

DOCKETED

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20 January 2021

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

Re: Docket No. 19-BSTD-03, 2022 Energy Code Pre-Rulemaking; *Response to TN 236201*

Dear CEC Staff,

On November 17, 2020, the Home Ventilating Institute (HVI) submitted comments to CEC in response to CEC staff's request for information regarding proposed modifications to the kitchen exhaust performance requirements within California's Energy Standards (TN 235643). Within that comment, HVI supported CEC's objective to develop more stringent requirements for capture efficiency (CE) for kitchen exhaust systems, while requesting that CEC simplify the compliance tiers by adopting the following targets:

- Electric cooking: CE \geq 65% or NIA¹/field-verified airflow \geq 160 cfm
- Gas cooking: CE \geq 80% or NIA/field-verified airflow \geq 250 cfm.

On December 31, 2020, CEC posted a memo from the Statewide CASE Team (TN 236201) that included revised and supplemental information to the CASE study. This comment is provided in response to that memo.

Incremental Costs

CASE's memo included updated estimates for the incremental cost of kitchen exhaust systems that would comply with CEC's proposed kitchen exhaust performance targets. Within the memo, incremental cost was reported as the difference between the average costs of compliant and the average costs of non-compliant products. Because cost is a function of many variables (not just flow rates), and because exhaust systems with higher airflows often have more features than those with lower airflows, this analysis approach is likely to overestimate the incremental cost of minimally compliant products. The following statistics provided in this letter are based on information that has been publicly released and publicly available. If incremental costs were calculated as the difference in price between the compliant product with the lowest price and the reference product with the lowest price, the incremental cost would likely be closer to the following:

¹ Nominal Installed Airflow as defined in HVI Publication 920.

- Hood serving electric cooking: \$0 for a range hood with an NIA \geq 160 cfm and working speed sones \leq 3.² This finding is presumably in agreement with the CASE memo, which did not appear to report a cost differential at 160 cfm.
- Hood serving natural gas cooking: \$207 for a range hood with an NIA \geq 250 cfm and working speed sones \leq 3.³ This value is compared to the \$415 estimated by CASE in Table 8 of TN 236201 for range hoods with a rated airflow \geq 250 cfm at 0.1 in. w.g.

Compliant Products

CASE's memo reported the number of manufacturers with kitchen exhaust models that were found to be compliant with proposed targets of 250 and 280 cfm at 0.1 in. w.g. However, it is important to note that LBNL's recommended airflow targets when used as a proxy for CE are "as-installed" airflow targets, not airflow at 0.1 in. w.g.⁴ Referencing a rated airflow at 0.1 in. w.g. can significantly overestimate "as-installed" airflow, as shown by Figure 1 below.

² The \$0 was determined as the difference in online retail pricing obtained from lowes.com between the average of the three lowest-cost, identified "2022_T24 compliant" range hoods serving an electric cooking appliance (working speed sones \leq 3; NIA \geq 160 cfm, which is the airflow proxy for a hood achieving \geq 65% CE and at the upper end of the range recommended by LBNL/CEC/CASE for kitchen exhaust serving an electric cooking appliance; average price = \$132) and the average of the three lowest-cost, identified reference range hoods (2019_T24 compliant by achieving an airflow of at least 100 cfm at 0.25" w.g. in compliance with the prescriptive duct sizing requirements of Title 24-2019; working speed sones \leq 3; average price = \$132). Pricing was obtained January 19, 2021. Note: this pricing exercise was not comprehensive but was meant to be illustrative of typical retail pricing and incremental costs.

³ The \$207 was determined as the difference in online retail pricing obtained from lowes.com between the average of the three lowest-cost, identified "2022_T24 compliant" range hoods serving a natural gas cooking appliance (working speed sones \leq 3; NIA \geq 250 cfm, which is the airflow proxy for a hood achieving \geq 80% CE and near the upper end of the range recommended by LBNL/CEC/CASE for kitchen exhaust serving a natural gas cooking appliance; average price = \$339) and the average of the three lowest-cost, identified reference range hoods (2019_T24 compliant by achieving an airflow of at least 100 cfm at 0.25" w.g. in compliance with the prescriptive duct sizing requirements of Title 24-2019; working speed sones \leq 3; average price = \$132). Pricing was obtained January 19, 2021. Note: this pricing exercise was not comprehensive but was meant to be illustrative of typical retail pricing and incremental costs.

⁴ Chan WR, Walker IS, and Singer BC. October 27, 2020. Technical Memo on Updated Analysis from NO₂ and PM_{2.5} Cooking Simulations to Inform Capture Efficiency Standards. TN 235477. Docketed 11/2/2020. See Figure 3.

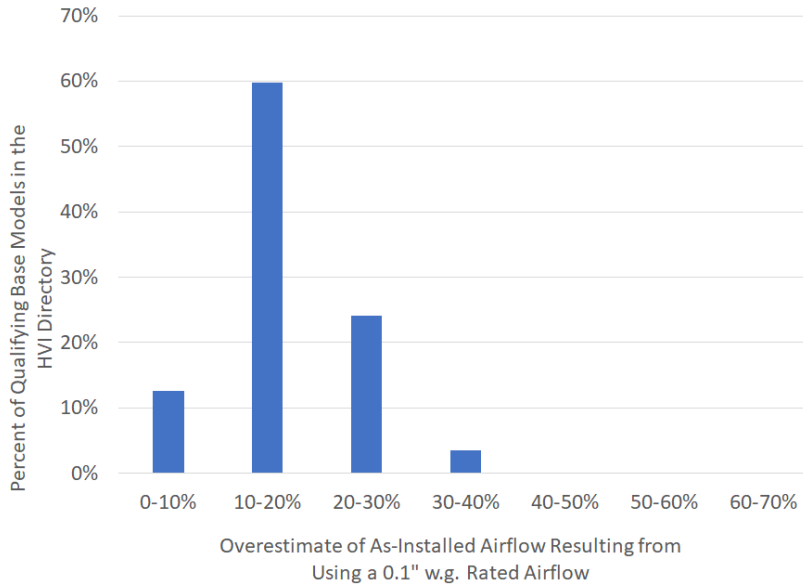


Figure 1. Frequency distribution of the percent of kitchen exhaust base models in HVI's database with a $Q_{0.1} \leq 400$ cfm that overestimate "as-installed airflow". The overestimate is calculated as $(Q_{0.1} - Q_{installed})/Q_{installed}$ where $Q_{0.1}$ is the tested airflow at 0.1 in. w.g. and $Q_{installed}$ is the NIA. According to this analysis, Figure 1 shows that 60% of the 0.1 in. w.g. airflows for base models in HVI's database are likely to overestimate the "as-installed" airflow by 10-20%. Also, 27% of 0.1 in. w.g. airflows for base models in HVI's database are likely to overestimate the "as-installed" airflow by more than 20%.

To provide a better estimate of "as-installed" airflow, HVI has developed the metric "Nominal Installed Airflow" (NIA) within HVI Publication 920; this metric accounts for the pressure drop and reduction in airflow that are associated with a typical duct installation (i.e., up to 10' of duct, 2 elbows, and one termination fitting). HVI recommends that NIA be used any time Title-24 intends to reference an "as-installed" airflow.

If CEC were to reference an NIA instead of airflow at 0.1 in. w.g. (and maintain Title 24-2019's same rating requirement), HVI's analysis shows that there are still a significant number of compliant base models with an airflow ≤ 400 cfm that exist today. Figure 2, based on HVI's preliminary calculations of NIA for base models in HVI's database as of January 15, 2021, shows that only 1 model is not likely to achieve a minimum as-installed airflow of 160 cfm (i.e., the as-installed airflow that HVI recommends CEC adopt for kitchen exhaust serving electric cooking appliances). The percent of models that are likely to achieve an as-installed airflow of at least 160 cfm are 93% of microwaves and 100% of range hoods. If CEC were to set the bar for kitchen exhaust serving gas cooking appliances at an as-installed airflow of 250 cfm, 44 base models would likely reach this target, representing 40% of microwaves and 53% of range hoods. Note that each base model in HVI's database may represent several derived models that are available from one or more brand owners. HVI intends to publish final NIA values no later than Q2 2021: well in advance of the effective date for Title 24-2022.

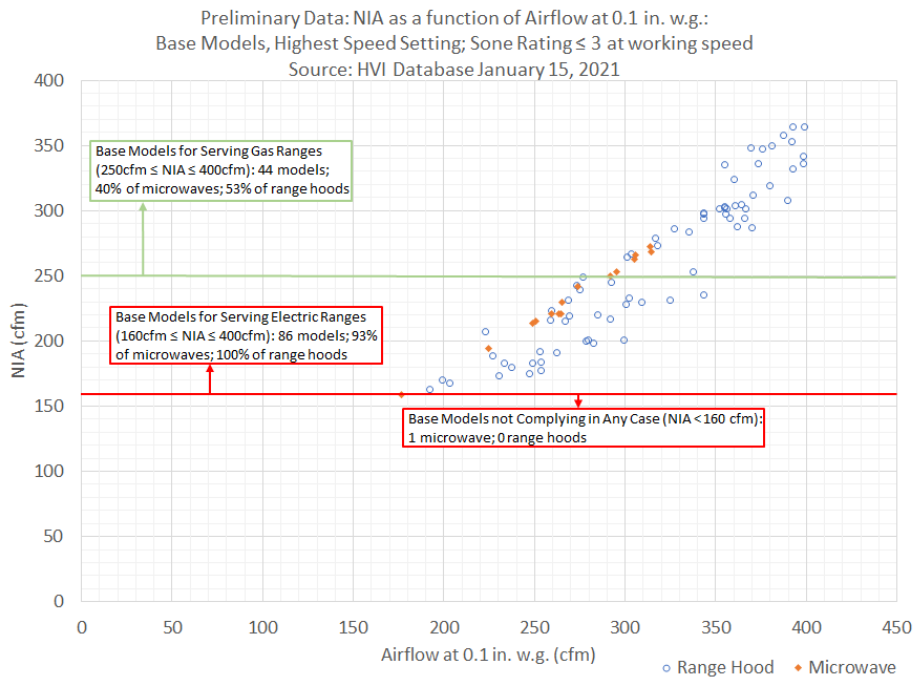


Figure 2. Calculated NIA (preliminary data) as a function of tested airflow at 0.1 in. w.g.

The enclosed appendix translates HVI's recommendations into proposed language for Title 24-2022.

Thank you for the opportunity to provide this comment, and we look forward to continuing to collaborate with CEC to improve access to ventilation and acceptable indoor air quality in California's homes.

Kind regards,

Jacki Donner, CEO

Appendix: Proposed Modifications to CASE and Title 24 Language

Proposed Modifications to CASE Language

Page 7 of CASE’s memo contains proposed language for Title 24-2022. For CEC’s consideration, following are proposed modifications to CASE’s language that align with HVI’s recommendations.

1. Proposed modifications to the Statewide CASE Team’s language for Section 160.2(b)2BAviiB

Objective: *reference a nominal installed airflow (NIA) for the targeted as-installed airflow. Establish one target for CE/NIA for kitchen exhaust over electric ranges and one target for CE/NIA for kitchen exhaust over gas ranges.*

Discussion: *Minimizing the number of compliance tiers is expected to improve product selection, compliance, and enforcement. Selecting a performance target at the upper range of the values proposed by CASE/LBNL/and CEC is expected to promote equivalent protection for individuals located within the immediate vicinity of the cooktop during cooking events (e.g., cooks, guests, children doing homework, etc.), independent of the size of the home that they are located in. For more information, please see HVI’s prior comment submitted to CEC on November 17, 2020 and filed as TN 235643 within this docket.*

Modify CASE’s proposed Section 160.2(b)2BAviiB as follows:

Kitchen Ventilation. A local mechanical exhaust system shall be installed in each kitchen ~~and comply with the following.~~ 1. Exhaust systems in non-enclosed kitchens must meet a, b, or c below, and exhaust systems in enclosed kitchens must meet a, b, c, or d below. Where used for compliance, nominal installed airflow shall be listed in accordance with HVI Publication 920.

- a. A vented range hood with at least one speed setting with a ~~minimum~~ capture efficiency no less than that shown in Table 4.506.2, measured in accordance with ASTM E3087 at a nominal installed airflow described in HVI Publication 920; or
- b. A vented range hood with at least one speed setting with a ~~minimum~~ nominal installed airflow no less than that shown in Table 4.506.2 or higher; or
- c. A vented downdraft kitchen exhaust fan with at least one speed setting with a ~~minimum~~ nominal installed airflow no less than of 300 cfm at 25 Pa (0.1 inches w.c.) or higher; or
- d. Continuous exhaust system with a minimum airflow equal to five kitchen air changes per hour.

TABLE 4.506.2 MINIMUM CAPTURE EFFICIENCY (CE) OR NOMINAL INSTALLED AIRFLOW (CFM NIA) FOR DEMAND-CONTROLLED RANGE HOODS

<u>Dwelling Unit Floor Area (ft²)</u>	<u>Hood Over Electric Range^a</u>	<u>Hood Over Gas Range^a</u>
≤ 750	65% CE or 160 cfm <u>NIA^b</u>	85% CE or 280 cfm
750 – 999	55% CE or 130 cfm	
1,000 – 1,500	50% CE or 110 cfm	80% CE or 250 cfm <u>NIA^b</u>
> 1,500		70% CE or 180 cfm
a. If a range is plumbed for both electricity and gas, the minimum CE or <u>nominal installed airflow</u> must meet the requirements for gas.		
b. <u>A field-verified airflow shall be permitted in place of a nominal installed airflow for a listed product when confirmed by a HERS Rater in accordance with the field verification procedures in Reference Appendices RA3.7 or NA2.2, as applicable.</u>		

2. Proposed Modifications to the Residential Appendices.

Objective: Align the Section 160.2(b)2BAviiB Reference to NIA with HERS Verification Protocols

Modify RA3.7.4.3 as follows:

RA3.7.4.3 Kitchen Range Hood Verification

The verification shall utilize certified rating data from the Home Ventilating Institute (HVI) Certified Home Ventilating Products Directory at <https://hvi.org/proddirectory/index.cfm> or another directory of certified product performance ratings approved by the Energy Commission for determining compliance. The verification procedure shall consist of visual inspection of the installed kitchen range hood to verify and record the following information:

- (a) The manufacturer name and model number.
- (b) The model is listed in the HVI Directory.
- (c) The “as-installed” airflow, determined as either the rated nominal installed airflow value listed in the HVI directory or as the field-verified airflow in accordance with RA3.7.4.1.1.
- (d) The sound rating value listed in the HVI directory.
- (e) If the value for the ~~rated~~ “as-installed” airflow given in the directory is greater than or equal to the airflow requirements specified in the Standards, and if the value for the ~~sound~~ rating given in the directory is less than or equal to the ~~sound~~ rating requirements specified in Standards, then the kitchen range hood complies, otherwise the kitchen range hood does not comply.

Modify NA2.2.4.1.3 as follows:

NA2.2.4.1.3 Kitchen Range Hood Verification

The verification shall utilize certified rating data from the Home Ventilating Institute (HVI) Certified Home Ventilating Products Directory at <https://hvi.org/proddirectory/index.com> or another directory of certified product performance ratings approved by the Energy Commission for determining compliance. The verification procedure shall consist of visual inspection of the installed kitchen range hood to verify and record the following information:

- (a) The manufacturer name and model number.
- (b) The model is listed in the HVI Directory.
- (c) The “as-installed” airflow, determined as either the rated nominal installed airflow value listed in the HVI directory or as the field-verified airflow in accordance with NA2.2.4.1.1.
- (d) The sound rating value listed in the HVI Directory.
- (e) If the value for the ~~rated~~ “as-installed” airflow given in the directory is greater than or equal to the airflow requirements specified in the Standards, and if the value for the ~~sound~~ rating given in the directory is less than or equal to the ~~sound~~ rating requirements specified in Standards, then the kitchen range hood complies, otherwise the kitchen range hood does not comply.

3. Proposed Modification to Title 24 Exceptions to ASHRAE 62.2.

Objective: Permit NIA as an Alternative to Field Verification of Kitchen Exhaust Airflow

Discussion: The following change is recommended for the multifamily and single-family sections of Title 24-2022 within the sections addressing “Amendments to ASHRAE 62.2 requirements”. This language would permit NIA as an alternative to ASHRAE 62.2 Section 5.4 airflow field verification requirements for local exhaust systems, alongside the options of prescriptive duct sizing at 0.25 in. w.g. and installation in accordance with manufacturer duct sizing guidance.

Modify Title 24 “Amendments to ASHRAE 62.2 requirements” as follows:

Kitchen exhaust fans having a nominal installed airflow no less than the minimum required by Section 160.2(b)2BAviiB shall be exempt from the requirements of ASHRAE 62.2 Section 5.4, provided that the associated duct system is no greater than 10 feet in length, has no more than two elbows, and has a duct diameter no less than that associated with the listed nominal installed airflow.