

*Comment Received From: HVI  
Submitted On: 1/6/2022  
Docket Number: 21-BSTD-04*

## **HVI Comment - 2022 Energy Code Compliance Manuals and Forms**

*Additional submitted attachment is included below.*



06 January 2022

Building Standards Office  
California Energy Commission  
715 P Street  
Sacramento, California 95814

**RE: Docket No. 21-BSTD-04, Draft 2022 Energy Code Single Family Compliance Manual and Draft 2022 Energy Code Multifamily and Nonresidential Compliance Manual**

Dear CEC Staff:

Thank you for the opportunity to present comments on the Draft 2022 Energy Code Single Family Compliance Manual. The 2022 Energy Code incorporated many changes related to ventilation and indoor air quality, and HVI appreciates the effort required to update the Compliance Manuals to align with the latest requirements. HVI's comments are focused on supporting consistent implementation and enforcement of the 2022 Energy Code and associated ASHRAE 62.2 requirements for ventilation of single-family and multifamily dwelling units by providing clarifications and corrections where necessary. The comments are provided in two appendices: one for single-family and one for multifamily. Comments are indexed using the draft manuals' page number. Italicized text provides background information for the suggested modifications to the manuals' text, which are generally provided in legislative format (i.e., strike-through and underline text).

*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.

Enclosures:

Appendix A: Draft 2022 Energy Code Single Family Compliance Manual Comments  
Appendix B: Draft 2022 Energy Code Multifamily and Nonresidential Compliance Manual

*Advancing the Value of Residential Ventilation for Healthier Living®*

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## Appendix A: Draft 2022 Energy Code Single Family Compliance Manual Comments

*General: Please coordinate with RJ Wichert of CEC to include information on new accessibility and Fault Indicator Display (FID) requirements for supply systems and balanced systems to receive full credit for associated energy savings versus the reference case when a project uses the performance path for compliance. These requirements are detailed in CEC's Alternative Calculation Method reference manuals.*

*2-38: Use the same terminology as ASHRAE 62.2 and the multifamily compliance manual when referencing exhaust system operation types. The Energy Code uses "intermittent ventilation" in place of ASHRAE 62.2's "variable ventilation." Modify this page's and all other references to "intermittent ventilation" to read "intermittent/variable ventilation" to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use "variable ventilation" in place of "intermittent ventilation").*

- Continuous ~~whole-building~~ whole-dwelling unit mechanical ventilation airflow
- Intermittent/variable ~~whole-building~~ whole-dwelling unit mechanical ventilation airflow

*4-87: Use the same terminology as ASHRAE 62.2 and the multifamily compliance manual when referencing exhaust system operation types.*

This section provides basic concepts and context to help navigate the mandatory requirements for ~~intermittent~~ demand-controlled exhaust fans in bathrooms and kitchens, and continuous low-cfm indoor-outdoor (I-O) air exchange in single-family homes.

*4-90: When a ventilation system supplies outdoor air through a space conditioning system's MERV 13 filter prior to its introduction into occupiable space, the Energy Code requirement for MERV 13 filtration should be satisfied. Clarifying this exception will reduce fan power, fan sound, first-costs, and maintenance costs while still delivering the intended IAQ. The CASE study to support the MERV 13 filtration of outdoor air did not propose or provide a case for double-MERV 13 filtration of outdoor air before introduction to an occupiable space, so please clarify the language to align with The Energy Code's intent in this regard.*

The Energy Code includes mandatory requirements for local mechanical exhaust and whole-dwelling unit mechanical ventilation intended to improve indoor air quality (IAQ) in homes and MERV 13 air filtration requirements for recirculated air and outdoor air ventilation systems.

*4-92: Recognize that H/ERVs can be used to ventilate bathrooms.*

2. Kitchens and bathrooms must ~~have local~~ be provided with exhaust fans systems vented to outdoors.

*4-92: Bolster statement that "ventilation air shall come from outdoors."*

Ventilation air shall come from outdoors and shall not be transferred from adjacent dwelling units, garages, unconditioned attics, or crawl spaces. According to Interpretation IC 62.2-2019-1 of ASHRAE 62.2, "air from adjacent spaces cannot be credited toward the outdoor air required."

*4-92: When a ventilation system supplies outdoor air through a space conditioning system's MERV 13 filter prior to its introduction into occupiable space, the Energy Code requirement for MERV 13 filtration should be satisfied. Clarifying this exception will reduce fan power, fan sound, first-costs, and maintenance costs while still delivering the intended IAQ. The CASE study to support the MERV 13 filtration of outdoor air did not propose or provide a case for double-MERV 13 filtration of outdoor air*

*before introduction to an occupiable space, so please clarify the language to align with The Energy Code's intent in this regard.*

6. Mechanical systems ~~including space conditioning systems that supply air to habitable spaces~~ shall be designed to ensure that recirculated air and outdoor air is filtered with a have a MERV 13 or better filter prior to supplying to an occupiable space and shall be designed to accommodate the air filter's rated pressure drop at the designed airflow rate.

4-93: *Clarify that the AHAM directory is approved by CEC in 150.0(o)2B for verifying range hood ratings. Air-moving equipment used to meet the whole-dwelling unit ventilation requirement and the local exhaust requirement shall be rated by HVI or, in the case of kitchen range hoods, AHAM, for airflow and sound:*

4-93: *Clarify that range hoods are exempt from sound requirements provided they have a minimum airflow setting exceeding 400 cfm. Also, align reference to habitable space with ASHRAE 62.2 Exception to Section 7.2 to include bathrooms, toilets, and hallways.*

d. Remotely located air-moving equipment (mounted outside habitable spaces, bathrooms, toilets, and hallways) are exempt from the sound requirements provided there is at least 4 feet of ductwork between the remote fan and interior grille. Kitchen range hoods are also exempt from the sound requirements provided they have a minimum airflow setting exceeding 400 cfm.

4-93: *Modify text to align with the Energy Code's unconventional approach of using W/cfm for fan efficacy instead of cfm/W, meaning that increasing fan efficacy has the effect of reducing energy efficiency. In the future, please modify the Energy Code terminology to align with the industry and ENERGY STAR convention of associating higher fan efficacy with more energy efficient performance. If a central heating/cooling system air-handler fan is used to ventilate the dwelling (central fan-integrated ventilation, also known as CFI ventilation), the air-handler must ~~meet or~~ not exceed the mandatory fan efficacy criteria.*

4-94: *ASHRAE 62.2 and the Energy Code require that dwelling unit ventilation systems sound ratings be listed by HVI; the Energy Code also recognizes AHAM listing as an alternative compliance option for listing of sound ratings for range hoods. Specification of systems with low-sone sound ratings is especially critical to ensuring that continuous operation of dwelling unit ventilation systems is acceptable to occupants. At a minimum, the CF1R-PRF-01 form should confirm that the dwelling unit ventilation system sound requirements are met by referencing the listed values in a CEC-approved directory. The performance certificate of compliance (CF1R-PRF-01) will report the following parameters for the whole-dwelling unit ventilation system:*

1. Minimum mechanical ventilation airflow rate (calculated value) that must be delivered by the system.
2. Type of ventilation system (exhaust, supply, balanced, CFI).
3. Fan efficacy (W/CFM) for the selected system.
4. Recovery efficiency (%) applicable only to HRV or ERV system types
5. For CFI systems--HERS verification of air handler fan efficacy is required.
6. Sound performance (sones) for the selected system. Remotely located air-moving equipment (mounted outside habitable spaces, bathrooms, toilets, and hallways) is exempt from the sound requirements provided there is at least 4 feet of ductwork between the remote fan and interior grille.

4-94: *The Energy Code uses “intermittent ventilation” in place of ASHRAE 62.2’s “variable ventilation.” Modify this page’s and all other references to “intermittent ventilation” to read “intermittent/variable ventilation” to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use “variable ventilation” in place of “intermittent ventilation”).*

Control type (i.e., continuous, or intermittent, ~~or~~ variable operation)

4-95: *The Energy Code uses “intermittent ventilation” in place of ASHRAE 62.2’s “variable ventilation.” Modify this page’s and all other references to “intermittent ventilation” to read “intermittent/variable ventilation” to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use “variable ventilation” in place of “intermittent ventilation”).*

Type of exhaust fan control (intermittent/variable, demand-controlled, or continuous)

4-95: *Remove reference to the “HVI certification number”, which is not a field in the HVI-Certified Products Directory.*

~~4. HVI or AHAM certification number~~

4-97: *When a ventilation system supplies outdoor air through a space conditioning system’s MERV 13 filter prior to its introduction into occupiable space, the Energy Code requirement for MERV 13 filtration should be satisfied. Clarifying this exception will reduce fan power, fan sound, first-costs, and maintenance costs while still delivering the intended IAQ. The CASE study to support the MERV 13 filtration of outdoor air did not propose or provide a case for double-MERV 13 filtration of outdoor air before introduction to an occupiable space, so please clarify the language to align with The Energy Code’s intent in this regard.*

Balanced ventilation – may be a single packaged unit containing supply and exhaust fans that move approximately the same airflow through a heat or energy recovery core, or may use separate fans without heat exchange. In both cases, air supplied from outdoors must be filtered prior to providing to the occupiable space. (See Section 4.4.1.14 for filter requirements.)

4-97: *Align reference to habitable space with ASHRAE 62.2 Exception to Section 7.2 to include bathrooms, toilets, and hallways.*

Remotely located fans (fans mounted outside habitable spaces, bathrooms, toilets, and hallways) are exempt from the sound requirements if there is at least 4 feet of ductwork between the fan and the interior grille.

4-98: *Align reference to habitable space with ASHRAE 62.2 Exception to Section 7.2 to include bathrooms, toilets, and hallways.*

Remotely located fans (fans mounted outside habitable spaces, bathrooms, toilets, and hallways) are exempt from the sound requirements if there is at least 4 feet of ductwork between the fan and the interior grille.

4-98: *Retain language that clarifies that the MERV 13 filter may be located upstream or downstream from the supply fan; otherwise, the proposed change suggests that locating the MERV 13 air filter downstream of the supply fan may no longer be permitted. Also, clarify that MERV 13 filtration must occur before the outdoor air is introduced to the dwelling unit’s occupiable space, in alignment with 150.0(m)12Bi.*

The same type of inline fan used for exhaust ventilation can also be installed as a supply fan by reversing its orientation to the house and ensuring that the incoming outdoor air passes through a MERV 13 filter prior to delivery to the dwelling unit occupiable space, adding a filter between the outdoor air duct and supply fan.

~~Most supply systems locate the MERV 13 air filter upstream of the supply fan.~~ Supply systems may locate the MERV 13 air filter either upstream or downstream of the supply fan as long as the incoming outdoor air is filtered prior to delivery to the dwelling unit occupiable space.

4-99: *Clarify that the CFI damper control requirements are not intended to prohibit the use of H/ERVs with recirculation defrost. 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 could be misinterpreted to prohibit 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 (2% or less over the course of a year for a typical defrost control system located in any California climate zone, and less than 1% all counties in California but Mono and Alpine), 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. The following modification will clarify 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.*

Damper Control – The outdoor air damper must be controlled to be in the open position only when outdoor air is required for whole-dwelling unit ventilation and must be in the closed position when outdoor air is not required. The damper must be in the closed position when the air handler is not operating. If the outdoor airflow is fan-powered, then the outdoor air fan must not operate when the outdoor air damper is in the closed position. The Energy Code damper control requirements do not prohibit installation of HRVs or ERVs that use recirculation as a defrost strategy.

4-100: *When a ventilation system supplies outdoor air through a space conditioning system’s MERV 13 filter prior to its introduction into occupiable space, the Energy Code requirement for MERV 13 filtration should be satisfied. Clarifying this exception will reduce fan power, fan sound, first-costs, and maintenance costs while still delivering the intended IAQ. The CASE study to support the MERV 13 filtration of outdoor air did not propose or provide a case for double-MERV 13 filtration of outdoor air before introduction to an occupiable space, so please clarify the language to align with The Energy Code’s intent in this regard.*

Section 150.0(m)12 requires that outside air be filtered using MERV 13 (or greater) ~~particle removal efficiency rated~~ air filters. Filters must be accessible to simplify replacement. For CFI systems, the filters must be installed upstream of the cooling or heating coil; thus, the filter rack provided at the inlet to the air handler may be used. In this case, it is not necessary to provide another MERV 13 (or greater) filter within the outdoor air duct. Otherwise, filters must be provided at the return grill(s) for the central fan, and another filter must be provided in the outside air ductwork before the point the outside air enters the return plenum of the central fan.

4-101: *The Energy Code uses “intermittent ventilation” in place of ASHRAE 62.2’s “variable ventilation.” Modify this page’s and all other references to “intermittent ventilation” to read “intermittent/variable ventilation” to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use “variable ventilation” in place of “intermittent ventilation”).*

CFI ventilation systems are considered intermittent/variable mechanical ventilation systems and must be certified to the Energy Commission...

4-102: *Mirror the filtration language from the supply ventilation section to clarify that outdoor air must be filtered prior to delivery to the dwelling unit. This permits filtration through a connected space conditioning duct system's MERV 13 filter as an alternative to filtration within the balanced ventilation system's outdoor air duct.*

~~Like supply ventilation systems, balanced systems are required to be equipped with MERV 13 or better filters to remove particles from the outside airflow. Section 150.0(m)12 requires that outside air be filtered using MERV 13 (or greater) air filters. The filters must be accessible to facilitate replacement. Balanced systems may locate the MERV 13 air filter either upstream or downstream of the fan as long as the incoming outdoor air is filtered prior to delivery to the dwelling unit's occupiable space.~~

4-102: Please correct the truncated text in Figure 4-31.

4-105: *The Energy Code uses "intermittent ventilation" in place of ASHRAE 62.2's "variable ventilation." Modify this page's and all other references to "intermittent ventilation" to read "intermittent/variable ventilation" to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use "variable ventilation" in place of "intermittent ventilation").*

These measurement procedures are applicable for ventilation systems that operate at a specific airflow rate or systems that operate intermittently/variably at a fixed speed (averaged over any three-hour period), according to a control with a fixed schedule that is verifiable by a HERS Rater on site... ~~Variable or intermittent~~ Intermittent/variable operation that complies with ASHRAE 62.2 Sections 4.5.2 and 4.5.3 complies with the dwelling unit mechanical ventilation requirements by use of varying ventilation airflow rates based on complicated calculations for relative exposure as specified in ASHRAE 62.2 Normative Appendix C... (4-106)...Dwelling unit mechanical ventilation systems may operate continuously or intermittently/variably... (4-112)...Time-of-day timers or duty-cycle timers can be used to control intermittent/variable dwelling unit ventilation... (4-113)... An intermittently/variably operating ventilation system must be controlled by a timer that will cycle at least once every three hours...

4-113: *Clarify that the AHAM directory is approved by CEC in 150.0(o)2B for verifying range hood ratings only. AHAM does not maintain a CEC-approved directory for other ventilation system types.*

For balanced heat recovery or energy recovery ventilators (HRVs/ERVs), the HVI ~~or AHAM~~ rated recovery efficiency can be input to the performance compliance software to account for the heat recovery benefit, which helps offset higher fan energy use.

4-114: *Correct the following statement, which is incorrect, based on 150.0(o)2C, that requires H/ERVs to have a maximum fan efficacy of 1.0 W/cfm. Please also modify the rest of the section as necessary to communicate the default fan efficacy for H/ERVs when using the performance path.*

~~There are no prescriptive or mandatory requirements for maximum fan energy (watt draw) for dwelling unit ventilation systems other than CFI systems. The maximum mandatory fan efficacy for H/ERVs is 1.0 W/cfm.~~

4-114: Clarify that the AHAM directory is approved by CEC in 150.0(o)2B for verifying range hood ratings. Values for airflow and fan W/CFM information may be available from the HVI directory, and in the case of kitchen range hoods, ~~or the AHAM directories.~~

4-118: Use the same terminology as ASHRAE 62.2 and the multifamily compliance manual when referencing exhaust system operation types.

Demand-Controlled (~~Intermittent~~) Local Exhaust

4-119: Use the same terminology as ASHRAE 62.2 and the multifamily compliance manual when referencing exhaust system operation types.

Control and Operation for ~~Intermittent~~ Demand-Controlled Local Exhaust

4-120: Clarify that capture efficiency is determined in accordance with ASTM E3087.

Capture efficiency is ~~defined~~ determined in accordance with ASTM E3087 as the fraction of emitted tracer gas that is directly exhausted by a range hood.

4-120: Clarify that the minimum airflows required for kitchen exhaust fans must be achieved at one or more airflow settings.

To adequately capture the moisture, particulates, and other products of cooking and/or combustion in kitchens, the Energy Code requires minimum ventilation rates or capture efficiencies at one or more speed settings in Table 4-15 and Table 4-16.

4-121: Clarify that remotely mounted kitchen exhaust equipment is exempt from the sound rating requirements.

The Energy Code requires verification that range hoods are HVI or AHAM-certified to provide at least one speed setting at which they can deliver at least 100 CFM at a ~~noise sound~~ level of 3 sones or less. Verification must be in accordance with the procedures in RA3.7.4.3. Range hoods that have a minimum airflow setting exceeding 400 CFM are exempt from the ~~noise sound~~ requirement. Remotely located air-moving equipment (mounted outside habitable spaces, bathrooms, toilets, and hallways) is exempt from the sound requirements provided there is at least 4 feet of ductwork between the remote fan and interior grille.

4-121: Retain website reference for ease of use.

Ratings for Local Exhaust Fans are listed at the following web pages:

- Home Ventilating Institute (HVI): [https://www.hvi.org/hvi-certified-products-directory ...](https://www.hvi.org/hvi-certified-products-directory...)

4-126: Clarify makeup air requirements in alignment with ASHRAE 62.2 and California Mechanical Code definitions as follows:

1. 62.2 requires “compensating outdoor air” be provided when the exhaust rate of the two largest appliances exceeds the 15 cfm/100 ft<sup>2</sup> threshold. “Outdoor air” is defined by 62.2 as “air from outside the building taken into a ventilation system or air from outside the building that enters a space through infiltration or natural ventilation openings.” Therefore, infiltration can be used as compensating outdoor air (e.g., where the building leakage rate is determined through a blower door test). Further, 62.2 does not require the outdoor air to be provided mechanically. For example, there may be some cases where infiltration is sufficient to maintain design depressurization levels below the pressure at which the atmospherically vented appliance is



*expected to back-draft products of combustion. However, 62.2 does require that “gravity or barometric dampers in nonpowered exhaust makeup air systems shall not be used to provide compensating outdoor air.”*

2. *62.2 does not provide an exception to compensating outdoor air requirements when a summer cooling fan is provided. However, it does state that such fans should be disregarded when determining the total exhaust airflow of the two largest exhaust appliances.*
3. *62.2 notes that “atmospherically vented combustion appliances do not include direct-vent appliances.” It does not define “atmospherically vented”, nor does it address mechanically vented combustion appliances (also referred to as “power-type” within the California Mechanical Code). The California Mechanical Code recognizes two primary classes of venting systems in its definitions:*
  - a. *Gravity-type: a system that depends entirely on the heat from the fuel being used to provide the energy required to vent an appliance, and*
  - b. *Power-type: a system that depends upon a mechanical device to provide a positive draft within the venting system*

*Of these terms, the one that aligns most closely with the 62.2 term “atmospherically vented combustion appliances” is “gravity-type.” To coordinate terms across California’s codes, consider using “power-type” alongside “direct-vent.”*

This provision applies only when the atmospherically vented appliance is inside the pressure boundary. Consideration of the two largest exhaust fans should and the house does not include a disregard summer cooling fans that is designed to be operated only when windows are open. Direct-vent appliances and power-type appliances as defined in the California Mechanical Code are not considered “atmospherically vented.”

The two largest exhaust fans are normally the kitchen range hood and the clothes dryer (if located inside the dwelling unit pressure boundary). Large-range hoods, particularly downdraft range hoods, can have capacities of 1,000 CFM or more. Issues relating to this can be solved in several. First, all atmospherically vented combustion appliances can be located outside the pressure boundary of the house (to the garage or outdoor utility closet). Second, the flow rate of one or more of the fans can be reduced so the combined exhaust flow is less than 15 CFM/100 ft<sup>2</sup> floor area. Third, a supply system can be specified for the whole-dwelling unit ventilation system. Fourth, a blower door test can be performed to determine the portion of compensating outdoor air that can be provided through infiltration. Finally, outdoor makeup air can be mechanically provided to offset the net exhaust rate.

4-132: *Clarify that the AHAM directory is approved by CEC in 150.0(o)2B for verifying range hood ratings. ASHRAE 62.2-2019 does not approve AHAM-certified ratings, so this reference should be removed. Retain the website reference for ease of use.*

~~ASHRAE Standard 62.2~~ The Energy Code requires that equipment used to comply with the standard be selected based on tested and HVI-Certified ratings, or in the case of kitchen range hoods, AHAM-certified ratings, for airflow and sound... The HVI-Certified Products Directory can be viewed at the following URL: <https://www.hvi.org/hvi-certified-products-directory>.

4-133: *Clarify that adherence to installation instructions can be expected to improve performance but will not ensure that laboratory-tested performance is achieved in-situ.*

Adherence to the installation instructions and other literature shipped with the fan will help improve performance ~~ensure the installation complies with the ratings.~~

4-134: Use the same terminology as ASHRAE 62.2 and the multifamily compliance manual when referencing exhaust system operation types. The Energy Code uses “intermittent ventilation” in place of ASHRAE 62.2’s “variable ventilation.” Modify this page’s and all other references to “intermittent ventilation” to read “intermittent/variable ventilation” to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use “variable ventilation” in place of “intermittent ventilation”). Intermittent/Variable or Demand Controlled Fans (Surface-Mounted Fans)  
Intermittently/variably operated dwelling unit ventilation fans shall be rated at a maximum of 1.0 sone... However, ~~intermittent~~ or demand-controlled local exhaust fans must be 3.0 sones or less.

4-136: Clarify that the new prescriptive duct sizing table assumes a static duct length of 25 feet; reducing the duct length does not affect the diameter that must be provided. Remove old text that limits the maximum airflow rate to 125 cfm.

The higher the airflow, the larger in diameter ~~or shorter in length~~ the duct must be. Smooth duct can be used to manage longer duct runs. Interpolation and extrapolation of Table 4-185 are not allowed. For airflow rates not listed, use the next higher value. The table is not applicable for systems with airflow greater than 800 ~~125~~-CFM at 62 Pa (0.25 inches water column) static pressure.

4-140: Update examples to reference the new prescriptive duct sizing table, Table 4-18. This will yield different explanations and answers.

4-178: Use the same terminology as ASHRAE 62.2 and the multifamily compliance manual when referencing exhaust system operation types. The Energy Code uses “intermittent ventilation” in place of ASHRAE 62.2’s “variable ventilation.” Modify this page’s and all other references to “intermittent ventilation” to read “intermittent/variable ventilation” to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use “variable ventilation” in place of “intermittent ventilation”). Additionally, reference the requirement for the HERS Rater to record HRV/ERV fan efficacy and sensible recovery efficiency.

16. Continuous whole-dwelling unit mechanical ventilation airflow for IAQ
17. Intermittent/variable whole-dwelling unit mechanical ventilation airflow for IAQ
22. HRV/ERV fan efficacy and sensible recovery efficiency

## Appendix B: Draft 2022 Energy Code Multifamily and Nonresidential Compliance Manual

*General: Please coordinate with RJ Wichert of CEC to include information on new accessibility and Fault Indicator Display (FID) requirements for supply systems and balanced systems to receive full credit for associated energy savings versus the reference case when a project uses the performance path for compliance. These requirements are detailed in CEC's Alternative Calculation Method reference manuals.*

*2-2: The Energy Code uses "intermittent ventilation" in place of ASHRAE 62.2's "variable ventilation." Both of these control approaches pertain to dwelling unit ventilation systems and should not be confused with demand-controlled ventilation, which pertains to control of a local exhaust system. Modify this page's and all other references to "intermittent ventilation" to read "intermittent/variable ventilation" to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use "variable ventilation" in place of "intermittent ventilation").*

Intermittent/variable mechanical ventilation systems

*4-20: Modify the hyperlink to the HVI database.*

4. The Home Ventilating Institute (HVI) certified products directory available at [www.hvi.org-  
https://www.hvi.org/hvi-certified-products-directory](https://www.hvi.org/hvi-certified-products-directory).

*4-31: When a ventilation system supplies outdoor air through a space conditioning system's MERV 13 filter prior to its introduction into occupiable space, the Energy Code requirement for MERV 13 filtration should be satisfied. Clarifying this exception will reduce fan power, fan sound, first-costs, and maintenance costs while still delivering the intended IAQ. The CASE study to support the MERV 13 filtration of outdoor air did not propose or provide a case for double-MERV 13 filtration of outdoor air before introduction to an occupiable space, so please clarify the language to align with The Energy Code's intent in this regard.*

The Energy Standards require that some filters have a particle removal efficiency equal to or greater than the minimum efficiency reporting value (MERV) 13 when tested in accordance with ASHRAE Standard 52.2, or a particle size efficiency rating equal to or greater than 50 percent in the 0.3-1.0 µm and 85 percent in the 1.0-3.0 µm range when tested in accordance with AHRI Standard 680.

The following system types are required to provide air filtration meeting these minimum requirements:

a. Mechanical space conditioning (space conditioning) systems that utilize forced air ducts greater than 10 feet in length to supply air to an occupied space. The total is determined by summing the lengths of all the supply and return ducts for the force air system.

b. The following systems that provide outside air to an occupied space, when such air does not otherwise pass through a mechanical space conditioning system air filter prior to introduction to the occupied space:

1. b- Mechanical supply-only ventilation systems ~~that provide outside air to an occupied space.~~

2. e- The supply side of mechanical balanced ventilation systems, including heat recovery ventilator and energy recovery ventilators ~~that provide outside air to an occupied space.~~

*11-13: The Energy Code uses "intermittent ventilation" in place of ASHRAE 62.2's "variable ventilation." Both of these control approaches pertain to dwelling unit ventilation systems and should not be confused with demand-controlled ventilation, which pertains to control of a local exhaust system. Modify this*

page's and all other references to "intermittent ventilation" to read "intermittent/variable ventilation" to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use "variable ventilation" in place of "intermittent ventilation").

Intermittent/variable whole-building mechanical ventilation airflow

11-78: Bolster statement that "ventilation air shall come from outdoors."

Ventilation air shall come from outdoors and must not be transferred from adjacent conditioned spaces, garages, or unconditioned spaces. According to Interpretation IC 62.2-2019-1 of ASHRAE 62.2, "air from adjacent spaces cannot be credited toward the outdoor air required."

11-78: Recognize that H/ERVs can be used to ventilate bathrooms.

Kitchens and bathrooms must ~~have local~~ be provided with exhaust ~~fans~~ systems vented to outdoors.

11-79: When a ventilation system supplies outdoor air through a space conditioning system's MERV 13 filter prior to its introduction into occupiable space, the Energy Code requirement for MERV 13 filtration should be satisfied. Clarifying this exception will reduce fan power, fan sound, first-costs, and maintenance costs while still delivering the intended IAQ. The CASE study to support the MERV 13 filtration of outdoor air did not propose or provide a case for double-MERV 13 filtration of outdoor air before introduction to an occupiable space, so please clarify the language to align with The Energy Code's intent in this regard:

Mechanical systems, including ventilation systems, that supply air to habitable spaces shall be designed to ensure that recirculated air and outdoor air is filtered with a must have MERV 13 filters or better prior to supplying to an occupiable space and shall be designed to accommodate the rated pressure drop of the system air filter at the designed airflow rate.

11-79: Clarify that the AHAM directory is approved by CEC in 160.2(b)2Bii for verifying range hood ratings.

Air-moving equipment used to meet the whole-dwelling unit ventilation requirement and the local exhaust requirement shall be rated by HVI or, in the case of kitchen range hoods, AHAM, for airflow and sound:

11-79: Clarify that sound testing of kitchen range hoods must occur at a minimum of 100 cfm.

Kitchen exhaust fans must be rated at a maximum of 3.0 sones at one or more airflow settings greater than or equal to 100 CFM. (As described in Section 11.4.2.0, the Standard requires kitchen range hoods to have a higher airflow than 100 CFM, but the range hoods must be tested for sound at a minimum of 100 CFM.)

11-79: Clarify that range hoods are exempt from sound requirements provided they have a minimum airflow setting exceeding 400 cfm. Also, align reference to habitable space with ASHRAE 62.2 Exception to Section 7.2 to include bathrooms, toilets, and hallways.

... Remotely located air-moving equipment (mounted outside habitable space, bathrooms, toilets, and hallways) is exempt from the sound requirements provided there is at least 4 ft. of ductwork between the fan and the interior grille. Kitchen range hoods are also exempt from the sound requirements provided they have a minimum airflow setting exceeding 400 cfm.

11-81: *When a ventilation system supplies outdoor air through a space conditioning system’s MERV 13 filter prior to its introduction into occupiable space, the Energy Code requirement for MERV 13 filtration should be satisfied. Clarifying this exception will reduce fan power, fan sound, first-costs, and maintenance costs while still delivering the intended IAQ. The CASE study to support the MERV 13 filtration of outdoor air did not propose or provide a case for double-MERV 13 filtration of outdoor air before introduction to an occupiable space, so please clarify the language to align with The Energy Code’s intent in this regard:*

The Energy Code require MERV 13 filtration for all recirculated air and outdoor air, including outdoor air provided by supply air ventilation systems ~~and~~ or the supply side of balanced ventilation systems, while ASHRAE Standard 62.2 requires MERV 6 filtration for HVAC systems with at least 10 ft. of ductwork. The additional filtration requirements in the Energy Code are important for reducing particulate matter which can pose a health to residents.

11-83: *Clarify that infiltration air from adjacent spaces is not permitted to be counted towards the outdoor air required by the Energy Code.*

In an exhaust-only system, air is drawn from the dwelling unit and exhausted to the outdoors. Outdoor air enters the unit through infiltration. This infiltration air will include both outdoor air, as well as air from adjacent spaces in the building (e.g., corridor, adjacent units). According to Interpretation IC 62.2-2019-1 of ASHRAE 62.2, “air from adjacent spaces cannot be credited toward the outdoor air required.” While not prohibited, exhaust-only ventilation systems are not good practice in dwelling units that will have difficulty drawing adequate outside air due to limited exterior wall area.

11-83: *The Energy Code uses “intermittent ventilation” in place of ASHRAE 62.2’s “variable ventilation.” Both of these control approaches pertain to dwelling unit ventilation systems and should not be confused with demand-controlled ventilation, which pertains to control of a local exhaust system. Modify this page’s and all other references to “intermittent ventilation” to read “intermittent/variable ventilation” to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use “variable ventilation” in place of “intermittent ventilation”).*

Exhaust ventilation is typically provided using a continuously operating ceiling-mounted fan. Projects may use intermittent/variable fans for meeting the dwelling unit ventilation rate, but these must be on a schedule to ensure that the minimum ventilation rate is met. Examples of intermittent/variable ventilation systems can be found in ASHRAE 62.2 Section 4.5. Intermittent/variable ventilation systems must be certified to the Energy Commission. All fans must meet sound requirements: maximum of one sone for whole-dwelling unit ventilation fans and continuously operated fans and 3 sones for ~~intermittent~~ demand-controlled exhaust fans.

11-84: *Modify the example given for a dual-duty (i.e., dwelling unit ventilation and local exhaust) kitchen range hood to recognize that there are other scenarios that are eligible besides continuous operation (e.g., a range hood operating continuously for dwelling unit ventilation with a demand-controlled boost setting to achieve the minimum demand-controlled airflow requirement.*

A kitchen exhaust fan in an enclosed kitchen may also serve a dual purpose of whole-dwelling unit ventilation and kitchen ventilation, if it meets both the minimum dwelling unit ventilation rate and the minimum requirement for ~~continuous~~ kitchen exhaust (~~five kitchen air changes per hour~~, described in the Section Dwelling Unit Local Exhaust).

11-84: *Tighten terminology to clarify that space conditioning system fans (and not all heating, ventilating, and cooling fans) must meet the Central Fan-Integrated Ventilation approach. Use the same terminology in the definition of Ventilation System, Central Fan Integrated.*

Supply ventilation systems draw outdoor air into the unit using a dedicated supply fan. Indoor air escapes through leaks in the building envelope (exfiltration). ~~Central furnace fans or HVAC fans~~ Space conditioning system air handling units cannot be used to provide supply ventilation, unless they meet the Central Fan-Integrated Ventilation approach described in Section 11.4.2.10D.

11-84: *Align reference to habitable space with ASHRAE 62.2 Exception to Section 7.2 to include bathrooms, toilets, and hallways.*

Remotely located fans (fans mounted outside habitable space, bathrooms, toilets, and hallways) are exempt from the sound requirements if there is at least four ft. of ductwork between the fan and the interior grille.

11-85: Clarify that MERV 13 filtration must occur before the outdoor air is introduced to the dwelling unit's occupiable space, in alignment with 160.2(b)1Bi.

...upstream or downstream of the fan as long as the incoming outdoor air is filtered prior to delivery to the dwelling unit's occupiable space.

11-86: *Mirror the filtration language from the supply ventilation section to clarify that outdoor air must be filtered prior to delivery to the dwelling unit's occupiable space. This permits filtration through a connected space conditioning duct system's MERV 13 filter as an alternative to filtration within the balanced ventilation system's outdoor air duct.*

~~Like supply ventilation systems, balanced systems are required to be equipped with MERV 13 or better filters to remove particles from the intake airflow. §160.2(b)1 requires that outside air be filtered using MERV 13 (or greater) particle removal efficiency rated air filters. The filters must be accessible to facilitate replacement. Balanced systems may locate the MERV 13 air filter either upstream or downstream of the fan as long as the incoming outdoor air is filtered prior to delivery to the dwelling unit's occupiable space.~~

11-87: *Figure 11-29 shows a 3-foot separation between supply and exhaust of an H/ERV system. ASHRAE 62.2 Section 6.8 permits this to be reduced to zero when a combined exhaust/intake termination is used that meets certain criteria. Please provide an informational note that communicates this option.*

11-90: *Clarify that the CFI damper control requirements are not intended to prohibit the use of H/ERVs with recirculation defrost. 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 could be misinterpreted to prohibit 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 (2% or less over the course of a year for a typical defrost control system located in any California climate zone, and less than 1% all counties in California but Mono and Alpine), 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. The following modification will clarify 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.*

Damper Control – The outdoor air damper must be controlled to be in the open position only when outdoor air is required for whole-dwelling unit ventilation and must be in the closed position when outdoor air is not required. The damper must be in the closed position when the air handler is not operating. If the outdoor airflow is fan-powered, then the outdoor air fan must not operate when the outdoor air damper is in the closed position. The Energy Code damper control requirements do not prohibit installation of HRVs or ERVs that use recirculation as a defrost strategy.

11-90: *When a ventilation system supplies outdoor air through a space conditioning system’s MERV 13 filter prior to its introduction into occupiable space, the Energy Code requirement for MERV 13 filtration should be satisfied. Clarifying this exception will reduce fan power, fan sound, first-costs, and maintenance costs while still delivering the intended IAQ. The CASE study to support the MERV 13 filtration of outdoor air did not propose or provide a case for double-MERV 13 filtration of outdoor air before introduction to an occupiable space, so please clarify the language to align with The Energy Code’s intent in this regard.*

§160.2(b)1 requires that outside air be filtered using minimum MERV 13 particle removal efficiency rated air filters. Filters must be accessible to simplify replacement. For CFI systems, the filters must be installed upstream of the cooling or heating coil; thus, the filter rack provided at the inlet to the air handler may be used. In this case, it is not necessary to provide another MERV 13 (or greater) filter within the outdoor air duct. Otherwise, filters must be provided at the return grill(s) for the central fan, and another filter must be provided in the outside air ductwork before the point the outside air enters the return plenum of the central fan.

11-91: *The Energy Code uses “intermittent ventilation” in place of ASHRAE 62.2’s “variable ventilation.” Both of these control approaches pertain to dwelling unit ventilation systems and should not be confused with demand-controlled ventilation, which pertains to control of a local exhaust system. Modify this page’s and all other references to “intermittent ventilation” to read “intermittent/variable ventilation” to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use “variable ventilation” in place of “intermittent ventilation”).*

CFI ventilation systems are considered intermittent/variable mechanical ventilation systems and must be certified to the Energy Commission that the CFI ventilation system will meet the minimum whole-dwelling unit ventilation requirements.

11-92: *The Energy Code uses “intermittent ventilation” in place of ASHRAE 62.2’s “variable ventilation.” Both of these control approaches pertain to dwelling unit ventilation systems and should not be confused with demand-controlled ventilation, which pertains to control of a local exhaust system. Modify this page’s and all other references to “intermittent ventilation” to read “intermittent/variable ventilation” to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use “variable ventilation” in place of “intermittent ventilation”).*

Users installing any type of intermittent/variable ventilation control system (scheduled or real-time) must submit an application to the Energy Commission to have the control approved... Time-of-day timers or duty-cycle timers can be used to control intermittent/variable dwelling unit ventilation... An intermittent/variablely operating ventilation system must be controlled by a timer that will cycle at least once every three hours to assure that adequate ventilation is provided regardless of outdoor conditions.

11-95: Listing of H/ERVs is required by ASHRAE 62.2 and RA3.7.4.4. The HVI H/ERV directory listing includes fan power consumption. Modify to align with the requirements, terminology, and performance data provided by these references.

Fan efficacy is calculated as the average power consumption in Watts divided by the net supply airflow in CFM. Sensible recovery efficiency is directly reported in the HVI database. If the HVI database or other CEC approved directories do not list the fan energy for the installed model or the proposed product is a large-central ERV/HRV that is not covered by whose airflow rate exceeds the maximum listed in the HVI database, use information from the manufacturer's published documentation.

11-95: Correct error related to some requirements for on-demand bathroom exhaust systems: The Energy Code requires bathroom fans with a minimum exhaust airflow of 50 CFM and a sound rating of ~~at~~ no more than ~~one~~ three sones.

11-96: The Energy Code uses "intermittent ventilation" in place of ASHRAE 62.2's "variable ventilation." Both of these control approaches pertain to dwelling unit ventilation systems and should not be confused with demand-controlled ventilation, which pertains to control of a local exhaust system. Modify this page's reference to "intermittent ventilation" to clarify that "demand-controlled" is the intended reference.

The control can be a manual switch or automatic control like an occupancy sensor. Some exhaust fans have multiple speeds, and some fan controls have a delay-off function that operates the exhaust fan for a set time after the occupant leaves the bathroom. Title 24, Part 11 (CALGreen) specifies additional requirements for the control and operation of ~~intermittent~~ demand-controlled local exhaust.

11-97: The Energy Code uses "intermittent ventilation" in place of ASHRAE 62.2's "variable ventilation." Both of these control approaches pertain to dwelling unit ventilation systems and should not be confused with demand-controlled ventilation, which pertains to control of a local exhaust system. Modify this page's reference to "intermittent ventilation" to clarify that "demand-controlled" is the intended reference.

Many builders install a two-speed fan that runs at low speed continuously to satisfy the dwelling unit ventilation system requirement, but that can increase to a higher speed to meet the ~~intermittent~~ demand-controlled bathroom exhaust requirement using a wall switch.

11-97: Pickups can be provided for both continuous exhaust and demand-controlled local exhaust systems. Modify the text to allow for both options.

A ~~continuous~~ local exhaust system may also include a pickup, which refers to an interior grille that is ducted to a remote fan, which could be ducted to an HRV or ERV.

11-97: Provide information on sound requirements for continuously operating exhaust fans. Continuously operating bathroom fans must operate at a minimum of 20 CFM and a sound rating of no more than one sone.

11-97: Clarify that capture efficiency is determined in accordance with ASTM E3087. Capture efficiency is ~~defined~~ determined in accordance with ASTM E3087 as the fraction of emitted tracer gas that is directly exhausted by a range hood.



11-98: Clarify that the minimum airflows required for kitchen exhaust fans must be achieved at one or more airflow settings.

- A demand-controlled, vented downdraft kitchen exhaust fan (not represented in the table below) in enclosed kitchens with a minimum airflow at one or more speed settings of 300 cfm or a capacity of 5 air changes per hour. In a nonenclosed kitchen, the fan must have a minimum airflow at one or more speed settings of 300 cfm (no air changes per hour option).
- For enclosed kitchens only: Continuous exhaust system with a minimum airflow at one or more speed settings equal to five kitchen air changes per hour.

11-99: Clarify the conditions under which recirculating range hoods can be used in kitchens.

Recirculating range hoods that do not exhaust pollutants to the outside cannot be used to meet the Energy Code requirements, unless paired with an exhaust system exhausting to the outside that can provide at least five air changes of the kitchen volume per hour one of the following:

1. Continuous or demand-controlled operation in an enclosed kitchen providing at least five air changes of the kitchen volume per hour, or
2. Demand-controlled operation in an enclosed or unenclosed kitchen providing at least 300 cfm of exhaust.

11-100: Modify the hyperlink to the HVI database.

HVI listings are available at: [https://www.hvi.org/proddirectory/CPD\\_Reports/section\\_1/index.CFM](https://www.hvi.org/proddirectory/CPD_Reports/section_1/index.CFM).  
<https://www.hvi.org/hvi-certified-products-directory>.

11-100: Reference the Energy Code requirement for range hood rated airflow at 0.25" w.c.

The Energy Code require either field-measurement of kitchen exhaust airflow or meeting prescriptive duct sizing requirements. When complying using prescriptive duct sizing requirements, the Energy Code require range hood airflow at a static pressure of 0.25" w.c. Section 11.4.4.3 Duct Sizing provides more detail.

11-100: Recognize that some multifamily units with atmospherically vented appliances may not require makeup air. For example, a 1,750 ft<sup>2</sup>, 3-bedroom apartment has a DUV rate of 82.5 cfm and a kitchen range hood airflow requirement of 180 cfm, for a total of 262.5 cfm, which translates to 15 cfm/100 ft<sup>2</sup>. This is below the ASHRAE 62.2 and Title 24 trigger that would require makeup air (i.e., airflow exceeding 15 cfm/100 ft<sup>2</sup>):

The Energy Code limits exhaust airflow when atmospherically vented combustion appliances are located inside the pressure boundary. The demand-controlled range hood airflow and capture efficiency requirements will often exceed this exhaust airflow limit for typical multifamily dwelling units. Therefore, any most multifamily dwelling units with atmospherically vented appliances will need a makeup air fan. Refer to Section 11.4.5.3 for more information.

11-101: Clarify that manufacturers are not required to test and list both airflow and capture efficiency.

Manufacturers shall test the rRange hood air flow and or capture efficiency, which will be available in shall be verified through reference to the HVI or AHAM database.

11-101: The Energy Code uses "intermittent ventilation" in place of ASHRAE 62.2's "variable ventilation." Both of these control approaches pertain to dwelling unit ventilation systems and should not be confused with demand-controlled ventilation, which pertains to control of a local exhaust system. Modify this

page's and all other references to "intermittent ventilation" to read "intermittent/variable ventilation" to clarify that these terms are interchangeable. To promote consistency in terminology moving forward, HVI recommends that the Energy Code align its terminology with ASHRAE 62.2 (i.e., use "variable ventilation" in place of "intermittent ventilation").

These measurement procedures are applicable when there is a fixed airflow rate required for compliance, such as for systems that operate continuously at a specific airflow rate or systems that operate intermittently/variably at a fixed speed (averaged over any three-hour period), according to a fixed programmed pattern that is verifiable by a HERS Rater on site.

11-103: *When a ventilation system supplies outdoor air through a space conditioning system's MERV 13 filter prior to its introduction into occupiable space, the Energy Code requirement for MERV 13 filtration should be satisfied. Clarifying this exception will reduce fan power, fan sound, first-costs, and maintenance costs while still delivering the intended IAQ. The CASE study to support the MERV 13 filtration of outdoor air did not propose or provide a case for double-MERV 13 filtration of outdoor air before introduction to an occupiable space, so please clarify the language to align with The Energy Code's intent in this regard:*

§160.2(b)1 requires that all recirculated air or outdoor air supplied to the occupiable space is filtered with MERV 13 filtration prior to being supplied to the occupiable space. This requirement applies to includes all ventilation systems with supply-side ventilation, including supply-only systems, ERVs, HRVs, and the supply side of other balanced systems. Exceptions exist for air supplied by mechanical space conditioning systems without ducts or having ducts that do not exceed 10 feet in length and also for supply-side ventilation systems whose outdoor air passes through a space conditioning system's MERV 13 filter prior to being supplied to the occupiable space. This filtration requirement does not apply to exhaust-only ventilation systems, since those systems do not have dedicated supply air. However, since §160.2(b)1 applies to both recirculated and outdoor air, a dwelling unit with an exhaust-only ventilation system and forced air furnace will still need MERV 13 filtration in the furnace air handling unit, provided its ducts exceed 10 feet in length.

11-106: *Provide more guidance on how to determine the fan efficacy of balanced systems by confirming that linear interpolation is permitted and referencing the relevant fields in the HVI database.*

The total fan efficiency for the ventilation system is calculated using the parameters in the following equation.

Total fan efficiency = Total rated power of exhaust and supply fan at ventilation flow rate (W)/ Outdoor air ventilation flow rate (cfm)

Compliance with the fan efficiency requirements for ventilation can be verified by reviewing product certification data from the HVI database or the AHAM Certified Range Hood Directory. Linear interpolation of rated performance parameters may be used when calculating the fan efficacy at the required outdoor airflow rate (see Reference Residential Appendix RA3.7.4.4 for an example of how to determine fan efficacy using linear interpolation). When using the HVI database, reference the following database fields for rated power and rated airflow:

1. For a balanced system composed of separate but interlocked supply and exhaust systems, "Input Power" and "Rated Airflow"
2. For a balanced, integrated supply and exhaust ventilator without heat or energy recovery, "Power Consumed" and "Net Airflow"

11-106: *Modify the hyperlink to the HVI database.*

Compliance with the requirements for unitary equipment can be verified by reviewing product certification data from the HVI database at the URL below. ~~www.hvi.org/hvi-certified-products-directory/section-i-complete-product-listing/~~ <https://www.hvi.org/hvi-certified-products-directory>.

11-107: *Provide a cross-reference for determining fan efficacy of H/ERVs.*

Compliance with the requirements for unitary equipment can be verified by reviewing product certification data from the HVI database at the URL below. See Reference Residential Appendix RA3.7.4.4 for more information on verification of unitary equipment performance parameters.

11-108: *Modify the hyperlink to the HVI database.*

~~https://www.hvi.org/hvi-certified-products-directory/section-iii-hrv-erv-directorylisting/~~  
<https://www.hvi.org/hvi-certified-products-directory>.

11-108: *In alignment with ASHRAE 62.2's requirement for HVI listing of unitary equipment, Title 24's recognition of AHAM certification as an alternative for range hoods, and recognizing that both directories publish input power for fans, communicate that fan efficacy for unitary dwelling unit ventilation system equipment without heat recovery be determined by referencing the HVI or AHAM directory.*

~~If HVI does not list fan energy for the installed model,~~ For unitary equipment, use HVI-certified fan power (or AHAM-certified fan power for unitary range hoods) for the installed model; otherwise, use information from the manufacturer's published documentation. Note that fan energy may sometimes be listed as CFM/W rather than W/CFM, so must be converted to the Energy Code' fan efficacy units of W/CFM. Installation of a dwelling unit ventilation system with a fan watt draw greater than 1.2 W/CFM of ventilation airflow will increase the proposed design energy. Values less than 1.2 W/CFM are compliance-neutral (standard design = proposed design).

11-112: *Modify the hyperlink to the HVI database.*

The HVI-Certified Products Directory can be viewed at the following link:  
~~www.hvi.org/proddirectory/index.CFM~~ <https://www.hvi.org/hvi-certified-products-directory>.

11-113: *Correct error related to ASHRAE 62.2 sone exception. Also, align terminology with ASHRAE 62.2 by inserting "/variable" when referencing "intermittent" fans.*

D. Intermittent/Variable or Demand Controlled Fans (Surface-Mounted Fans)

Intermittently/variably operated dwelling unit ventilation fans shall be rated at a-1 sone or less.

Demand-controlled local exhaust fans shall be rated at a maximum of 3 sones, unless the ~~maximum~~ minimum rated airflow is greater than 400 CFM.

11-113: *Clarify the rationale for the Energy Code permitting sound ratings at lower airflows than the Energy Code's airflow requirements for range hoods.*

The 3 sone requirement is measured at a minimum required speed of 100 CFM that is different from the minimum airflow requirements of the Energy Code for kitchen range hoods. The Energy Code require range hoods to have a minimum airflow between 110 CFM and 280 CFM when using an airflow rating for compliance, dependent on the size of the dwelling unit and kitchen fuel used. The requirements for the minimum airflows for a sound rating and the minimum airflow for an airflow rating requirements are

different to allow sound ratings of previously tested range hoods to be used, since ~~existing requirements have required sound testing at 100 cfm~~ the Energy Code previously permitted sound testing at “working speed” (i.e., determined at no less than 90 CFM).

11-113: *Communicate the limitations to use of the prescriptive duct sizing table (i.e., Table 11-25 / Table 160.2-H / ASHRAE 62.2 Table 5-3), as follows. Recognize the Energy Code’s requirement for prescriptive duct design table as the only CEC-approved alternative to in-situ testing.*

Use a fan that has a certified airflow rating that meets or exceeds the required ventilation airflow and ventilation ducts that meet ~~either the fan manufacturer’s published duct design specifications or the~~ duct design requirements given in Table 11-25 (Table 160.2-H). Use of Table 11-25 (Table 160.2-H) is limited to duct systems not exceeding 25 ft (8 m) in length, duct systems with no more than three (3) elbows, and duct systems with exterior termination fittings having a hydraulic diameter greater than or equal to the minimum duct diameter and not less than the hydraulic diameter of the fan outlet.

11-114: *Modify the hyperlink to the HVI database.*

... available from the HVI Certified Products Directory at the HVI website (~~www.hvi.org~~)  
<https://www.hvi.org/hvi-certified-products-directory>.

11-117: *This text diverges from 160.2(b)2 by listing Section 6.8 of ASHRAE 62.2 as optional. This section permits the use of combined exhaust/intake terminations that meet certain criteria. Please remove Section 6.8 from the list of optional sections to ensure that combined exhaust/intake terminations can continue to comply with the code.*

The following sections of ASHRAE Standard 62.2 are not required for compliance: Section 4.1.1, Section 4.1.2, Section 4.1.4, Section 4.3, Section 4.6, Section 5, Section 6.1.1, Section 6.5.2, ~~Section 6.8,~~ and Normative Appendix A.

11-119: *Recognize that some multifamily units with atmospherically vented appliances may not require makeup air. For example, a 1,750 ft<sup>2</sup>, 3-bedroom apartment has a DUV rate of 82.5 cfm and a kitchen range hood airflow requirement of 180 cfm, for a total of 262.5 cfm, which translates to 15 cfm/100 ft<sup>2</sup>. This is below the 62.2 and Energy Code trigger that would require makeup air (i.e., airflow exceeding 15 cfm/100 ft<sup>2</sup>):*

The two largest exhaust fans are normally the kitchen range hood and the clothes dryer. In many cases, the range hood airflow/capture efficiency requirements result in the range hood alone exceeding the 15 CFM/100 sq. ft limit. Thus, any many units with atmospherically vented appliances must have will require a makeup air fan regardless of unit size. Example 4-13 discusses an example of a multifamily unit.

11-131: *Remove reference to the “HVI certification number”, which is not a field in the HVI-Certified Products Directory.*

~~Kitchen exhaust system HVI certification number~~

11-131: *Clarify sources required to determine fan performance parameters. Where a dwelling unit uses the performance path for compliance, the dwelling unit ventilation fan efficacy should be recorded. Report the sone rating, where required.*

For dwelling unit ventilation systems:

- Measured airflow rate of the installed dwelling unit ventilation system. For balanced systems, exhaust and supply airflows must be measured and recorded.
- Installed ERV or HRVs' nominal sensible recovery efficiency and fan efficacy, if applicable. For unitary equipment, these values shall be derived from the HVI directory or other CEC approved directory. See Reference Residential Appendix RA3.7.4.4 for more information.
- Installed exhaust or supply dwelling unit ventilation system fan efficacy, if applicable. For unitary equipment, these values shall be derived from the HVI directory, AHAM directory (applicable to range hoods only), or other CEC approved directory.
- Installed dwelling unit ventilation system fan sound rating for fans that are not remotely mounted, as sourced from the HVI directory, AHAM directory (applicable to range hoods only), or other CEC approved directory. Remotely located fans (fans mounted outside habitable spaces, bathrooms, toilets and hallways) are exempt from the sound requirements if there is at least four ft. of ductwork between the fan and the interior grille.
- Confirmation installed ERV or HRV has a sensible recovery efficiency and fan efficacy greater than those specified in standards.
- If a central ERV or HRV is installed, confirmation that the installed ERV or HRV includes a bypass or free cooling function.

11-134: *Mirror text in 160.2(b)1Bv.*

Filter racks or grilles must use a gasket, ~~or~~ sealing, or other means to prevent air from bypassing the filter.

HVI welcomes any further discussion with CEC's staff and contractors that may be necessary to resolve these comments.

Kind regards,



Jacki Donner, CEO