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Modulating DOAS Requirements Comments

Please see attached file.

Additional submitted attachment is included below.

July 17th, 2026

TO: California Energy Commission, Building Energy Efficiency Standards Division

RE: Comment on 2028 Title 24, Part 6 Draft CASE Report: HVAC Air Distribution, Section 3 (Modulating DOAS)

DOCKET: 25-BSTD-03

FROM: Charlie Stephens, Systems Consultant, Sisters, OR

In the period since I first submitted comments for this docket on May 14th, I've had the opportunity to speak and exchange emails with the CASE team with regard to the proposed code changes in this docket. While the CASE team's information was not always consistent, it was valuable to learn in more detail how they had arrived at their recommendations to the Commission. I was able to compare their analysis to what I've learned over the last 10 years in being a lead particpant in designing and specifying dozens of true Dedicated Outside Air Systems in buildings of several occupancy types in cities all over the country, including in California.

After acquiring all of this additional information, I still find that the measures proposed for Section 3 (modulating DOAS air flow). I'll do my best to be brief here.

Savings

In an on-line meeting, the CASE team suggested that the savings from the DOAS modulation proposal would derive from heating and cooling savings, while in an email exhange, they suggested that, "The analysis also only takes credit for fan energy savings from DCV. No credit is taken for occupied standby fan savings, and no credit is taken for heating/cooling savings from either DCV or occupied standby."

If the latter statement is true – that credit is taken only for DCV fan energy savings – then these modeled savings are highly unlikely to manifest in a true DOAS system (where ventilation air is not anywhere delivered with heating/cooling air) that is based on an efficient HRV or ERV (Sensible Recovery Efficiency, or SRE, at 70 percent or better), properly zoned, controlled, and installed. There won't be any significant savings, if any savings at all. In fact, if the modulation strategy involves additional fans or increases system static pressures, the savings could be negative.

In a true DOAS system, "properly zoned" means ventilation zones that are based on the occupancy patterns in the various building spaces and the control strategy appropriate to those patterns. Heating/cooling loads are based on thermal loads, only part of which comes from occupancy. Our projects typically have quite a few more heating/cooling zones than ventilation zones, so they're not at all the same. Title 24 is not as specific about its use of the word "zones" as I would like in that regard. In spaces where DCV is appropriate (or required, as the case may be), individual HRVs or ERVs are assigned and control parameters programmed. A properly sized HRV or ERV will run at about 70 percent of full rated flow when operating to meet ASHRAE 62.1 conditions for the space(s) it serves, so fan power, with air flow rates programmed only by the HRV or ERV, will be relatively low during most hours.

Costs

Adding any kind of modulating devices at or near the zone(s) is more likely to increase fan energy use than decrease it in this sort of design, so savings would be zero or negative, and no amount of increased cost would be justified. As a side note, based on my own experience with many projects in the field, I sense that the installed measure costs in the CASE report are too low, but I'll leave it to others to provide those details – I don't design or specify the types of systems the CASE report analysis is based on. At a minimum, the controls costs and commissioning costs (including incremental TAB costs) seem to be missing or underestimated.

Cost-effectiveness

Given the above, I doubt that the proposed changes to this part of the code are cost-effective. **But at a minimum, any true DOAS system that's based on an efficient HRV or ERV (in terms of SRE and**

fan efficacy) should be exempt from any requirement for zone-level air flow modulation on top of the built-in HRV or ERV modulation. The proposed code language is general enough that it may end up being applied inappropriately to systems that are inherently more efficient than the CASE report analyses assume.

In addition, total building or system ventilation air flow requirements are irrelevant as a threshold for additional DCV requirements. The appropriateness of DCV controls is based on occupancy patterns and schedules, not on system air flow rates. Savings won't be any more or less cost-effective at 5,000 cfm than they are at 500 cfm in a true DOAS system.

Supply Air Temperature Limitations (Submeasure D)

The proposed limits on DOAS supply air conditioning are somewhat meaningless, especially in most of California's climate zones. The amount of energy required to slightly modify the delivered air temperature or humidity is trivial for a system based on an efficient HRV or ERV, and is most often supplied using heating/cooling efficiencies that are equivalent or better than those doing the heating/cooling for the building (except for the use of electric resistance for heating, which I'm fine with excluding). **In other words, minimum and maximum supply air temperatures from the ventilation system are not worth worrying about in the energy code, as any claim to energy savings from these provisions would be highly speculative.**

Conclusion

On the whole, I don't find the proposed changes to Title 24 in this docket to be very compelling. While there may be some energy savings in applying the Submeasures A, B and C to the type of system the CASE analyses highlights (outside air delivered to the back of fan/coil units in each heating/cooling zone), I doubt they're truly cost-effective, and I'm sure they're not cost-effective for ventilation systems that are truly separate from the heating/cooling system and based on an efficient HRV or ERV.

Basic math and physics tell us that the higher the ventilation system efficiency (heat/energy exchange and fan power), the lower the savings will be with DCV controls added on. Based on testing with the procedures in CSA SPE18-24, such systems operate with a seasonal heating or cooling COP (SCOP) between 4 and 5, or higher in certain climate zones like Marine climates, which California has in abundance. This is higher than the efficiency of any heating/cooling system that serves the thermal loads, so hunting for additional energy savings from managing DCV at the zone level in such systems is a fool's errand, at any cost. After collecting and analyzing many gigabytes of system performance data in dozens of projects in every US climate zone, I can say this with a lot of assurance. In the case of the first 15 NEEA pilot projects, that performance was validated by Pacific Northwest National Laboratory (PNNL) after more than 2 years of operation.

A truly high performance DOAS system, based on a fully independent ventilation air flow and a high performance HRV or ERV doesn't need, and shouldn't be required to include, any modulation aside from that provide by the variable flow of the HRV or ERV. I hope you agree.

Charlie Stephens

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