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Section 1201(c)3 Revisions

See attached Document

Additional submitted attachment is included below.

There are clerical errors and incorrect CBC references in Section 120.1(c)3 and Table 120.1-A. The following revisions correct those errors:

1. 120.1(c)3 EXCEPTION 1:
 - a. Revise the reference to Section 1004.1.2 of the CBC to Section 1004.5. Section 1004.1.2 does not exist. The appropriate reference is to Section 1004.5 Areas without Fixed Seating.
 - b. Revise the reference to Section 1004.4 of the CBC to Section 1004.6. Section 1004.4 refers to Multiple Occupancies which is unrelated. The appropriate reference is to Section 1004.6 Fixed Seating.
2. Table 120.1-A
 - a. Revise the column title for "Area Outdoor Air Rate Ra (cfm/ft²)" to "Total Outdoor Air Rate Rt (cfm/ft²)" to match revision in section 120.1(c)3.
 - b. Do not delete the "Min Air Rate for DCV" column or note "2". Delete note "G" and "H". The DCV column is informative and useful to have within the table instead of as a note which could be missed.

Please also see the markup below.

between the two openings that are the farthest apart. Floor area outside that line shall comply with i or ii. [ASHRAE 62.1:6.4.1.3]

- iv. Ceiling Height. The ceiling height (H) to be used in Section 120.1(c)2Ai through 120.1(c)2Aiii shall be the minimum ceiling height in the space.

EXCEPTION to Section 120.1(c)2Aiv: For ceilings that are increasing in height as distance from the opening is increased, the ceiling height shall be determined as the average height of the ceiling within 20 feet from the operable openings. [ASHRAE 62.1:6.4.1.4]

- B. Location and Size of Openings. Spaces or portions of spaces to be naturally ventilated shall be permanently open to operable wall openings directly to the outdoors. The openable area shall be not less than 4 percent of the net occupiable floor area. Where openings are covered with louvers or otherwise obstructed, the openable area shall be based on the net free unobstructed area through the opening. Where interior rooms, or portions of rooms, without direct openings to the outdoors are ventilated through adjoining rooms, the opening between rooms shall be permanently unobstructed and have a free area of not less than 8 percent of the area of the interior room or less than 25 square feet. [ASHRAE 62.1:6.4.2]
- C. Control and Accessibility. The means to open the required operable opening shall be readily accessible to building occupants whenever the space is occupied. Controls shall be designed to coordinate operation of the natural and mechanical ventilation systems. [ASHRAE 62.1:6.4.3]

EXCEPTION 1 to Section 120.1(c)2: The mechanical ventilation system shall not be required where natural ventilation openings complying with 120.1(c)2 are either permanently open or have controls that prevent the openings from being closed during periods of expected occupancy.

EXCEPTION 2 to Section 120.1(c)2: The mechanical ventilation system shall not be required where the zone is not served by a space conditioning system.

3. **Mechanical Ventilation.** Occupiable spaces shall be ventilated with a mechanical ventilation system capable of providing an outdoor airflow rate to the zone (V_z) ~~to the zone~~ no less than Equation 120.1-F ~~the larger of A or B~~ as described below:

- A. ~~The outdoor airflow rate to the zone (V_z) shall be determined in accordance with Equation 120.1-F; or~~

$$V_z = R_{\text{at}} \times A_z \quad \text{(Equation 120.1-F)}$$

Where:

R_{at} = Total outdoor airflow rate required per unit area as determined from Table 120.1-A.

A_z = Zone floor area, ~~is meaning~~ the net occupiable floor area of the ventilation zone in square feet.

- B. **EXCEPTION 1 to Section 120.1(c)3: Designed Occupancy.** For spaces designed for an expected number of occupants per the Exception to Section 1004.1.2 of the CBC, or spaces with fixed seating per Section 1004.4 of the CBC, the outdoor airflow rate to the zone (V_z) shall be determined in accordance with Equation 120.1-G;

$$V_z = \text{The larger of } R_p \times P_z \text{ or } R_a \times A_z \quad \text{(Equation 120.1-G)}$$

Where:

R_p = 15 cubic feet per minute of outdoor airflow per person

P_z = The expected number of occupants. The expected number of occupants shall be the expected number specified by the building designer. For spaces with fixed seating, the expected number of occupants shall be determined in accordance with the California Building Code.

R_a = The minimum ventilation rate allowed for DCV in Table 120.1-A.

A_z = Zone floor area, meaning the net occupiable floor area of the ventilation zone in square feet.

EXCEPTION 2 to Section 120.1(c)3: Transfer air. The rate of outdoor air required by Section 120.1(c)3 may be provided with air transferred from other ventilated space if:

- A. Use of transfer air is in accordance with Section 120.1(g); and
 - B. The outdoor air that is supplied to all spaces combined, is sufficient to meet the requirements of Section 120.1(c)3 for each space individually.
4. **Exhaust Ventilation.** The design exhaust airflow shall be determined in accordance with the requirements in Table 120.1-B. Exhaust makeup air shall be permitted to be any combination of outdoor air, recirculated air, or transfer air. [ASHRAE 62.1:6.5.1]

(d) **Operation and Control Requirements for Minimum Quantities of Outdoor Air.**

1. **Times of occupancy.** The minimum rate of outdoor air required by Section 120.1(c) shall be supplied to each space at all times when the space is usually occupied.

EXCEPTION 1 to Section 120.1(d)1: Demand control ventilation. In intermittently occupied spaces that do not have processes or operations that generate dusts, fumes, mists, vapors or gasses and are not provided with local exhaust ventilation (such as indoor operation of internal combustion engines or areas designated for unvented food service preparation), the rate of outdoor air may be reduced if the ventilation system serving the space is controlled by a demand control ventilation device complying with Section 120.1(d)4 or by an occupant sensor ventilation control device complying with Section 120.1(d)5.

EXCEPTION 2 to Section 120.1(d)1: Temporary reduction. The rate of outdoor air provided to a space may be reduced below the level required by Section 120.1(c) for up to 30 minutes at a time if the average rate for each hour is equal to or greater than the required ventilation rate.

2. **Pre-occupancy.** The lesser of the minimum rate of outdoor air required by Section 120.1(c) or three complete air changes shall be supplied to the entire building during the 1-hour period immediately before the building is normally occupied.
3. **Required Demand Control Ventilation.** Demand ventilation controls complying with Section 120.1(d)4 are required for a space 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) if the ventilation system serving the space has one or more of the following:
- A. an air economizer; or
 - B. modulating outside air control; or
 - C. design outdoor airflow rate > 3,000 cfm.

EXCEPTION 1 to Section 120.1(d)3: 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 120.1(d)3: 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 120.1(d)3: 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.

4. **Demand Control Ventilation Devices.**

- A. For each system with demand control ventilation (DCV), CO₂ sensors shall be installed in each room that meets the criteria of Section 120.1(d)3 with no less than one sensor per 10,000 ft² of floor space. When a zone or a space is served by more than one sensor, a signal from any sensor indicating that CO₂ is near or at the setpoint within the zone or space shall trigger an increase in ventilation.

- B. CO₂ sensors shall be located in the room between 3 ft and 6 ft above the floor or at the anticipated height of the occupants' heads.
- C. Demand ventilation controls shall maintain CO₂ concentrations less than or equal to 600 ppm plus the outdoor air CO₂ concentration in all rooms with CO₂ sensors.

EXCEPTION to Section 120.1(d)4C: The outdoor air ventilation rate is not required to be larger than the design outdoor air ventilation rate required by Section 120.1(c)3 regardless of CO₂ concentration.

- D. Outdoor air CO₂ concentration shall be determined by one of the following:
 - i. CO₂ concentration shall be assumed to be 400 ppm without any direct measurement; or
 - ii. CO₂ concentration shall be dynamically measured using a CO₂ sensor located within 4 ft of the outdoor air intake.
 - E. When the system is operating during hours of expected occupancy, the controls shall maintain system outdoor air ventilation rates no less than the rate listed in Table 120.1-A for DCV, times the conditioned floor area for spaces with CO₂ sensors, plus the rate required by Section 120.1(c)3 for other spaces served by the system, or the exhaust air rate whichever is greater.
 - F. CO₂ sensors shall be certified by the manufacturer to be accurate within plus or minus 75 ppm at a 600 and 1000 ppm concentration when measured at sea level and 25°C, factory calibrated, and certified by the manufacturer to require calibration no more frequently than once every 5 years. Upon detection of sensor failure, the system shall provide a signal which resets to supply the minimum quantity of outside air to levels required by Section 120.1(c)3 to the zone serviced by the sensor at all times that the zone is occupied.
 - G. The CO₂ sensor(s) reading for each zone shall be displayed continuously, and shall be recorded on systems with DDC to the zone level.
5. **Occupant Sensor Ventilation Control Devices.** ~~When occupancy sensor ventilation devices are required by Section 120.2(e)3, Occupancy sensor ventilation controls are required for zones that are both permitted to have their ventilation air reduced to zero while in occupied standby mode per Table 120.1-A and required to install occupant sensors to comply with Section 130.1. Occupant sensors shall be used to reduce the rate of outdoor airflow when occupants are not present in accordance with the following:~~
- A. ~~Occupant sensors shall meet the requirements in Section 110.9(b)4 and shall have suitable coverage and placement to detect occupants in the entire space ventilated.~~
 - B. ~~If~~ When occupant sensors controlling lighting are also used for ventilation, the ventilation signal shall be independent of daylighting, manual lighting overrides or manual control of lighting.
 - C. When a single zone damper or a single zone system serves multiple rooms, there shall be an occupancy sensor in each room and the zone is shall not be considered vacant until all rooms in the zone are vacant.
 - ~~B~~D. One hour prior to normal scheduled occupancy, the occupancy sensor ventilation control shall allow pre-occupancy purge as described in Section 120.1(d)2.
 - E. When the zone is scheduled to be occupied and occupancy sensing controls in all rooms and areas served by the zone indicate the spaces are unoccupied, the zone shall be placed in occupied standby mode.
 - F. Within 5 minutes of entering occupied-standby mode, if all rooms or areas within the zone are permitted to have their ventilation reduced to zero while unoccupied as specified in Table 120.1-A, mechanical ventilation to the zone shall be shut off until the space becomes occupied and unless needed to provide space heating or conditioning.

- (e) **Ducting for Zonal Heating and Cooling Units.** Where a return plenum is used to distribute outdoor air to a zonal heating or cooling unit which then supplies the air to a space in order to meet the requirements of Section 120.1(c)3, the outdoor air shall be ducted to discharge either:

1. Within 5 feet of the unit; or
2. Within 15 feet of the unit, substantially toward the unit, and at a velocity not less than 500 feet per minute.

(f) **Design and Control Requirements for Quantities of Outdoor Air.**

1. All mechanical ventilation and space-conditioning systems shall be designed with and have installed ductwork, dampers, and controls ~~to that~~ allow outside air rates to be operated at the larger of (1) the minimum levels specified in Section 120.1(c)3 or (2) the rate required for make-up of exhaust systems that are required for an exempt or covered process, for control of odors, or for the removal of contaminants within the space.
2. All variable air volume mechanical ventilation and space-conditioning systems shall include dynamic controls that are capable of maintaining measured outside air ventilation rates within 10 percent of the required outside air ventilation rate at both full and reduced supply airflow conditions. Fixed minimum damper position is not considered to be dynamic and is not an allowed control strategy.
3. ~~Measured outdoor air rates of constant volume~~ All mechanical ventilation and space-conditioning systems shall be tested to confirm their ability to operate within 10 percent of the required outside air rate.

(g) **Air Classification and Recirculation Limitations.** Air classification and recirculation limitations of air shall be based on the air classification as listed in Table 120.1-A or Table 120.1-C, and in accordance with the requirements of 120.1(g)1 through 4.

NOTE: Air class definitions are taken directly from ASHRAE 62.1 and are duplicated here for convenience.

1. **Class 1 Air** is air with low contaminant concentration, low sensory-irritation intensity, or inoffensive odor. Recirculation or transfer of Class 1 air to any space shall be permitted; [ASHRAE 62.1:5.16.3.1]
2. **Class 2 Air** is air with moderate contaminant concentration, mild sensory-irritation intensity, or mildly offensive odors (Class 2 air also includes air that is not necessarily harmful or objectionable but that is inappropriate for transfer or recirculation to spaces used for different purposes). Recirculation or transfer of Class 2 air shall be permitted in accordance with 120.1(g)2A through 120.1(g)2E:
 - A. Recirculation of Class 2 air within the space of origin shall be permitted [ASHRAE 62.1:5.16.3.2.1];
 - B. Recirculation or transfer of Class 2 to other Class 2 or Class 3 spaces shall be permitted, provided that the other spaces are used for the same or similar purpose or task and involve the same or similar pollutant sources as the Class 2 space [ASHRAE 62.1:5.16.3.2.2]; or
 - C. Transfer of Class 2 air to toilet rooms [ASHRAE 62.1:5.16.3.2.3]; or
 - D. Recirculation or transfer of Class 2 air to Class 4 spaces [ASHRAE 62.1:5.16.3.2.4]; or
 - E. Class 2 air shall not be recirculated or transferred to Class 1 spaces. [ASHRAE 62.1:5.16.3.2.5]

EXCEPTION to Section 120.1(g)2E: When using any energy recovery device, recirculation from leakage, carryover, or transfer from the exhaust side of the energy recovery device is permitted. Recirculated Class 2 air shall not exceed 10% of the outdoor air intake flow.

3. **Class 3 Air** is air with significant contaminant concentration, significant sensory-irritation intensity, or offensive odor. Recirculation or transfer of Class 3 air shall be permitted in accordance with 120.1(g)3A and B:
 - A. Recirculation of Class 3 air within the space of origin shall be permitted. [ASHRAE 62.1:5.16.3.3.1]
 - B. Class 3 air shall not be recirculated or transferred to any other space. [ASHRAE 62.1:5.16.3.3.2].

EXCEPTION to Section 120.1(g)3B: When using any energy recovery device, recirculation from leakage, carryover, or transfer from the exhaust side of the energy recovery device is permitted. Recirculated Class 3 air shall not exceed 5% of the outdoor air intake flow.

4. **Class 4 Air** is air with highly objectionable fumes or gases or with potentially dangerous particles, bioaerosols, or gases at concentrations high enough to be considered as harmful. Class 4 air shall not be recirculated or transferred to any space or recirculated within the space of origin. [ASHRAE 62.1:5.16.3.4]
5. **Ancillary spaces.** Redesignation of Class 1 air to Class 2 air shall be permitted for Class 1 spaces that are ancillary to Class 2 spaces. [ASHRAE 62.1:5.16.2.3]
6. **Transfer.** A mixture of air that has been transferred through or returned from spaces or locations with different air classes shall be redesignated with the highest classification among the air classes mixed. [ASHRAE 62.1:5.16.2.2]
7. **Classification.** Air leaving each space or location shall be designated at an expected air-quality classification not less than that shown in Tables 120.1-A, 120.1-B or 120.1-C. Air leaving spaces or locations that are not listed in Tables 120.1-A, 120.1-B or 120.1-C shall be designated with the same classification as air from the most similar space or location listed in terms of occupant activities and building construction.

(h) **Ventilation Only Mechanical Systems.** HVAC Systems without mechanical cooling or mechanical heating shall meet the requirements of Section 120.2(f).

Table 120.1-A – Minimum Ventilation Rates

Occupancy Category	Area Outdoor Air Rate ¹ Ra (cfm/ft ²)	Min Air Rate for DCV ² cfm/ft ²	Air Class	Notes
Educational Facilities				
Daycare (through age 4)	0.21	0.15	2	<u>G</u>
Daycare sickroom	0.15		3	
Classrooms (ages 5-8)	0.38	0.15	1	<u>G</u>
Classrooms (age 9 -18)	0.38	0.15	1	<u>G</u>
Lecture/postsecondary classroom	0.38	0.15	1	F, <u>G</u>
Lecture hall (fixed seats)	-	0.15	1	F, <u>G</u>
Art classroom	0.15		2	
Science laboratories	0.15		2	
University/college laboratories	0.15		2	
Wood/metal shop	0.15		2	
Computer lab	0.15		1	
Media center	0.15		1	A
Music/theater/dance	1.07	0.15	1	F, <u>G</u>
Multiuse assembly	0.5	0.15	1	F, <u>G</u>

Occupancy Category	Area Outdoor Air Rate ¹ Ra cfm/ft ²	Min Air Rate for DCV ² cfm/ft ²	Air Class	Notes
Food and Beverage Service				
Restaurant dining rooms	0.5	0.15	2	<u>G</u>
Cafeteria/fast-food dining	0.5	0.15	2	<u>G</u>
Bars, cocktail lounges	0.5	0.2	2	<u>H</u>
Kitchen (cooking)	0.15		2	
General				
Break rooms	0.5	0.15	1	F, <u>G</u>
Coffee Stations	0.5	0.15	1	F, <u>G</u>
Conference/meeting	0.5	0.15	1	F, <u>G</u>
Corridors	0.15		1	F
Occupiable storage rooms for liquids or gels	0.15		2	B
Hotels, Motels, Resorts, Dormitories				
Bedroom/living room	0.15		1	F
Barracks sleeping areas	0.15		1	F
Laundry rooms, central	0.15		2	
Laundry rooms within dwelling units	0.15		1	
Lobbies/pre-function	0.5	0.15	1	F, <u>G</u>
Multipurpose assembly	0.5		1	F
Office Buildings				
Breakrooms	0.5	0.15	1	<u>G</u>
Main entry lobbies	0.5	0.15	1	F, <u>G</u>
Occupiable storage rooms for dry materials	0.15		1	
Office space	0.15		1	F
Reception areas	0.15		1	F
Telephone/data entry	0.15		1	F
Miscellaneous Spaces				
Bank vaults/safe deposit	0.15		2	F
Banks or bank lobbies	0.15		1	F
Computer (not printing)	0.15		1	F
Freezer and refrigerated spaces (<50oF)	-		2	E
General manufacturing (excludes heavy industrial and process using chemicals)	0.15		3	

Occupancy Category	Area Outdoor Air Rate ¹ Ra cfm/ft ²	Min Air Rate for DCV ² cfm/ft ²	Air Class	Notes
Pharmacy (prep. Area)	0.15		2	
Photo studios	0.15		1	
Shipping/receiving	0.15		2	B
Sorting, packing, light assembly	0.15		2	
Telephone closets	0.15		1	
Transportation waiting	0.5	0.15	1	F, G
Warehouses	0.15		2	B
All others	0.15		2	
Public Assembly Spaces				
Auditorium seating area	1.07	0.15	1	F, G
Places of religious worship	1.07	0.15	1	F, G
Courtrooms	0.19	0.15	1	F, G
Legislative chambers	0.19	0.15	1	F, G
Libraries (reading rooms and stack areas)	0.15		1	
Lobbies	0.5	0.15	1	F, G
Museums (children's)	0.25	0.15	1	G
Museums/galleries	0.25	0.15	1	F, G
Residential				
Common corridors	0.15		1	F
Retail				
Sales (except as below)	0.25	0.2	2	H
Mall common areas	0.25	0.15	1	F, G
Barbershop	0.4		2	
Beauty and nail salons	0.4		2	
Pet shops (animal areas)	0.25	0.15	2	G
Supermarket	0.25	0.2	1	F, H
Coin-operated laundries	0.3		2	
Sports and Entertainment				
Gym, sports arena (play area)	0.5	0.15	2	E, G
Spectator areas	0.5	0.15	1	F, G
Swimming (pool)	0.15		2	C
Swimming (deck)	0.5	0.15	2	C, G

Occupancy Category	Area Outdoor Air Rate ¹ Ra cfm/ft ²	Min Air Rate for DCV ² cfm/ft ²	Air Class	Notes
Disco/dance floors	1.5	0.15	2	<u>F, G</u>
Health club/aerobics room	0.15		2	
Health club/weight rooms	0.15		2	
Bowling alley (seating)	1.07	0.15	1	<u>G</u>
Gambling casinos	0.68	0.15	1	<u>G</u>
Game arcades	0.68	0.15	1	<u>G</u>
Stages, studios	0.5	0.15	1	D, F, <u>G</u>

General footnotes for Table 120.1-A:

¹ Ra ~~was is~~ determined as being the larger of the area method and the default per person method. The occupant density used in the default per person method ~~was assumed to be~~ one half of the maximum occupant load assumed for egress purposes in the CBC.

² ~~If this column specifies a minimum cfm/ft2 then it shall be used to comply with Section 120.1(d)4E.~~

Specific Notes:

A – For high-school and college libraries, the values shown for “Public Assembly Spaces – Libraries” shall be used.

B – Rate may not be sufficient where stored materials include those having potentially harmful emissions.

C – Rate does not allow for humidity control. “Deck area” refers to the area surrounding the pool that is capable of being wetted during pool use or when the pool is occupied. Deck area that is not expected to be wetted shall be designated as an occupancy category.

D – Rate does not include special exhaust for stage effects such as dry ice vapors and smoke.

E – Where combustion equipment is intended to be used on the playing surface or in the space, additional dilution ventilation, source control, or both shall be provided.

F – Ventilation air for this occupancy category shall be permitted to be reduced to zero when the space is in occupied-standby mode.

G – DCV systems using CO₂ sensors shall not reduce ventilation below 0.15 cfm/ft² during occupancy.

H – DCV systems using CO₂ sensors shall not reduce ventilation below 0.20 cfm/ft² during occupancy.