



Code Amendment Proposal Application

Proposal 6

Department of Consumer & Business Services
Building Codes Division
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Read the entire code amendment proposal application before completing this form. Please complete all parts before submitting your proposal and refer to the provided checklist.

APPLICANT INFORMATION

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PROPOSAL INFORMATION

Specialty code: Oregon Reach Code
Code section(s): 5.6.8
Briefly explain the subject of your proposal: Dedicated outdoor air systems (DOAS)

INSTRUCTIONS AND CHECKLIST


Fill in all the information above and submit this page, signed and dated, with the required supplementary information for Parts I, II, and III listed in the following checklist. This application may be submitted by mail to the mailing address above, or by email to BCD.PTSPtech@oregon.gov.

Checklist:

- Part I** Code amendment language is attached in the proper format.
- Part II** Amendment proposal requirements for amending the code have been reviewed.
- Part III** Amendment proposal criteria questions have been answered and are attached.

Note: One application is required for each code section you are proposing to amend. If this proposal requires changes in other sections of the code for alignment, include those changes as part of this application.

APPLICANT SIGNATURE

Signature:  Date: 2/24/2022

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Oregon Reach Code Proposal: Dedicated outdoor air systems (DOAS)

Part I: Code Amendment Language

Add new language in Section 6.4 (Mandatory Provisions):

6.4.8 Dedicated outdoor air systems (DOAS)

For buildings with occupancies as shown in Table 6.4.8, outdoor air shall be provided to each occupied space by a dedicated outdoor air system (DOAS) which delivers 100 percent outdoor air without requiring operation of the heating and cooling system fans for ventilation air delivery. The DOAS shall meet the requirements for total energy recovery in Section 6.4.9 and minimum efficiency requirements in Table 6.8.1-14.

Exceptions:

1. Occupied spaces that are not ventilated by a mechanical ventilation system and are only ventilated by a natural ventilation system in accordance with Section 402 of the International Mechanical Code;
2. Buildings where the primary cooling exceeds the minimum cooling, efficiency requirements in Section 6.8 by 10 percent. If a unit is rated with an IPLV, IEER, or SEER, the minimum cooling efficiency of the HVAC unit must be increased by the percentage shown. If the HVAC unit is only rated with a full-load metric like EER cooling then these must be increased by 10 percent;
3. Buildings with underfloor air systems

Table 6.4.8 Occupancy Classifications Requiring DOAS

<u>IBC Occupancy Classification</u>	<u>Inclusions</u>	<u>Exempted</u>
<u>A-1</u>	<u>All occupancies not specifically exempted</u>	<u>Television and radio studios</u>
<u>A-2</u>	<u>Casinos (gaming area)</u>	<u>All other A-2 occupancies</u>
<u>A-3</u>	<u>Lecture halls, community halls, exhibition halls, gymnasiums, courtrooms, libraries, places of religious worship</u>	<u>All other A-3 occupancies</u>
<u>A-4, A-5</u>		<u>All occupancies excluded</u>
<u>B</u>	<u>All occupancies not specifically exempted</u>	<u>Food processing establishments including commercial kitchens, restaurants, cafeterias; laboratories for testing and research;</u>

		<u>data processing facilities and telephone exchanges; air traffic control towers; animal hospitals, kennels, pounds; ambulatory care facilities.</u>
F, H, I, R, S, U		All occupancies excluded
E, M	All occupancies included	

6.4.8.1 Controls. The HVAC system shall include supply-air temperature reset controls that meet the requirements of Section 6.5.3.5.

6.4.8.2 Energy recovery ventilation with DOAS. The DOAS shall include energy recovery ventilation. The energy recovery system shall have a 50 percent *enthalpy recovery ratio* in accordance with Section 6.5.6.1. For DOAS having a total fan system motor nameplate hp less than 5 hp, total combined fan power shall not exceed 1 W/cfm of outdoor air. For DOAS having a total fan system motor hp greater than 5 hp, refer to fan power limitations of Section 6.5.3.1. The airflow rate thresholds for energy recovery requirements in Tables 6.5.6.1.2-1 and 6.5.6.1.2-2 do not apply.

Exceptions:

1. Occupied spaces with all of the following characteristics: complying with Section 6.5.6.1, served by less than 5000 cfm, with an average occupant load greater than 25 people per 1000 square feet (93 m²) of floor area (as established in Table 403.3.1.1 of the International Mechanical Code) that include demand control ventilation configured to reduce outdoor air by at least 50% below design minimum ventilation rates when the actual occupancy of the space served by the system is less than the design occupancy.
2. Systems installed for the sole purpose of providing makeup air for systems exhausting toxic, flammable, paint, or corrosive fumes or dust, dryer exhaust, or commercial kitchen hoods used for collecting and removing grease vapors and smoke.

6.4.8.3 Heating/cooling system fan controls. Heating and cooling equipment fans, heating and cooling circulation pumps, and terminal unit fans shall cycle off and terminal unit primary cooling air shall be shut off when there is no call for heating or cooling in the zone.

Exception: Fans used for heating and cooling using less than 0.12 watts per cfm may operate when space temperatures are within the set point dead band (Section 6.4.3.1.2) to provide destratification and air mixing in the space.

6.4.8.4 Decoupled DOAS supply air. The DOAS supply air shall be delivered directly to occupied space or downstream of the terminal heating and/or cooling units.

Exceptions:

1. Active chilled beam systems.
2. Sensible only cooling terminal units with pressure independent variable airflow regulating devices limiting the DOAS supply air to the greater of latent load or minimum ventilation requirements.

3. Terminal heating and/or cooling units that comply with the low fan power allowance requirements in the exception of Section 6.4.8.3.

Part II –Code Amendment Proposal Requirements

To the best of our knowledge, this proposal aligns with all statutes and rules governing the Oregon state building code

Part III -Code Amendment Proposal Criteria

The majority of commercial HVAC systems are based around a central air handling delivery system. This system typically provides heating, cooling and ventilation air from a single source. Since cooling is typically the largest instantaneous load, the fans must be sized large enough to deliver enough air to meet the peak cooling requirements. When the ventilation is integrated, these large fans must operate during all occupied hours to deliver ventilation effectively to the space. This leads to very high fan energy use. With ventilation separated from the heating and cooling delivery, the large heating/cooling fans can be shut off unless there is a call for heating or cooling and the much smaller ventilation-only fans can operate to deliver fresh air to the space. Furthermore, when the ventilation air is delivered using either Energy Recovery Ventilation (ERV) the heating energy requirements associated with tempering the ventilation air are significantly reduced or eliminated. Compliance with this proposed code amendments requires the following in buildings where the cooling or heating system is not 10 percent more efficient than code requirements.

- a. 100% ventilation air delivered directly to each zone separate from the heating/cooling system.
- b. Ventilation air delivered using an ERV
- c. Run heating and cooling equipment (fans and pumps) only when there is a call for conditioning in the zone.

Note that designs based around a DOAS is not new and it has long been established that this design direction leads to more energy efficient buildings. The General Services Administration required DOAS as the baseline design for all new GSA buildings unless otherwise directed by design programming in 1998.¹ The specifications require perimeter and interior systems have 100 percent outside air ventilation systems which are completely independent of any other air distribution system. Enthalpy heat recovery must be included if the outside air required or equipment capacity exceeds a stated amount.

This proposed code change is similar to the requirements currently adopted in the Washington State Energy Code which requires buildings of only certain occupancy types to have a DOAS system. A DOAS would be required in buildings whose occupancy is intended for Mercantile (Group M), and Educational (Group E). A DOAS would also be required in most Business's (Group B) except those exempted, certain Assembly occupancies (Group A) for performing arts or motion pictures (except for television and radio studios), casinos, and lecture halls, community halls, exhibition halls, gymnasiums, courtrooms, libraries, and places of religious worship. A DOAS would not be required in buildings where the cooling or heating system is 10 percent more efficient than code requirements.

A DOAS would also not be required in the building for occupancies for Residential (Group R), Factory and Industrial (Group F), High Hazard (Group H), Institutional (Group I), Storage (Group S), and Utility and Miscellaneous (Group U).

Costs and Savings

The proposed code change will increase costs. On average the incremental cost of adding a DOAS for several building prototypes (small, medium and large office, retail, and schools) was found to be \$880 per thousand square foot. The increased cost of requiring DOAS systems is more than offset by operating cost savings. When compared to a code-minimum system upgrade, very high efficiency DOAS can reduce commercial building energy use by an average of 9% to 17% depending on the type of DOAS system used in Climate Zone 4A. In California, installing a DOAS was found to save on average \$4-\$5 in operating costs for every additional dollar spent to install a DOAS in a building. Buildings with DOAS systems not only save energy but also exhibit improved indoor air quality which is especially important in businesses and schools.