DOCKETED	
Docket Number:	19-BSTD-03
Project Title:	2022 Energy Code Pre-Rulemaking
TN #:	237059
Document Title:	Several comments on HVAC sections
Description:	N/A
Filer:	System
Organization:	Jeff Stein
Submitter Role:	Public
Submission Date:	3/9/2021 12:38:26 PM
Docketed Date:	3/9/2021

Comment Received From: Jeff Stein
Submitted On: 3/9/2021
Docket Number: 19-BSTD-03

Several comments on HVAC sections

see attached file

Additional submitted attachment is included below.

TAYLOR ENGINEERING

To:	CEC
From:	Jeff Stein
Subject:	Docket # 19-BSTD-03, 2022 Energy Code Pre-Rulemaking – General HVAC Comments
Date:	March 9, 2021

Below are some of our comments on the 2022 Energy Code Pre-Rulemaking

1. Delete Exception 3 to 140.4(k)8

   Rationale:

   a. This exception exempts perimeter convective heating and radiant ceiling panels from the new boiler system efficiency requirements. Neither of these two types of systems need or deserve an exemption. Both types can easily meet the requirements. This exception is not explained in the CASE report. Note that the new boiler system efficiency requirements exactly match the new requirements in ASHRAE 90.1-2019, except for this exception, which is not included in 90.1. This exception will result in less efficient convective heating and radiant ceiling panels and will drive some designers to select this less efficient type of system to avoid the new requirements.

2. Revise 140.4(p)1.A to make it clear that the independent space condition system must include an economizer and that the DOAS must include heat recovery.

   Rationale:

   a. The way it is currently written the independent system does not have to include an economizer if Section 140.4(e)1 does not require it to have an economizer. Similarly, if the DOAS system meets one of the many exceptions to energy recovery in 140.4(g) then it does not need to include energy recovery. Clearly this is not the author's intent because if this was the author's intent then there would be no need to add a new section to the code that basically just says "comply with the rest of the code". So presumably the intent is that you do not need to comply with 140.4(p)1.B if you have an economizer and heat recovery.

3. Delete 140.4(p)1.B.iv and revise 120.1(d)3.C from 3,000 cfm to 1,000 cfm.

   Rationale:

   a. The way 140.4(p)1.B.iv is currently written it says DOAS > 1,000 cfm must meet the DCV requirements in 120.1(d)3 but the DCV requirements in 120.1(d)3 only apply to DOAS > 3,000 cfm. Clearly the author's intent is that DCV is required for DOAS > 1,000. Otherwise 140.4(p)1.B.iv would have no meaning. Revising 120.1(d)3.C achieves the author's intent in a much less ambiguous way.

   b. 140.4(p)1.B.iv refers to DCV requirements in 120.1(d)5 but 120.1(d)5 is not about DCV. It is about occupant standby controls and it already applies to DOAS units (not

just DOAS < 1,000 cfm). This reference creates confusion about what is required. Better to simply delete it or make it a note: "Note that DOAS units are not exempt from the DCV and occupied standby requirements in …"

4. Revise Table 140.4-G and 140.4-H to make it clear that the values are in CFM of design outdoor air.

   Rationale:

   a. There is no way to tell what the units are or if the values are supply air or outside air.

5. Delete EXCEPTION 1 to Section 140.4(q) or revise it to make it clear that heat recovery is not required for variable volume lab systems capable of reducing zone exhaust and makeup airflow rates below 10 ACH.

   Rationale:

   a. The way this exception is currently worded it exempts all lab systems, regardless of whether they are required to be VAV, per Section 140.9(c). For example, a 24/7 constant volume lab system with 20 ACH is exempt from 140.9(c) so it "meets" the prescriptive requirements in 140.9(c) because there are no prescriptive requirements for this system in 140.9(c). Obviously heat recovery is cost effective for such a lab, so it should not be exempt.

6. 140.4(a)2 – Rather than requiring heat pumps, consider requiring the criteria desired, such as electric (non-fossil fuel) heating with a heating COP > x.

   Rationale:

   a. There may be other technologies now or in the future that achieve the desired criteria.

7. 140.4(a)2 – consider deleting the requirements for air conditioners with furnaces.

   Rationale:

   a. Do we really care if someone uses a heat pump in these cases?

8. Revise EXCEPTION 6 to Section 140.4(e)1 as follows "For Climate Zones 1-4 and 8-16, systems <u>with a mechanical cooling capacity under 54,000 Btu/hr</u> providing cooling and heating decoupled from ventilation and that utilize a dedicated outdoor air system ~~for ventilation in accordance with~~ <u>that meets the criteria in</u> 140.4(p)1B"

   Rationale:

   a. Allowing this new exception to be applied to systems over 54kBtuh that require economizers under current T24-2019 is a big step backwards. A DOAS+ERV system is not equivalent to an economizer and will result in higher energy use (heating, cooling, and fan energy will all be higher). Cooling energy is higher due to the loss of the economizer. Fan energy is higher because DOAS and fan coil fans typically run at constant speed, while VAV economizer systems spend most of the time at part

load and capture cube law fan energy savings. Note that a common myth with DOAS is that it eliminates reheat. A DOAS will condition the air to a single supply air temperature and that temperature is only likely to be optimum energy-wise for only one zone. All the rest must reheat or recool. And the energy used to do so is on par with a VAV system. And if dehumidification is required, as it is for chilled beams and sometimes radiant, then there will be more reheat used.

b. We have serious concerns with the energy models that were used to justify this. For example, the models used a fixed 20% minimum ventilation rate for the baseline VAV systems. However, the 20% allowable minimum is being deleted from Title 24-2022. Thus the minimum should be based on the design OA rate, which is often well below 20% of the design cooling flow.

c. The results in the CASE report do not match similar analyses we have evaluated such as this one: https://taylorengineers.com/wp-content/uploads/2020/05/ASHRAE_Journal_-_VAVR_vs_ACBDOAS.pdf

d. Adding energy recovery does not make up for the loss of the economizer. As evidenced by the separate exhaust air heat recovery proposal, heat recovery only makes sense on large buildings with very high ventilation rates (e.g. labs), in extreme climates. This exception applies mostly to small buildings, with low minimum ventilation rates (e.g. office, retail, school with DCV, etc), in mild climates (e.g. LA and Bay Area). For most of the buildings that this will affect there is little or no heat or cooling to recover. Outside air needed to make up for toilet and other exhausts and to adequately pressurize the building can be as much or more than the ventilation requirement. So there is no available exhaust to recover heat from. Many DOAS system simply match the exhaust rate to the intake rate but this means drawing the building negative which increases the heating/cooling load and can encourage mold growth in the walls.

e. In addition to the energy benefits, economizer systems are also superior to DOAS in terms of indoor air quality because they provide much higher outside air rates in economizer mode, which is most occupied hours. Economizer systems also have greater flexibility to deal with COVID and wildfire smoke.

f. The proposed DOAS exception is quite complicated. Unscrupulous salespeople will use this complexity to convince engineers and AHJs that pretty much any DOAS meets the exception.

g. There is a common misperception that DOAS systems are exempt from some of the more important energy savings requirements in Title 24, like DCV and occupied standby. Even well-meaning engineers and AHJs may inadvertently omit these important requirements from DOAS systems.

h. The proposed requirement that DOAS be sized at 200% of the ventilation rate is in conflict with the mandatory requirement in 120.1(f) (Design and Control Requirements for Quantities of Outdoor Air) which requires that the system be

capable of operating at 100% of the ventilation rate. DOAS systems are typically constant volume, without zone control dampers. So if it is designed for 200% then it is not capable of operating at 100%.

i. Adding a new exception to an existing prescriptive requirement reduces the stringency of the standard and will not save energy. If it were more efficient then designers could use the performance method.

j. Changing "for ventilation in accordance with" to "that meets the criteria in" makes it clear that the DOAS needs to include energy recovery, bypass, etc. Otherwise someone could argue that a DOAS that is not required to meet 140.4(p)1B (e.g. because it meets 140.4(p)1A) is "in accordance with" 140.4(p)1B because 140.4(p)1B does not apply to it. Changing it to "that meets the criteria in" removes this ambiguity.