

Proposal Summary



2022 California Energy Code (Title 24, Part 6)

Nonresidential HVAC Controls – Dedicated Outside Air Systems

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Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on October 15, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email info@title24stakeholders.com by October 29, 2019.

Measure Description

This measure will add prescriptive requirements to Dedicated Outside Air Systems (DOAS) when used as the primary source of ventilation in nonresidential buildings to include a minimum level of efficiency criteria and control capabilities. This measure is based on research conducted by PG&E's Code Readiness project and code enhancements in Washington State Building Energy Code on DOAS in 2015 and 2017.

The measure will also add prescriptive requirements for exhaust air heat recovery previously presented in draft language from 2019 Title 24, Part 6 and similar to the requirements in the current version of ASHRAE 90.1.

Dedicated Outside Air Systems of a nominal size (xxxx cfm or greater) are being considered to include:

1. Ventilation heat recovery with a minimum level of sensible heat recovery ratio (to be determined) and an integrated bypass control.
2. Modulating fan speed control capabilities and for systems under 5 hp, a maximum W/cfm. Fans greater than 5 hp to meet existing requirements in 140.4 (c).
3. Zone heating and cooling equipment fan and/or pump controls configured to cycle off when no call for conditioning.
4. Increased space ventilation and/or exhaust minimums to 150% to 200% for buildings which are not required to have full economizing.
5. Maximum supply air temperature to avoid reheating ventilation air when in cooling mode.

Exhaust Air Heat Recovery based on criteria defined in ASHRAE 90.1 specific to California climate zones.



Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions). Expected sections or tables of the proposed code (but not specific changes at this time) are highlighted in yellow.

Standards

SECTION 140.4 – PRESCRIPTIVE REQUIREMENTS FOR SPACE CONDITIONING SYSTEMS

(p) Dedicated Outside Air Systems (DOAS). Each individual dedicated outside air system (to be defined) greater than or equal to xxxx cfm which delivers 100 percent outside air for ventilation air delivery shall include:

1. An energy recovery system with a minimum xx% sensible effectiveness at design conditions in accordance with AHRI Standard 1060, 2013 and ability to bypass or control to enable economizer operations as required by section 140.4 (e). The bypass or control shall include the ability to modulate airflow bypass to achieve a supply air setpoint or outside air control setpoint for partial bypass.

EXCEPTION to Section 140.4(p)1: Systems installed for sole purpose of providing makeup air for exhausting toxic, flammable, paint, or corrosive fumes or dust, dryer exhaust, or commercial kitchen hoods used for collecting and removing grease vapors and smoke.

2. Fan systems shall be capable of fan speed control and for DOAS fans with a motor nameplate hp less than 5 hp shall not exceed a total combined fan power of xxx W/cfm of outdoor air. Fans greater than 5 hp shall meet requirements of Section 140.4 (c).
3. Systems dedicated to providing ventilation air to one zone meeting the criteria for occupied-standby control in Section 120.2(e)3, shall shut off the fan when the occupied standby control calls for ventilation air to be shut-off. Systems providing ventilation to multiple zones and at least zone meets the criteria for occupied-standby control in Section 120.2(e)3, when the occupied standby control calls for ventilation air to be shut-off, airflow to zone shall be shut off and fan speed reduced. If occupied standby control calls for ventilation air to be shut-off in all zones the fan shall be shut off.
4. Systems shall modulate airflow and control fan speed in response to demand ventilation controls complying with 120.1(d)4 for all spaces with a design occupant density, or a maximum occupant load factor for egress purposes in the CBC, greater than or equal to 25 people per 1000 square feet (40 square feet or less per person).

EXCEPTION 1 to Section 140.4(p)4: Where space exhaust is greater than the design ventilation rate specified in Section 120.1(c)3 minus 0.2 cfm per ft² of conditioned area.

EXCEPTION 2 to Section 140.4(p)4: Spaces that have processes or operations that generate dusts, fumes, mists, vapors, or gases and are not provided with local exhaust ventilation, such as indoor operation of internal combustion engines or areas designated for unvented food service preparation, daycare sickrooms, science labs, barber shops or beauty and nail salons shall not install demand control ventilation.

EXCEPTION 3 to Section 140.4(p)4: Spaces with an area of less than 150 square feet, or a design occupancy of less than 10 people as specified by Section 120.1(c)3.

5. Fans not required for ventilation shall cycle off and terminal unit primary cooling air shall be shut off when there is no call for heating or cooling in a zone.
6. Dedicated outside air systems installed with separate heating and cooling systems which do not meet 140.4 (e) 1 shall have a design airflow rate no less than 150 percent of outdoor airflow rate (Vz) to each zone.
EXCEPTION 1: spaces meeting the criteria for natural ventilation per 120.1 (c) 2.
EXCEPTION 2: DOAS serving unconditioned spaces.
7. Systems shall not use heating or heat recovery to warm the supply air above 60F when representative building loads or outdoor air temperatures indicate the majority of zones require cooling.

(q) – Exhaust Air Heat Recovery.

1. Each fan system shall have an energy recovery system with a minimum xx% apparent sensible effectiveness at design conditions in accordance with AHRI Standard 1060 when the design supply fan airflow rate exceeds the value listed in TABLE 140.4-H and TABLE 140.4-I, based on operating hours, the climate zone and percentage of outdoor air at design airflow conditions. TABLE 140.4-H shall be used for all ventilation systems that operate less than 8,000 hours per year, and TABLE 140.4-I shall be used for all ventilation systems that operate 8,000 or more hours per year.
2. For systems required by Section 140.4 (e) to have an economizer the system shall have a control to bypass the heat exchanger or reduce overall heat exchange effectiveness to less than 10%.
3. The pressure drop of the outdoor air through the energy recovery exchanger shall not exceed xx in. H2O (xxx Pa); the pressure drop of the exhaust air through the energy recovery exchanger shall not exceed xx in. H2O (xxx Pa).

EXCEPTION 1 to Section 140.4(q): Systems serving spaces that are not cooled and that are heated to less than 60°F.

EXCEPTION 2 to Section 140.4(q): Where more than 60% of the outdoor air heating energy is provided from site-recovered energy or site-solar energy.

EXCEPTION 3 to Section 140.4(q): Heating energy recovery in Climate Zones

EXCEPTION 4 to Section 140.4(q): Cooling energy recovery in Climate Zones

EXCEPTION 5 to Section 140.4(q): Where the sum of the airflow rates exhausted and relieved within 20 ft. of each other is less than 25% of the design outdoor airflow rate, excluding exhaust air that is

- a) used for another heat or energy recovery system
- b) not allowed by ASHRAE Standard 170 (or CA equivalent code) for use in heat or energy recovery systems with leakage potential, or
- c) of Class 4 as defined in ASHRAE Standard 62.1.

EXCEPTION 6 to Section 140.4(q): Systems expected to operate less than 20 hours per week

TABLE 140.4-H EXHAUST AIR HEAT RECOVERY REQUIREMENTS FOR VENTILATION SYSTEMS OPERATING LESS THAN 8000 HOURS PER YEAR

Climate Zone	% Outdoor Air at Full Design Airflow Rate								
	> 10% and <20%	> 20% and <30%	> 30% and <40%	> 40% and <50%	> 50% and <60%	> 60% and <70%	> 70% and <80%	> 80% and <90%	> 90%
	Design Supply Fan Airflow Rate, cfm								
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16	NR	NR	NR	NR	NR	NR	NR	NR	xxxx cfm
15	NR	NR	NR	NR	26,000 cfm	12,000 cfm	5,000 cfm	4,000 cfm	xxxx cfm

NR-Not Required

TABLE 140.4-I EXHAUST AIR HEAT OR ENERGY RECOVERY REQUIREMENTS FOR VENTILATION SYSTEMS OPERATING GREATER THAN OR EQUAL TO 8000 HOURS PER YEAR

Climate Zone	% Outdoor Air at Full Design Airflow Rate								
	> 10% and <20%	> 20% and <30%	> 30% and <40%	> 40% and <50%	> 50% and <60%	> 60% and <70%	> 70% and <80%	> 80% and <90%	> 90%
	Design Supply Fan Airflow Rate, cfm								
2, 3, 4, 5, 6	NR	NR	NR	NR	NR	NR	NR	NR	xxxx cfm
1, 7, 8, 9, 10, 11, 12, 13, 14, 16	NR	19,500 cfm	9000 cfm	5000 cfm	4000 cfm	3000 cfm	1500 cfm	120 cfm	xxxx cfm
15	2,500 cfm	2,000 cfm	1,000 cfm	500 cfm	140 cfm	120 cfm	100 cfm	80 cfm	xxxx cfm

NR-Not Required

In Section 140.4 (c) Fan Power Limitations.

TABLE 140.4-B – Fan Power Limitation Pressure Drop Adjustment

Device	Adjustment Credits
Return or exhaust systems required by code or accreditation standards to be fully ducted, or systems required to maintain air pressure differentials between adjacent rooms	0.5 in. of water
Return and/or exhaust airflow control devices	0.5 in. of water
Exhaust filters, scrubbers, or other exhaust treatment	The pressure drop of device calculated at fan system design condition
Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters	Pressure drop calculated at 2 x clean filter pressure drop at fan system design condition
Carbon and other gas-phase air cleaners	Clean filter pressure drop at fan system design condition

Biosafety cabinet	Pressure drop of device at fan system design condition
Energy recovery device, other than coil runaround loop	For each airstream [(2.2 x Energy Recovery Effectiveness) - 0.5] in. of water
Coil runaround loop	0.6 in. of water for each airstream
Exhaust systems serving fume hoods	0.35 in. of water
Device	Adjustment Deductions
Systems without central mechanical cooling device	-0.6 in. of water
Systems without central mechanical heating device	-0.3 in. of water
Systems with central electric resistance heat	-0.2 in. of water

In Section 140.4 (e) Economizers.

EXCEPTION 6 to Section 140.4(e)1: Systems design to operate at 100 percent outside air at all times which meet the requirements of Section 140.4 (p).

Reference Appendices

There are no proposed changes to the Reference Appendices.