DOCKETED	
Docket Number:	19-BSTD-03
Project Title:	2022 Energy Code Pre-Rulemaking
TN #:	235280
Document Title:	Home Ventilating Institute Comments - HVI Comment - Docket No 19-BSTD-03, 2022 Energy Code Pre-Rulemaking, October 16, 2020
Description:	N/A
Filer:	System
Organization:	Home Ventilating Institute
Submitter Role:	Public
Submission Date:	10/16/2020 10:47:34 AM
Docketed Date:	10/16/2020

Comment Received From: Home Ventilating Institute
Submitted On: 10/16/2020
Docket Number: 19-BSTD-03

HVI Comment - Docket No 19-BSTD-03, 2022 Energy Code Pre-Rulemaking, October 16, 2020

Additional submitted attachment is included below.

HOME VENTILATING INSTITUTE

HARCA

ANSI ACCREDITED
ISO/IEC 17065
Product Certification Body
#0841

MEMBER OF
Indoor Air Quality ASSOCIATION INC.

RESNET
RESIDENTIAL ENERGY SERVICES NETWORK

16 October 2020

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

Re: Docket No. 19-BSTD-03, 2022 Energy Code Pre-Rulemaking

Dear CEC Staff:

The Home Ventilating Institute (HVI) provides more certifications for residential kitchen ventilation products than any other U.S. certification body. We appreciate the opportunity to submit comments regarding CEC's September 30, 2020 hearing and panel discussion on kitchen ventilation, indoor cooking, and indoor air quality (IAQ). Like CEC, HVI shares the common objective of supporting healthier homes through specification of better ventilation systems. With respect to range hoods, HVI is advancing product performance through development of a new certification program to quantify range hood capture efficiency (RHCE) and through development of a new metric, Nominal Installed Airflow (NIA) to provide a better approximation of a range hood's installed airflow under typical field conditions.

In the September 30th hearing, CEC requested industry input on the following range hood specification criteria: Rating Metrics, Cooking Energy Source, Dwelling Unit Size, and Sones. In response to this request, HVI offers the following comments and draft language for CEC's consideration.

1. Approve the following rating metrics and values to be referenced for range hood compliance: RHCE at 70%, NIA at 200 cfm, and airflow of 230 cfm at 0.1 in. w.g.
2. Establish one range hood performance target for all dwelling units, regardless of the size of the dwelling unit and regardless of the cooking energy source.
3. Maintain the current sound requirement and exception to provide the sound rating at working speed.

Rationale supporting these recommendations is provided below.

Rating Metrics
CEC questioned whether range hood capture efficiency "should be used as the basis for an updated standard, if a proxy CFM value should be used, or if both options should be available (i.e., must achieve either a target CE value or a target CFM)."

HVI recognizes RHCE as a robust rating metric that promises a better characterization of hood performance than does airflow alone. HVI has developed a procedure, HVI 917, Range Hood Capture Efficiency Testing and Rating Procedure, that is based on ASTM E3087-18 and will serve as the cornerstone for HVI's certified rating program. Certification will begin once an approved laboratory is able to replicate the standard's test configuration and to demonstrate repeatable test results. HVI is working with Texas A&M's REEL laboratory to execute this task, and to date, the results have been inconsistent, necessitating additional modifications to REEL's experimental setup and test method.

Because REEL's testing and HVI's certification program is still in flux, it is too soon for CEC to require RHCE as the sole performance criteria within Title 24-2022. However, HVI does support CEC's proposal to permit RHCE to be one of multiple options for demonstrating compliance (i.e., RHCE, NIA rating, and airflow rating at 0.1" w.c.).

The critical question is what value to use for each of these compliance options. The cornerstone metric should be capture efficiency, because it is the most closely coupled with pollutant exposure. LBL's most recent research (Chan et al. 2020) suggests that, "requiring a minimum capture efficiency of at least 70% is needed to avoid unacceptably high NO2 (1-h average concentration of 100 ppb or higher) and at least 60% to avoid unacceptably high PM2.5 (24-h average of 25 μg/m3 or higher)."

Depending on the airflow rate required to achieve this RHCE, HVI believes that 70% RHCE could be a widely achievable target. Chan notes that "when using front cooktop burners, range hood airflow in the range of 200 to 300 cfm is needed to achieve a capture efficiency of 70% or higher." A prior LBL report (Kim et al. 2019) suggested that an airflow between 150 – 210 cfm could achieve 70% RHCE. The REEL test data referenced in CASE's report suggests 250 – 290 cfm are necessary to achieve 70% RHCE, but REEL has indicated that this value is likely inflated, and modifications to their test configuration should yield higher RHCE at lower flows in the future. Given these considerations, and until better data are available, HVI offers 200 cfm (actual airflow) as a reasonable proxy for 70% RHCE.

The rating metric that provides the closest approximation of a range hood's actual airflow is NIA. NIA is calculated from the intersection of a range hood's fan curve and a system curve that is considered "typical" (i.e., 10 feet of smooth duct, two elbows, a termination fitting, and a duct diameter that is equivalent to the range hood's duct take-off). Therefore, HVI proposes that the 200 cfm proxy be an NIA rating. Because the NIA rating is relatively new, HVI proposes that CEC also permit a rated airflow at 0.1 in. w.g. for demonstrating compliance. An analysis of over 700 rating points for range hoods listed in HVI's Certified Product Database suggests that an airflow rating of 230 cfm at 0.1 in. w.g. is a reasonable proxy for an NIA of 200 cfm. See Figure 1.

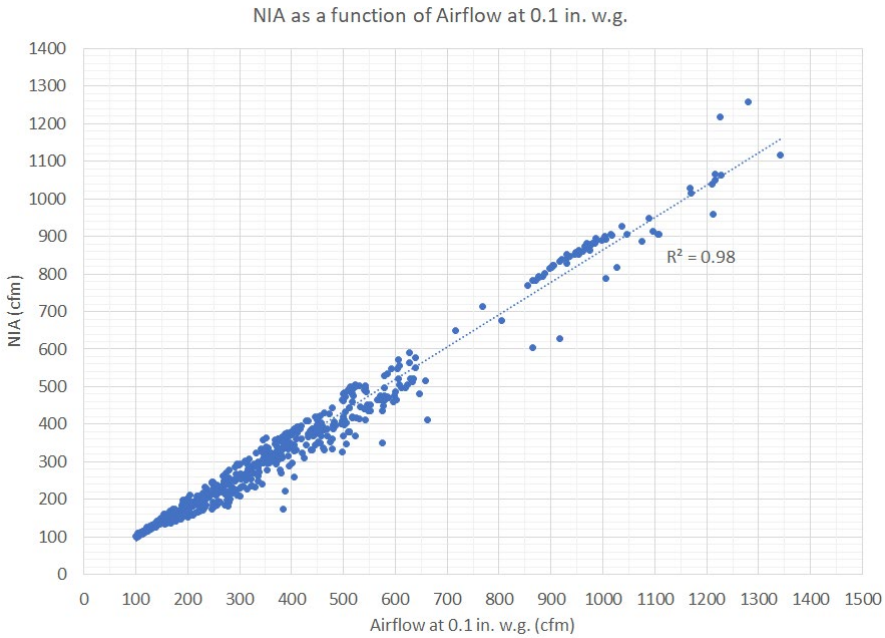

Figure 1. NIA as a function of airflow at 0.1 in. w.g. An airflow of 230 cfm at 0.1 in. w.g. can be expected to produce an NIA of 200 cfm. An airflow of 350 cfm at 0.1 in. w.g. can be expected to produce an actual airflow of 300 cfm (generally, 300 cfm is the airflow that ASHRAE 62.2 requires for kitchen exhaust systems that are not vented range hood).

Cooking Energy Source and Dwelling Unit Size

Cooking events are dynamic and complex, and pollutant exposures resulting from cooking are a function of many variables, such as the two that CEC has highlighted (i.e., cooking energy source and dwelling unit size), but also variables such as range hood height, duration of hood operation, airflow, kitchen layout (e.g., enclosed or open), cook activity, cooking temperature, cooking medium, cooking duration, etc. However, a complicated problem does not require a complicated solution. HVI's proposed solution is based on a simple premise: a range hood should protect not only a theoretical occupant in the center of a well-mixed zone; a range hood should protect the actual cook at the center of the cooking event. To do this, it is necessary to provide a minimum acceptable RHCE regardless of whether a range hood is in a 700 or 7,000 sqft home. Additionally, LBL's research suggests that considerations for setting a target RHCE on the basis of cooking energy source would only yield a 10% difference in the targeted RHCE for a gas versus electric cooktop. This deviation is not significant enough to warrant a different RHCE requirement. Setting one targeted RHCE, regardless of cooking energy source and dwelling unit size, will promote better selection, compliance, and enforcement.

Sones
As noted previously, the industry is working to transition to new and better performance metrics for range hoods. This transition is aligned with the ASHRAE 62.2 Rating Metrics Workgroup recommendations with respect to adoption of a nominal installed airflow metric and a capture efficiency metric. Of particular interest is the loudness of a range hood when operating at a speed setting that produces an acceptable RHCE. However, such data are not available at this time, and as CASE noted in their report, extrapolation of low-speed sound ratings does not provide a very good prediction of high-speed sound ratings. Until more data are available on RHCE and the correlation between RHCE and airflow, and the correlation between airflow/speed-setting/pressure and sound, CEC should not amend its current sound requirements and exceptions.

Appendix A includes proposed modifications to Title 24-2019 that are aligned with these recommendations.

Thank you for the opportunity to provide these comments and for your consideration.

Sincerely,

Jacki Donner, CEO

Enclosure: Appendix A

Appendix A

This appendix includes references and proposed revisions to the high-rise multifamily range hood provisions of Title 24-2019. Similar changes are also recommended for low-rise dwelling units.

Title 24 Part 6, SECTION 120.1 – REQUIREMENTS FOR VENTILATION AND INDOOR AIR QUALITY, High-rise Residential Buildings

120.1(b)2Avi. Kitchen exhaust systems shall comply with the following requirements:

a. Kitchen exhaust systems shall be rated for sound in accordance with Section 7.2 of ASHRAE 62.2. EXCEPTION to Section 120.1(b)2Avi~~i~~a: Kitchen range hoods may be rated for sound at a static pressure determined at working speed as specified in HVI 916 Section 7.2

b. Kitchen exhaust systems shall provide an airflow rate that is no less than the following at one or more speed settings:

1. 200 cfm provided by a vented range hood, verified by demonstrating compliance with at least one of the following:
   - i. a rated nominal installed airflow no less than 200 cfm,
   - ii. a rated nominal installed airflow providing a range hood capture efficiency no less than 70%
   - iii. a rated airflow no less than 230 cfm at 0.1 in. w.g, or
   - iv. a rated airflow no less than 200 cfm at 0.1 in. w.g. and an installed airflow no less than 200 cfm as verified by a HERS rater.
2. 300 cfm provided by a kitchen exhaust system that is not a vented range hood, verified by demonstrating compliance with at least one of the following:
   - i. a rated airflow no less than 350 cfm at 0.1 in. w.g, or
   - ii. a rated airflow no less than 300 cfm at 0.1 in. w.g. and an installed airflow no less than 300 cfm as verified by a HERS rater.
3. Five air changes per hour provided by any kitchen exhaust system that is installed to operate continuously in an enclosed kitchen, verified by demonstrating compliance with at least one of the following:
   - i. calculation of no less than five air changes per hour using a rated nominal installed airflow,
   - ii. calculation of no less than five air changes per hour using a rated airflow at 0.1 in. w.g., and verification by a HERS rater of an installed airflow providing no less five air changes per hour.

120.1(b)2Bii. Kitchen Range Hoods. The installed kitchen range hood shall be field verified in accordance with Reference Nonresidential Appendix NA7.18.1 to confirm the model is rated by HVI to comply with the following requirements:

a. The minimum ventilation airflow rate as specified in Section ~~5 of ASHRAE 62.2~~120.1(b)2Avib.

b. The maximum sound rating as specified in Section 120.1(b)2Avia.

Nonresidential Appendix

NA7.18 High-Rise Residential Dwelling Unit Acceptance Tests

NA7.18.1 Ventilation Airflow

NA7.18.1.1 Dwelling Unit Ventilation Acceptance

NA7.18.1.1.1 Construction Inspection

Prior to functional testing, verify and document the following:

(a) System is designed to provide a fixed minimum outside air when the unit is operating.

(b) Specify the ventilation system type, such as balanced, supply or exhaust.

(c) Specify the method of control.

~~(d) Confirm the kitchen range hood is ventilated to outside.~~

~~(e) Record the kitchen range hood manufacturer name and equipment model number~~

~~(f) Confirm the kitchen range hood is HVI certified.~~

NA7.18.1.1.2 Functional Testing

Step 1: Perform the dwelling unit mechanical ventilation airflow procedure as specified by Reference Nonresidential Appendix NA2.2 to verify the dwelling unit ventilation airflow conforms to the requirements of Standards §120.1(b)2.

Step 2: Obtain HERS Rater field verification as specified in Reference Nonresidential Appendix NA1.

NA7.18.1.2 Kitchen Exhaust System Ventilation Acceptance

NA7.18.1.2.1 Construction Inspection

(a) Confirm the kitchen range hood is ventilated to outside.

(b) Record the kitchen range hood manufacturer name and equipment model number

(c) Confirm the kitchen range hood is HVI certified.

NA7.18.1.2.2 Airflow Verification

(a) Verify and document that the kitchen exhaust system complies with the airflow requirement of Standards §120.1(b)2Avib using one of the following methods:

i. Perform the kitchen exhaust system airflow procedure as specified by Reference Nonresidential Appendix NA2.2 to verify the kitchen exhaust system airflow conforms to the requirements of Standards §120.1(b)2Avib.

ii. Verify that the kitchen exhaust duct system has a diameter no less than the range hood's take-off diameter, a length not exceeding 10 feet, and has no more than 2 elbows; where a nominal installed airflow is used to comply with Standards §120.1(b)2Avib and that nominal installed airflow is associated with an HVI-certified external duct termination fitting, installation of the fitting shall be verified.

iii. Verify that the kitchen exhaust duct system is sized in accordance with manufacturer instructions to provide the

airflow rate required by Standards §120.1(b)2Avib. Manufacturer instructions shall verify that the duct sizing is based on the same assumptions and calculation methodology used in HVI 920 Table AII1, with the exception that the installed duct length and number of elbows shall be used.

Step 2: Obtain HERS Rater field verification as specified in Reference Nonresidential Appendix NA1.

References

Chan WR, Kumar S, Johnson A, Singer BC. 2020. Simulations of short-term exposure to NO2 and PM2.5 to inform capture efficiency standards. Berkeley, CA: Lawrence Berkeley National Laboratory.

Kim YS, Walker IS, Delp WW. Development of a standard capture efficiency test method for residential
kitchen ventilation. Berkeley, CA: Lawrence Berkeley National Laboratory.