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<th><strong>Docket Number:</strong></th>
<th>13- ATTCP-01</th>
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<tr>
<td><strong>Project Title:</strong></td>
<td>Acceptance and Training Certification</td>
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<tr>
<td><strong>TN #:</strong></td>
<td>213523-2</td>
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<tr>
<td><strong>Document Title:</strong></td>
<td>California 2016 Building Energy Efficiency Standards for Nonresidential Buildings</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>2016 Updates</td>
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<td><strong>Filer:</strong></td>
<td>Patty Paul</td>
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<td><strong>Organization:</strong></td>
<td>NEMIC</td>
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<tr>
<td><strong>Submitter Role:</strong></td>
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<td><strong>Submission Date:</strong></td>
<td>9/8/2016 8:27:00 AM</td>
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<td><strong>Docketed Date:</strong></td>
<td>9/7/2016</td>
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The purpose of this webinar is to familiarize yourself with the updates to the 2016 Building Energy Efficiency Standards (“Standards”), and in particular, changes to the Nonresidential Compliance Manual and the mandated mechanical acceptance tests.

You are required to attend this webinar as part of the recertification requirements as set forth by the Standards Section §10-103.2(c)3B(vi) Recertification as well as by Section 2.3 Renewal of Certification of the NEMIC ATTCP Certification Manual. Failure to do so will result in decertification.
Overview

- The most significant efficiency improvements to the nonresidential Standards include alignment with the ASHRAE 90.1 2013 national standards.
- New efficiency requirements for direct digital controls are included in the nonresidential Standards.
- The 2016 Standards also include changes made throughout all of its sections to improve the clarity, consistency, and readability of the regulatory language.
Overview

- Changes to Standards Part 1 - California Building Standards Administrative Code
- Changes to Standards Part 6 - California Energy Code
- Changes to Nonresidential Appendix NA7 - Installation and Acceptance Requirements for Nonresidential Buildings and Covered Processes
Overview

- The California Code or Regulation Title 24 is organized into separate parts:
  - Part 1 - California Building Standards Administrative Code
  - Part 2 - California Building Code
  - Part 2.5 - California Residential Building Code
  - Part 3 - California Electrical Code
  - Part 4 - California Mechanical Code
  - Part 5 - California Plumbing Code
  - Part 6 - California Energy Code
CHANGES TO STANDARDS PART 1 - California Building Standards Administrative Code
10-103.2 – NONRESIDENTIAL MECHANICAL ACCEPTANCE TEST TRAINING AND CERTIFICATION

- (b)1A. No changes with regard to number of (300) Certified Acceptance Test Technicians for the mandates to take effect.
- (c)3B(vi) Recertification. The ATTCP shall recertify all Acceptance Test Technicians and Acceptance Test Employers 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.
10-103.2 – NONRESIDENTIAL MECHANICAL ACCEPTANCE TEST TRAINING AND CERTIFICATION

- § 10-103.2(c)3F adds the quality assurance requirement for minimum sample sizing for ATTCP audits.
- § 10-103.2(c)3B(iii) removes the requirement for an ATTCP to describe their review process for determining professional experience.
- §10-103.2(d) adds the distinction between Annual Reports and Update Reports.
- §10-103.2(e) removes the expired Interim Approval clauses.
- §10-103.2(f) adds the Amendment Process to provide a process for both substantive and non-substantive changes to an ATTCP application without requiring a new application.
CHANGES TO STANDARDS PART 6 - California Energy Code
### TABLE 100.0-A APPLICATION OF STANDARDS

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<th>Occupancies</th>
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<td>Envelope (unconditioned process spaces)</td>
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<td>140.3(c)</td>
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<td>HVAC (conditioned)</td>
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<td>Indoor Lighting (conditioned, process spaces)</td>
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<td>140.3(c), 140.6</td>
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<td>Indoor Lighting (unconditioned and parking garages)</td>
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<td>Electrical Power Distribution</td>
<td>110.11, 130.5</td>
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<td>Pool and Spa Systems</td>
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<tr>
<td>Solar Ready Buildings</td>
<td>110.10</td>
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<td>N.A.</td>
<td></td>
<td>141.0</td>
</tr>
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</table>
SECTION 110.2 – MANDATORY REQUIREMENTS FOR SPACE CONDITIONING EQUIPMENT

[Note: This update brings the minimum efficiency requirements in alignment with ASHRAE 90.1]

Certification by Manufacturers. Any space-conditioning equipment listed in this section may be installed only if the manufacturer has certified to the Commission that the equipment complies with all the applicable requirements of this section.

(a) Efficiency. Equipment shall meet the applicable efficiency requirements in TABLE 110.2-A through TABLE 110.2-K subject to the following:

1. If more than one efficiency standard is listed for any equipment in TABLE 110.2-A through TABLE 110.2-K, the equipment shall meet all the applicable standards that are listed; and

2. If more than one test method is listed in TABLE 110.2-A through TABLE 110.2-K, the equipment shall comply with the applicable efficiency standard when tested with 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.
Table 110.2-a Electrically Operated Unitary Air Conditioners And Condensing Units – Minimum Efficiency Requirements
Table 110.2-b Unitary And Applied Heat Pumps, Minimum Efficiency Requirements
Table 110.2-c Air-cooled Gas-engine Heat Pumps
Table 110.2-d Water Chilling Packages – Minimum Efficiency Requirements
Table 110.2-e Packaged Terminal Air Conditioners And Packaged Terminal Heat Pumps – Minimum Efficiency Requirements
Table 110.2-f Heat Transfer Equipment
Table 110.2-g Performance Requirements For Heat Rejection Equipment
Table 110.2-h Electrically Operated Variable Refrigerant Flow (Vrf) Air Conditioners Minimum Efficiency Requirements
Table 110.2-i Electrically Operated Variable Refrigerant Flow Air-to-air And Applied Heat Pumps - Minimum Efficiency Requirements
Table 110.2-j Warm-air Furnaces And Combination Warm-air Furnaces/Air-conditioning Units, Warm-air Duct Furnaces, And Unit Heaters
Table 110.2-k Gas- And Oil-fired Boilers, Minimum Efficiency Requirements
SECTION 120.2 – REQUIRED CONTROLS FOR SPACE-CONDITIONING SYSTEMS

Nonresidential, high-rise residential, and hotel/motel buildings shall comply with the applicable requirements of Sections 120.2(a) through 120.2(k).

(a) Thermostatic Controls for Each Zone.
(b) Criteria for Zonal Thermostatic Controls.
(c) Hotel/Motel Guest Room and High-rise Residential Dwelling Unit Thermostats.
(d) Heat Pump Controls.
(e) Shut-off and Reset Controls for Space-conditioning Systems.
(f) Dampers for Air Supply and Exhaust Equipment.
(g) Isolation Area Devices.
(h) Automatic Demand Shed Controls
SECTION 120.2 – REQUIRED CONTROLS FOR SPACE-COOLING SYSTEMS [continued]

(i) Economizer Fault Detection and Diagnostics (FDD)

All newly installed air-cooled packaged direct expansion units with an air handler mechanical cooling capacity greater than 54,000 Btu/hr with an installed air economizer shall include a stand alone or integrated Fault Detection and Diagnostics (FDD) system in accordance with Subsections 120.2(i)1 through 120.2(i)8.

- List of Economizer Fault Detection and Diagnostics Certified to the Energy Commission can be downloaded from [http://www.energy.ca.gov/title24/equipment_cert/fdd/](http://www.energy.ca.gov/title24/equipment_cert/fdd/)
SECTION 120.2 – REQUIRED CONTROLS FOR SPACE-CONDITIONING SYSTEMS [continued]

(j) Direct Digital Controls (DDC).

(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.
SECTION 140.4 – PRESCRIPTIVE REQUIREMENTS FOR SPACE CONDITIONING SYSTEMS

(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 140.4(n): Interlocks are not required on doors with automatic closing devices.

EXCEPTION 2 to Section 140.4(n): Any space without a thermostatic control (thermostat or a space temperature sensor used to control heating or cooling to the space).
CHANGES TO NONRESIDENTIAL APPENDIX NA7 - Installation And Acceptance Requirements For Nonresidential Buildings And Covered Processes
13. Acceptance Test Requirements

13.1 New Acceptance Test Requirements for 2016

A. Building Envelope, §110.6:
   • No changes.

B. Mechanical Acceptance Tests, §120.5:
   • Thermal Energy Storage (TES) Systems (NRCA-MCH-15-A)
     o Incorporates new acceptance criteria.
   • Minor clarifications:
     o Outdoor Air (NRCA-MCH-02-A)
     o Supply Water Temperature Reset Controls (NRCA-MCH-09-A)
     o Hydronic System Variable Flow Controls (NRCA-MCH-10-A)
     o Fault Detection & Diagnostics for DX Units (NRCA-MCH-12-A)
     o Automatic Fault Detection & Diagnostic for Air Handling & Zone Terminal Units (NRCA-MCH-13-A)

C. Lighting Controls Acceptance Tests, §130.4:
   • New Acceptance Test
     o Institutional Tuning of Lighting Controls (NRCA-LTI-05-A)
   • Significant Alterations to Acceptance Tests
     o New sampling allowance for acceptance tests.
     o Changes to the lighting control occupancy sensor maximum time-out period.
     o Changes to the weighted area calculation procedure requirements.
   • Minor clarifications:
     o Outdoor Lighting Acceptance Tests (NRCA-LTO-02-A)

D. Covered Process Spaces and Equipment, §120.6:
   • New Acceptance Tests
     o Elevator Lighting and Ventilation Controls (NRCA-PRC-12-F)
     o Escalator and Moving Walkway Speed Control (NRCA-PRC-13-F)
   • Changes to Acceptance Procedures
     o Commercial Kitchen Exhaust (NRCA-PRC-02-A)
     o Parking Garage Exhaust (NRCA-PRC-03-F)
NA7.5.1 Outdoor Air: Variable Air and Constant Volume Systems
A. Construction Inspection

Note: MCH-02-A can be performed in conjunction with MCH-07-A Supply Fan VFD Acceptance (if applicable) since testing activities overlap.

1. Supporting documentation needed to prepare test includes:
   a. As-built and/or design documents (for example, Mechanical Equipment Schedules, Equipment
      start-up sheets or balancing reports).
      Systems AA Bl diesel and MCH 2.2 Constant Volume Systems Outdoor Air Acceptance AA Bl diesel)
   c. **MCH-02-C**, Building energy efficiency standards.

2. Instrumentation needed to perform test includes:
   a. Watch
   b. Calibrated means to measure airflow (e.g. hot-wire anemometer, velocity pressure probe, etc.).
      i. Method and equipment used:
      1. equipment calibration date (must be within one year)

3. System type (check either VAV or CV)
   a. Check if Variable Air Volume (VAV) and complete the following:
      i. Outside air flow is either factory calibrated or field calibrated.
      □ Check if factory-calibrated and attach calibration certification.
      □ Check if field-calibrated and attach calibration report.
   b. Damper control (must be checked):
      □ Dynamic damper control is being used to control outside air. *(This is NOT a fixed minimum position)*
   c. One of the following dynamic control is being utilized to control outside air (check method used):
      □ Outdoor Air O&M Specification
      □ Energy Balance Hatch
      □ Demand Control Ventilation
      □ Return Fan Tracking
      □ Inlet Air Temperature
      □ Dedicated Minimum Ventilation Damper with Pressure Control
      □ Other Active Control, describe

b. Check if Constant Air Volume (CAV) and verify the following:
   i. System is designed to provide a fixed minimum CAV when the unit is on.

4. Method of delivering outside air to the unit (check one of the following):
   □ Outside air is ducted to the return air plenum. Confirm that outside air is ducted to either (check one of the following):
      1. outside air is ducted to the outside unit
      2. Outside air is ducted to the outside of the unit
      3. Outside air is ducted to the outside of the unit (and not distributed to the exterior of the unit).
   □ Return air plenum is not used to distribute outside air to the unit (i.e., outside air is not ducted directly to the unit or outside air is
   provided independent of the unit).

5. Pre-occupancy purge has been performed for the 1-hour period immediately before the building is normally occupied to provide (one of the following methods must be verified and checked):
   a. The conditioned area times the ventilation rate from the MCH-02-B, Building Energy Efficiency Standards TABLE 130.1-it, or 15
   cfm per person times the expected number of occupants, whichever is less.
   b. Complete air changes to the zone served by the air handler.
Section A. Construction Inspection

This section consists of check boxes and data entry requirements for both constant and variable air volume systems. Complete only the check boxes associated with the appropriate system type.

Section B. NAE E.1 Outdoor Air Acceptance - Functional Testing

This section consists of check boxes and data entry requirements for both constant and variable air volume systems. Enter data associated with the appropriate system type as instructed.

Section C. Testing Calculations and Results

This section consists of data entry requirements for both constant and variable air volume systems. Enter data associated with the appropriate system type as instructed.

Section D. Evaluation

This section contains check boxes to indicate the pass/fail results of the test(s). Check the appropriate box. Any test that fails should be re-inspected in the ground plane.

Declaration Statement

This section contains fields for three declaration statements: one from the Documentation Author, one from the Field Technician, and one from the Responsible Person. Each area contains a combination of check boxes and data entry requirements: periodic report date and issue number. Complete check boxes and enter data as illustrated.

The Documentation Author is the person completing the form. The Field Technician is responsible for performing and documenting the results of the acceptance procedures on the Certificate of Acceptance form. The Field Technician must sign the Certificate of Acceptance to certify that the information provided on the Certificate is true and correct. It is important to note that the Field Technician is not required to have a contractor’s, designer’s or engineer’s license. A Responsible Person is anyone under Section 2 of the Business and Professions Code in the applicable jurisdiction to take responsibility for the scope of work specified by the Certificate of Acceptance document. The Responsible Person must perform both the field testing and verification work, and if this is not the case the Responsible Person must complete and sign both the Field Technician’s signature block and the Responsible Person’s signature block on the Certificate of Acceptance form. The Responsible Person assumes responsibility for the acceptance testing work performed by the Field Technician and employee.
NA7.5.4 Air Economizer Controls Acceptance
NATIONAL ENERGY MANAGEMENT INSTITUTE COMMITTEE

STATE OF CALIFORNIA
AIR ECONOMIZER CONTROLS ACCEPTANCE
CALIFORNIA ENERGY COMMISSION
NEMIC AIR COMMISSION

Air Economizer Controls Acceptance

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.

<table>
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<tr>
<th>Enforcement Agency Use: Checked by:</th>
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A. Construction Inspections

1. Supporting documentation needed to perform test includes:
   a. [Link to Building Energy Efficiency Standards Nonresidential Compliance Manual] (S147.3.4 Air Economizer Controls Acceptance At-A-Glance)
   b. ASHRAE 90.1 Building energy efficiency standards.

2. Instrumentation to perform tests includes:
   a. Hand-held temperature probe
      - Calibration Date: [must be within last year]
   b. Device capable of calculating enthalpy
      - Calibration Date: [must be within last year]
   c. 1.2 kVA load tester (when specified by the manufacturer)

3. Installation (all of the following boxes should be checked):
   - [Check box] Economizer high limit switch control complies with Table 140.4-B found in the [Building Energy Efficiency Standards Section 140.4].
   - [Check box] Consumer reliability features are present per the standard.
     a. Power supplied warranty of economizer assembly
     b. Provide a product specification sheet proving capability of at least 40,000 operations.
     c. Include a product specification sheet proving compliance with ASHRAE Standard 500 dryer year leakage at 10 m/s airflow.
      In other words, a product specification sheet showing the manufacturer's results after following the testing procedures of ASHRAE Standard 500 or ASHRAE certification by a third party under ASHRAE Publication 513 can be used to satisfy this requirement.
     d. If the high limit switch is fixed-dry-bulb or fixed enthalpy, fixed dry-bulb then the control shall have an adjustable setpoint.
     e. Outdoor air, return air, mixed air, and supply air sensors shall be calibrated as follows:
        1. Dry-bulb and wet-bulb temperatures accurate to 0.5°F over the range of 40°F to 80°F
        2. Enthalpy accurate to 5.5 Btu/lb over the range of 20 Btu/lb to 16 Btu/lb
        3. Relative humidity (%) accurate to 5% over the range of 20% to 80% RH
     f. Check that the sensor performance survey is provided by the factory and sensor output values measured during sensor calibration are plotted on the performance curves.
     g. Sensors used for high limit control shall be located to prevent false readings, including but not limited to being properly shielded from direct sunlight.
   - [Check box] Unitary systems with an economizer have control systems, including two-stage or electronic thermostats, that cycle compressors off when economizers can provide partial cooling.
   - [Check box] System has return fan speed control, relief dampers, or dedicated relief fans to prevent backdrafting from high pressure in full economizer mode.
   - [Check box] For systems with DDC controls, sensor used for economizer lockout has been factory or field calibrated.
   - [Check box] For systems with non-DDC controls, manufacturer's startup and testing procedures have been applied.
B. Functional Testing

Results

Step 1. Disable demand control ventilation systems (if applicable).

Step 2. Enable the economizer and simulate a cooling demand large enough to drive the economizer fully open. Verify the following:

- Economizer damper modulates 100% open.
- Return air damper modulates 100% closed.
- For systems that meet the criteria of NECA 2004 Building Energy Efficiency Standards Section 144-4.16, verify that the economizer remains 100% open with the use of mechanical cooling. This occurs when the cooling demand can no longer be met by the economizer alone.
- All secondary fans and dampers operate as intended to maintain building pressure.
- The unit heating is disabled (if applicable).
- Economizer damper closes to its minimum position.
- All secondary fans and dampers operate as intended to maintain building pressure.
- The unit heating is disabled (if applicable).

Step 3. If the unit is equipped with heating, simulate a heating demand and enable the economizer. Verify the following:

- Economizer damper closes to its minimum position.
- Return air damper open.
- Turn off the unit and verify the following:
  - Economizer damper closed completely.
  - System returned to initial operating conditions.

Step 4. Simulate heating demand and enable the economizer (all answers are Y).

Step 5. Simulate cooling load and disable the economizer (all answers are N).

Step 6. Simulate cooling load and enable the economizer (all answers are Y).

Step 7. Simulate heating demand and enable the economizer (all answers are Y).

Step 8. Turn off the unit (all answers are Y).

C. Testing Results

PASS / FAIL

Step 3. Simulate cooling load and enable the economizer (all answers are Y).

Step 4. Simulate heating demand and enable the economizer (all answers are Y).

Step 6. Simulate heating demand and enable the economizer (all answers are Y).

Step 8. Turn off the unit (all answers are Y).

D. Evaluation

PASS: All Construction Inspection responses are complete and all Testing Results responses are "PASS" at the economizer is listed in the

CERTIFICATION OR EQUIPMENT CERTIFICATION DIRECTORY.
NA7.5.8 Supply Water Temperature Reset Controls Acceptance
NATIONAL ENERGY MANAGEMENT INSTITUTE COMMITTEE

STATE OF CALIFORNIA
SUPPLY WATER TEMPERATURE RESET CONTROLS ACCEPTANCE

CERTIFICATE OF ACCEPTANCE

Project Name: Supply Water Temperature Controls Acceptance

Enforcement Agency: NA

System Type: M warm, S warm

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.

A. Construction Inspection

1. Supporting documentation needed to perform test includes, but not limited to:
   b. Instrumentation to perform test includes, but is not limited to:
      a. Calibrated reference temperature sensor, evacuated, or drywell bath
         1. Calibration date: must be within last year
   c. Document that hydronic system supply temperature sensors have been factory or field calibrated (check the following that apply):
      a. Factory Calibrated
      b. Provides supporting documentation
      c. Field-calibrated by Controls contractor or other
      d. Calibration complete, hydronic system supply temperature sensors within 1% of calibrated reference sensor, evacuated or drywell bath
      e. Provides supporting documentation

B. Functional Testing

1. Step 1: Test Maximum Reset Value
   a. Change reset control variable to its maximum value. This can be accomplished by any one of the following (check method):

      □ Commanding at least one valve to 100% open
      □ Adjust discharge air temperature or zone temperature setpoints to drive a valve into a 20% open
      □ Override actual outdoor air sensor to exceed maximum water temperature boundary value
   b. Verify that chilled or hot water temperature sensor is reset to appropriate value
   c. Verify that actual system temperature changes to within 2% of the new setpoint

2. Step 2: Test Minimum Reset Value
   a. Change reset control variable to its minimum value
   b. Verify that chilled or hot water temperature sensor is reset to appropriate value
   c. Verify that actual system temperature changes to within 2% of the new setpoint

3. Step 3: Test Automatic Control of Reset Control Variable
   a. Restore reset control variable to automatic control
   b. Verify that chilled or hot water temperature sensor is reset to appropriate value
   c. Verify that actual system temperature changes to meet setpoint
   d. Verify that actual supply temperature changes to within 2% of the new setpoint

C. Testing Results

System passes criteria in 1c, 2c and 3d

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Section A. Construction Inspection
This pre-test section consists of check boxes and data entry requirements. Complete check boxes and enter data as instructed.

Section B. Functional Testing
This section consists of check boxes and yes or no questions arranged by individual test. Check each box or circle the correct answer for each specific test or line item.

Section C. Testing Results
This section consists of check boxes for each test procedure. Complete check boxes as instructed.

Section D. Evaluation
Check the appropriate box as instructed.

Declaration Statement of Acceptance
This section contains fields for three declaration statements: one from the Documentation Author, one from the Field Technician, and one from the Responsible Person. Each area contains a combination of check boxes and data entry requirements including name, date, and license number. Complete check boxes and enter data as instructed.

The Documentation Author is the person completing the form. The Field Technician is responsible for performing and documenting the results of the acceptance procedures on the Certificate of Acceptance Form. The Field Technician must sign the Certificate of Acceptance to certify that the information has or has not been completed. The Certificate of Acceptance is true and correct. It is important to note that the Field Technician is not required to have a contractor's, architect’s, or engineer’s license. A Responsible Person is allowed under Division 3 of the Business and Professions Code as the applicable classification to take responsibility for the scope of work specified by the Certificate of Acceptance. The Responsible Person can also perform the field testing and verification work, and if the case the Responsible Person must complete and sign both the Field Technician’s signature block and the Responsible Person’s signature block on the Certificate of Acceptance form.

The Responsible Person assumes responsibility for the acceptance testing work performed by the Field Technician agent or employees.
NA7.5.9 Hydronic System Variable Flow Control Acceptance
STATE OF CALIFORNIA
HYDRONIC SYSTEM VARIABLE FLOW CONTROL ACCEPTANCE

CERTIFICATE OF ACCEPTANCE
NRA-AMC 10-A

Hydronic System Variable Flow Control Acceptance

[Table with columns and rows, but content is not clearly visible]

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.

A. Construction Inspection
1. Supporting documentation needed to perform test includes, but not limited to:
   a. As-built and/or design documents including mechanical equipment schedules.
   c. ASHRAE Building Energy Efficiency Standards.
2. Instrumentation to perform test includes, but not limited to:
   a. Calibrated differential pressure gage (hydronic system)

B. Functional Testing
1. Minimum / Low flow test
   a. Close all control valves to achieve a minimum of 50% of design flow
   b. Verify that the operating speed decreases
   c. Verify that the current operating speed has not increased for all other systems that are not more
   d. Record the system pressures as measured at the control sensor (either F. w.c. or psig)
   e. Record the system pressure setpoint (either F. w.c. or psig)
   f. Is the pressure reading on line 1.3 within 5% of pressure setpoint on line 1.3.7
   g. Did the system operate stably within 5 minutes after completion of step 1.3.7

Notes:

[Signatures and stamps]
NA7.5.11 Fault Detection and Diagnostics (FDD) for Packaged Direct-Expansion (DX) Units Acceptance
## Fault Detection and Diagnostics (FDD) for Packaged Direct Expansion Units

### Certificate of Acceptance

**NEMIC-MEH-12-A**

**Certificate of Acceptance**

<table>
<thead>
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<th>Informational Agency</th>
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**Note:** Submit one Certificate of Acceptance for each system that must demonstrate compliance.

**Enforcement Agency Use:**

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### A. Construction Inspection

1. Prior to functional testing, verify and document the following:
   - The fault detection and diagnostics (FDD) hardware is installed on the unit.
   - The FDD system is certified by the California Energy Commission.

2. The following air temperature sensors are permanently installed:
   - Outside Air Sensor
   - Supply Air Sensor
   - Return Air Sensor (applicable for differential economizer operation only)

### B. Functional Testing

#### Air Temperature Sensor Failure/Fault

**Step 1:** Verify the FDD system indicates normal operation.

**Step 2:** Disconnect outside air temperature sensor from unit controller, verify the following:
   - If FDD system reports a fault.

**Step 3:** Connect outside air temperature sensor to unit controller, verify the following:
   - If FDD system indicates normal operation.

**Excess Outside Air**

**Step 1:** Coordinate this test with NEMIC-MEH-02-A (fan 7.3.1 Outdoor Air). If NEMIC-MEH-02-A indicates "pass" then verify the following:
   - If FDD system indicates normal operation.

**Economizer Operation**

**Step 1:** Coordinate this test with NEMIC-MEH-02-A (fan 7.3.1 Air Economizer Controls). Simulate failure by disconnecting the outdoor air economizer damper by disconnecting the control signal from the damper actuator (or another method specified by the manufacturer). Verify the following:
   - If FDD system reports a fault.

**Step 2:** Successfully complete and pass NEMIC-MEH-02-A and verify the following:
   - If FDD system reports normal operation.

### C. Testing Results

<table>
<thead>
<tr>
<th>PASS / FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

Test passes if all boxes are checked under functional testing.

---

*CA Building Energy Efficiency Standards - AB 802, Nonresidential Compliance*
STATE OF CALIFORNIA
FAULT DETECTION AND DIAGNOSTICS FOR PACKAGED DIRECT EXPANSION UNITS
(CALIFORNIA ENERGY COMMISSION)
NNEC-15013-A

CERTIFICATE OF ACCEPTANCE
Fault Detection and Diagnostics (FDD) for Packaged Direct Expansion Units
(Pages 2 of 3)

Project Name: ____________________________________________
Enforcement Agency: _______________________________________
Project Address: __________________________________________
Permit Number: ____________________________________________
System Name or Identification: ________________________________
System Location or Area Designated: __________________________

A. Construction Inspection
   1. Prior to functional testing, verify and document:
      □ The Fault Detection and Diagnostics
      □ The FDD system is certified to the C
      □ All of the following or temperature sensors are good:
         □ Outside Air Sensor
         □ Supply Air Sensor
         □ Return Air Sensor (applicable for different operation)

B. Functional Testing
   Air Temperature Sensor Failure/Fault
   Step 1: Verify the FDD system indicates normal operation.
   Step 2: Disconnect outside air temperature sensor
      □ FDD system reports a fault.
   Step 3: Connect outside air temperature sensor
      □ FDD system indicates normal operation.
   Ensure Outside Air
   Step 1: Coordinate this test with NNEC-15013-A
   □ FDD system indicates normal operation.
   Damper/Operation
   Step 1: Coordinate this test with NNEC-15013-A
   □ FDD system reports a fault.
   Step 2: Successfully complete and pass NNEC-15013-A
   □ FDD system reports normal operation

C. Testing Results
   Test passed if all boxes are checked under hand

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CA Building Energy Efficiency Standards — 2014 Nonresidential Compliance

Note: All construction inspection responses are complete and testing results are "Passed"
CERTIFICATE OF ACCEPTANCE - USER INSTRUCTIONS

NRCA-MCH-12-0 User Instructions

Section A. Construction Inspection
This pre-final section consists of check boxes and data entry requirements. Complete check boxes and enter data as instructed.

Section B. Functional Testing
This section consists of check boxes and yes or no questions arranged by individual test. Check each box or enter the correct answer for each specific test or item.

Section C. Testing Results
This section consists of check boxes for each test procedure. Complete check boxes as instructed.

Section D. Evaluation
Check the appropriate box as instructed.

Declaration Statements of Acceptance
These document acceptance criteria in the form of declarations statements, one from the Documentation Author, one from the Field Technician, and one from the Responsible Person. Each section contains a combination of check boxes and data entry requirements, including signature, date, and license number. Complete check boxes and enter data as instructed.

The Documentation Author is the person completing this form. The Field Technician is responsible for installing and documenting the results of the acceptance procedure on the Certificate of Acceptance forms. The Field Technician must sign the Certificate of Acceptance to certify that the information is true and correct. It is important to note that the Field Technician is not required to have a contractor’s, architect’s, or engineer’s license. A Responsible Person is required under Division 3 of the Business and Professions code in the applicable classification to take responsibility for the scope of work specified in the Certificate of Acceptance document. The Responsible Person can perform the field testing and installation work, and in this case, the Responsible Person must complete and sign both the Field Technician’s signature block and the Responsible Person’s signature block on the Certificate of Acceptance form. The Responsible Person assumes responsibility for the acceptance testing work performed by the Field Technician and its employees.
NA 7.5.12 FDD for Air Handling Units and Zone Terminal Units Acceptance
### CERTIFICATE OF ACCEPTANCE

**NICA-MO-13-A**

**Automatic Fault Detection and Diagnostics (TFD) for Air Handling Units and Zone Terminal Units Acceptance**

**Page 1 of 10**

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Information Agency</th>
<th>Enforcement Agency</th>
</tr>
</thead>
</table>

**Purpose:** Verify that the system detects common faults in air handling units and zone terminal units.

#### A. Construction Inspections

1. Instrumentation to perform test includes, but not limited to:
   - No instrumentation is required – changes are implemented at the building automation system control station.

2. Commission
   - The functional testing verifies proper installation of the controls for TFD for air handling units and zone terminal units. No additional installation checks are required.

#### B. Functional Testing for Air Handling Units

Testing of each unit with TFD features shall include the following tests:

<table>
<thead>
<tr>
<th>Step</th>
<th>Sensor/Actuator Failure</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Disconnect outside air temperature sensor from unit controller</td>
<td>Y/N</td>
</tr>
<tr>
<td>2.</td>
<td>Verify that the TFD system reports a fault</td>
<td>Y/N</td>
</tr>
<tr>
<td>3.</td>
<td>Connect air sensor to the unit controller</td>
<td>Y/N</td>
</tr>
<tr>
<td>4.</td>
<td>Verify that TFD indicates normal system operation</td>
<td>Y/N</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2: Damper/Actuator Fault</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td>3.</td>
</tr>
<tr>
<td>4.</td>
</tr>
<tr>
<td>5.</td>
</tr>
<tr>
<td>6.</td>
</tr>
<tr>
<td>7.</td>
</tr>
<tr>
<td>8.</td>
</tr>
</tbody>
</table>
## Functional Testing for Zone Terminal Units

Testing shall be performed on each type of terminal unit (TVU box) in the project. A minimum of 5% of the terminal boxes shall be tested.

<table>
<thead>
<tr>
<th>Step</th>
<th>Details</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Sensor drift/failure</td>
<td>y/n</td>
</tr>
<tr>
<td>2.</td>
<td>Damper/valve actuator fault - damper stuck open</td>
<td>y/n</td>
</tr>
<tr>
<td>3.</td>
<td>Damper/valve actuator fault - damper stuck closed</td>
<td>y/n</td>
</tr>
</tbody>
</table>

### Returns
- y: Yes
- n: No
Section A. Construction Inspection

This section consists of check boxes and data entry requirements. Complete check boxes and enter data as instructed.

Sections B. Functional Testing for Air Handling Units

This section consists of check boxes and yes or no questions arranged by individual test. Check each box or circle the correct answer for each specific test or line item.

Sections C. Functional Testing for Zone Terminal Units

This section consists of check boxes and yes or no questions arranged by individual test. Check each box or circle the correct answer for each specific test or line item.

Sections D. Testing Results

This section consists of check boxes for each test procedure. Complete check boxes as instructed.

Sections E. Evaluation

Check the appropriate box as instructed.

Declaration of Acceptance

This section contains filled fields for three declaration statements: one from the Documentation Author, one from the Field Technician, and one from the Responsible Person. Each box contains a combination of check boxes and data entry requirements, including signature, date, and title, number. Complete check boxes and enter data as instructed.

The Documentation Author is the person completing the form. The Field Technician is responsible for performing and documenting the acceptance test. The Responsible Person can also perform the field testing and verification work, and if this is the case, the Responsible Person must complete and sign both the Field Technician’s signature block and the Responsible Person’s signature block on the Certificate of Acceptance form.

The Responsible Person assumes responsibility for the acceptance testing work performed by the Field Technician or employees.
NA7.5.14 Thermal Energy Storage (TES) System Acceptance
# STATE OF CALIFORNIA

## THERMAL ENERGY STORAGE (TES) SYSTEM ACCEPTANCE

### CERTIFICATE OF ACCEPTANCE

**Certificate No.** NREAC-MOH-25-A

### Thermal Energy Storage (TES) System Acceptance

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Project Address</th>
<th>Project Contact Person</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
- Submit a Certificate of Acceptance for each system.
- Must demonstrate compliance.

### Intent:
Verify proper operation of distributed energy storage TES systems.

### A. Construction Inspection

1. Supporting documentation needed to perform test includes:
   a. Construction documents (plans, drawings, equipment schedule, etc.)
   b. Approved submittals (for chillers, storage tanks, controls)
   c. Copy of manufacturer's product literature
   d. Copy of Title 24 code
   e. Copy of pertinent appendices to Title 24

### B. System Installation Information

The following information for both the chiller and the storage tank(s) shall be provided on the plans to document the key TES system parameters. Information is likely to be found in submittal documents.

#### 1. Chiller(s)

<table>
<thead>
<tr>
<th>Brand and Model</th>
<th>Type (Centrifugal, Reciprocating, etc) and (rly)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heat rejection type (air, water, other)</td>
</tr>
<tr>
<td></td>
<td>Charge mode capacity (tons) @ avg. fluid temp.</td>
</tr>
<tr>
<td></td>
<td>Discharge mode capacity (tons) @ temp.</td>
</tr>
<tr>
<td></td>
<td>Discharge mode efficiency (kW/ton or EER/°F)</td>
</tr>
<tr>
<td></td>
<td>Charge mode efficiency @ nighttime design ambient temp. (kW/ton or EER)</td>
</tr>
<tr>
<td></td>
<td>Fluid type and percentage (nameplate)</td>
</tr>
</tbody>
</table>

---

**On Building Energy Efficiency Standards - 2016, 2018 Nonresidential Compliance**
STATE OF CALIFORNIA
THERMAL ENERGY STORAGE (TES) SYSTEM ACCEPTANCE

Thermal Energy Storage (TES) System Acceptance

CA Building Energy Efficiency Standards - 2014/2016 Nonresidential Compliance

2. Storage

<table>
<thead>
<tr>
<th>Type (Check):</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Chilled Water</td>
</tr>
<tr>
<td>□ Brine (or chilled water with additives)</td>
</tr>
<tr>
<td>□ Exchanger (e.g., ice banks)</td>
</tr>
<tr>
<td>□ Ice Harvested</td>
</tr>
<tr>
<td>□ Ice Slurry</td>
</tr>
<tr>
<td>□ Other Phase Change Material (e.g., paraffin)</td>
</tr>
<tr>
<td>□其他: (Specify)</td>
</tr>
</tbody>
</table>

Brand and Model

Number of tanks

Storage capacity per tank (in gallons) @ entering/leaving temp, and hours discharged

Storage rate (tons) @ flow rate (gpm) per tank

Minimum charging temp, based on chiller and tank selections:

Liquid temperature (hours @ entering/leaving temp, and hours discharged).

C. Functional Testing

Step 1: TES System Design Verification

The installing contractor(s) shall certify the following information, which verifies proper installation of the TES system components, consistent with system design expectations.

- □ Chiller(s) start-up procedure has been completed
- □ System fluid test and balance has been completed
- □ An separation and purge has been completed
- □ Fluid (e.g., glycol) has been verified at the concentration and type indicated on the design documents
- □ The TES system has been fully charged at least once and charge duration noted
- □ The system has been partially discharged at least once and charge duration noted
- □ The system is in a partial charge state in preparation for step 2 tests
- □ Schedule of operation has been activated as designed
- □ Documentation describes the status of system components in each mode of operation

Step 2: TES System Controls and Operation Verification

- □ The TES system and the chilled water plant is controlled and monitored by an EMS
- □ The system has controls in place that are configured for the operator to (check all that apply):  
  - [ ] manually select each mode of operation  
  - [ ] use an EMS schedule to specify mode of operation
Thermal Energy Storage (TES) System Acceptance

Certificate of Acceptance

Section A: Construction Inspection

This section consists of check boxes and data entry requirements. Complete check boxes and enter data as instructed.

Section B: Functional Testing

This section consists of check boxes and yes or no questions arranged by individual test. Check each box or circle the correct answer for each specific test or item.

Section C: Testing Results

This section consists of check boxes for each test procedure. Complete check boxes as instructed.

Section D: Final Review

Check the appropriate box as instructed.

Declaration of Acceptance

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The latest version of the Mechanical Acceptance Forms can be downloaded from the CEC website at http://www.energy.ca.gov/2015publications/CEC-400-2015-033/appendices/forms/NRCA/
RECERTIFICATION
Next Steps

1. Download (by double clicking on the image) and save the document to your local folder

2. Complete the 2016 Recertification Statement. The document should be signed electronically. If not, you will need to make a paper copy and rescan the paper copy before emailing it. NEMIC will not accept paper copies of the document.

3. Email the completed document to administrator@attcp.org.
Thank you!