Interpretation IC 170-2017-4 of
ANSI/ASHRAE/ASHE Standard 170-2017
Ventilation of Health Care Facilities

Date Approved: 6/25/2019

Request from: Peter Langowski, BSA LifeStructures Inc., 9365 Counselors Row, Indianapolis, IN 46240.

Reference: This request for interpretation refers to the requirements in ANSI/ASHRAE/ASHE Standard 170-2017, Section 7.1 and Table 7.1, regarding system minimum outdoor air calculation.

Background: Reference Interpretation IC 170-2013-14 airflow calculations.

Background No.1: A return air, variable air volume air handling system contains an air handling unit (AHU) equipped with an airside economizer. This AHU serves a Healthcare Facility which contains Inpatient Healthcare spaces as listed on Table 7.1 The spaces served by this AHU consist entirely of fifty patient rooms; it serves no other spaces. Each patient room is served by a dedicated pressure independent, single supply air duct inlet, DDC-controlled, air terminal unit with a terminal heating coil (hereafter referred to as a terminal box) and each patient room has it's own space thermostat which controls the terminal box. Each patient room is exactly the same size, 200 square feet and has a 9'-0" tall ceiling. (2 ACH)(200)(9)/60 = 60 cfm of outdoor air minimum is required in each patient room. The AHU is designed to be controlled to always bring in a minimum of (60 cfm OA)(50 patient rooms) = 3,000 cfm of outdoor air. Paragraph 7.1.a.6 allows the use of method 7.1.a.6.i whereby: "i. System minimum outdoor air quantity for an air-handling system shall be calculated as the sum of the individual space requirements as defined by the standard." In our case the fifty individual spaces each have an individual space requirement of 60 cfm minimum outdoor air quantity: and the sum of the individual spaces equals 50*60=3,000.

Interpretation No.1: If the Background #1 AHU was designed to be controlled to introduce a minimum of 3,000 cfm of outdoor air at all times, this AHU would meet the Table 7.1 design requirements of Standard 170 with regard to the minimum quantity of outdoor air required to be introduced to the system.

Question No.1: Is this interpretation correct?

Answer No.1: Yes

Background No.2: For the AHU described in Background #1, the designer decides to size the AHU system to provide a maximum of 200 cfm of supply air to each patient room; (200 cfm)(50 patient rooms) = 10,000 cfm. The system will be capable of supplying 10,000 cfm supply air if all 50 spaces were at maximum cooling simultaneously. The designer then calculates that (200 gsf)(9'-0" ceiling)(4 minimum total ACH)/60 = 120 cfm. 120 cfm is the minimum total ACH requirement for each room. The designer schedules these fifty terminal boxes to each control to a minimum cooling cfm control setpoint of 120 cfm and a minimum heating cfm control setpoint

of 120 cfm at all times. In this way each of the terminal boxes will provide a minimum of 4 ACH of total (supply air) at all times.

Interpretation No.2: If the designer schedules these Background #2 terminal boxes to control to a minimum cooling cfm control setpoint of 120 cfm and a minimum heating cfm control setpoint of 120 cfm at all times, these fifty terminal units would meet the current design requirements of Standard 170 with regard to the minimum quantity of total air changes required to be introduced (four) into each of the patient rooms.

Question No.2: Is this interpretation correct?

Answer No.2: Yes

Background No.3: For the AHU described in Background #1, the designer does a theoretical exercise for the case of the Table 7.1 entry for minimum total air changes per hour for patient rooms being 2 rather than 4. The author of this Interpretation Request understands that Standard 170 does not currently contain a Table 7.1 minimum total air change per hour entry of 2. The purpose here is to ask if the calculation method that may have been applicable for a total ach of 4 (Question #2 above) is also applicable in theory for a theoretical total ach of 2. The designer calculates that (200 gsf) (9'-0" ceiling) (theoretical 2 minimum total ACH)/60 = 60 cfm. The designer theoretically schedules these terminal boxes to control to a minimum cooling cfm control setpoint of 60 cfm and a minimum heating cfm control setpoint of 60 cfm at all times. In this way each of the terminal boxes will provide a minimum of 2 ACH of total (supply air) at all times.

Interpretation No.3: If the designer schedules these Background #3 terminal boxes to control to a minimum cooling cfm control setpoint of 60 cfm and a minimum cooling cfm control setpoint of 60 cfm at all times, these fifty terminal units would meet the theoretical design requirements of Standard 170 with regard to the minimum quantity of total air changes required to be introduced into each of the patient rooms **if** the Table 7.1 entry were 2 rather than 4.

Question No.3: Is this interpretation correct?

Answer No.3: No

Comments No.3: We cannot provide an interpretation on theoretical changes to Standard 170, only on actual language contained in the standard.

Background No.4: For the AHU described in Background #1, the designer notes in the AHU control sequence to measure the amount of outdoor air introduced at the AHU and to control the fan speeds and dampers such that the AHU always brings in a quantity of outdoor air of exactly 3,000 cfm whenever the AHU's airside economizer is not operative. All of this outdoor air introduced into the AHU is then distributed via the supply air ductwork to the fifty spaces.

Interpretation No.4: If the design were completed as stated in Background #4, this AHU would meet the Table 7.1 design requirements of Standard 170 with regard to the minimum quantity of outdoor air required to be introduced to the system.

Question No.4: Is this interpretation correct?

Answer No.4: Yes

Background No.5: For the AHU described in Background #1, the designer notes in the AHU control sequence to measure the amount of outdoor air introduced at the AHU and to control the fan speeds and dampers such that the AHU always brings in a quantity of outdoor air of at least 3,000 cfm whenever the AHU's airside economizer is operative. All of this outdoor air introduced into the AHU is then distributed via the supply air ductwork to the fifty spaces. The designer notes that under many combinations of weather and cooling loads that the AHU will actually introduce more than 3,000 cfm of outdoor air into the supply air ductwork to the fifty spaces when the airside economizer is relieving warm return air to the exterior and bringing in cool outdoor air to replace it.

Interpretation No.5: If the design were completed as stated in Background #5, this AHU would meet the Table 7.1 design requirements of Standard 170 with regard to the minimum quantity of outdoor air required to be introduced to the system.

Question No.5: Is this interpretation correct?

Answer No.5: Yes

Background No.6: For the AHU described in Background #1, the designer calculates mixed air temperatures for sizing cooling coils and for sizing heating coils based on always introducing at least 3,000 cfm of outdoor air into the AHU. The designer notes that with the Table 7.1 entry for minimum total ACH being 4, that the fans should be sized to be able to always deliver at least (50)(120) = 6,000 cfm of supply air if all 50 patient rooms were simultaneously occupied and selects fans accordingly. The designer notes that if the Table 7.1 entry for minimum total ACH was 2 rather than 4, the fans should be sized to be able to always deliver at least (50)(60) = 3,000 cfm of supply air if all 50 patient rooms were simultaneously occupied and if so, they could select fans suitable to operate across this broader airflow range. The designer notes that with minimum total ACH of 4, and all fifty of the terminal boxes were simultaneously at the minimum heating setpoint or at the minimum cooling setpoint then the AHU would be producing supply air which consists of 50% outdoor air (3,000 cfm out of a total 6,000 cfm supply air). The designer notes that if the minimum total ACH was theoretically 2 rather than 4, and all fifty of the terminal boxes were simultaneously at the minimum heating setpoint or at the minimum cooling setpoint then the AHU would be producing supply air which consists of 100% outdoor air (3,000 cfm out of 3,000 cfm supply air). The designer decides to not call the AHU a "percentage outdoor air system" though because that would be confusing to people as the number of hours per year out of 8,760 that this is expected to occur for this building is relatively small.

The designer finishes the drawings and submits for review the following three items: 1. A terminal box schedule with the minimum heating cfm and minimum cooling cfm noted on the schedule for each terminal box. 2. An AHU control schematic with the details of how the AHU will always introduce at least 3,000 cfm of outdoor air. 3. All the other drawings and specifications associated with the project which document all the other Standard 170 requirements.

Interpretation No.6: If the design were completed as stated in Background #6 including the submission of the three items noted there, this AHU system would reasonably be expected to meet the design requirements of Standard 170 Section 4.3.2 Construction Details Compliance Documents.

Question No.6: Is this interpretation correct?

Answer No.6: No

Comments No.6: We cannot provide an interpretation on theoretical changes to Standard 170, only on actual language contained in the standard.