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Staff Supplement to CASE Report #2019-NR-ASHRAE90.1-F

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Subject: Proposals Based on ASHRAE 90.1-2016 – Final Report, 2019-NR-ASHRAE90.1-F

DESCRIPTION OF PROPOSED REGULATORY CHANGES

CASE report #2019-NR-ASHRAE90.1-F, titled Proposals Based on ASHRAE 90.1-2016, and proposes to make the following changes to the Standards:

- Proposal aims to modify Section 140.4(c) - Power Consumption of Fans. The measure titled "Fan System Power", in section 2 of the CASE report, proposes to harmonize with the calculation methodology used in ASHRAE 90.1-2016 Section 6.5.3.1 to determine the allowed fan power. In this proposal the ASHRAE 90.1-2016 calculation methodology was used as starting point, but adjustments were made to match the fan power allowance as documented in the 2016 Title 24, Part 6 Nonresidential Alternative Calculation Method (ACM) Reference Manual. The ACM assumes a lower total static pressure which results in more stringency in allowed fan power. This increased stringency will be reflected in the fan power equations found in Table 140.4-A, in section 2.6.1 of the CASE report. Also, ASHRAE 90.1-2016 includes fan adjustment factors to allow for variability in allowed fan power for certain applications. These fan adjustment factors will be incorporated into Title 24, Part 6 as proposed in Table 140.4-B, in section 2.6.1 of the CASE report.

- Proposal aims to add a new section in 140.4(xx). The measure titled "Exhaust Air Heat Recovery", in Section 3 of the CASE report, proposes a prescriptive requirement for heat recovery ventilations be installed in the exhaust airstream of certain buildings. The proposed requirements are based on the requirements in ASHRAE 90.1-2016 Section 6.5.6.1, but the minimum energy recovery ratio requirements in ASHRAE 90.1-2016 were adjusted to 60 percent establish more appropriate requirements for California's climate.

- Proposal aims to modify the efficiency tables in Section 110.2. The measure titled "Equipment Efficiency", in section 4 of the CASE report, proposes to implement the increased minimum efficiency values as published in the 2016 release of ASHRAE 90.1.

The proposed equipment efficiency measure will update the mandatory efficiency requirements for space conditioning equipment that appear in Tables 110.2-A through K of Title 24, Part 6. Tables 110.2-A through K include efficiency requirements for a wide variety of space conditioning equipment and contain hundreds of unique efficiency values. The Statewide CASE Team is proposing that 18 values in these tables be updated. Most of these changes will update the minimum efficiency values for equipment that is already covered by Title 24, Part 6.

- Proposal aims to add new waterside economizer requirements to Section 140.4(e) – Economizers. The measure titled "Waterside Economizers", in section 5 of the CASE report, proposes to require chilled water systems have a waterside economizer if over a climate zone specific capacity as proposed in 5.6.1 of the CASE report, in addition to the existing air handling unit requirement. It also adds requirements for the 15 feet of water pressure drop limitation or bypass on the water loop to minimize energy penalty when the economizer is not in use. The measure includes a requirement that heat rejection fan energy cannot increase when the economizer is not in operation, and adds clarifying language specifying that waterside economizers must be capable of integrated partial economizing. Finally, it adds a table of chilled water capacities that specifies in which climate zones an economizer is required and what the capacity is to activate the requirement.

- Proposal aims to add a new section in 140.4(p) – Exhaust System Transfer Air and 140.9(d) – Exhaust System Transfer Air. The measure titled "Transfer Air for Exhaust Air Makeup", in section 6 of the CASE report, proposes to expand the existing Title 24, Part 6 requirement for kitchen exhaust transfer air to other types of exhaust systems, such as restroom and lab exhaust. This measure exactly matches the same requirement that was added to ASHRAE 90.1 in 2013. It is a prescriptive measure that applies to most spaces that have a process exhaust airflow rate that exceeds the airflow required for heating or cooling and that are adjacent to spaces that do not have high exhaust requirements. This will eliminate the wasteful practice of providing 100 percent outside air or 100 percent supply air to spaces with high exhaust rates while at the same time relieving air from other spaces in the same building, when the relieved air could have been transferred to the high exhaust space to reduce the total heating/cooling load. The payback for this measure is immediate because it reduces both first cost and energy cost compared to 100 percent supply air to spaces with high exhaust rates.

- Proposal aims to modify section 120.1(c)3 – Required Demand Control Ventilation. The measure titled "Demand Controlled Ventilation for Classrooms", in section 7 of the CASE report, proposes several modifications to the existing mandatory requirement for demand control ventilation (DCV) for high-density spaces. It applies to high-density spaces in most building types covered by Title 24, Part 6, such as offices, schools, universities, assembly spaces, churches, and retail spaces. Some spaces not previously covered by DCV, notably classrooms, call centers and certain office spaces, would now be covered.

- Proposed aims to modify section 120.1(c)5 – Occupant Sensor Ventilation Control Devices and section 120.2(e)3 – Occupancy Sensing HVAC Zone Controls. The measure titled "Occupant Sensor Ventilation Control Requirements", in section 8 of the CASE report, proposes to modify the existing mandatory occupant sensor ventilation control requirements in Section 120.1(c)5 and 120.2(e)3. One of the main changes is to the existing requirement which calls for maintaining one quarter of the occupied minimum ventilation rate when the zone is unoccupied. The proposed requirement is to completely shut off ventilation if the space is unoccupied and the heating/cooling setpoints are satisfied. This change is facilitated by the fact that ANSI/ASHRAE Standard 62.1-2016 Ventilation for Acceptable Indoor Air Quality (ASHRAE 62.1), which is also being proposed for the 2019 Standards update, allows "occupied standby mode" for selected spaces, meaning that zero ventilation is allowed when the space is unoccupied. The proposed measure also modifies the zones to which occupant sensor ventilation control requirements apply. This proposal is similar to a proposal that ASHRAE 90.1 approved for publication and public review at the January 2017 ASHRAE meeting.

Staff agrees with the proposed changes to Section(s) 110.2, 140.4(e), 140.4(p), 140.9(d), 120.1(c)3 and 120.2(e)3, and have incorporated substantively similar changes into the proposed Express Terms.

Staff does not agree with the proposed changes to Section(s) 140.4(c), 140.4(xx), 120.1(c)5 or 120.2(e)3, and have instead proposed to make the following changes to Section(s) 140.4(c), 140.4(xx), 120.1(c)5 and 120.2(e)3 in the Express Terms:

- Proposal for Section 140.4(c) - Staff is in favor of aligning with ASHRAE's fan power methodology without increasing the stringency. The increased stringency will result in an elimination of certain unitary packaged HVAC units with fan motors above five hp. Due to the possible elimination of units Staff is proposing to align with ASHRAE's fan power calculation as written by ASHRAE. This proposal will result in energy savings compared to the current power limitations.

- Proposal for Section 140.4(xx) - Staff does not agree with this proposal due to the limited applicability based on cost effectiveness. Instead Staff is recommending this measure be included as a voluntary measure in CalGREEN and for not changes to be done in Section 140.4.

- Proposal for Sections 120.1(c)5 and 120.2(e)3 – Staff proposes to limit the Occupancy Sensing HVAC Zone Controls to spaces that already have an occupancy sensor for lighting controls and which the new proposed table 120.1-B (which is based on ASHRAE 62.1 breathing zone table) designates as eligible for reducing the ventilation to zero. By retaining the occupancy sensor and lighting control dependence, Staff is not recommending deletion of all of Section 120.1(c)5, only Sections 120.1(c)5C,D and E will be deleted. Also, the reduction in ventilation will continue to be only while the space is within the deadband. Staff proposes to require a 2 degree deadband for non DDC controlled systems and a 0.5 degree deadband for DDC based controlled systems.

Staff is proposing the alternative to Section 140.4(c) to keep in alignment with ASHRAE 90.1 fan power limitation and not eliminate certain product lines of unitary packaged HVAC units.

Staff is proposing the alternative to Section 140.4(xx) because this measure was only cost effective in Climate Zones 2, 9-15 and only for buildings with very high exhaust rates which were occupied many hours of the year. Due to this limited applicability Staff will be proposing for this measure to be considered for CalGREEN.

Staff is proposing the alternative to Sections 120.1(c)5 and 120.2(e)3 because of several factors. The deletion of section 120.1(c)5 eliminates the occupancy sensor independent signal requirement when the occupancy sensor is used to control both the DCV and lighting as well as the allowance of the preoccupancy purge. Also, the draft CASE report proposed code change only impacted spaces that used an occupant sensor to control lighting and was allowed to reduce ventilation to zero according to ASHRAE 62.1. The final CASE report expanded the proposed measure to more spaces by mandating an occupant sensor even if one was not used for lighting controls. This is a significant change with no justification for expanding the scope of the current occupied standby designated spaces nor the effects on indoor air quality.

STAFF ANALYSIS AND CONCLUSION

Staff has analyzed the submitted CASE report and reached the following conclusions for the measures included in the Express Terms:

- Based on the evidence presented in the CASE Report, the measures, as proposed, appear to be cost effective and the author appears to have appropriately followed the Energy Commission's Life Cycle Cost methodology.

- Measure costs premiums presented in the CASE Report appear reasonable and appropriate for the measure proposed.

- Measure energy savings presented in the CASE Report appear to have been appropriately modeled and appear credible.

Staff additionally find that the alternate proposal for Sections 140.4(c), 120.1(c)5 and 120.2(e)3 falls within the analysis of the CASE report, and is found to be feasible and cost effective based on the report's analysis of the CASE proposal for Sections 140.4(c), 120.1(c)5 and 120.2(e)3, for the following reasons:

The CASE report noted that the ASHRAE 90.1 fan power limitation was more stringent than our current 2016 Title 24, Part 6 prescriptive requirement for fan power. Although the amount of energy savings would be less, the alternative proposal will not eliminate any federally covered unitary packaged HVAC system.

The CASE report showed cost effectiveness and energy savings for the original proposed code change which was limited to spaces that already had an occupant sensor for lighting controls and for which were eligible under ASHAE 62.1 to reduce ventilation to zero.