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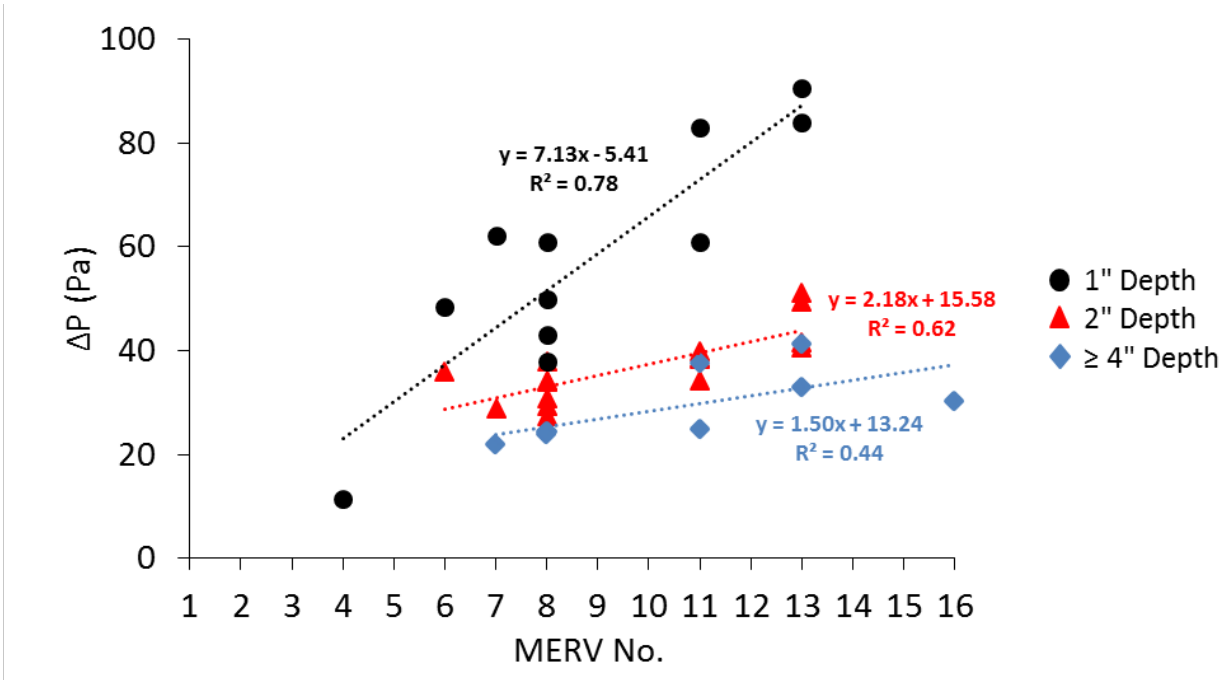
Dear Jeff:

We are writing in support of two specific items in the proposed language on residential air filtration introduced by California Energy Commission staff for the next update to the California Building Energy Efficiency Standards. The two items we specifically support are: (1) requiring MERV 13 filters and (2) requiring two-inch minimum depth filters. We support the MERV 13 requirement based on a combination of measurements and modeling work that we have done in our lab and what we have read from the work of others. Results from this work demonstrate that only MERV 13 filters are required to have at least 50% removal efficiency for 0.3 to 1 µm particles in ASHRAE Standard 52.2, which means they are also most likely to have at least 50% removal efficiency for size classification of particles for which we know most about health effects: $PM_{2.5}$. We also support the two-inch depth requirement because, in our experience in making in-situ filter pressure drop and air handler airflow rate measurements, 2-inch filters (and deeper) tend to have much lower pressure drops (and thus smaller impacts on airflow rates and/or fan power draws) than 1-inch filters. In fact, we want to share some unpublished data with you here to support this conclusion.

Since 2016, we have been making measurements of in-situ particle filtration efficiency, filter pressure drop, and air handler flow rates for a large number of new, clean filters in an unoccupied apartment unit on the main campus of Illinois Institute of Technology in Chicago, IL. To date, we have made these measurements for over 50 residential filters, 36 of which have had a MERV rating reported by the manufacturer. Tests were conducted in a 100% recirculating central air-handling unit with a nominal ~1000 CFM air handler (i.e., with no filter) and a permanent split-capacitor (PSC) blower. The air-handling unit is connected to supply ductwork but does not have return ductwork. Instead, the unit sits upon a return plenum and with a deep filter slot so it can accommodate 16-inch x 25-inch filters of various depths (up to ~12 inches). The figure on the next page shows filter pressure drop measurements made with each of these 36 filters plotted against the manufacturer-reported MERV rating for each filter. The filters ranged from MERV 4 to MERV 16 and from 1-inch depth to 5-inch depth.

Results from these measurements demonstrate that there is a weak correlation between measured filter pressure drop and reported MERV when analyzing the data across all filter depths. However, there is a much stronger correlation between measured filter pressure drop and reported MERV when analyzing only 1-, 2-, or 4+-inch depth filters independently. The filter pressure drops for clean 1-inch filters increase dramatically as MERV increases, up to nearly 100 Pa for the MERV 13 1-inch filters that we have tested. However, filter pressure drop does not increase nearly as dramatically for 2-inch filters or for 4- or 5-inch filters, and the difference between 2-inch filters and 4- or 5-inch filters is much smaller than the difference between 2-inch filters and 1-inch filters. Within just the sample of MERV 13 filters that we have tested, the maximum pressure drop of 2-inch MERV 13 filters was about 50 Pa, while the maximum pressure drop of 4- or 5-inch MERV 13 filters was about 40 Pa. Both are much lower than the maximum pressure drop of 1-inch MERV 13 filters, which was over 90 Pa (and no 1-inch MERV 13 filters had a pressure drop lower than 80 Pa). Clearly,

increasing filter depth to at least 2 inches is wise thing to do if one is to accommodate MERV 13 filters or better, which, as we stated before, we support doing. Although our data are limited to just one system, we believe these data can be easily replicated in other systems as well.



One other item worth noting in the proposed changes that may warrant more consideration and that concerns us to a degree is the requirement that new, clean filter pressure drops be less than 25 Pa (0.1 inches of water column) at the flow rate specified for use. In our system, no filters higher than MERV 10 actually had a pressure drop lower than 25 Pa (and many of the MERV 6 to 8 1-inch filters had a much higher pressure drop than 25 Pa). This target of 25 Pa may be an unrealistic number to obtain by the majority of commercially available filters in most systems. Therefore, we recommend you revisit the requirement.

Sincerely,

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