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Mandatory Ventilation Requirements

Additional submitted attachment is included below.

TAYLOR ENGINEERING

To:	CEC
From:	Hwakong Cheng
Subject:	Comments on Mandatory Ventilation Requirements
Date:	February 16, 2018

The proposed 120.1(c)3 revises the mechanical ventilation section with the apparent intent to keep the requirements consistent with the current ventilation requirements. However, one critical exception is missing, which allows the outdoor air rates to each space to be met with transfer air. This is a key difference in the ventilation requirements between Title 24 and 62.1. Title 24 requires that the appropriate outdoor air flow be provided at the system level, but then does not track each cfm of outdoor air to each space, as long as the equivalent minimum supply airflow rate is maintained at each space. This exception is not included in the 45-day language so, as written, the zone minimums in a VAV system would need to account for the outdoor air fraction in the supply air, in order to maintain the outdoor airflow rate (Vz) to each zone. We strongly recommend retaining the following language from the existing standard (with minor update in accordance with new air classifications in Section 120.1(g)):

EXCEPTION 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 spaces 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.

The proposed 120.1(c)1 requires MERV 13 air filters for non-residential and hotel/motel buildings for system types described in 120.1(b)1.A. This would apply to systems providing outside air as well as recirculating fan coils with 10 ft of ductwork. Pleated 2" MERV 13 filters become fully loaded very quickly and add significant pressure drop. If not replaced frequently enough, they can also become a pollutant source. We recommend limiting the scope of this requirement to systems that provide outdoor air (as described in its title: "Outdoor Air Treatment") by changing 120.1(c)1 as follows:

1. Outdoor Air Treatment. Mechanical systems providing supply ventilation shall be provided with air filters to clean the outdoor air at any location prior to its introduction to occupied spaces in accordance with subsection A and B.

A. The filters shall have a designated efficiency equal to or greater than MERV 13 when tested in accordance with ANSI/ASHRAE Standard 52.2, or a particle size efficiency rating equal to or greater than 50 percent in the 0.30-1.0 µm range, and equal to or greater than 85 percent in the 1.0-3.0 µm range when tested in accordance with AHRI Standard 680; and

B. Systems shall be equipped with air filters that are two or more inches in depth.

2. Particulate Matter Removal. Particulate matter filters or air cleaners having a designated efficiency equal to or greater than MERV 8 when tested in accordance with ANSI/ASHRAE

Standard 52.2 shall be provided upstream of all cooling coils or other devices with wetted surfaces through which air is supplied to an occupiable space.

EXCEPTION to Section 120.1(c)2: Cooling coils that are design, controlled, and operated to provide sensible cooling only.

This language is more succinct, more closely resembles that in ASHRAE Standard 62.1, and eliminates an awkward reference to the section on high-rise residential buildings. LEED v4 also only requires MERV 13 filtration for systems providing outdoor air in the "Enhanced Indoor Air Quality Strategy". Requiring MERV 13 filtration for purely recirculating systems is unfounded and impractical.

The analogous requirement in section 120.1(b)1.A for high-rise residential buildings is similarly inappropriate. The proposed requirement for MERV 13 filtration for recirculating systems per 120.1(b)1.A.i should be deleted or adjusted to MERV 8 when there is no outdoor air. Section 120.1(b)1.A is also confusing as it is not clear how subparagraphs ii and iii are different. We recommend revising as follows:

A. Mechanical systems providing supply ventilation shall be provided with air filters to clean the outdoor air at any location prior to its introduction to occupied spaces in accordance with Sections 120.1(b)1.B through 120.1(b)1.E.

There is an editorial mistake in 120.1(c)4.E. Consider revising to:

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…

There is an editorial mistake in 120.1(c)5.A. Consider revising to:

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. If o~~O~~ccupant sensors controlling lighting are~~may~~ be used for ventilation, ~~as long as~~ the ventilation signal shall be~~is~~ independent of daylighting, manual lighting overrides or manual control of lighting.

Table 120.1-A includes a note "F" for Barbershop occupancies which allows for ventilation to be reduced to zero when the space is in occupied-standby mode. This is consistent with Standard 62.1, which currently allows occupied-standby mode for barbershops but it really should not. Occupied-standby mode is generally for spaces with "clean" air, which a barbershop is not. It is a mistake in 62.1. Given that Title 24 prohibits DCV in barbershops (exception 2 to 120.1(d)3), occupied-standby also should not be allowed. We recommend deleting the note "F" for Barbershop occupancies.

Section 120.1(c)3 requires the higher of the area- or occupant-based ventilation rates. For the latter, the number of occupants is either based on fixed seating or the design occupancy.

However, Table 120.1-A has variable area-based rates which effectively dictate a minimum design occupant density. For example, a conference room has an area outdoor rate of 0.5 cfm/ft2. Based on 15 cfm/p, that corresponds to a design occupant density of 30 ft2/p. Though 120.1(c)3.B would require higher ventilation rates for spaces with higher occupant density, this 0.5 cfm/ft2 could require higher-than-necessary ventilation for conference rooms with lower occupant densities. Table 120.1-A should be simplified to list 0.15 cfm/ft2 for all occupancies, except those with historically higher area rates defined in the old table based on building-component sources. Spaces with high occupant densities are covered by the occupant-based rate in 120.1(c)3.B. Making this change would keep the Title 24 ventilation approach consistent with the historical requirements and keep the requirement simple since only one area-based requirement would apply to almost all occupancies. It would also eliminate the need for a separate column in Table 120.1-A to define the DCV rates.

Our recommendation is to revise Table 120.1-A to list 0.15 cfm/ft2 for almost all occupancies (except 0.2 for retail, 0.4 for barbershops, etc,… per the current Table 120.1-A) and delete the separate DCV column, since that would no longer be needed. Spaces with high occupant densities would be addressed by 120.1(c)3.B and spaces that require DCV would just drop to the basic area-based rates. The existing 2016 mechanical ventilation language could mostly be reused with only a minor edit to achieve the same end result. This would largely keep the supply ventilation requirements unchanged from the 2016 versions, except to add more categories to Table 120.1-A to define air classes and define where occupied-standby mode is permitted.

Recommended language for 120.1(c)3:

3. Mechanical ventilation. Each space shall be ventilated with a mechanical system capable of providing an outdoor air rate no less than the larger of:

A. The conditioned floor area of the space times the applicable ventilation rate from TABLE 120.1-A; or

B. 15 cfm per person times the expected number of occupants.

For meeting the requirement in Section 120.1(c)3.B for spaces without fixed seating, the expected number of occupants shall be either the expected number specified by the building designer or one half of the maximum occupant load assumed for egress purposes in the CBC, whichever is greater. For spaces with fixed seating, the expected number of occupants shall be determined in accordance with the CBC.

EXCEPTION 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 spaces if:

A. ~~None of the spaces from which air is transferred have any unusual sources of indoor air contaminants~~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.

Recommended format for Table 120.1-A (highlighting added for clarity):

Table 120.1-A – Minimum Ventilation Rates

Occupancy Category	Area Outdoor Air Rate ~~R$_a$~~ (cfm/ft^2)	~~Min Air Rate for DCV[b] cfm/ft^2~~	Air Class	Notes
Educational Facilities				
Daycare (through age 4)	0.15	~~0.15~~	2	
Daycare sickroom	0.15		3	
Classrooms (ages 5-8)	0.15	~~0.15~~	1	
Classrooms (age 9-18)	0.15	~~0.15~~	1	
Lecture/postsecondary classroom	0.15	~~0.15~~	1	F
Art classroom	0.15		2	
…rows skipped…				
Food and Beverage Service				
Restaurant dining rooms	0.15	~~0.15~~	2	
Cafeteria/fast-food dining	0.15	~~0.15~~	2	
Bars, cocktail lounges	0.20	~~0.20~~	2	
Kitchen (cooking)	0.15		2	
General				
Break rooms	0.15	~~0.15~~	1	F
Coffee Stations	0.15	~~0.15~~	1	F
Conference/meeting	0.15	~~0.15~~	1	F
…rows skipped…				
Barbershop	0.40		2	~~F~~
Beauty and nail salons	0.40		2	
Pet shops (animal areas)	0.15	~~0.15~~	2	
Supermarket	0.20	~~0.20~~	1	F
Coin-operated laundries	0.30		2	
…rows skipped…				

~~General:~~
~~[a] This value assumes non-fixed seating and uses the occupant density assumption in accordance with Section 120.1(c)3.~~
~~[b] 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

Also, Table 120.1-A specifies 1.07 cfm/ft2 for auditoriums, which equates to 14 ft2/p, or half of the occupant load in Table 1004.1.2 of the CBC. However, note "a" states that this rate assumes

non-fixed seating using the occupant density assumption from 120.1(c)3. The current 2016 language defines the number of occupants as the greater of the design occupancy or half of the CBC occupant load for areas without fixed seating but the proposed 2019 language no longer includes that reference. This note would not be needed though if simply relying on occupant densities to be addressed in 120.1(c)3.B.