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*Comment Received From: Mike Moore*
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## An Alternative Kitchen Exhaust Fan Sone Metric for Better Results

*Additional submitted attachment is included below.*

NEWPORT VENTURES

October 19, 2017

California Energy Commission
1516 Ninth Street, MS-34
Sacramento, CA 95814

Re: Docket 17-BSTD-01, Proposed Kitchen Exhaust Fan Sone Requirements, Section 150.0(o)2 and Section 120.1(b)2b

Dear CEC Staff and CASE Initiative Team:

This comment recommends using a metric for kitchen exhaust fan sones that is better aligned with HVI listings and is expected to yield better performance than the metric proposed by CEC. Additionally, the comment recommends using the terminology “kitchen exhaust fan” instead of “range hood” to avoid introducing loop holes from the performance requirements for non-range hood kitchen exhaust equipment.

The industry is generally supportive of requirements for quiet kitchen exhaust fans. However, there are better methods to achieve specification of quiet kitchen exhaust fans than CEC’s proposal to enforce the max 3 sone requirement at a static pressure of 0.1” w.c. A survey of the HVI range hood database shows that there are ~100 models that can meet the requirement for ≤ 3 sones at 0.1" w.c. However, if we apply filters to identify unique models that are applicable to the majority of the market (i.e., models that are not discontinued, models that are under cabinet or wall-mount, models with width = 30", models differentiated by a feature other than color, models available in the U.S.), **there are only 6 "unique" models available from 4 brands that comply with CEC’s proposed field enforcement**. The average retail cost of these models is $361. Compare this to economy-hoods whose retail starts at <$40, and **there is an ~9x cost increase that will be imposed on consumers with corresponding massive restrictions in selection.**

The issue with the ASHRAE and CEC-proposed requirement is that manufacturers overwhelmingly test and list their hoods at two speeds: high speed (taken at 0.1” w.c.) and working speed. HVI defines working speed as “the speed that produces 100 cfm, or the lowest speed above 100 cfm that a hood can produce while working on the same duct system as the maximum speed test.” With the high-speed rating at 0.1” w.c., working speed generally occurs somewhere around 0.03” w.c. The average high speed in the directory is 315 cfm, which is 3 times the minimum cfm at which the sone rating must be taken, according to ASHRAE 62.2. In other words, there is a disconnect between ASHRAE/CEC requirements and market reality.

The good news is that **if CEC wants to enforce an aggressive sone requirement for hoods, there is another option available today that will work well for consumers, builders, and manufacturers**. The alternative metric is cfm/sone at 0.1” w.c., which can be calculated for any hood listed in the HVI data base and can help level the playing field across models of various exhaust capacities.

I'm not aware of any data that define what a maximum sone level should be, but we do know that loudness is a primary barrier to occupant use. So, a logical approach in capping sound levels for range hoods is to ratchet up the cfm/sone level until range hoods in the HVI database start falling out. This approach led me to a minimum

target of > 30 cfm/sone at 0.1" w.c. This would equate to 3.3 sones at 0.1" w.c. at 100 cfm, and is a little bit noisier than the ASHRAE target.

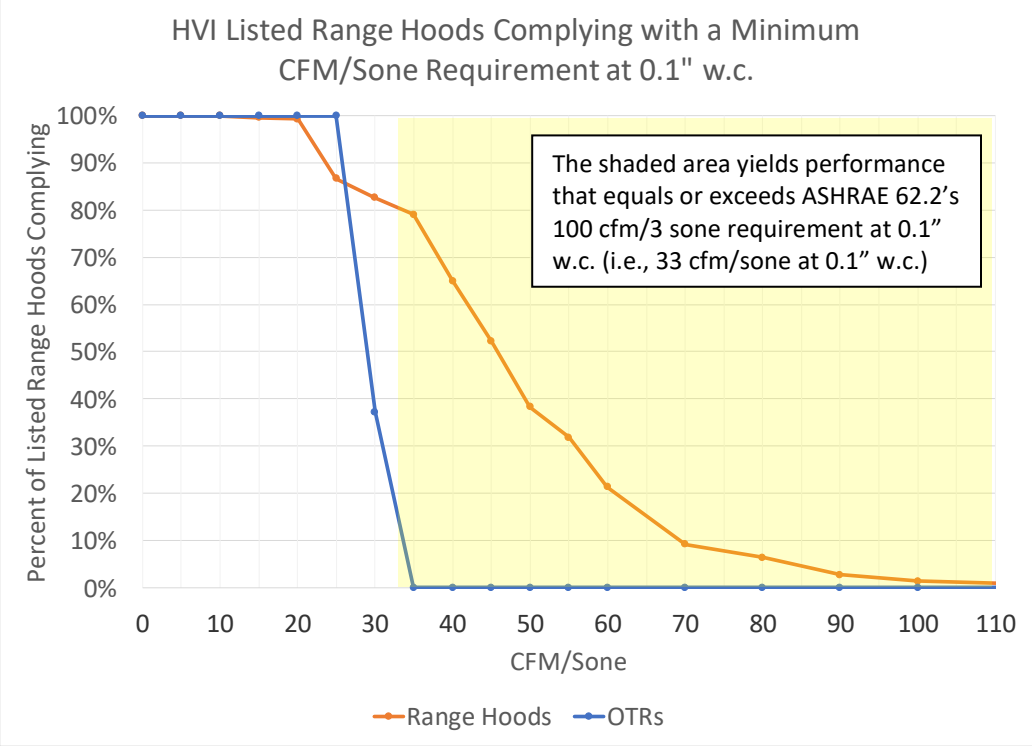
If CEC elected to mandate this metric (i.e., > 30 cfm/sone; see the yellow highlighted row in the table below), it would result in the following compliance levels for models listed in the HVI database at 0.1" w.c. with a flow >= 100 cfm:

- 78% of all models would comply (1096 models)
- 37% of OTRs would comply (48 models; note that OTRs were just listed in June, so this will likely increase in the future)
- 83% of range hoods would comply (1048 models)

CEC may want to be more aggressive than this, to be more in keeping with the ASHRAE 62.2 target of 3 sones at 100 cfm. If the metric were set at > 35 cfm/sone, this would put us at 2.8 sones at 0.1" w.c. for a 100-cfm range hood, which is better aligned with the ASHRAE 62.2 target of 3 sones at 100 cfm. At this level, there would not be any OTRs that currently qualify (though 79% of range hoods still would; see the blue highlighted row in the table below). Perhaps this is okay, because OTRs are notoriously poor performers with respect to capture efficiency, quieter fans will get better use resulting in better IAQ and occupant health, and there's nothing stopping better performing OTRs from meeting this spec.

Increasing the cfm/sone requirement further, to say, 40 cfm/sone would trigger a rapid decline in compliant range hoods and would push the limitations of economy hood performance (at least for now). See the graph and table below for more information with respect to compliance outcomes associated with various cfm/sone scenarios. These data were sourced from the HVI database in August, 2017.

| CFM/Sone | All Listings | All Listing, % of Total | All Listings, % Cumulative | OTR Models | OTR Models, % of Total | OTR Models, % Cumulative | Range Hood Models | Range Hood Models, % of Total | Range Hood Models, % Cumulative |
|---|---|---|---|---|---|---|---|---|---|
| 275< x <=300 | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% |
| 250< x <=275 | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% |
| 225< x <=250 | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% |
| 200< x <=225 | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% |
| 175< x <=200 | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% |
| 150< x <=175 | 0 | 0% | 0% | 0 | 0% | 0% | 0 | 0% | 0% |
| 125< x <=150 | 3 | 0% | 0% | 0 | 0% | 0% | 3 | 0% | 0% |
| 100< x <=125 | 14 | 1% | 1% | 0 | 0% | 0% | 14 | 1% | 1% |
| 90< x <=100 | 18 | 1% | 3% | 0 | 0% | 0% | 18 | 1% | 3% |
| 80< x <=90 | 46 | 3% | 6% | 0 | 0% | 0% | 46 | 4% | 6% |
| 70< x <=80 | 35 | 3% | 8% | 0 | 0% | 0% | 35 | 3% | 9% |
| 60< x <=70 | 154 | 11% | 19% | 0 | 0% | 0% | 154 | 12% | 21% |
| 55< x <=60 | 134 | 10% | 29% | 0 | 0% | 0% | 134 | 11% | 32% |
| 50< x <=55 | 82 | 6% | 35% | 0 | 0% | 0% | 82 | 6% | 38% |
| 45< x <=50 | 175 | 13% | 47% | 0 | 0% | 0% | 175 | 14% | 52% |
| 40< x <=45 | 163 | 12% | 59% | 0 | 0% | 0% | 163 | 13% | 65% |
| 35< x <=40 | 178 | 13% | 72% | 0 | 0% | 0% | 178 | 14% | 79% |
| 30< x <=35 | 94 | 7% | 78% | 48 | 37% | 37% | 46 | 4% | 83% |
| 25< x <=30 | 132 | 9% | 88% | 81 | 63% | 100% | 51 | 4% | 87% |
| 20< x <=25 | 160 | 11% | 99% | 0 | 0% | 100% | 160 | 13% | 99% |
| 15< x <=20 | 4 | 0% | 100% | 0 | 0% | 100% | 4 | 0% | 100% |
| 10< x <=15 | 5 | 0% | 100% | 0 | 0% | 100% | 5 | 0% | 100% |
| 5< x <=10 | 0 | 0% | 100% | 0 | 0% | 100% | 0 | 0% | 100% |
| 0< x <=5 | 0 | 0% | 100% | 0 | 0% | 100% | 0 | 0% | 100% |
| Total | 1397 | | | 129 | | | 1268 | | |




On the basis of this analysis, following is a proposed amendment to 62.2 for California that would establish a minimum cfm/sone metric for range hoods. I've included the phrase "for each of its listed duct orientations and dimensions" to avoid gaming. For example, horizontal ducting generally produces lower sones, but vertical ducting is thought to be the most common in the field. Requiring all listed orientations and duct dimensions to comply with the metric would ensure that a range hood that complies in one orientation is not installed in a non-compliant orientation in the field. Additionally, this will make it easier to coordinate with the Title 20 appliance efficiency database down the road. Also, the proposed language changes the reference in Title 24 from "kitchen range hoods" to "kitchen exhaust fans". This is critical because ASHRAE 62.2 permits non-range hood products such as down drafts, in-line fans, and ceiling- or wall-mounted fans to be used to exhaust kitchens. As such, 62.2 uses the term "kitchen exhaust fans" when establishing minimum sone requirements. Unless the Title 24 language is changed to align with 62.2 and read "kitchen exhaust fans" the Title 24's proposed sone requirements would not apply to these product classes.

**Amend ASHRAE 62.2 as follows:**

**7.2.2 Demand-Controlled Local Exhaust Fans**. Bathroom exhaust fans used to comply with Section 5.2 shall be rated for sound at a maximum of 3 sones. Kitchen exhaust fans used to comply with Section 5.2 shall be rated for sound to exceed 35 cfm/sone at a minimum of 0.1 in. wc (25 Pa) static pressure for each of its listed duct orientations and dimensions ~~at a maximum of 3 sones at one or more airflow settings greater than or equal to 100 cfm (47 L/s). Exception: Fans with a minimum airflow setting exceeding 400 cfm (189 L/s) need not comply.~~

**Amend Title 24 Section 150.0(o)2 and Section 120.1(b)2b as follows:**

**Kitchen ~~Range Hoods~~ Exhaust Fans**. The installed kitchen ~~range hood~~ exhaust fan shall be field verified in accordance with the procedures in Reference Residential Appendix RA3.7.4.3 to confirm the model is rated by HVI to comply with the following requirements:

[*rest of section remains unchanged*]

In the industry's opinion, enforcement of the ASHRAE 62.2 loudness target of ≤ 3 sones at 0.1" w.c. would be extremely costly to manufacturers and consumers of range hoods while providing little value. However, there is great opportunity to realize comparable and even improved kitchen exhaust fan performance versus the ASHRAE 62.2 metric using a metric currently available in the HVI database for all kitchen exhaust fans (i.e., a cfm/sone requirement as outlined above). Establishing a minimum performance criterion on the basis of cfm/sone would be productive for all involved, including consumers, manufacturers, and builders.

Thank you for the opportunity to comment.

Sincerely,

Mike Moore, P.E.
ASHRAE 62.2 Indoor Air Quality Subcommittee Chair