

Proposal Summary

RESIDENTIAL HVAC PERFORMANCE

Updated: Thursday, January 23, 2023
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Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on January 24, 2023. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback.

In this document, [TBD] indicates that the CASE Team is working on the proposal for specific requirements.

To participate or provide information, please email Kristin Heinemeier, kheinemeier@frontierenergy.com and cc info@title24stakeholders.com by **February 7, 2023**.

Data may be provided anonymously.

Measure Description

Design: Load Calculation (Applicable to ALL HVAC)

- **Mandatory: Manual J load calculation would be required.**
 - Design temperatures based on the data from the American Society of Heating and Refrigeration Engineers, “2021 ASHRAE Handbook – Fundamentals”, provided in a new JA2.2.
 - Load calcs would use:
 - Heating design temperatures no lower than the 99% DB
 - Cooling design temperatures no higher than 1% DB and MCWB.
 - Simplifying Assumptions would be allowed for:
 - Like-for-like system replacements
 - Existing systems serving an addition that is less than 144 ft².
 - Simplifying Assumptions not allowed for heat pumps with strip heating.
- **Mandatory when measured infiltration is not used:**

- The Manual J infiltration value used in the calculations no worse than “Average”.
- Would require disclosure that the system could be undersized and future infiltration reduction measures are recommended to improve comfort.
- **Mandatory when measured infiltration is used:**
 - Manual J infiltration value no greater than measured infiltration.
 - Infiltration test per RESNET protocols for existing homes.
 - If measured CFM50 is greater than conditioned floor area, would require disclosure that the system size could have been reduced with very cost-effective infiltration reduction measures.

Design: Load Calculation (Applicable to ALL HVAC)

- **Mandatory for heat pumps:**
 - Installed equipment sized based on ACCA Manual S-2023, substituting the following limits:

Minimum Capacity:

 - Heating Capacity \geq Heating Load

Exception: The heating capacity can be lower if there is no available equipment that has a capacity that will meet the Manual J load.

Maximum Capacity:

 - *Only where Total Cooling Load > Heating Load:*
 - Single Speed:
 - Cooling Capacity \leq Cooling Load + 6,000 Btuh AND
 - Heating Capacity \leq Heating Load + 12,000 Btuh*
 - Part Load (Multi- or Variable-Speed):
 - Cooling Capacity \leq Cooling Load * 0.80 AND
 - Heating Capacity \leq Heating Load * 0.80

Exception: The single speed Max limits are waived if duct size is verified, per Verified Duct Design protocol. *Note this means that in some highly cooling-dominated climate zones, Verified Duct Design will be mandatory.*
- **Mandatory for Cooling-only systems:**
 - Subject to the Cooling limits above.
- **Mandatory for Heating-only systems:**
 - Use Manual S-2023 Table N2.5 for gas furnace sizing.

Design: Verification (Applicable to ALL HVAC)

- **Mandatory:**

- Designer must submit on a CF1R to the local jurisdiction for plan review:
 - Manual J and S Calculations
 - A duct layout or room-by-room list of ducts and diffusers meeting requirements that will likely be based on ACCA Manuals D and T. The specific proposal is currently still under consideration.
 - A self-certification that air distribution design meets best practices, described in ACCA Manual T.

Supplementary Heating (Applicable to HEAT PUMPS)

- **Mandatory if Electric Resistance Strip Heat is used:**

- Simplifying assumptions not allowed in Manual J inputs.
- For existing dwellings, infiltration testing required and the measurement used for Manual J inputs.
- Controls required that use either an outdoor air temperature sensor or an internet weather feed to lock out strip heating whenever the outdoor temperature exceeds 35°. Controls verified.

Exceptions: Supplementary heating can operate during defrost mode or emergency operation.

- Strip heating capacity limited to the maximum of:
 - The difference between the heat pump capacity and design load.
 - [TBD] kw per ton (for defrost).

- **Mandatory if Dual Fuel is used:**

- Controls that lock out fossil fuel use whenever the outdoor temperature exceeds 35°F. Controls verified.

Exception: Supplementary heating can operate during defrost mode or emergency operation.

Defrost (Applicable to ALL Heat Pumps and AC)

- **Mandatory:**

- If it has a defrost delay timer, it must be set and verified to be ≥ 90 minutes

- **Compliance Option for Defrost Smart Control:**

- Embedded controls:

- Demand Control Defrost
- Detection of excessive differential air pressure across coils
- Measurement of coil temperature
- Thermostat-based controls:
 - Turn blower motor off

For this credit, would require that options be configured properly and possibly HERS-verified.

Crankcase Heating (Applicable to ALL Heat Pumps and AC)

- **Mandatory:**
 - **Disallow CCH that runs continuously, even when the compressor is ON.**
 - Installer would be required to provide manufacturer certification that CCH does not run when the compressor is ON, or that there is no CCH.
- **Mandatory, in addition, one of these options would be required:**
 - Install [TBD] additional energy savings measure, saving approximately 200 kWh/yr.
 - Provide manufacturer certification of CCH performance:
 - “P2” measurement from AHRI 210/240 testing, which would be required to be less than [TBD]
 - Type of control, which would be required to include either: Thermostatic Control (off above [TBD] degrees), or Positive Temperature Coefficient Control (wattage varies with temperature).
 - Provide manufacturer certification that the equipment does not have CCH.

Refrigerant Charge Verification (Applicable to ALL non-packaged HVAC)

- **Mandatory in all Climate Zones where verification is found to be cost effective:**
 - Heat pumps and air conditioners would be required to have refrigerant charge verified.
- **Mandatory when charge verification is required, there would be three options available:**
 - Current Standard Charge Verification Procedure
 - Including winter setup and tentative approval with return visit.
 - Only allowed for Single Speed systems.
 - Weigh-In Charging Procedure, with ONSITE Verification

- Current Weigh-In procedure, including ONSITE HERS observation.
Exception: Pre-charged systems with line length less than [TBD].
- Capacity test, including ONSITE HERS verification.
- Weigh-In Charging Procedure, with REMOTE Verification
 - Current Weigh-In procedure, including REMOTE HERS observation.
Exception: Pre-charged systems with line length less than [TBD].
 - Capacity test, including REMOTE HERS verification.
- Sampling allowed only for Standard Charge Verification and Capacity Tests for ONSITE Weigh-In.

Variable Capacity / Zoned Systems (Applicable to ALL Variable Capacity systems)

- **Mandatory for all Variable Capacity/Zoned Systems:**
 - VCMS/Zoned systems must do airflow and efficacy testing in every zonal control mode.

Exception: Systems with integrated compressor/fan speed and zone controls may be tested with all zones calling.
 - For systems with multiple air handlers, the sum of airflows measured at all air handlers must be at least 350 cfm per ton of compressor capacity, not per ton of each air handler capacity.
- **Mandatory for non-zonally controlled VCMS systems with attic ducts:**
 - Performance (airflow, distribution efficiency, and duct loss) will be calculated as a function of instantaneous load.
 - The VCHP-Detailed option will be retained.

Data Needs/Stakeholder Information Requests

Data needs may include:

Energy Savings –

Seeking data on the prevalence of improper refrigerant charge; other impacts of improper refrigerant charge; energy consequences of morning pull-up with supplementary heat compared to no-setback; prevalence and impacts of different crankcase heater methods.

Technical Feasibility –

Stakeholder Outreach: Reliability and benefits of alternative refrigerant charge verification methods; current practices for charge verification; manufacturer recommended charging for heat pumps; required care needed to ensure comfort without auxiliary heating; estimated

current under and oversizing rates and reasons; existing thermostat standards for optimum start functionality; availability and reliability of reported crankcase heater power data.

Contractor Surveys/Focus Groups: How often supplementary heating is included, what type, what kind of control, and why, typical practices for sizing and why, how thermostats are typically set for staging, typical design practices for ducts and diffusers, type of diffusers used.

Customer Surveys: Attitudes towards conventional and dual-fuel heat pumps; any differences in customer willingness to install different types of heat pumps.

Supplementary Heating: Appropriate limits on supplementary heating capacity; potential for OAT lockout, warranty issues for after-market controls; implications for single and variable/multiple speed systems.

Refrigerant Charge Verification: How to use EDDS to verify reports from tools; accuracy and feasibility of alternative methods.

Sizing: Appropriate targets for ft²/ton; implications for single and variable/multiple speed systems; specific requirements and capabilities for OSS and optimal configuration; thermostat capabilities required by other agencies; implications of “smart” adaptive control vs. fixed pre-heat periods or setpoint ramps; methods to ensure proper configuration, over lifetime; simple measures that can be specified in code to improve comfort through duct and diffuser design.

Defrost: Data on technical feasibility of basic defrost efficiency measures; implications of blower fan lockout for single and variable/multiple speed systems.

Crankcase Heaters: Currently available data on reliability.

Market Readiness –

Supplementary Heating: Characteristics of different types of supplementary heating; systems that include OAT supplementary heat lockout; configuration requirements of supplementary heat control; after-market supplementary heat controls.

Refrigerant Charge Verification: Available technician tools with applicability to charge verification.

Sizing: Tools for sizing of AC, Furnace, HP, and supplementary heating; components that are a part of a good diffuser and duct design; thermostats with Optimal Start and staging capabilities.

Defrost: Products with various defrost controls; after-market defrost controls; products that have defrost blower fan lockout.

Crankcase Heating: Products with various crankcase heating control; after-market crankcase heating and controls.

Non-energy Benefits –

Supplementary Heating: Measures necessary to ensure system designed and configured correctly; measures necessary to ensure system is designed and installed correctly; impacts of GHG reductions from energy efficiency.

Refrigerant Charge Verification: Impacts of GHG reductions from energy efficiency.

Sizing: Impacts of GHG reductions from energy efficiency; comfort impacts for heat pumps without supplementary heat, from avoiding cold mornings after setback; comfort impacts from avoiding cold air falling on occupants during defrost; impacts of GHG reductions from energy efficiency.

Defrost: Impacts of GHG reductions from energy efficiency.

Crankcase Heating: Impacts of GHG reductions from energy efficiency; market research to identify potential to harm equipment health if not done correctly.

Costs –

First Costs: For modified refrigerant charging methods, including Technician Tools; eliminating supplementary heat; avoiding the need for a panel modification in additions and alterations; reducing the size of a heat pump and supplementary heating; thermostat that can accomplish Optimal Start; labor for optimal diffuser design; labor costs for efficacy tests modifications for VC/Z systems.

Operational Costs: Change in maintenance costs and EUL for supplementary heating controls; reducing the size of a heat pump and supplementary heating; defrost controls; diffuser design; crankcase heaters not controlled correctly.

Economic Impacts –

Supplementary Heating: Data on adoption of products with different types of supplementary heating (e.g. strip and dual fuel); supplementary heat OAT lockout; proper staging configuration; after-market supplementary heat controls.

Refrigerant Charge Verification: Emerging FDD Tools

Sizing: Data on adoption of thermostats with Optimal Start and staging capabilities.

Defrost: Data on adoption of products with various defrost controls; after-market defrost controls; defrost blower fan lockout; good diffuser and duct design

Crankcase Heating: Data on adoption of products with various crankcase heater control; after-market crankcase heaters and controls.