center*

cooling system to the space heating system and/or to the *service water heating* (SWH) system serving the non-*data center conditioned floor area*:

1. 0.5 x Total *ITE design load* of all *data centers* in the *building.*
2. 0.2 x (Capacity of space heating system + Capacity of SWH system).

Exception ~~1~~ to Section 910.1.4: *Group R occupancies*.

910.2 *[Section 140.9(a)]* **Prescriptive requirements (Newly Constructed).**

~~*Computer rooms* with a power density greater than 20 W/ft^2~~ *Data centers* shall comply with this section.

910.2.1 *[Section 140.9(a)1]* **Economizers.**

1. *Air-Cooled ITE*:
   1.1. Each individual *air-cooled ITE* system primarily serving *data centers* shall include an integrated economizer, designed and operated to provide 100 percent of the design cooling load without *mechanical cooling* at the outdoor conditions specified in Table 910.2-(1). Compliance shall be demonstrated at either the design *supply air* temperature or at a *supply air* temperature of 75 degrees Fahrenheit.
2. *Liquid-Cooled ITE*:
   2.1. Each individual *liquid-cooled ITE* system primarily serving *data centers* shall include an integrated economizer, designed and operated to provide 100 percent of the design cooling load without *mechanical cooling* at the outdoor conditions specified in Table 910.2-(1). Compliance shall be demonstrated at the design fluid temperature.
3. Air-cooled and *Liquid-cooled ITE* economizers shall comply with the following:
   3.1. The economizer shall be integrated to provide partial cooling when *outside air* conditions do not allow for full economizing.
   3.2. Compliance with Section 910.2.1 shall be determined with redundant equipment operating if the redundant equipment is expected to operate in normal operation.

   The economizer shall be equipped with a *fault* detection and diagnostic system as specified by Section 401.2.2.9.

   3.3.
4. Differential Temperature (Delta T) and Variable Flow
   4.1. Air handling systems with a capacity exceeding 30,000 Btu/hr serving *air-cooled ITE* shall be designed for a return to *supply air* Delta T of at least 20°F. These systems shall be designed and controlled to vary airflow as a function of *ITE* operating load or *ITE* airflow with a minimum airflow not to exceed 25% of design airflow, in order to maintain constant Delta T at *ITE* operating loads from 25% to 100% of maximum *ITE design load*.
   4.2. Chilled water and *facility water* systems serving air-cooled and *liquid-cooled ITE* shall be designed for a return to supply fluid Delta T of at least 15°F. These systems shall be designed and controlled to vary fluid flow as a function of *ITE* operating load, in order to maintain constant Delta T at *ITE* operating loads from 25% to 100% of maximum *ITE design load*.

Exception 1 to Section 910.2.1: Individual ~~*computer rooms*~~*data centers* with an *ITE design load* under 5 tons (18 kW) in a *building* that does not have any economizers.

Exception 2 to Section 910.2.1: A ~~*computer room*~~*data center* with an *ITE design load* less than 20 tons (70 kW) may be served by a second *fan system* without an economizer if it is also served by a *fan system* with an economizer that also serves other spaces within the *building*, provided that all of the following are met:

1. The economizer system is sized to meet the design cooling load of the ~~computer room~~*data center* when the other spaces within the *building* are at 50 percent of their design load at *outside air* temperatures of 65°F dry-bulb and below, or ~~50~~60°F wet-bulb and below; and
2. An economizer system that can stop *service* to other spaces in the *building* when those spaces are unoccupied and serve only ~~the *computer rooms*~~*data centers*.

Exception 3 to Section 910.2.1: *Data centers* that reject heat to a heat recovery system that is sized to accept at least 50% of the *data center* design heat and that serves either:

1. Space heating systems and/or *service water heating* systems with design loads greater than 5 times the *data center* design cooling load, or
2. *Processes* determined by the *Executive Director* to require more than 50% of the design *data center* heat for more than 3,000 hours/year.

Exception 4 to Section 910.2.1: *Data center economizers* in hotel/motel *buildings*~~*Group R occupancies*~~ shall be permitted to use high limit temperatures of 65°F dry-bulb and 50°F wet-bulb for *air economizers*, or 50° dry-bulb and 45°F wet-bulb for *water economizers*, for All Other *ITE* types in Table 910.2-(1).

Exception 5 to Section 910.2.1: Section 910.2.1 does not apply to *data centers* in multifamily *buildings*.

TABLE 910.2-(1) DATA CENTER ECONOMIZER OUTDOOR THRESHOLDS

TYPE OF *ITE*	OUTDOOR DRY-BULB	OUTDOOR WET-BULB
Air-Cooled ITE with average design load > 25 kW/rack and served by a cooling system that does not evaporate water at these outdoor conditions	≤ 55°F	≤ 55°F
All *liquid-cooled ITE* with a design load greater than 2 MW	≤ 75°F	≤ 75°F
All other *ITE*	≤ 65°F	≤ 60°F

910.2.2 *[Section 140.9(a)2]* **Power consumption of fans.**

The total fan power at *design conditions* of each *fan system* shall not exceed 27 W/kBtu·h of net sensible cooling capacity.

910.2.3 *[Section 140.9(a)3]* **Air containment.**

~~*Computer rooms*~~*Data centers* with air-cooled computers in racks and with an *ITE design load* exceeding 10 kW (2.8 tons) per room shall include *air barriers* such that there is no significant air path for computer discharge air to recirculate back to computer inlets without passing through a cooling system.

Exception 1 to Section 910.2.3: Computer racks with a design load less than 1 kW (0.28 tons) per rack.

Exception 2 to Section 910.2.3: Equivalent energy performance based on computational fluid dynamics or other analysis.

910.2.4 *[Section 140.9(a)4]* **Alternating current-output Uninterruptible Power Supplies (UPS).**

Alternating current-output UPS systems serving a *computer room or data center* shall meet or exceed minimum average efficiencies in Table 910.2-~~A~~(1) *[Table 140.9-B]*.

TABLE 910.2-~~A~~(1) [TABLE 140.9-B] ALTERNATING CURRENT-OUTPUT UNINTERRUPTIBLE POWER SUPPLY MINIMUM AVERAGE EFFICIENCY

AC OUTPUT	VOLTAGE AND FREQUENCY DEPENDENT	VOLTAGE INDEPENDENT	VOLTAGE AND FREQUENCY INDEPENDENT
P≤350 W	$5.71 \times 10^{-5} \times P + 0.962$	$5.71 \times 10^{-5} \times P + 0.964$	$0.011 \times \ln(P) + 0.824$
350 W<P≤1,500 W	0.982	0.984	$0.011 \times \ln(P) + 0.824$
1,500 W<P≤10,000 W	$0.981 - E_{MOD}$	$0.980 - E_{MOD}$	$0.0145 \times \ln(P) + 0.800 - E_{MOD}$
P>10,000 W	0.970	0.940	$0.0058 \times \ln(P) + 0.886$

Minimum average efficiency for alternating current-output UPS shall meet or exceed calculation and testing requirements identified in ENERGY STAR Program Requirements for Uninterruptible Power Supplies (UPSs) – Eligibility Criteria Version 2.0.

where:

P is the rated output power in watts (W).

E_{MOD} is an allowance of 0.004 for modular UPSs applicable in the commercial 1,500-10,000 W range.

ln is the natural logarithm.

The requirement shall be rounded to the third decimal place for certification and reporting.

Exception to Section 910.2.4: Alternating current-output UPS that utilizes standardized NEMA 1-15P or NEMA 5-15P input plug, as specified in *ANSI*/NEMA WD-6-2016.

910.3 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

910.4 *[Section 141.1, 141.1(b)]* **Additions and alterations to existing buildings.**

Covered processes in *additions* or *alterations* to existing *buildings* that ~~will be~~are *nonresidential or Group R occupancies*~~, hotel/motel, or multifamily occupancies~~ shall comply with the applicable requirements of Section 910.1 *[Section 120.6(j)]*, Sections 910.2.2 and 910.2.4 *[Sections 140.9(a)2 and 4],* Section 910.4.1 *[Section 141.1(b)],* and the applicable requirements of Section 400.5.1 *[Section 110.2(a)]* and Section 913 *[Section 120.3].*

910.4.1 *[Section 141.1(b)]* **Economizers.**

Each individual cooling system primarily serving ~~*computer rooms*~~*data centers* in an existing *building* shall include either:

1. An integrated *air economizer* capable of partial cooling when additional *mechanical cooling* is required and capable of providing 100 percent of the expected system cooling load up to 80°F room *supply air* temperature at *outside air* temperatures of 55°F dry-bulb and below or 50°F wet-bulb and below, and be equipped with a *fault* detection and diagnostic system as specified by Section 401.2.2.9 *[Section 120.2(i)]*; or
2. An integrated *water economizer* capable of partial cooling when additional *mechanical cooling* is required and capable of providing 100 percent of the expected system cooling load up to 80°F room *supply air* temperature at *outside air* temperatures of 40°F dry-bulb and below or 35°F wet-bulb and below.

Exception 1 to Section 910.4.1: Individual ~~*computer rooms*~~*data centers* with an *ITE design load* under 5 tons (18 kW) in a *building* that does not have any economizers.

Exception 2 to Section 910.4.1: New cooling systems serving an existing ~~*computer room*~~*data center* in an existing *building* with an *ITE design load* up to a total of 50 tons (176 kW).

Exception 3 to Section 910.4.1: New cooling systems serving a new ~~*computer room*~~*data center* in an existing *building* with an *ITE design load* up to a total of 20 tons (70 kW).

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 911

COMMERCIAL KITCHENS

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

911.1 *[Section 120.6(k)]* **Mandatory requirements (Newly Constructed).**

Newly Constructed Commercial *Kitchens* shall meet the requirements of this section.

911.1.1 *[Section 120.6(k)1 and 2]* **Electric readiness.**

Quick-service commercial kitchens and *institutional commercial kitchens* shall include a dedicated branch circuit wiring and outlet that would be *accessible* to cookline appliances and shall meet all of the following requirements:

1. The branch circuit conductors shall be rated at 50 amps minimum.
2. The electrical *service* panel shall have a minimum capacity of 800 connected amps.
3. The electrical *service* panel shall be sized to accommodate an additional either 208v or 240v 50-amp breaker.

Exception 1 to Section 911.1.1: *Healthcare facilities*.

Exception 2 to Section 911.1.1: All-electric commercial *kitchens*.

Exception 3 to Section 911.1.1: Where a *building* includes existing electrical infrastructure.

911.2 *[Section 140.9(b)]* **Prescriptive requirements (Newly Constructed).**

Exception to Section 911.2: *Healthcare facilities*.

911.2.1 *[Section 140.9(b)1A]* **Kitchen exhaust systems – replacement air.**

Replacement air introduced directly into the hood cavity of *kitchen* exhaust hoods shall not exceed 10 percent of the hood exhaust airflow rate.

911.2.2 *[Section 140.9(b)1B]* **Kitchen exhaust systems – exhaust rate.**

For *kitchen*/*dining* facilities having total Type I and Type II *kitchen* hood exhaust airflow rates greater than 5,000 cfm, each Type I hood shall have an exhaust rate that complies with Table 911.2-~~A~~(1) *[Table 140.9-C]*.

If a single hood or hood section is installed over appliances with different duty ratings, then the maximum allowable flow rate for the hood or hood section shall not exceed the Table 911.2-~~A~~(1) *[Table 140.9-C]* values for the highest appliance duty rating under the hood or hood section.

Refer to *ASHRAE Standard 154*-2011 for definitions of hood type, appliance duty and next exhaust flow rate.

Exception to Section 911.2.2: 75 percent of the total Type I and Type II exhaust *replacement air* is *transfer air* that would otherwise be exhausted.

TABLE 911.2 ~~A~~(1) [TABLE 140.9-C] MAXIMUM NET EXHAUST FLOW RATE, CFM PER LINEAR FOOT OF HOOD LENGTH

TYPE OF HOOD	LIGHT DUTY EQUIPMENT	MEDIUM DUTY EQUIPMENT	HEAVY DUTY EQUIPMENT	EXTRA HEAVY DUTY EQUIPMENT
Wall-mounted *Canopy*	140	210	280	385
Single Island	280	350	420	490
Double Island	175	210	280	385
Eyebrow	175	175	Not Allowed	Not Allowed
Backshelf / Passover	210	210	280	Not Allowed

911.2.3 *[Section 140.9(b)2A]* **Kitchen ventilation – makeup air limit.**

Mechanically cooled or heated *makeup air* delivered to any space with a *kitchen* hood shall not exceed the greater of:

1. The supply flow required to meet the space heating and cooling load; or
2. The hood exhaust flow minus the *available transfer air* from adjacent spaces. *Available transfer air* is that portion of outdoor ventilation air serving adjacent spaces not required to satisfy other exhaust needs, such as *restrooms*, not required to maintain pressurization of adjacent spaces, and that would otherwise be relieved from the *building*.

911.2.4 *[Section 140.9(b)2B]* **Kitchen ventilation – strategies.**

A *kitchen*/*dining* facility having a total Type I and Type II *kitchen* hood exhaust airflow rate greater than 5,000 cfm shall have one of the following:

1. **Minimum *transfer air*.** At least 50 percent of all *replacement air* is *transfer air* that would otherwise be exhausted; or
2. **Demand controlled ventilation.** Demand ventilation system(s) on at least 75 percent of the exhaust air. Such systems shall:
   - 2.1. Include controls necessary to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and idle; and
   - 2.2. Include failsafe controls that result in full flow upon cooking sensor failure; and
   - 2.3. Include an adjustable timed override to allow occupants the ability to temporarily override the system to full flow; and

2.4. Be capable of reducing exhaust and *replacement air* system airflow rates to the larger of:

50 percent of the total design exhaust and *replacement air* system airflow rates; or

The ventilation rate required as specified by Section 401.2.1.1.3 *[Section 120.1(c)3]*.

3. **Energy recovery device.** *Listed* energy recovery devices with a sensible heat recovery effectiveness of not less than 40 percent on at least 50 percent of the total exhaust airflow; or

4. **Unconditioned or semi-conditioned *makeup air*.** A minimum of 75 percent of *makeup air* volume that is:

4.1. Unheated or heated to no more than 60°F; and

4.2. Uncooled or cooled without the use of *mechanical cooling*.

911.2.5 *[Section 140.9(b)3]* **Kitchen exhaust system acceptance.**

Before an occupancy permit is granted for a commercial *kitchen* subject to Section 911.2 *[Section 140.9(b)]*, the following *equipment* and systems shall be certified as meeting the *acceptance requirements for code compliance*, as specified by the Reference Nonresidential Appendix NA7.

A certificate of acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements specified in NA7.11.

911.3 *[Section 100.2]* **Performance requirements (Newly Constructed).**

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

911.4 *[Section 141.1]* **Additions and alterations to existing buildings.**

Covered processes in *additions* or *alterations* to existing *buildings* that will be *nonresidential*, *hotel/motel*, or *multifamily occupancies* shall comply with the applicable requirements of Section 911, and the applicable requirements of Section 400.5.1 *[Section 110.2(a)].*

Exception 1 to Section 911.4: Existing hoods not being replaced as part of an *addition* or *alteration* do not need to comply with exhaust rate requirements in Section 911.2.2.

Exception 2 to Section 911.4: Existing *kitchen makeup air* units not being replaced as part of an *addition* or *alteration* do not need to comply with *makeup air* limitations in Section 911.2.3.

Exception 3 to Section 911.4: Existing hoods not being replaced as part of an *addition* or *alteration* do not need to comply with *kitchen* ventilation strategy requirements in Section 911.2.4.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 912

LABORATORY AND FACTORY EXHAUST SYSTEMS

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

912.1 Mandatory requirements.

RESERVED.

912.2 *[Section 140.9(c)]* **Prescriptive requirements (Newly Constructed).**

Exception to Section 912.2: *Healthcare facilities*.

912.2.1 *[Section 140.9(c)1]* **Airflow reduction requirements.**

Building laboratory exhaust systems shall be able to reduce zone exhaust and makeup airflow rates to the occupied and unoccupied minimum exhaust airflow rates based on demand and sensed *occupancy* as follows:

1. **Occupied minimum exhaust airflow.** When *occupant sensing controls* sense occupants in the space, the minimum exhaust and *makeup air*flow rates shall be the greater of:
   1.1. User-defined airflow not to exceed 1.0 cfm/ft^2 (equivalent to 6 air changes per hour for a 10-foot high ceiling), or
   1.2. The regulated minimum occupied circulation rate documented to comply with code, accreditation, or facility environmental health and safety department requirements, or
   1.3. The minimum needed to maintain occupied pressurization.
2. **Unoccupied minimum exhaust airflow.** Within 15~~20~~ minutes of no occupancy being detected by any occupant sensors covering the space, the minimum exhaust and makeup airflow rates shall be the greater of:
   2.1. User-defined airflow not to exceed 0.67 cfm/ft^2 (equivalent to 4 air changes per hours for a 10-foot high ceiling), or
   2.2. The regulated minimum unoccupied circulation rate documented to comply with code, accreditation, or facility environmental health and safety department requirements, or
   2.3. The minimum needed to maintain unoccupied pressurization.
3. **Airflow reduction acceptance.** Applicable *equipment* and systems shall be certified as meeting the *acceptance requirements for code compliance*, as specified by the reference Nonresidential Appendix NA7.16.

A certificate of acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements specified in Nonresidential Appendix NA7.16.

912.2.2 *[Section 140.9(c)2]* **Exhaust system transfer air.**

Conditioned *supply air* delivered to any space with mechanical exhaust shall comply with the requirements of Section 401.3.16 *[Section 140.4(o)]*.

912.2.3 *[Section 140.9(c)3]* **Fan system power consumption.**

All newly installed fan exhaust systems serving a *laboratory* or *factory* with a design exhaust *fan system airflow* rate greater than 10,000 cfm shall meet Section 912.2.3.1 and either Section 912.2.3.2, 912.2.3.3, or 912.2.3.4.

Exhaust air in *laboratories* or *factories* includes all indoor air and gases removed by the exhaust system, including exhaust air from fume hoods, hazardous exhaust flows, or other manifolded exhaust streams.

Exhaust *fan system airflow* rate is the total of the airflow rates entering the exhaust fans, which includes exhaust air and bypass air but does not include entrained or induced airflow downstream of the exhaust fans.

912.2.3.1 *[Section 140.9(c)3A]* **Discharge.**

Systems serving *laboratory* spaces shall meet all discharge requirements in *ANSI* Z9.5-2022, Section 6.4.

912.2.3.2 *[Section 140.9(c)3B]* **Exhaust fan system power budget.**

The exhaust *fan system electrical input power (Fan* $kW_{design,system}$*)* determined per Section 401.3.5.1.2 *[Section 140.4(c)1B]* at the *fan system* design airflow does not exceed Fan kW_{budget} as calculated per Section 401.3.5.1.1 *[Section 140.4(c)1A]*.

912.2.3.3 *[Section 140.9(c)3C]* **Exhaust fan system power default limitation.**

The exhaust *fan system* power shall not exceed 0.85 watts per cfm of exhaust *fan system airflow* for systems with air filtration, scrubbers, or other air treatment devices. For all other exhaust *fan systems* the system power shall not exceed 0.65 watts per cfm of exhaust *fan system airflow*.

Exhaust *fan system* power equals the sum of the power of all fans in the exhaust system that are required to operate at normal occupied *design conditions* in order to exhaust air from the *conditioned space* to the outdoors.

912.2.3.4 *[Section 140.9(c)3D]* **Exhaust fan system power based on airflow.**

The exhaust *fan system* shall comply with all of the following:

1. The sum of the occupied minimum circulation rates of the spaces served by the *fan system* shall be less than 60 percent of the exhaust *fan system* design airflow rate.
2. The design exhaust *fan system* power shall not exceed 1.3 watts per cfm of exhaust *fan system airflow* when operating under full load *design conditions*.

3. The system shall include variable speed controls so that exhaust system fans shall draw no more than 40 percent of the design fan power when the exhaust *fan system airflow* is 60 percent of the design airflow rate.
4. The exhaust *fan system airflow* rate shall not exceed the larger of the sum of the space exhaust airflow rates served by the system, or the minimum acceptable exhaust *fan system airflow* rate.
5. The minimum acceptable exhaust airflow rate, using the procedures and system definitions included in *ANSI* Z9.5 (2022) Appendix 3, shall be one of the following:
   5.1. Less than 60 percent of the exhaust *fan system* design airflow rate (simple turndown control system), or
   5.2. Dynamically reset based on measured wind speed and/or wind direction and assumes worst case emissions rate and shall be less than 60 percent of the exhaust *fan system* design airflow rate for at least 70 percent of the hours during a typical meteorological year (TY) for the site (wind responsive control system), or
   5.3. Dynamically reset based on measured contaminant concentration and shall be less than 60 percent of the exhaust *fan system* design airflow rate when measured contaminants in the exhaust system plenum are below the threshold contaminant concentration value (monitored control system).
6. Exhaust system design and control results in calculated outdoor contaminant concentrations in compliance with applicable federal, state, or local regulations.

Lab *exhaust ventilation system* acceptance. Applicable *equipment* and systems shall be certified as meeting the *acceptance requirements for code compliance*, as specified by the reference Nonresidential Appendix NA7.16. A certificate of acceptance shall be submitted to the *enforcement agency* that certifies that the *equipment* and systems meet the acceptance requirements specified in Nonresidential Appendix NA7.16.

912.2.4 *[Section 140.9(c)4]* **Fume hood automatic sash closure.**

Variable air volume *laboratory* fume hoods with vertical only sashes located in fume hood intensive *laboratories*, as described in Table 912.2-~~A~~(1) *[Table 140.9-D]*, shall have an *automatic* sash closure system that complies with the requirements of this section.

TABLE 912.2-~~A~~(1) [TABLE 140.9-D] FUME HOOD INTENSIVE LABORATORIES THRESHOLD (BOTH MUST BE TRUE)

Occupied Minimum Ventilation ACH	≤ 4	> 4 and ≤ 6	> 6 and ≤ 8	> 8 and ≤ 10	> 10 and ≤ 12	> 12 and ≤ 14
Hood density (linear feet per 10,000 ft^3 of *laboratory* space)	≥ 6	≥ 8	≥ 10	≥ 12	≥ 14	≥ 16

The *automatic* sash closure system shall be capable of the following:

1. The *automatic* sash closure system shall have a dedicated zone presence sensor that detects people in the area near the fume hood sash and automatically closes the sash within 5 minutes of no detection.
2. The *automatic* sash closure system shall have controls to prevent the sash from *automatic* closing when a force of no more than 10 lbs is detected.
3. The *automatic* sash closure system shall be equipped with an obstruction sensor that prevents the sash from *automatic* closing with obstructions in the sash opening. Obstruction sensor shall be capable of sensing transparent materials such as *laboratory* glassware.
4. The *automatic* sash closure system shall be capable of being configured in a *manual* open mode where once the sash is closed, detection of people in the area near the fume hood by the zone presence sensor does not open the fume hood sash.

Fume hood *automatic* sash closure acceptance. Before an occupancy permit is granted for the fume hoods subject to Section 912.2.4 *[Section 140.9(c)4]*, the equipment and systems shall be certified as meeting the Acceptance Requirement for Code Compliance as specified by the Reference Nonresidential Appendix NA7. A Certificate of Acceptance shall be submitted to the *enforcement agency* that certifies that the equipment and systems meet the acceptance requirements specified in NA7.17.

912.2.5 *[Section 140.9(c)5]* **Reheat limitation.**

Air handlers in *buildings* with greater than 20,000 cfm of *laboratory* exhaust that serve multiple *space-conditioning zones* in *laboratory* spaces shall not mechanically cool *air handler supply air* below 80°F and shall not heat *air handler supply air* above 50°F, and each zone shall include heating and cooling capacity to prevent cooling at the *air handler* and *reheating* at the zones.

Exception 1 to Section 912.2.5: Systems in *Climate Zones* 7 or 15.

Exception 2 to Section 912.2.5: Systems dedicated to vivarium spaces or to spaces classified as biosafety level 3 or higher.

Exception 3 to Section 912.2.5: Systems that:

1. Are located where the outdoor *dew point temperature* is greater than or equal to 64°F at the *ASHRAE* 2 percent annual dehumidification design condition, and
2. Include heating and cooling capacity at each zone, and
3. Do not mechanically cool *air handler supply air* below 80°F when the outdoor *dew point temperature* is below 60°F.

912.2.6 *[Section 140.9(c)6]* **Exhaust air heat recovery.**

Buildings with greater than 10,000 cfm of *laboratory* exhaust shall include an exhaust air heat recovery system that meets the following:

1. A *sensible energy recovery ratio* of at least 45 percent at heating *design conditions* and 25 percent at cooling *design conditions*.

2. Heat is recovered from at least 75 percent of all lab exhaust air volume.
3. The system includes a run-around coil pump or other means to disable heat recovery.
4. The system includes a bypass damper or other means so that the exhaust air pressure drop through the heat exchanger does not exceed 0.4 inch w.g. when heat recovery is disabled.

Exception 1 to Section 912.2.6: *Buildings* where the total *laboratory* exhaust rate exceeds 20 cfm/ft^2 of *roof* area.

Exception 2 to Section 912.2.6: Locations that meet both of the following:

1. In Climate Zone 6 or 7; and
2. In a jurisdiction where gas heating is allowed.

Exception 3 to Section 912.2.6: *Buildings* with an exhaust air heat recovery system and heat recovery chillers designed to provide at least 40 percent of the peak heating load from exhaust heat recovery.

Exception 4 to Section 912.2.6: Exhaust systems requiring wash down systems such as exhaust systems dedicated to perchloric acid fume hoods.

912.3 *[Section 100.2]* Performance requirements (Newly Constructed).

A *building* complies with the performance standards compliance approach as described in Section 102 if the energy consumption calculated for the *proposed design building* is no greater than the *energy budget* calculated for the *standard design building* using Energy Commission-certified *compliance software* as specified by the *Alternative Calculation Methods* Reference Manual.

912.4 *[Section 141.1, 141.1(a)]* Additions and alterations to existing buildings.

Covered processes in *additions* or *alterations* to existing *buildings* that will be *nonresidential*, *hotel/motel*, or *multifamily occupancies* shall comply with the applicable requirements of Section 912, and the applicable requirements of Section 400.5.1 *[Section 110.2(a)].*

Exception 1 to Section 912.4: New zones on an existing constant volume exhaust system do not need to comply with airflow reduction requirements in Section 912.2.1.

Exception 2 to Section 912.4: *Additions* or *alterations* to existing air-handling systems serving existing zones without heating and cooling capacity do not need to comply with *reheat* limitation requirements in Section 912.2.5.

Exception 3 to Section 912.4: *Additions* or *alterations* to existing *laboratory* exhaust systems that do not include exhaust air heat recovery do not need to comply with exhaust air heat recovery requirements in Section 912.2.6.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 913

PROCESS SYSTEM PIPING

(NEWLY CONSTRUCTED, ADDITIONS, ALTERATIONS)

913.1 Mandatory requirements (Newly Constructed, Additions, Alterations).

913.1.1 *[Section 120.3]* Pipe Insulation.

Nonresidential and *hotel/motel buildings* shall comply with the applicable requirements of Section 913.1.1.1 through 913.1.1.3 *[Sections 120.3(a) through 120.3(c)]*.

Exception 1 to Section 913.1.1: Piping that conveys fluids with a design operating temperature range between 60°F and 105°F.

Exception 2 to Section 913.1.1: Where the heat gain or heat loss to or from piping without insulation will not increase *building Ssource Eenergy* use.

Exception 3 to Section 913.1.1: Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration. Metal piping that penetrates metal framing shall use grommets, plugs, wrapping or other insulating material to assure that no contact is made with the metal framing.

Exception 4 to Section 913.1.1: Fluid pumps, steam traps, blow-off valves, and piping within *process equipment*.

Exception 5 to Section 913.1.1: Valves, strainers, coil u-bends, air separators with at least 0.5 inches of insulation, and piping within *process equipment*.

913.1.1.1 *[Section 120.3(a)]* General requirements.

The piping conditions listed below for *process* heating and *process* cooling systems piping with fluid normal operating temperatures listed in Table 913.1-A(1) or Table 913.1-B(2) *[Table 120.3-A1 or Table 120.3-A2]*, the fluid distribution system shall have at least the amount of insulation specified in Section 913.1.1.3 *[Section 120.3(c)]*:

1. ***Process* heating system piping.** All refrigerant, steam, steam condensate and hot water fluid distribution systems for heating a *process* unrelated to space conditioning or *service water-heating*.
2. ***Process* cooling system piping.** All refrigerant suction, chilled water, and brine fluid distribution systems for cooling a proves unrelated to space conditioning.

Insulation conductivity shall be determined in accordance with *ASTM* C335 at the mean temperature listed in Table 913.1-A(1) or Table 913.1-B(2) *[Table 120.3-A1 or Table 120.3-A2]*, and shall be rounded to the nearest 1/100 Btu-inch per hour per square foot per °F. Fluid distribution systems include all elements that are in series with the fluid flow, such as pipes, fittings, pumps, valves, strainers, coil u-bends, and air separators,

but not including elements that are not in series with the fluid flow, such as expansion tanks, fill lines, chemical feeders, and drains.

913.1.1.2 *[Section 120.3(b)]* **Insulation protection.**

Pipe insulation shall be protected from damage due to sunlight, moisture, equipment maintenance and wind. Protection shall, at minimum, include the following:

1. Pipe insulation exposed to weather shall be protected by a cover suitable for outdoor service. The cover shall be water retardant and provides shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be used to provide this protection.
2. Pipe insulation covering chilled water piping and refrigerant suction piping located outside the *conditioned space* shall include, or be protected by, a Class I or Class II vapor retarder. All penetrations and joints shall be sealed.
3. Pipe insulation buried below grade must be installed in a water proof and non-crushable casing or sleeve.

913.1.1.3 *[Section 120.3(c)]* **Insulation thickness.**

For insulation with a conductivity in the range shown in Table 913.1-~~A~~(1) or Table 913.1-~~B~~(2) *[Table 120.3-A1 or Table 120.3-A2]* for the applicable fluid temperature range, the insulation shall have the applicable minimum thickness or *R-value* shown in Table 913.1-~~A~~(1) or Table 913.1-~~B~~(2) *[Table 120.3-A1 or Table 120.3-A2]*.

For insulation with a conductivity outside the range shown in Table 913.1-~~A~~(1) or Table 913.1-~~B~~(2) *[Table 120.3-A1 or Table 120.3-A2]* for the applicable fluid temperature range, the insulation shall have a minimum *R-value* shown in Table 913.1-~~A~~(1) or Table 913.1-~~B~~(2) *[Table 120.3-A1 or Table 120.3-A2]* or thickness as calculated:

MINIMUM INSULATION THICKNESS EQUATION *(Equation 913.1-A)*

$$T = PR\left[\left(1 + \frac{t}{PR}\right)^{\frac{K}{k}} - 1\right]$$

where:

T = insulation thickness for material with conductivity K, inches.

PR = actual outside radius, inches.

t = Insulation thickness from Table 913.1-~~A~~(1) or Table 913.1-~~B~~(2) *[TABLE 120.3-A1 OR TABLE 120.3-A2]*, inches.

K = Conductivity of alternate material at the mean rating temperature indicated in Table 913.1-~~A~~(1) or Table 913.1-~~B~~(2) *[TABLE 120.3-A]* for the applicable fluid temperature range, in Btu-inch per hour per square foot per °F.

k = The lower value of the conductivity range *listed* in Table 913.1-~~A~~(1) or Table 913.1-~~B~~(2) *[TABLE 120.3-A]* for the applicable fluid temperature range, Btu-inch per hour per square foot per °F.

TABLE 913.1-~~A~~(1) [TABLE 120.3-A-1] PROCESS HEATING SYSTEM PIPE INSULATION THICKNESS

FLUID OPERATING TEMPERATURE RANGE (°F)	INSULATION CONDUCTIVITY (IN BTU·IN/H·FT²·°F)	INSULATION MEAN RATING TEMPERATURE (°F)	NOMINAL PIPE DIAMETER < 1 INCH	NOMINAL PIPE DIAMETER 1 TO < 1.5 INCHES	NOMINAL PIPE DIAMETER 1.5 TO < 4 INCHES	NOMINAL PIPE DIAMETER 4 TO < 8 INCHES	NOMINAL PIPE DIAMETER 8 INCHES AND LARGER
Above 350	0.32-0.34	250	4.5 inches	5.0 inches	5.0 inches	5.0 inches	5.0 inches
Above 350	0.32-0.34	250	R 37	R 41	R 37	R 27	R 23
251-350	0.29-0.32	200	3.0 inches	4.0 inches	4.5 inches	4.5 inches	4.5 inches
251-350	0.29-0.32	200	R 24	R 34	R 35	R 26	R 22
201-250	0.27-0.30	150	2.5 inches	2.5 inches	2.5 inches	3.0 inches	3.0 inches
201-250	0.27-0.30	150	R 21	R 20	R 17.5	R 17	R 14.5
141-200	0.25-0.29	125	1.5 inches	1.5 inches	2.0 inches	2.0 inches	2.0 inches
141-200	0.25-0.29	125	R 11.5	R 11	R 14	R 11	R 10
105-140	0.22-0.28	100	1.0 inch	1.5 inches	1.5 inches	1.5 inches	1.5 inches
105-140	0.22-0.28	100	R 7.7	R 12.5	R 11	R 9	R 8

TABLE 913.1-~~B~~(2) [TABLE 120.3-A2] PROCESS COOLING SYSTEM PIPE INSULATION THICKNESS

FLUID OPERATING TEMPERATURE RANGE (°F)	INSULATION CONDUCTIVITY (IN BTU·IN/H·FT²·°F)	INSULATION MEAN RATING TEMPERATURE (°F)	NOMINAL PIPE DIAMETER < 1 INCH	NOMINAL PIPE DIAMETER 1 TO < 1.5 INCHES	NOMINAL PIPE DIAMETER 1.5 TO < 4 INCHES	NOMINAL PIPE DIAMETER 4 TO < 8 INCHES	NOMINAL PIPE DIAMETER 8 INCHES AND LARGER
Nonresidential 40-60	0.21-0.27	75	0.5 inch	0.5 inch	1.0 inch	1.0 inch	1.0 inch
Nonresidential 40-60	0.21-0.27	75	R 3	R 3	R 7	R 6	R 5
Below 40	0.20-0.26	50	1.0 inch	1.5 inches	1.5 inches	1.5 inches	1.5 inches
Below 40	0.20-0.26	50	R 8.5	R 14	R 12	R 10	R 9

Footnote to Table 913.1-(1) *[Table 120.3-A-1]* and Table 913.1-(2) *[Table 120.3-A-2]*:

a. These thicknesses are based on energy efficiency considerations only. Issues such as water vapor permeability or surface condensation sometimes require vapor retarders or additional insulation.

~~Footnote to Table 913.1-A *[Table 120.3-A-1]* and Table 913.1-B *[Table 120.3-A-2]*:~~

~~1. These thicknesses are based on energy efficiency considerations only. Issues such as water vapor permeability or surface condensation sometimes require vapor retarders or additional insulation.~~

913.2 Prescriptive requirements (Newly Constructed).

RESERVED.

913.3 Performance requirements (Newly Constructed).

RESERVED.

913.4 *[Section 141.1(d)]* Additions and alterations to existing buildings.

Newly installed *process* heating and *process* cooling system piping and pipes relocated as part of an *alteration* shall meet the requirements of Section 913 *[Section 120.3]*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SUBCHAPTER 10
DESIGN REVIEW AND COMMISSIONING

SECTION 1000

MANDATORY REQUIREMENTS FOR ALL OCCUPANCIES

RESERVED.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 1001

NONRESIDENTIAL OCCUPANCIES

(NEWLY CONSTRUCTED)

1001.1 *[Section 120.8]* **General.**

Nonresidential *use designations* not including ~~*buildings* other than~~ *healthcare facilities*, with *conditioned space* of 10,000 square feet or more, shall comply with the applicable requirements of Section 1001.2 *[Sections 120.8(a) through 120.8(i)]* in the *building* design and construction processes. All *building* systems and components covered by Sections 100.0, 200.0, 300.0, 400.0, 500.0, 600.0, 700.0, 800.0, 900.0 *[Sections 110.0, 120.0, 130.0, and 140.0]* shall be included in the scope of the commissioning requirements in this Section, excluding those related solely to *covered processes*.

Nonresidential *use designations* not including ~~*buildings* other than~~ *healthcare facilities*, with *conditioned space* of less than 10,000 square feet shall comply with the *design review* requirements specified in Section 1001.2.3 *[Section 120.8(d)]*, and shall include any measures or requirements necessary for completing this review in the construction documents in a manner consistent with Section 1001.2.4 *[Section 120.8(e)]*.

Healthcare facilities shall ~~instead~~ comply with the applicable requirements of Chapter 7 of the California Administrative Code (Title 24, *Part 1*).

~~**NOTE:** *Nonresidential buildings* include nonresidential spaces such as *nonresidential function areas* within *hotel/motel* and *high-rise residential buildings*. The requirements of Section 1001 *[Section 120.8]* apply based on the square footage of the nonresidential spaces.~~

The commissioning described in this Section is in addition to any commissioning required by Title 24, Part 11, Section 5.410.2, 5.410.4 and subsections.

1001.2 [Section 120.8(a)] **Mandatory requirements (Newly Constructed).**

All *building* systems and components covered by the nonresidential requirements of Title 24, *Part 6* *Sections 100.0, 200.0, 300.0, 400.0, 500.0, 600.0, 700.0, 800.0, 900.0 [Sections 110.0, 120.0, 130.0, and 140.0]* shall be included in the scope of the commissioning requirements in this section, excluding those related solely to *covered processes*.

Commissioning shall include completion of the following items:

1. Owner's or owner representative's project requirements;
2. Basis of design;
3. Design phase *design review*;

4. Commissioning measures shown in the construction documents;
5. Commissioning plan;
6. Functional performance testing;
7. Documentation and training; and
8. Commissioning report.

1001.2.1 *[Section 120.8(b)]* **Owner's or Owner Representative's Project Requirements (OPR).**

The energy-related expectations and requirements of the *building* shall be documented before the design phase of the project begins. This documentation shall include the following:

1. Energy efficiency goals;
2. Ventilation requirements;
3. Project documentation requirements, including facility functions, hours of operation and need for after-hours operation;
4. *Equipment* and systems expectations; and
5. *Building envelope* performance expectations.

1001.2.2 *[Section 120.8(c)]* **Basis of Design (BOD).**

A written explanation of how the design of the *building* systems and components meets the OPR shall be completed at the design phase of the *building* project, and updated as necessary during the design and construction phases. The basis of design document shall cover the following systems and components:

1. Heating, ventilation, air conditioning (HVAC) systems and controls;
2. Indoor *lighting* system and controls;
3. Water heating systems and controls;
4. Any other *building equipment* or system listed in the OPR; and
5. Any *building envelope* component considered in the OPR.

1001.2.3 *[Section 120.8(d)]* **Design phase design review.**

1001.2.3.1 Design reviewer requirements.

The *design reviewer* shall be the *Responsible Person,* signer of the ~~*Design Review* Kickoff Certificate(s) of Compliance and Construction Document *Design Review* Checklist Certificate(s)~~*Nonresidential Building Commissioning Certificate* of Compliance, as specified ~~in *Part 1* Section 10-103(a)1~~herein.

~~**1001.2.3.1.1** The *Design Reviewer* shall be one of the following professions:~~

1001.2.3.1.1- The *Design Reviewer* shall be one of the following professions:

1. California licensed professional engineer;

2. California licensed architect;
3. California licensed contractor representing services performed by or under the direct supervision of a licensed engineer or architect, as specified in the provisions of Division 3 of the Business and Professions Code; or
4. Nonresidential Certified Energy Analyst (CEA) certified by the California Association of *Building* Energy Consultants (CABEC).

1001.2.3.1.2- The *Design Reviewer* shall also conform with the following:~~1001.2.3.1.2 The Design Reviewer shall also conform with the following:~~

1001.2.3.1.2.1-— For *buildings* 10,000 square feet or less, the *Design Reviewer* shall be either the primary project engineer, architect, contractor, or CEA.

1001.2.3.1.2.2-— For *buildings* greater than 10,000 square feet but less than 50,000 square feet, the *Design Reviewer* shall be one of the following:

1. A qualified in-house engineer or architect with no other project involvement;
2. A qualified third-party engineer or architect;
3. A contractor representing services performed by or under the direct supervision of a qualified in-house or third party licensed engineer or architect; or
4. A Nonresidential CEA certified by CABEC.

1001.2.3.1.2.3-— For *buildings* 50,000 square feet or more, or for *buildings* that have *complex mechanical systems* serving more than 10,000 square feet, the *Design Reviewer* shall be one of the following:

1. A third-party engineer or architect;
2. A contractor representing services performed by or under the direct supervision of a third-party licensed engineer or architect; or
3. A Nonresidential CEA certified by CABEC.

1001.2.3.2 Design Team Membership Requirements.

The design team shall, at minimum, include the following members:

1001.2.3.2.1- – Owner or owner's representative.

1001.2.3.2.2- —The *design reviewer*.

1001.2.3.2.3- —A certified *Lighting* Controls Acceptance Test Technician (CLCATT) in accordance with Section 103.1 *[Part 1, Section 10-103.1]*.

1. The CLCATT shall be limited to reviewing the *lighting* and *lighting* controls designs and Energy Code compliance documentation (if available) that are related to the *lighting* controls acceptance testing required by Section 601.2.5 *[Section 130.4]* for general Energy Code compliance, including the appropriate identification of any required *lighting* controls acceptance tests.

2. If licensed under the provisions of Division 3 of the Business and Professions Code, the CLCATT may also serve as the *design reviewer*, *lighting* design engineer, *lighting* installation contractor, and the CLCATT to perform the required *lighting* controls acceptance tests.

Exception to Section 1001.2.3.2.3: The CLCATT are not required as *design team* members for projects containing *Group R occupancies*.

1001.2.3.2.4 A Certified Mechanical Acceptance Test Technician (CMATT) in accordance with Section 103.2 *[Part 1, Section 10-103.2]*.

1. The CMATT shall be limited to reviewing all mechanical designs and Energy Code compliance documentation (if available) that are related to the mechanical acceptance testing required by Section 401.2.7 *[Section 120.5]* for general Energy Code compliance including the appropriate identification of any required mechanical acceptance tests.
2. If licensed under the provisions of Division 3 of the Business and Professions Code, the CMATT may also serve as the *design reviewer*, mechanical design engineer, mechanical installation contractor, and the CMATT to perform the required mechanical acceptance tests.

Exception to Section 1001.2.3.2.4: The CMATT are not required as *design team* members for projects containing *Group R occupancies*.

1001.2.4 Design review kickoff.

During the schematic design phase of the *building* project, the ~~owner or owner's representative,~~ *design team* ~~and *design reviewer*~~ must meet to discuss the project scope, schedule and how the *design reviewer* will coordinate with the project and *design teams*. The *building* owner or owner's representative shall include the *Nonresidential Building Commissioning Certificate*~~*Design Review* Kickoff Certificate of Compliance form in the certificate~~ of compliance documentation (as specified in Section 100.5 *[Part 1 Section 10-103]*).

1001.2.5 Construction documents design review.

The construction documents *Nonresidential Building Commissioning Certificate*~~*design review* Checklist Certificate~~ of Compliance shall list the items checked by the *design reviewer* during the construction document review. The completed form shall be returned to the owner and *design team* for review and *sign*-off. The *building* owner or owner's representative shall include this form in the certificate of compliance documentation (as specified in Section 100.5 *[Part 1 Section 10-103]*).

1001.2.64 *[Section 120.8(e)]* **Commissioning measures shown in the construction documents.**

Complete descriptions of all measures or requirements necessary for commissioning shall be included in the construction documents (plans and specifications). Commissioning measures or requirements shall be clear, detailed and complete to clarify the commissioning process.

1001.2.75 *[Section 120.8(f)]* **Commissioning plan.**

Prior to permit issuance a commissioning plan shall be completed to document how the project will be commissioned and shall be started during the design phase of the *building* project. The commissioning plan shall include the following:

1. General project information;
2. Commissioning goals;
3. Systems to be commissioned; and
4. Plans to test systems and components, which shall include:
   4.1. An explanation of the original design intent;
   4.2. *Equipment* and systems to be tested, including the extent of tests;
   4.3. Functions to be tested;
   4.4. Conditions under which the test shall be performed;
   4.5. Measurable criteria for acceptable performance;
   4.6. Commissioning team information; and
   4.7. Commissioning process activities Section 1001.2.6 through 1001.2.8 *[Sections 120.8(g) through 120.8(i)]* shall be included.

1001.2.8~~6~~ *[Section 120.8(g)]* **Functional performance testing.**

Functional performance tests shall demonstrate the correct installation and operation of each component, system and system-to-system interface in accordance with the acceptance test requirements in Sections 401.2.7 *[Sections 120.5]*, 601.2.5 *[Section 130.4]*, 910.2, 911.2, 912.2, *[Section 140.9]*, 403.2.3.5 *[Section 160.3(d)]* and 603.2.2.5 *[Section 160.5(e)]*.

Functional performance testing reports shall contain information addressing each of the *building* components tested, the testing methods utilized, and include any readings and adjustments made.

Exception to Section 1001.2.8~~6~~: *Healthcare facilities*.

1001.2.9~~7~~ *[Section 120.8(h)]* **Documentation and training.**

A systems manual and systems operations training shall be completed.

1. **Systems manual.** Documentation of the operational aspects of the *building* shall be completed within the systems manual and delivered to the *building* owner or representative and facilities operator. The systems manual shall include the following:
   1.1 Site information, including facility description, history and current requirements;
   1.2 Site contact information;
   1.3 Instructions for basic operations and maintenance, including general site operating procedures, basic troubleshooting, recommended maintenance requirements, and a site events log;
   1.4 Description of major systems;
   1.5 Site *equipment* inventory and maintenance notes; and

1.6 A copy of all special inspection verifications required by the enforcing agency or the standards.

2. **Systems operations training.** The training of the appropriate maintenance staff for each equipment type or system shall be documented in the commissioning report. Training materials shall include the following:

2.1 System and equipment overview (i.e., what the equipment is, what it does and with what other systems or equipment it interfaces);

2.2 Review and demonstration of operation, servicing and preventive maintenance procedures;

2.3 Review of the information in the systems manual; and

2.4 Review of the record drawings on the systems and equipment.

1001.2.10~~8~~ *[Section 120.8(i)]* **Commissioning report.**

A complete report of commissioning *process* activities undertaken through the design, construction and reporting recommendations for post- construction phases of the *building* project shall be completed and provided to the owner or owner's representative.

1001.2.11 *[New section]* **Data Center Commissioning.**

All *data centers* with at least 1 MW of new *ITE design load* shall complete the following commissioning scope.

1001.2.11.1 Design Phase.

1001.2.11.1.1- *Data centers* shall comply with sections 1001.2.1 through 1001.2.5 for the following systems. The 10,000 sq. ft. trigger in *Part 1* Section 10-103 shall not apply:

~~**1001.2.11.1.1** *Data centers* shall comply with sections 1001.2.1 through 1001.2.5 for the following systems. The 10,000 sq. ft. trigger in *Part 1* Section 10-103 shall not apply:~~

1. Cooling
2. Ventilation
3. Heat recovery
4. Humidification
5. Pumps
6. Fans

1001.2.11.1.2- In addition to the requirements in Section 1001.2.3, the design review shall confirm the following:

1. ~~1.~~ Economizers: All ~~E~~economizers ~~is~~are designed to meet economizer temperature thresholds in Section 910.2.1 at *design conditions*, and all economizers ~~is~~are designed to meet the *Data Center* Room Economizer definition in Section 200.3.

~~2.~~ Variable airflow control: System is designed to maintain at least 20°F airside temperature difference (delta T) at 25-100% part loads in accordance with Section 910.2.1.

2.

~~3.~~ ~~3. Variable water flow control: System is designed to maintain at least 15°F waterside temperature difference (delta T) at 25-100% part loads in accordance with Section 910.2.1.~~

4. Variable water flow control: System is designed to maintain at least 15°F waterside temperature difference (delta T) at 25-100% part loads in accordance with Section 910.2.1.

5. Heat recovery: System is designed to meet *Data Center* Heat Recovery requirements specified in Section 910.1.4. If project is utilizing Exception 3 to Section 910.2.1, system shall be designed to meet the requirements of~~or~~ Exception 3 to Section 910.2.1.

1001.2.11.2 Construction Phase.

1001.2.11.2.1- ~~1001.2.11.2.1~~ The following systems serving *data centers* shall comply with Sections 1001.2.6 and 1001.2.8:

1. Cooling
2. Ventilation
3. Heat recovery
4. Humidification
5. Pumps
6. Fans

1001.3 Prescriptive requirements (Newly Constructed).

RESERVED.

1001.4 Performance requirements (Newly Constructed).

RESERVED.

1001.5 Additions and alterations to existing buildings.

~~**RESERVED.**~~

1001.5.1 *[New Section]* Additions to existing buildings.

1001.5.1.1 Mandatory Requirements (Additions)

1001.5.1.1.1 *[New section]* Data Center Commissioning.

Additions with at least 1 MW of new *ITE design load* shall comply with Section 1001.2.11.

Exception to Section 1001.5.1: *Data centers* in *Group R occupancies*.

1001.5.2 *[New Section]* Alterations to existing buildings.

Alterations to components of existing *nonresidential buildings*, including *alterations* made in conjunction with a change in *building occupancy* to a *nonresidential occupancy*, shall comply with the applicable requirements of Section 1001.5.2 in the *building* design and construction processes.

Exception 1 to Section 1001.5.2: *Alterations* to *healthcare facilities* and *Group R occupancies* are not required to comply with this Section.

Exception 2 to Section 1001.5.2: *Nonresidential buildings* that have completed an *ASHRAE* Level 1 or higher energy audit, or a comparable ~~n~~ energy audit of equivalent scope within the previous five years at the time *existing building commissioning* (*EBCx*) is required by Sections 401.5.2.2.1.3 or 401.5.2.2.2.3.

1001.5.2.1 Mandatory Requirements (Alterations)

1001.5.2.1.1 Existing Building Commissioning (EBCx)

When required by Sections 401.5.2.2.1.3 or 401.5.2.2.2.3 , *EBCx* shall be performed as specified in Table 1001.5-(1) in Section 1001.5.2.1.1.3.

1001.5.2.1.1.1 Existing Building Commissioning Process

EBCx shall be performed in accordance with Reference Nonresidential Appendix NA9. The results of the *EBCx* study shall be documented in an *EBCx* Investigation Report, as specified in Reference Nonresidential Appendix NA9. Prior to final inspection, the report shall be signed by the owner or owner's representative and submitted to the *enforcement agency*.

1001.5.2.1.1.2 General Provisions

This section specifies the general provisions that shall apply to the required *EBCx* process. During the *EBCx* process, the *existing building commissioning agent (EBCxA)* shall document in the *EBCx Investigation Report* all of the following:

1. All actions taken in compliance with Table 1001.5-(1) in Section 1001.5.2.1.1.3.
2. An ~~E~~estimate of the remaining -useful life of chillers, boilers, *air handlers* and packaged rooftop units with design heating or cooling capacity

greater than 150 kBtu/h, and a recommended replacement schedule for existing equipment.

3. Where pneumatic control devices exist for some *space-conditioning systems*, a summary of the possible benefits, if any, to the installation of interface devices between the existing pneumatic controls and new *DDC* (for example, electric-to-pneumatic transducers).

4. Any *ASHRAE Guideline 36* sections as specified in *Reference Appendices*, Joint Appendix JA18, Table JA18.4-1, applicable in the professional judgment of the *EBCxA* to the existing system type, configuration, and controls. The *EBCx Investigation Report* shall include~~s~~ an assessment of the necessary input and output control points that are available, sensor technology, as well as the ability to implement the recommended sequence of operations.

5. A list of identified issues and corrective actions taken by the *EBCxA*. At a minimum, the *EBCxA* shall attempt to take corrective actions ~~-~~which align the *building* with its originally intended operating parameters. The *EBCxA* shall also ~~and~~ document any recommended actions requiring additional *building* professional(s). Corrective actions that cannot be performed during times when the *building* is unoccupied, or that require the owner to hire additional *building* professionals, shall be listed as future recommendations. Future recommended corrective actions listed in the *EBCx Investigation Report* shall include both the corrective process recommended and the type of *building* professional(s) that would be required.

1001.5.2.1.1.3 System-Specific Provisions

The *EBCx* process shall include, at a minimum, the following scope for each of the applicable systems and equipment listed in Table 1001.5~~-~~(1).

Table 1001.5(1) *EBCx* Scope for *Space-Conditioning System* Replacements and *Alterations*

Scope of New, Replaced, or Altered *Space-Conditioning System*	**Capacity Threshold of New, Replaced, or Altered *Space-Conditioning System***	***Existing Building Commissioning* Scope**
Air-handling system	Design heating or cooling capacity of 150 kBtu/h and larger	For all existing air-handling systems with a design heating or cooling capacity of 150 kBtu/h and larger: 1. Restore occupancy–based schedules and temperature setpoints that do not meet *current facility requirements*. 2. Recommend implementation of energy saving control strategies, where applicable, including: a. *Occupancy*–based schedules. b. *Occupancy*–based temperature setpoint resets. c. *Supply air* temperature reset. d. Static pressure reset. 3. Evaluate system *outdoor air* ventilation rates specified by Section 401.2.1.2 *[Section 120.1(d)]*. 4. Visually inspect *outdoor air* and *economizer* dampers and linkages for the signs of movement restrictions. 5. Evaluate any zone heating/cooling overlap of perimeter and central systems and implement *deadband* control to avoid simultaneous heating/cooling.

Scope of New, Replaced, or Altered *Space-Conditioning System*	**Capacity Threshold of New, Replaced, or Altered *Space-Conditioning System***	***Existing Building Commissioning* Scope**
New or upgraded chiller	Plant with design cooling capacity 300 kBtu/h and larger	For the chilled water plant: 1. Restore chilled water and *condenser* water temperature setpoints and plant operating schedules that do not meet *current facility requirements*. 2. Recommend implementation of energy saving control strategies, where applicable, including: a. Chilled water supply temperature reset. b. *Condenser* water supply temperature reset. c. Differential pressure reset. For all existing air-handling systems served by the chilled water system: 1. Evaluate system *outdoor air* ventilation rates specified in Section 401.2.1.2 *[Section 120.1(d)]*. 2. Visually inspect *outdoor air* and economizer dampers and linkages for signs of movement restrictions.

Scope of New, Replaced, or Altered *Space-Conditioning System*	**Capacity Threshold of New, Replaced, or Altered *Space-Conditioning System***	***Existing Building Commissioning* Scope**
New or upgraded boiler	Plant with design heating capacity 300 kBtu/h and larger	For the heating hot water (HHW) plant: 1. Restore HHW temperature setpoints and plant operating schedules that do not meet *current facility requirements*. 2. Recommend implementation of energy saving control strategies, where applicable, including: a. Supply temperature reset. b. Pump differential pressure reset. 3. Evaluate heating plant capability to meet zone heating loads at the lowest possible HHW supply temperature (down to 130°F as specified by Section 401.2.2.13 *[Section 120.1(l)]*. a. Document the minimum HHW supply temperature at which the existing system is capable of satisfying zone heating loads. b. If the minimum HHW supply temperature at which the existing system satisfies zone heating loads is greater than 130°F, recommend potential system *alterations* that may be implemented to satisfy zone heating loads at a HHW supply temperature of 130°F. For all existing air-handling systems served by the HHW plant: 1. Evaluate system *outdoor air* ventilation rates specified by Section 401.2.1.2 *[Section 120.1(d)]*. 2. Visually inspect *outdoor air* and *economizer* dampers and linkages for signs of movement restrictions.

1001.5.2.1.2 *[New section]* **Data Center Commissioning.**

Alterations with at least 1 MW of new *ITE design load* shall comply with Section 1001.2.11.

Exception to Section 1001.5.1: *Data centers* in *Group R occupancies*.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code;* Section 18930*, Health and Safety Code*.

SECTION 1002

SINGLE-FAMILY RESIDENTIAL OCCUPANCIES

RESERVED.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code*.

SECTION 1003

MULTIFAMILY OCCUPANCIES

(NEWLY CONSTRUCTED)

1003.1 *[Section 120.8]* **General.**

NOTE: *Nonresidential* *use designations* ~~*buildings* include nonresidential spaces such as *nonresidential function areas* within *high-rise residential*~~*a mixed occupancy* *buildings*~~*s.*~~ shall comply with ~~The~~ *nonresidential* requirements of Section 1001 *[Section 120.8]*. ~~apply based on the square footage of the nonresidential spaces.~~

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, *Public Resources Code*. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, 25605, 25910, and 25943, *Public Resources Code;* Section 18930*, Health and Safety Code*.