DOCKETED

Docket Number:	21-BSTD-01
Project Title:	2022 Energy Code Update Rulemaking
TN #:	239056
Document Title:	HVI Comment - Title 24 -15-day language
Description:	N/A
Filer:	System
Organization:	HVI
Submitter Role:	Public
Submission Date:	7/28/2021 11:49:34 AM
Docketed Date:	7/28/2021

Comment Received From: Jacki Donner
Submitted On: 7/28/2021
Docket Number: 21-BSTD-01

HVI Comment - Title 24 Docket 21-BSTD-01, 15-day language

Additional submitted attachment is included below.

HOME VENTILATING INSTITUTE

28 July 2021

Building Standards Office
California Energy Commission
1516 Ninth Street
Sacramento, California 95814

RE: Docket No. 21-BSTD-01, 2022 Energy Code Pre-Rulemaking, Draft Express Terms

Dear CEC Staff:

Thank you for the opportunity to present comments on CEC's Title 24-2022 15-day language. The Home Ventilating Institute (HVI) appreciates staff's consideration and incorporation of several of HVI's comments submitted to prior versions of the draft express terms (especially those comments submitted within 19-BSTD-03 TN# 237402). While the revisions made by CEC staff within the 15-day language provide a substantial improvement over the prior language, several of HVI's comments went unaddressed, some of which have a very large effect on energy use. Especially concerning are certain CEC proposals that have not been supported by an IAQ or cost-effectiveness analysis and should be tabled until such an analysis is provided. This letter provides a topical summary of HVI's most prominent concerns with the 15-day language, with a focus on supporting cost-effective provision of residential IAQ for builders and residents.

About HVI
HVI is an ISO 17065 compliant certification body and a trade association representing over 100 manufacturers located in North America, South America, Asia, and Europe. Our manufacturer members provide the residential and light commercial ventilating products that deliver essential indoor air quality to California's homes and businesses. HVI's Certified Product Database contains listings for heat and energy recovery ventilators (H/ERVs), bath/utility room exhaust fans, kitchen exhaust fans, dryer exhaust duct power ventilators, in-line supply and exhaust fans, whole-house fans, duct termination fittings, and soffit vents, among other products.

Topic 1: Exhaust Fan Lighting

1. General requirements: Within Table 100.0-A, the 45-day language added requirements for indoor lighting of single-family dwelling units to comply with Section 130.0. However, the scope of Section 130.0(a) does not include indoor lighting of single-family dwelling units. For consistency, please modify Table 100.0-A as follows:

Occupancies	Application	Mandatory
Single-Family	Indoor Lighting (conditioned, unconditioned, and parking garages)	110.9, ~~130.0,~~ 150.0(k)

2. Dimming controls: CEC's proposed revisions to Sections 150.0(k)2F and 160.5(a)2F will introduce a new requirement for all range hoods lighting to be provided with dimming controls. Any such proposal should be accompanied by a cost effectiveness study in compliance with the Warren-Alquist Act; however, HVI is not aware of any cost effectiveness study to support the

requirement to provide range hood lighting with dimming controls. Range hood lighting differs from general lighting in the following ways:

a. Range hood lighting is used for task lighting during cooking, when brightness is often desired.
b. Controls for range hood lighting are typically located on the device, limiting the ability to use after-market, wall-mounted dimming controls.
c. Range hood lighting is subject to higher temperatures which restricts the selection of high efficacy lighting that can be used for this application.
d. In many cases, range hood lighting is provided with two or more brightness levels, but dimming controls are very rare.

Finally, if CEC introduces dimming control requirements for range hoods in addition to the new requirements for range hood capture efficiency, the number of compliant products will be severely restricted. The CASE team's estimate of incremental costs for introducing capture efficiency requirements for range hoods did not take dimming requirements into consideration. For these reasons, please exempt range hoods from the dimming controls requirements.

3. Lighting requirements for alterations: Section 150.2(b)1K (Section 180.2(b)4A for multifamily) requires altered luminaires to meet the requirements of Section 150.0(k) (Section 160.5(a) for multifamily) and Table 150.0-A (Table 160.5-A for multifamily). However, Section 150.0(k)1A (Section 160.5(a)1A for multifamily) provides exceptions for compliance with Table 150.0-A (Table 160.5-A for multifamily) in certain cases, including exhaust fan lighting. This exception is especially important for range hood lighting that is subjected to higher environmental temperatures than general lighting and for which high efficacy options are significantly restricted. For consistency, and because no cost-effectiveness study was presented to remove these exceptions in the case of alterations, please extend the same exceptions to these sections by only requiring compliance with Table 150.0-A through reference to Section 150.0(k), as follows (similar change proposed for Section 180.2(b)4A):
   Lighting. The altered lighting system shall meet the lighting requirements of Section 150.0(k). The altered luminaires shall meet the luminaire efficacy requirements of Section 150.0(k)~~ and TABLE 150.0-A~~…

Topic 2: Range Hood Capture Efficiency

Conceptually, HVI supports CEC's proposed requirements to establish a minimum range hood capture efficiency (RHCE) with the option to comply using a proxy airflow during this cycle. However, CEC's RHCE targets were developed by LBNL assuming that the minimum RHCE should be determined based on the exposure for a person somewhere else in the home besides the kitchen (i.e., assuming that the home is a well-mixed zone). This approach significantly underestimates the exposure for those in proximity to cooking – especially the exposure for the cook. To provide adequate protection for the cook, regardless of the size of the dwelling unit that the cook happens to be in, it is prudent to establish a minimum RHCE/proxy airflow that is at the higher end of the range that LBNL recommended based on dwelling unit size. HVI requests that CEC modify Table 150.0-G to use the following values for RHCE and proxy airflow within this cycle. Please see 19-BSTD-03 TN# 235643, "Home Ventilating Institute Comments - Response to CEC's Nov 3 Proposal to Establish Minimum Capture Efficiency for Range Hoods" and 19-BSTD-03 TN# 236371, "HVI Comments on 2022 Energy Code Pre-Rulemaking," for a detailed justification supporting this recommendation:

- Electric cooking: RHCE ≥ 65% or airflow ≥ 160 cfm
- Gas cooking: RHCE ≥ 80% or airflow ≥ 250 cfm

Topic 3: Verification of Airflow by the System Installer
CEC has proposed to modify ASHRAE 62.2 to restrict the methods of ventilation airflow verification by the system installer. HVI opposes these modifications on the grounds that no performance data have been presented to demonstrate that IAQ is compromised by following the 62.2 verification options or to substantiate restricting ASHRAE 62.2 options. If IAQ is not affected by these changes, then CEC should demonstrate cost-effectiveness of these proposed modifications in accordance with the Warren-Alquist Act; no such cost-effectiveness study has been presented. As such, HVI requests that CEC continue to align Title 24's airflow verification requirements with ASHRAE 62.2. The following modifications are proposed in this regard:

1. Manufacturer design criteria. ASHRAE Section 5.4 permits "manufacturer design criteria (to be used) in place of a measurement" when verifying local exhaust airflows. Until data are presented that demonstrate that these options compromise IAQ, please modify Sections 150.0(o)1Gv and 160.2(b)2Avie to provide the option for manufacturer design criteria to be used for verifying local exhaust airflows. The following language is offered for CEC's consideration: 150.0(o)1Gv, new subsection "c" (similar change recommended for 160.2(b)2Avie): 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 manufacturer's sizing instructions. Manufacturer sizing instructions shall verify that the duct sizing uses the calculation methodology identified in HVI 920 Table AII1, with the exception that the field-installed duct length and number of elbows shall be used. Visual inspection shall verify the installed system conforms with the duct length, diameter, and number of elbows used within the manufacturer's sizing instructions and that the duct system has an exterior termination fitting with a hydraulic diameter greater than or equal to the minimum duct diameter.
2. Manufacturer installation instructions for measurement. ASHRAE 62.2 Section 4.3 permits ventilation airflows to "be measured according to the ventilation equipment manufacturer installation instructions" and also permits measurement by "using a flow hood, flow grid, or other airflow measuring device at the mechanical ventilation fan's inlet terminals/grilles, outlet terminals/grilles, *or in the connected ventilation ducts*." CEC has removed the options to "measure according to the ventilation equipment manufacturer installation instructions" and to take measurements "in the connected ventilation ducts." No data have been presented on IAQ effects or cost-effectiveness associated with these modifications. In the absence of such data, HVI requests that CEC retain these options provided by the consensus standard. The following modifications are offered for CEC's consideration in this regard:
   a. Section 150.0(o)1Gva (similar change recommended for 160.2(b)2Avie1):
   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, or at another location between the inlet and outlet terminals/grilles as specified by the manufacturer in accordance with the procedures in Reference Residential Appendix RA3.7…
   b. Section 150.0(o)1H (similar change recommended for 160.2(b)2Avii):
   The airflow required by 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, or at another location between the inlet and outlet terminals/grilles as specified by the manufacturer in accordance with the procedures in Reference Residential Appendix RA3.7…

c. RA3.7.2.2 Airflow Rate Measurements (similar change recommended for NA2.2.2.2): …Airflows shall be measured at the mechanical ventilation fan's inlet terminals/grilles, ~~or~~ outlet terminals/grilles, or at another location between the inlet and outlet terminals/grilles as specified by the manufacturer.

d. RA3.7.3 Diagnostic Apparatus for Measurement of Ventilation System Airflow (similar change recommended for NA2.2.3): …The airflow rate measurement apparatus manufacturers shall publish in their product documentation, specifications for how their airflow measurement apparatuses are to be used for accurately measuring residential mechanical ventilation system airflow at system inlet ~~or outlet~~ terminals/~~,~~grilles, outlet terminals/grilles, or at another location between the inlet and outlet terminals/grilles as specified by the manufacturer ~~or registers~~ of single or multiple branch ventilation systems….(b) The product manufacturers' product documentation that gives the specifications for use of the airflow measurement apparatuses to accurately measure residential mechanical ventilation system airflow at system inlet ~~or outlet~~ terminals/~~,~~grilles, outlet terminals/grilles, or at another location between the inlet and outlet terminals/grilles as specified by the manufacturer ~~or registers~~ of single or multiple branch ventilation systems.

e. ASHRAE 62.2's approval of ventilation verification that is "measured according to the ventilation equipment manufacturer installation instructions" allows for onboard airflow measurement devices. Such equipment is not permitted by the draft express terms, but again, no data have been presented on IAQ effects or cost-effectiveness associated with these proposed CEC modifications of ASHRAE 62.2. In the absence of such data, HVI requests that CEC retain this option provided by the consensus standard. Initial field testing from HVI's membership has indicated that such equipment can be more accurate than passive flow hoods that CEC currently approves for use in verifying ventilation system airflow. Following is language that is offered in this regard (similar change recommended for Section NA2.2.3.4):
RA3.7.3.4 Onboard Airflow Measurement Device. An instrument that is provided by the ventilation fan manufacturer, integrated with the ventilation fan, and designed for measurement of residential ventilation exhaust or supply airflows that meets the applicable instrument accuracy specifications in RA3.7.2 may be used to measure the mechanical exhaust or supply ventilation airflow.

3. Prescriptive duct sizing. HVI supports CEC's decision to maintain the ASHRAE 62.2 option to use prescriptive duct sizing to verify the local exhaust airflow associated with a range hood capture efficiency target. However, CEC should ensure that this option is used only to the extent that it is supported by physics (i.e., only when the rated airflow is determined at a static pressure of 0.25 in. w.g. or higher, in accordance with 62.2 Section 5.4). For example, a rated airflow that is determined at a lower static pressure (e.g., 0.1 in. w.g.) would need a larger duct diameter than shown in the 0.25 in. w.g. table to maintain that airflow under the conditions assumed in the table. This can be demonstrated through application of the Darcy Colebrook equations provided in the ASHRAE Handbook of Fundamentals. Physics therefore supports removal of the following exception to the prescriptive duct sizing table proposed by CEC in the draft express terms as follows:
   a. Section 150.0(o)1Gv (similar change proposed for Section 160.2(b)2Avie): When using Table 150.0-H for demonstrating compliance, the airflow rating shall be greater than or equal to the value required by 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 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 150.0-H for determining compliance.

   b. Table 150.0-H footnote f (similar change proposed for Table 160.2-H): When a vented range hood utilizes a capture efficiency rating to demonstrate compliance with 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 150.0-H for determining compliance.
   c. RA3.7.4.3 (similar change proposed for Section NA2.2.4.1.4): …The verification procedure shall consist of visual inspection of the installed kitchen range hood to verify and record the following information: … (c) The rated airflow value or rated capture efficiency value listed in the HVI, AHAM, or other CEC-approved directory. If the prescriptive duct sizing method in 150.0(o)1Gvb is used by the installer to verify the airflow value, then the rated airflow value shall be verified using the approved directory at a static pressure difference of 0.25 in. of water.

4. Prescriptive duct sizing alternative. In addition to the manufacturer design criteria option presented earlier in this comment, HVI's nominal installed airflow (NIA) method provides another option for physics-based prescriptive duct sizing. HVI 920 has provisions for the calculation of NIA, which is the prescriptive airflow that is expected in a typical duct system that complies with the specifications of HVI 920 Table AII1. The following language is offered for CEC's consideration (as new subsection to Sections 150.0(o)1Gv and 160.2(b)2Avie) to provide a physics based prescriptive duct sizing option for rated airflows that are not determined at a static pressure of 0.25 in. w.g. or greater:
   [New subsection "d":] As an alternative to performing an airflow measurement of the system as installed in the dwelling unit, compliance may be demonstrated for a range hood and duct system that complies with this section. The rated airflow used for compliance shall be a nominal installed airflow determined in accordance with HVI 920. Visual inspection shall verify the installed system has a duct length that does not exceed 10 feet, has a duct hydraulic diameter and exterior termination fitting hydraulic diameter that is greater than or equal to the diameter associated with the rated nominal installed airflow, and has no more than 3 elbows.
5. Instrument accuracy. The current accuracy requirement for airflow verification instruments is too stringent at the low end of the ventilation rates that may be provided in accordance with the energy code and is not supported by ASHRAE 62.2 or ANSI/RESNET/ICC 380-2019 Section 6.2.1.1.1. For example, requiring that the equipment accuracy must be equal to or better than ± 10% of a continuous, 20 cfm bathroom exhaust rate in compliance with Table 150.0-F translates to an accuracy of ± 2 cfm, which may be beyond that which can be provided by typical diagnostic equipment. For these reasons, it is reasonable to place a lower bound of 5 cfm on instrument accuracy, consistent with ANSI/RESNET/ICC 380-2019 Section 6.2.1.1.1, as follows:
   a. RA3.7.2.2 Airflow Rate Measurements (similar change recommended for NA2.2.2.2). All measurements of ventilation fan airflow rate shall be made with an airflow rate measurement apparatus (i.e., sensor plus data acquisition system) having an accuracy equal to or better than ± 10% of reading or 5 cfm, whichever is greater.

Topic 4: Makeup Air

CEC has introduced requirements for makeup air that are restricted to kitchen exhaust hoods. As stated in prior comments, HVI supports requirements for makeup air that are applied equally to all exhaust ventilation systems, with alternative compliance paths provided for systems that do not readily accommodate MERV 13 filtration for makeup air (i.e., for systems such as exhaust-only dwelling unit ventilation and whole-house fans). Understanding that CEC will not likely be able to accommodate equivalent provisions for systems such as exhaust-only dwelling unit ventilation and whole-house fans within this cycle, HVI requests that CEC address them in the next cycle. Within this cycle, HVI requests that CEC apply the makeup air requirements equally across all kitchen exhaust systems (e.g., hoods, wall-mount, ceiling-mount, downdraft, etc.). This could be accomplished with the following modification to the definition of makeup air:

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 a kitchen exhaust inlet ~~hood~~; and replaces air, vapor and contaminants being exhausted by the kitchen exhaust inlet ~~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 an ~~the~~ exhaust ~~hood~~ system.

Topic 5: Filtration

HVI supports CEC's expansion of its outdoor air filtration requirements to include makeup air and requests that CEC provide further clarification regarding when filtration is required for integrated systems. Specifically, when a ventilation system supplies outdoor air through a heating or cooling system's MERV 13 filter prior to its introduction into the breathing zone, there is no need to provide an additional MERV 13 filter for the ventilation system. Clarifying this exception will reduce fan power, fan noise, first-costs, and maintenance costs while still delivering the intended IAQ. CEC's prior study to support the MERV 13 filtration of outdoor air did not propose or provide a case for double filtration, so please clarify the language to align with CEC's original intent in this regard. The following language is offered as a modification to Section 150.0(m)12A for this purpose (similar change recommended for Section 160.2(b)1A):

EXCEPTION 2 to Section 150.0(m)12A: Systems specified in Section 150.0(m)12Ai that are integrated with the duct system of a space conditioning system such that the outdoor air passes through the space conditioning system's air filter prior to introduction to the occupiable space are exempt from the air filtration requirements in Section 150.0(m)12.

Topic 6: Fan Efficacy Determination

HVI supports the alignment of cost-effective fan efficacy requirements and appreciates CEC's modifications within the 15-day language that help clarify how to determine fan efficacy for H/ERVs. Section 170.2(c)3Bivc of the 15-day language also establishes a new requirement for fan efficacy for balanced ventilation systems without heat or energy recovery; consequently, the guidance in RA3.7.4.4.3 and NA2.2.4.1.5.3 should be expanded to include the procedure for determining fan efficacy for these systems. There are basically two types of in-suite balanced ventilation systems that are not H/ERVs: "integrated supply and exhaust ventilator" (a product class recognized by HVI 920 that is essentially a single box with a supply and exhaust component) and balanced systems composed of separate but interlocked supply and exhaust systems. The following modifications are proposed to Section RA3.7.4.4.3 (similar changes recommended to NA2.2.4.1.5.3) to clarify how fan efficacy should be determined for each of these system types:

1. New section c for integrated supply and exhaust ventilator: If compliance with a fan efficacy performance rating (w/cfm) is required for a balanced, integrated supply and exhaust ventilator without heat or energy recovery, then determine and record the fan efficacy rating for the installed model using the model details in the energy ratings in the HVI or other CEC-approved directory in accordance with steps a, b, and c below.

a. Record the required ventilation airflow (cfm) for the integrated supply and exhaust ventilator as specified on the certificate of compliance.

b. From the energy ratings in the HVI or other CEC approved directory, determine, and record the rated Power Consumed (Watts), at the closest Net Airflow (cfm) listed in the directory that is greater than or equal to the ventilation airflow (cfm) required on the certificate of compliance. Alternatively, linear interpolation of the directory ratings shall be allowed if the interpolated value is calculated based on a Net Airflow (cfm) that is equal to the ventilation airflow (cfm) required on the certificate of compliance. Interpolation shall be in accordance with equation RA3.7-2. Extrapolation of the directory ratings shall not be allowed.

Equation RA3.7-2 pc = pc1 + [(na – na1) / (na2 – na1)] X (pc2 – pc1)

where: na is the known value for Net Airflow equal to the ventilation airflow required on the certificate of compliance, pc is the unknown value for Power Consumed (Watts). na1 and pc1 are the closest rated values for Net Airflow (cfm) and Power Consumed (Watts) respectively that are below the known na value. na2 and pc2 are the closest rated values for Net Airflow (cfm) and Power Consumed (Watts) respectively that are above the known na value.

c. Divide the value for Power Consumed (Watts) recorded in step b, by the Net Airflow (cfm) used in step b to determine the system's fan efficacy.

2. New section d for a balanced system composed of separate but interlocked supply and exhaust systems: If compliance with a fan efficacy performance rating (w/cfm) is required for a balanced system composed of separate but interlocked supply and exhaust systems without heat or energy recovery, then determine and record the fan efficacy rating for the installed system using the model details in the energy ratings in the HVI or other CEC-approved directory in accordance with steps a, b, and c below.

   a. Record the required ventilation airflow (cfm) for the balanced system as specified on the certificate of compliance.

   b. From the energy ratings in the HVI or other CEC approved directory, for both the exhaust system and supply system components, determine and record the rated Input Power (Watts), at the closest Rated Airflow (cfm) listed in the directory that is greater than or equal to the ventilation airflow (cfm) required on the certificate of compliance. Alternatively, linear interpolation of the directory ratings shall be allowed if the interpolated value is calculated based on a Rated Airflow (cfm) that is equal to the ventilation airflow (cfm) required on the certificate of compliance. Interpolation shall be in accordance with equation RA3.7-3. Extrapolation of the directory ratings shall not be allowed.

   Equation RA3.7-3 ip = ip1 + [(ra – ra1) / (ra2 – ra1)] X (ip2 – ip1)

   where: ra is the known value for Rated Airflow equal to the ventilation airflow required on the certificate of compliance, ip is the unknown value for Input Power (Watts). ra1 and ip1 are the closest rated values for Net Airflow (cfm) and Input Power (Watts) respectively that are below the known ra value. ra2 and ip2 are the closest rated values for Net Airflow (cfm) and Power Consumed (Watts) respectively that are above the known ra value.

   c. Sum the Input Power (Watts) recorded for the exhaust system and the supply system in step b, and divide the result by the Rated Airflow (cfm) used in step b to determine the system's fan efficacy.

Additionally, please note the following erratum that should be corrected within Section RA3.7.4.4.3 (similar changes recommended to NA2.2.4.1.5.3):

c. Divide the value for Power Consumed (Watts) recorded in step b, by the Net Airflow (cfm) used in step b to determine ~~Power Consumed~~fan efficacy.

Topic 7: Central Fan Integrated Systems

Of the several topics referenced in this letter, this one may have the greatest effect on energy use of an individual dwelling unit. CEC's proposed changes to the draft express terms will require the operation of any ventilation system that is integrated with a space conditioning system's ducts to trigger the operation of the space conditioning system's fan. HVI is not cognizant of any consensus standard or model code that supports this proposed requirement. Additionally, HVI estimates the typical energy penalty associated with this requirement to be roughly 1,700 kWh annually per dwelling unit[1] – an enormous penalty that is comparable to adding ~4 refrigerators[2] to any home. Despite this large impact and despite this proposal going far beyond the requirements of any known consensus standard or model code, CEC has not provided an energy impact analysis, cost effectiveness analysis, or IAQ analysis to support this proposed change. CEC would reject any proposal from the public that did not provide such an analysis. HVI urges the commission to conduct such an analysis in accordance with the Warren-Alquist Act and to provide results for public review prior to making such a significant change to a very common installation configuration. As with the central fan interlock issue, CEC's proposal to introduce requirements for motorized dampers on central fan integrated ventilation systems was not accompanied by an IAQ or cost-effectiveness analysis and should be tabled until such an analysis is provided. If CEC elects to move forward without providing such an analysis for central fan interlock and for motorized dampers, then HVI requests that CEC at least provide reasonable exceptions to these requirements, such as those that are provided in the comments below.

---

[1] Annual central air handler energy savings for a single-family detached home were estimated at 1016 kWh, based on the following assumptions: 2300 sqft, 2-story, 3-bedrooms, balanced ventilation, 0.47 weather and shielding factor; resulting in 99 cfm Qtot, 22 cfm Qinf, 77 cfm Qfan; variable ventilation Qfan rate at 1.5x continuous Qfan ventilation rate (i.e., 116 cfm; 67% annual duty cycle for ventilation); 25% annual duty cycle for central air handler run time to provide heating/cooling (source: Rudd, A., I. Walker 2007. "Whole House Ventilation System Options – Phase 1 Simulation Study." ARTI Report No. 30090-01, Final Report, March. Air-Conditioning and Refrigeration Technology Institute, Arlington, VA); probability of coincidental operation of central air handler for heating/cooling and variable ventilation system for outdoor air: 67%*25%=17% (this is the % of "free" central air handler energy for distributing ventilation air); 0.58 W/cfm air handler fan efficacy (source: Section 150.1(c)10 prescriptive requirements for air handler efficacy that is not connected to a forced air furnace); 2-ton central cooling unit with airflow rate of 400 cfm/ton; air handler operates at design airflow rate when providing ventilation air (CEC's proposed language is silent on the operational speed of the central air handler, so the design rate is assumed to estimate an upper bound for coincidental energy use); result: 1016 kWh/yr consumed by central air handler for heating and cooling, 2710 kWh/yr consumed by central air handler for heating, cooling, and distributing ventilation air, 1694 kWh/yr savings potential when discrete ventilation fan is not interlocked with the central air handler.

[2] U.S. DOE's Federal Energy Management Program estimates typical, new refrigerators to use 403 kWh annually: https://www.energy.gov/eere/femp/purchasing-energy-efficient-residential-refrigerators.

1. Motorized Dampers – Clarifications: Please clarify that a motorized damper that is integral to a ventilation system can meet the requirement for a motorized damper in Sections 150.0(o)1Biii. For such systems, there is no need to have an additional damper "installed on the connected ventilation duct(s)."
2. Motorized Dampers - Recommended Exceptions: Motorized dampers can effectively reduce leakage through outdoor air versus gravity dampers in certain situations, such as when the ventilation system is off and when the central air handler's induced pressure would cause the gravity damper to open during operation. However, there are cases when there is no added value associated with specifying a motorized damper, such as:
    a. Where the ventilation system's discrete fan is designed to operate continuously,
    b. Where a gravity damper is provided on an outdoor air duct connected to the central air handler's supply duct, or
    c. Where a gravity damper is provided on an exhaust duct connected to the central air handler's return duct.
    d. Where a gravity damper is provided on an outdoor air duct connected to the central air handler's return duct and such gravity damper is provided with a mechanism that prevents its opening under the design negative static pressure of the central air handler's return duct. For example, some ventilation fan manufacturers provide integral gravity dampers with magnets that can be used for this purpose. Dampers held closed by such magnets open at static pressures that are expected to be beyond that which would be experienced during the run time of a typical central air handler's connected duct. For example, a magnet providing a resistance to a static pressure of 0.75 in. of water is well above that which is likely to be experienced in a typical central air handler's return trunk (e.g., 0.25 – 0.5 in. of water in practice).

    For these situations, CEC should introduce an exception to the proposed motorized damper requirements.
3. Damper Control – Recommended Exception: Generally speaking, the requirements in Section 150.0(o)1B.iii to close dampers when the ventilation system is not operating and open dampers when the ventilation system is operating are good practice. However, this section (perhaps inadvertently) prohibits H/ERVs from using recirculation defrost when connected to a duct system serving a space conditioning system. Such a condition is not expected to occur frequently, especially for systems specified in California, and when there is a need to defrost an H/ERV, recirculation defrost will result in lower contributions to peak power than electric resistance defrost. To ensure that such recirculation defrost H/ERVs, which represent the vast majority of H/ERVs available in North America, can continue to be used and integrated with central air handler ducts in California, HVI offers the following options for CEC's consideration:
    a. Retain the previous definition of the VENTILATION SYSTEM, CENTRAL FAN INTEGRATED, or CFI within Section 100.0 to exclude discrete ventilation systems with dedicated fans from the definition,
    b. Provide an interpretation to confirm that an ''outdoor air fan'' is not considered an ''outdoor air fan'' for an H/ERV during recirculation defrost, or
    c. Change 150.0(o)1Biii as follows: "…If the outdoor airflow for the CFI system is ~~fan-~~ powered by a discrete ventilation system with a dedicated fan, then the outdoor air fan shall not operate when the required motorized damper(s) on the outdoor air ventilation duct(s) is closed, except during a defrost cycle."
4. Central Air Handler Interlock – Recommended Exceptions: Central air handler interlock with a ventilation system that uses a discrete fan to supply outdoor air to a central air handler's duct system can provide an effective means for controlling the direction and distribution of outdoor

airflow. However, interlocking the operation of the central air handler is not required to accomplish these ends in all cases. For example, the following configurations can provide effective means of accomplishing these ends while saving hundreds to thousands of annual kilowatt-hours of central fan energy consumption per dwelling unit:

a. Where an outdoor air supply duct is routed to the central air handler return duct, upstream of the central air handler filter; the instantaneous or design condition ventilation supply air temperature is no less than the minimum return temperature permitted by the manufacturer of any furnace connected to the central air handler return; and there is no H/ERV exhaust ducted to the central air handler return.
b. Where an outdoor air supply duct with an integral MERV 13 filter is routed to the central air handler return duct, downstream of the central air handler filter; the instantaneous or design condition ventilation supply air temperature is no less than the minimum return temperature permitted by the manufacturer of any furnace connected to the central air handler return; and the H/ERV exhaust is not ducted to the central air handler return.
c. Where an outdoor air supply duct is routed to the central air handler supply duct and the H/ERV exhaust is not ducted to the central air handler return.

For the prior situations, CEC should introduce an exception to the proposed interlock requirements. Also, where operation of the dwelling unit ventilation system is interlocked with the central air handler, HVI recommends limiting the central air handler's speed to a low-speed setting to minimize the energy used for distribution.

Topic 8: H/ERV Requirements

HVI supports CEC's proposed requirements for H/ERVs for multifamily dwelling units in the prescriptive path. In alignment with the charge of the Warren-Alquist Act, HVI recommends that CEC expand the prescriptive path requirements for H/ERVs to all climate zones and multifamily building types where they were demonstrated by the CASE team to be cost effective. There were 6 multifamily building prototypes and location combinations for which the specification of H/ERVs was determined to be cost effective but for which neither CASE nor CEC proposed to require H/ERVs within the prescriptive path. For detailed information, please see HVI's comment number III.5 submitted under 19-BSTD-03 within TN# 237402. Additionally, HVI requests that in future cycles, CEC consider expanding the multifamily prescriptive requirement into more climate zones, consider adding a prescriptive requirement for single-family homes, and, when conducting building energy simulations to support these measures, modify the simulation thermostat setpoints to align more closely with those used in other codes and standards (i.e., ASHRAE 90.1 and IECC) and observed in California homes[3].

---

[3] Blasnik et al. 2016. Supplemental Data for California Smart Thermostat Work Paper: Large scale analysis of the efficiency of Nest customer thermostat set point schedules with projected heating and cooling savings compared to baseline behavior using pooled Fixed Regression Model and Comfort Temperature Analysis. https://static1.squarespace.com/static/53c96e16e4b003bdba4f4fee/t/57978c141b631b286ea3dae8/1469549595079/Supplemental+Data+for+California+Smart+Thermostat+Workpaper+-+June+2016.pdf

Thank you again for the opportunity to partner with CEC in developing the 2022 version of the code through submission of pre-rulemaking and rulemaking comments. HVI is especially appreciative of all the effort that staff has dedicated to HVI's concerns and stands ready to support staff with any final modifications needed to close out the 2022 edition.

Sincerely,

Jacki Donner, CEO

Tel: 855.HVI.VENT • Fax: 480.559.9722 • www.hvi.org