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Silicon Valley Mechanical Comments on 15-Day Language

Additional submitted attachment is included below.

Silicon Valley Mechanical

TO THE OFFICE OF

COMISSIONER ANDREW MCALLISTER
CALIFORNIA ENERGY COMMISSION

415 P Street
Sacramento, CA 95814

2025 Building Energy Efficiency Standards, Title 24 Part 6
Proposed 15-Day Language Comment Submittal

JUNE 28, 2024

Submitted on behalf of Silicon Valley Mechanical, Inc.
Blaine Flickner, PE
President

Silicon Valley Mechanical

June 28, 2024

Commissioner Andrew McAllister
California Energy Commission
715 P Street
Sacramento, CA 95814

RE: 2025 Building Energy Efficiency Standards, Title 24 Part 6 Proposed 15-Day Language

Dear Commissioner McAllister,

I am writing to submit comments regarding the proposed 2025 Building Energy Efficiency Standards. While I appreciate the efforts and the thorough work that has gone into these proposals, I believe there are several areas where constructive criticism may lead to further improvements.

Our comments include assessments of the proposed changes and offer suggestions that aim to enhance the efficiency, effectiveness, and practical application of the Building Energy Efficiency Standards. The primary focus of our concerns center on the requirements of §140.4 pertaining to prescriptive requirements of nonresidential mechanical systems. We have separated our comments in the following pages with the hope that it simplifies the review process for your team.

Please feel free to contact me at your convenience, I would welcome the opportunity to discuss these points in greater detail and provide any further clarification if needed.

Thank you for considering my input. I look forward to your response and to the continued progress of our shared goals in energy conservation and sustainability.

Sincerely,

Blaine Flickner, PE
President
Silicon Valley Mechanical, Inc.

2025 Energy Code Rulemaking
Docket 24-BSTD-01 Submission
June 27, 2024

Silicon Valley Mechanical

Comment 1 of 5

Subject: Space heating hot water temperature limits in §120.2(l) and §140.4(a)3Aiii

We have concerns with the space heating hot water (HHW) temperature restrictions of 130°F in §120.2(l) and 105°F in §140.4(a)3Aiii.

The energy models that surveyed these options do not account for a major factor of heat exchanger efficiencies: as the HHW temperature decreases, the log mean temperature difference of heat exchangers/coils drops drastically. Simply put, reducing HHW coil temperature decreases energy efficiency and heating efficacy regardless of the type of unit in which they are employed.

To compensate for the heat exchanger deficiency, corresponding fan systems will be required to adjust in either of the following ways to continue to meet the space load:

1. The coil depth will need to increase to allow more area for the heat exchange to take place. An increase to coil depth adds pressure drop to the fan system, even during periods of non-use on the coil. This pressure loss increase will contribute to increased energy usage of the building. Further, the current fan power budget allowances in §140.4(c) do not account for this increase of pressure drop for its hot water coil components.
2. The other option to overcome ineffective coils at the lower water temperature is to increase the amount of CFM required to heat the space to keep the same coils as before. Increasing the CFM raises the energy usage as the fans will be required to run at a higher speed due to an inefficient coil.

We recommend removing the new HHW temperature restrictions from §120.2(l) and §140.4(a)3Aiii entirely and instead changing them to the manufacturer's requirements for the heat pump.

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Comment 2 of 5

Subject: Fan coil unit four-pipe configuration requirements in §140.4(a)3Aii

The proposed specifications in §104.4(a)3Aii neglect to factor that many zones do not require space heating. Necessitating a four-pipe configuration in non-heated zones would create extraneous air pressure loss of the fan. For zones that do require heating, design engineers often use changeover coils to mitigate air pressure loss to the fan system.

Recommended changes to §140.4(a)3Aii language:

> *The space-conditioning system shall be two-pipe or four-pipe fan coil (FPFC) terminal units with a DOAS providing ventilation to all zones served by the space-conditioning system. When the fan coil requires heating, the ~~The~~ FPFC hot water or changeover coils shall be supplied by an air-to-water heat pump (AWHP) space-heating hot water loop that complies with Section 140.4(a)3C. Indoor fans shall meet the requirements of Section 140.4(a)3D. The DOAS shall comply with Section 140.4(a)3E. Fan coil units utilizing changeover to provide heating to the zone shall be equipped with changeover controls at each individual fan coil unit.*

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Comment 3 of 5

Subject: Required loop fluid volume in §140.4(a)3Ciii

§140.4(2)3Ciii states: *"The loop fluid volume shall not be less than 8 gallons per nominal ton of heating capacity of the loop"*

There are three primary concerns with this restriction as written:

1. The 8 gal/ton requirement contradicts typical manufacturer installation manual requirements of providing ~6 gallons/ton for two-pipe AWHPs, and ~9 gal/ton for four-pipe simultaneous AWHPs. Most design engineers do not size the primary loop volume for all the equipment capacity in the plant and only size it for the minimum design condition to prevent short cycling and wear on the equipment.
2. The code language is also unclear whether the entire loop fluid volume shall be considered in the requirement or if only the primary side of the bypass fluid volume is required to be considered.
3. We have concerns around the clarity of whether additional modular units provided for defrost de-rate, any redundant AWHPs, or any electric resistance boilers required by §140.4(a)3Civ also needs to be included in the requirement.

We suggest the following language for §140.4(a)3Ciii:

> *ii.* *The loop fluid volume shall not be less than the manufacturer requirements to prevent short cycling during minimum load conditions, ~~8 gallons per nominal ton of heating capacity of the loop~~ and*

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Comment 4 of 5

Subject: VRF fan coil unit efficiency in §140.4(a)3D

Restrictions in §140.4(a)3D will heavily limit the application of VRF fan coil units due to the following factors:

1. The efficiency requirement of 0.35 W/cfm is not attainable on most major manufacturer's smaller sized VRF fan coil units which are typically closer to 0.4 W/cfm.
2. Most available VRF fan coil units do not have listed partial power draw values with cfm values divided into exact thirds such as to meet the power draw limits at 66% and 33% of air flow. For example, a 1.25 ton ducted fan coil unit will have three speeds, and the cfm values of those speeds are 580, 530 & 500.
3. Depending on their size, many non-ducted VRF fan coil units only have two speeds, not the proposed three speeds.

Further, as larger sized units more typically meet the §140.4(a)3D requirements than smaller units, design engineers are likely to select larger units than under previous code cycles to comply with the prescriptive requirements – which will increase overall building energy usage and demand.

Lastly, fan efficiency is addressed in §140.4(m), so eliminating the following language will reduce redundancy and minimize conflicting standards.

In light of the above listed real-world limitations, we recommend the following changes to §140.4(a)3D:

D. Indoor Fans. Indoor fans used to comply with the requirements of Section 140.4(a)3Ai, or 140.4(a)3Aii, or 140.4(a)3B, shall meet the requirements of 140.4(m) ~~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.~~

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Comment 5 of 5

Subject: Clarification of intent for §140.4(a)3

§140.4(a)3 is currently titled "*Multi-zone space conditioning system types*" but includes single-zone space-conditioning systems. Four pipe fan coils are single-zone air handling units served by a central plant hot water and central chiller plant. We identified three possibilities for the **intent** of the code section. Depending on the CEC intention of the section, we have outlined recommended corresponding changes for clarification and application.

I. If the intent of §140.4(a)3 is meant to address the requirements of single-zone air handling units served by a central plant or central condensing unit, we recommend this clarifying language:

3. *Single-zone air handling units served by a central plant or central condensing unit.* ~~*Multi-zone space-conditioning system types.*~~ *Space-conditioning systems in office buildings and school buildings not covered by Section 140.4(a)2 shall meet the following requirements:*

In the above circumstance, we also recommend **adding** the following compliance option in section §140.4(a)3A for office spaces:

iv. The space-conditioning system shall be a water source heat pump unit with a DOAS providing ventilation to all zones served by the space-conditioning system. If heat injection is required into the condensing water loop servicing the water source heat pumps, an air-to-water heat pump (AWHP) that complies with Section 140.4(a)3C shall be used. The DOAS shall comply with Section 140.4(a)3E;

II. If the intent of §140.4(a)3 is to address DX multi-zone condensing unit systems that serve single-zone DX fan coil units or other single-zone DX cooling units, we recommend this clarifying language:

3. *Single-zone DX air handling units served by a central condensing unit.* ~~*Multi-zone space-conditioning system types.*~~ *Space-conditioning systems in office buildings and school buildings not covered by Section 140.4(a)2 shall meet the following requirements:*

For this intent, we also recommend entirely removing options §140.4(a)3Aii and §140.4(a)3Aiii as they are hydronic systems and do not fall under the DX category.

Silicon Valley Mechanical

Comment 5 of 5 (Continued)

Subject: Clarification of intent for §140.4(a)3

III. If the intent of §140.4(a)3 is to cover both single-zone air handlers served by a central condensing unit (VRF Systems) AND multi-zone air handlers served by a multi-zone condensing unit (package units):

We suggest removing requirement 140.4(a)3Aii entirely and editing §140.4(a)3Aiii. Our primary justification for these suggestions is that our proposed language allows for systems capable of airside economizing.

1. Unlike VRF which cannot airside economize, VAV systems and other traditional systems that airside economize will be subject to the economizing requirements of §140.4 (e). The benefits of airside economizing include improved indoor air quality and system efficiency.
2. If §140.4(a)3Aii were to be removed, two-pipe and four-pipe fan coil units – which are single zone systems served by a central plant – will still be subject to the requirements of:
    a. §140.4(e) to ensure usage of waterside economizing per system requirements or the heat recovery DOAS requirements of Exception 6,
    b. §140.4(m) for indoor fan efficiency
    c. §140.4(p) for DOAS requirements
    d. §140.4(q) requirements for exhaust air heat recovery.

Recommended §140.4(a)3 changes:

3. Multi-zone space-conditioning system types. Space-conditioning systems in office buildings and school buildings not covered by Section 140.4(a)2 shall meet the following requirements:

A. Offices. Office buildings shall use space-conditioning systems complying with one of the following requirements:

i. 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 140.4(a)3D. The DOAS shall comply with Section 140.4(a)3E.

~~*ii. The space-conditioning system shall be a four-pipe fan coil (FPFC) terminal unit system 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 which that complies with Section 140.4(a)3C. Indoor fans shall meet the requirements of Section 140.4(a)3D. The DOAS shall comply with Section 140.4(a)3E.*~~

ii.~~iii.~~ The space-conditioning system shall utilize heating and/or reheating supplied through a hot water loop served by an AWHP which complies with Section 140.4(a)3C. If additional indoor fans are required for heating or cooling of the spaces, the fans shall meet the requirements of Section 140.4(a)3D. ~~*The system shall be designed to operate with a water temperature leaving the AWHP that is no greater than 105 ºF. Ventilation systems serving the space-conditioning system zones shall be equipped with a heat recovery system in compliance with Section 140.4(q). A hydronic recirculated-air heating system complying with Section 140.4(a)3F shall be used in climate zones 2 through 4 and 6 through 16.*~~