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Statewide CASE Team and CI Team - Additional Comments on 45-Day Express Terms

Additional submitted attachment is included below.

Additional Comments on the 2025 Title 24 45-Day Express Terms

Docket Number 24-BSTD-01

May 13, 2024

Introduction

The California Statewide Utility Codes and Standards Enhancement (CASE) Team and utility Compliance Improvement (CI) Team appreciate the opportunity to review the 2025 Building Energy Efficiency Standards, Title 24 Parts 1 and 6, Express Terms, 45-day Language (45-Day Express Terms). We commend the California Energy Commission (CEC) for encouraging public participation in the proceeding and value the opportunity to offer suggestions to refine the draft code language.

The CASE initiative presents recommendations in support of the CEC's efforts to update the Energy Code with new or updated requirements for various technologies. The three California Investor-Owned Utilities (IOUs) — Pacific Gas and Electric Company, San Diego Gas and Electric, and Southern California Edison — and two Publicly Owned Utilities — Los Angeles Department of Water and Power and Sacramento Municipal Utility District— sponsored this effort. The program goal is to submit proposals that result in cost-effective enhancements to improve energy efficiency, energy performance, and GHG emissions reductions in California buildings.

CI Team subject matter experts work closely with the CASE proposal authors to address compliance and enforcement goals in Title 24, Part 6. The CI Team's goal is to reduce roadblocks for industry professionals in the compliance supply chain. Through the IOUs' sponsorship, the CI Team focuses on bridging the gaps between development and implementation of the energy code.

Comments on the 45-Day Express Terms

On May 3, 2024 the Statewide CASE Team and the CI Team submitted comments to the docket ([TN # 256172](#)) that recommended a number of revisions to the 45-Day

Express Terms.¹ This comment offers additional recommendations, corrections, and clarifications to the comments docketed on May 3, 2024. Each revision is summarized below:

- Substantive Remark #2: In the comments docketed on May 3, Table 1 inadvertently repeated the contents of remark 1 in the remark 2 row. We provided the correct recommendation.
- Substantive Remark #14: In Appendix A of this comment, we provided additional justification for substantive remark 14.
- Non-substantive Remark #73: In Appendix B of this comment, we provided additional justification for #73.
- Non-substantive Remarks #78 and 79: We added two recommendations.

Recommended revisions to the 45-Day Express Terms are provided in *Table 1: Substantive Recommendations – 45-Day Express Terms* and *Table 2: Non-Substantive Recommendations – 45-Day Express Terms* along with a justification for each change. We presented the remarks that have been revised or added since submitting comments on May 3, 2024.

For the marked-up language, revisions to the 2022 code language that appear in the 45-Day Express Terms are delineated with additions in black underlining and deletions in black ~~strikeouts~~. Our proposed revisions to the 45-Day Express Terms are delineated with additions in red underlining and deletions in red ~~strikeouts~~. In some instances it was not feasible to provide marked-up code language within the body of the tables, so marked-up language is provided in the appendices.

For each suggested edit and identified the member of the CASE Team or CI Team that developed the suggested edit. We welcome collaborative discussions between CEC staff and the individuals who recommended each revision so we can offer further descriptions, help address concerns, and resolve outstanding issues. Small improvements that make language clearer and less complex, including addressing the issues identified in the tables below will allow the 2025 code to achieve high compliance, be enforceable and will lead to sustained energy savings and GHG reductions.

¹ The Statewide CASE Team and CI Team comments from May 3, 2024 (TN 256172) are available for download here: <https://efiling.energy.ca.gov/GetDocument.aspx?tn=256172&DocumentContentId=91953>

Table 1: Substantive Recommendations – 45-Day Express Terms

Remark #	Building Type(s)	CASE Report	CASE Measure	Section(s) of Code	Person Making Recommendation	CEC Staff Lead	Language Markup (deletions marked with red strike throughs; additions marked with red <u>underlining</u>)	Justification	Is the Change needed for both single family and multifamily?	Does the change affect energy saving, cost, or cost effectiveness?	Does the change affect HERS or ATT procedure?
2	MF	Multifamily Restructuring	Skylight Properties (Additions and Alterations)	Table 180.2-B	Taylor Taylor Nick Brown	Mikey Shewmaker Payam Bozorgchami	See Appendix A for table mark-up	Requirements for CZ 15 and 16 are missing from the second page of the table. Because skylights do not have overhangs, SHGC is the appropriate terminology (not RSHGC).	No	Yes	No
14	SF/MF	Residential HVAC Performance	Design (Sizing, Equipment Selection, and Ducts/Diffusers)	150.0(h)2C, 160.3(b)2C and 170.2(c)2C	Kristin Heinemeier	Bach Tsan	"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."	The CASE Team recommends reverting to the prior language of Heating Winter Median of Extremes to not introduce confusion about which temperature represents the allowable minimum. Adding the 99.0% percentage level leads to confusion since JA2 Table 2-3 does not have 99.0% data and cannot be interpolated. See Attachment in new docketed comment 5/10/14 for more detail.	Yes	No	No

Table 2: Non-Substantive Recommendations – 45-Day Express Terms

Remark #	Building Type(s)	CASE Report	CASE Measure	Section(s) of Code	Person Making Recommendation	CEC Staff Lead	Language Markup (deletions marked with red <u>strikethroughs</u> ; additions marked with red <u>underlining</u>)	Justification	Is the Change needed for both single family and multifamily?	Does the language change affect energy saving cost or cost effectiveness?	Does the change to language affect HERS or ATT procedure?
73	SF/MF	Residential HVAC Performance	Design (Sizing, Equipment Selection, and Ducts/Diffusers)	150.0(h)2B, 160.3(b)2B and 170.2(c)2C	Kristin Heinemeier	Bach Tsan	Outdoor design conditions shall be selected from one of the following- i.-Reference Joint Appendix JA2, which is based on data from the 2024 ASHRAE Climatic Data for Region X; or- ii.-The ASHRAE Handbook, Equipment Volume, Applications Volume and Fundamentals Volume; or- iii.-The SMACNA Residential Comfort System Installation Standards Manual; or- iv.-The ACCA Manual J."	Suggest removing the proposed modification as ii and iii do not have design conditions listed in them and ACCA Manual J has a much shorter list of California cities than JA2. The reason for this is that the added listed sources (with the exception of ASHRAE Fundamentals Handbook) do not have design conditions. There are issues with using ASHRAE Fundamentals Handbook. See Attachment in new docketed comment 5/13/24 for more detail.	Yes	No	No
78	MF/NR	Nonresidential HVAC Controls	Guideline 36	140.4(r)3 160.3(a)2Hviii	Rupam Singla	Bach Tsan	140.4(r)3 <u>The programming library shall be certified by to the Energy Commission as meeting the requirements of JA18.</u> 160.3(a)2Hviii. The FDD system shall be certified <u>by to</u> the Energy Commission as meeting the requirements of Sections 160.3(a)2Hi through 160.3(a)2Hvii in accordance with Section 110.0 and JA6.3.	Make correction so language is referencing defined terms.	Yes	No	No
79	NR, MF	Lighting Code Cleanup	Lighting	Table 140.6-C	Gina Rodda	Simon Lee	No markup recommendations. Update table to address ambiguity on how many allowances can be used for each Primary Function Area.	Table 140.6-C is confusing because there are multiple rows with the same Primary Function Area and it is not clear how many credits are available for each Primary Function Area. This can be resolved with 2 steps: add a footnote to Table 140.6-C that clarifies multiple Additional Allowances can be used in same Primary Function Area. Example: Aging Eye/Low-vision Dining area can use both Decorative/Display (0.3 W/sqft) and Tunable white/dim to warm (0.1 W/sqft). Next, be consistent in the contents of the Primary Function Area and Allowed LPD for General Lighting columns. Some rows repeat Primary Function Area, some have "NA", and some rows repeat general lighting LPD.	No	No	No

Appendix A: Substantive Additional Mark-up Language

The appendix provides code language mark-ups for longer edits that did not fit into the table format in *Table 1: Substantive Recommendations – 45-Day Express Terms*.

Remark # 2 (Substantive) | Multifamily Restructuring, Skylight Properties (Additions and Alterations)

Delete the “R” from “RSHGC” in Table 180.2-B as shown below. The yellow highlighted text is new since the comments submitted on May 3, 2024.

Table 180.2-B Altered Fenestration Maximum U-Factor and Maximum RSHGC (Continue)

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, 4 habitable stories and greater	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, 4 habitable stories and greater	RSHGC	0.35 NA	0.25	0.25 NA	0.25	0.25 NA	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Skylights, 4 habitable stories and greater Serving Common Areas	VT ²	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

Remark # 14 (Substantive) | Single Family & Multifamily Residential HVAC Performance

The CASE Team recommends retaining the original language and limiting the selection of outdoor winter heating design conditions to the Winter Median of Extremes value from JA2. Adding the 99.0% percentage level leads to confusion since Title 24, Part 6 Joint Appendix 2 (JA2) Table 2-3 does not have 99.0% data and cannot be interpolated. However, the *2021 ASHRAE Handbook - Fundamentals*² does have 99.0% temperatures but are significantly higher than any of the JA2 values. See Table 1 below for a comparison of Median of Extreme temperatures from JA2 as compared to the 99.0% temperatures from the Fundamentals Handbook for three example locations in the bolded cells. Note that there is an approximately 30 degree difference between these two percentages. Based upon these differences, sizing heating systems no lower than the 99.0% temperatures would likely result in significantly undersized heating systems. This may not be a problem with residential gas furnaces which are generally oversized, but would be potentially an issue for heat pumps in meeting 150.0(h)5 where heat pump heating capacity are required to meet minimum heating requirements without supplementary heating. See Table 2 below for a comparison of cooling design temperatures.

If the Fundamentals Handbook is referenced as an optional source of design conditions, the acceptable winter heating design percentage will have to be specified so that the design temperatures are reasonably close to JA2 to avoid confusion. In looking at the three example locations, it appears that the Fundamentals Handbook 5-Year Return Period Values of Extreme Temperatures are closest to the JA2 Median of Extremes temperatures. For Twentynine Palms, the two values differ by one degree while for Riverside, there is a three degree difference, and the 20 or 50 year Return Period Values are closer to JA2. For Sacramento, the difference is two degrees, and the Mean Extreme Annual Temperature Minimum is closer to JA2.

² The *2021 ASHRAE Handbook – Fundamentals* is available here: <https://www.ashrae.org/technical-resources/ashrae-handbook>

Table 1: Examples of Winter Heating Design Temperatures (Degrees Fahrenheit) Comparing JA2 with Fundamentals Handbook

Source	Percentage Levels	Twentynine Palms (Degrees Fahrenheit)	Riverside (Degrees Fahrenheit)	Sacramento Airport (Degrees Fahrenheit)
Joint Appendix JA2 Table 2-3 (ASHRAE Climatic Data for Region X)	99.4%	29	35	33
	99.8%	26	32	31
	Median of Extremes	21	27	26
ASHRAE Fundamentals Handbook	99.0%	50	63	54
	99.6%	49	62	54
	Mean Extreme Annual Temperature Minimum	25	32	27
	Year Return Period Values of Extreme Temperatures (for 5 years)	22	30	24

Table 2: Examples of 1 Percent Summer Cooling Design Temperatures (Degrees Fahrenheit) Comparing JA2 with Fundamentals Handbook

Source	Twentynine Palms DB/MCWB (Degrees Fahrenheit)	Riverside DB/MCWB (Degrees Fahrenheit)	Sacramento Airport DB/MCWB (Degrees Fahrenheit)
Joint Appendix JA2 Table 2-3 (ASHRAE Climatic Data for Region X)	106/70	99/68	98/70
ASHRAE Fundamentals Handbook	106/67	98/69	98/69

DB = Dry Bulb

MCWB = Mean Coincident Wet Bulb

Appendix B: Non-Substantive Additional Mark-up Language

The appendix provides additional justification for non-substantive recommendations that did not fit into the table format in *Table 2: Non-Substantive Recommendations –45-Day Express Terms*.

#73 (Non-substantive) | Single Family and Multifamily Residential HVAC Performance

The recommendation is to retain the original language and limit the selection of outdoor design conditions to only reference Joint Appendix 2 (JA2), which is based upon ASHRAE Climatic Data for Region X. The added listed sources (with the exception of ASHRAE Fundamentals Handbook) do not have design conditions.

However, there are also concerns with the use of ASHRAE 2021 Fundamentals Handbook data which are described as follows:

1. There are only 146 California weather locations compared to the 800+ locations listed in JA2. Therefore, JA2 provides substantially more geographic granularity and potentially more accurate HVAC equipment sizing.
2. The percentage levels for winter heating conditions do not match JA2. The following percentage levels are provided:
 - a. Joint Appendix JA2 Table 2-3 (ASHRAE Climatic Data for Region X)
 - i. 99.4%
 - ii. 99.8%
 - iii. Heating Winter Median of Extremes.
 - b. ASHRAE Fundamentals Handbook
 - i. 99.0%
 - ii. 99.6%
 - iii. Mean Extreme Annual Temperature Minimum
 - iv. Year Return Period Values of Extreme Temperatures (for 5, 10, 20 and 50 years).
3. The summer cooling design conditions at the 1% level do not match JA2. See Table 2 above for comparison of conditions for example cities. For Riverside and Sacramento, the differences are minor, but for Twentynine Palms there is a three degree difference in the Mean Coincident Wet Bulb which impacts the sensible heat ratio and, potentially, the equipment sizing and operating conditions. In this example, if an HVAC sized for cooling, a three degree lower wet bulb temperature may allow for a smaller size condensing unit with the same size coil

with a higher air flow (CFM/ton) to meet the total load with the higher sensible heat ratio.

4. The tables are difficult to read and may lead to confusion and errors.

See Table 1 in Appendix A Remark 14 for a comparison of conditions for example locations.

It is acknowledged that the 2021 Fundamentals Handbook is more current than JA2, but the net benefits of using the proposed 2025 JA2 outweigh those of the newer data for the reasons described above. The ideal solution is to update the JA2 data by updating the source data which is the ASHRAE Climatic Data for Region X for the next 2028 update. Alternately, a study may first be conducted to investigate if more advanced methods of determining design conditions should be used instead.

If the 2021 Fundamentals Handbook design conditions are to be included as an option to JA2, Section 150.0(h)2C will need revision to reflect the appropriate temperature percentage that is allowed.