

## CHAPTER 1.1, INTRODUCTION

### 1.1-7.3.3 Technical Standards . . .

**1.1-7.3.3.2** The Fire Safety Evaluation System (FSES) has become widely recognized as a method for establishing a safety level equivalent to that of the Life Safety Code. It may be useful for evaluating compliance with the Life Safety Code in renovations of existing facilities ~~that will be affected by renovation and in new facility designs~~. For purposes of these Guidelines, use of the FSES is permitted, subject to AHJ approval, not intended to be used for new construction and renovation projects. (The FSES is intended as an evaluation tool for fire safety only.)

## CHAPTER 2.1, GENERAL HOSPITALS

### 2.1-3.2.2 Airborne Infection Isolation Room(s)

**2.1-A3.2.2.4 (4)** In general, reliance on a substantial pressure differential (~~of~~  $\geq 0.01$ "wg/4.2.5Pa) will maintain the appropriate directional airflow . . .

### 2.1-~~3~~2.5 Protected Units

#### ~~A3.2.5 Protected Units~~

~~The purpose of this section is to lend guidance in the design of units that by their very nature require a protected environment for the treatment and care of their patients. The following units fall within this intended guidance, although this list is not inclusive: transplant units, burn units, nurseries, units for immunosuppressed populations, and neonatal intensive care units. Portions of emergency departments where the initial triage occurs may be incorporated as part of the triage service while an assessment of potential infection and contamination is made prior to processing the suspected patient. Consideration for appropriate pressurization and air exchange rates to control contamination should be addressed.~~

**NOTE:** The Steering Committee of the Health Guidelines Revision Committee, the multidisciplinary consensus body responsible for updating the Guidelines, has determined that, because the term “protected unit” is not defined in the document, the appendix language for this entry should be ignored. The original idea was to include a paragraph for protected units as a placeholder for certain units *not yet defined*, so it is inappropriate to apply the language to particular hospital units.

### 2.1-10.2 HVAC Systems

#### 2.1-10.2.2 Requirements for Specific Locations . . .

##### 2.1-10.2.2.4 Operating and delivery rooms

~~\*(1) Air supply . . .~~

##### ~~2.1-A10.2.2.4 (3)(a) Operating and delivery room ventilation~~

##### 2.1-A10.2.2.4 (1) Operating and delivery room air supply

~~a. The operating and delivery room ventilation systems should operate at all times to maintain the air movement relationship to adjacent areas. The cleanliness of the spaces is compromised when the ventilation system is shut down. For example, airflow from a less clean space such as the corridor can occur, and standing water can accumulate in the ventilation system (near humidifiers or cooling coils).~~

**ab.** The recommended air change rate in an operating room is 20 to 25 air changes per hour (ACH) for ceiling heights between 9 feet (2.74 meters) and 12 feet (3.66 meters).

**be.** The system should provide a single directional flow regime, with both high and low exhaust locations.

**cd.** A face velocity of around 25 to 35 fpm (0.13 to 0.18 m/s) is sufficient from the non-aspirating diffuser array provided the array size itself is set correctly. The non-aspirating diffuser array size should be set appropriately such that it covers at least the area footprint of the table plus a reasonable margin around it. In the cited study, this margin is 21 inches (53.34 centimeters) on the short side and 12 inches (25.40 centimeters) on the long side.

**d.** If additional diffusers are required, they may be located outside this central diffuser array. Up to 30 percent of the central diffuser array may be allocated to non-diffuser items (medical gas columns, lights, etc.).

**Note:** The above conclusions were derived from studies conducted by the National Institutes of Health: Farhad Memarzadeh and Andrew P. Manning, "Comparison of Operating Room Ventilation Systems in the Protection of the Surgical Site" (ASHRAE Transactions 2002, Vol. 108, pt. 2) and Farhad Memarzadeh and Zheng Jiang, "Effect of Operation Room Geometry and Ventilation System Parameter Variations on the Protection of the Surgical Site" (IAQ 2004).

~~e. If additional diffusers are required, they may be located outside this central diffuser array. Up to 30 percent of the central diffuser array may be allocated to non-diffuser items (medical gas columns, lights, etc.).~~

#### 2.1-A10.2.2.4 (3)(a) Operating and delivery room ventilation rates

The operating and delivery room ventilation systems should operate at all times to maintain the air movement relationship to adjacent areas. The cleanliness of the spaces is compromised when the ventilation system is shut down. For example, airflow from a less clean space such as the corridor can occur, and standing water can accumulate in the ventilation system (near humidifiers or cooling coils).

### 2.1-10.2.4 HVAC Air Distribution . . .

#### 2.1-10.2.4.4 Air outlets and inlets

(1) Fresh air intakes . . .

(2) Relief air . . .

(3) Exhaust outlets from areas that may be contaminated shall be above roof level, arranged to minimize recirculation of exhaust air into the building, and directed away from personnel service areas.

~~(3)~~ Gravity exhaust . . .

~~(4)~~ Construction requirements. . .

#### **Table 2.1-2 Ventilation Requirements for Areas Affecting Patient Care in Hospitals and Outpatient Facilities**

<sup>8</sup>~~The ranges listed are the minimum and maximum limits where control is specifically needed. Where relative humidity ranges are indicated, the~~ maximum and minimum limits are not intended to be independent of a space's associated temperature. The humidity is expected to be at the higher end of the range when the temperature is also at the higher end, and vice versa. See Figure 2.1-1 for a graphic representation of the indicated ~~changes~~ ranges on a psychrometric chart. Shaded area is acceptable range.

<sup>9</sup>Where temperature ranges are indicated, the systems shall be capable of maintaining the rooms at any point within the range during normal operation. A single figure indicates a heating or cooling capacity of at least the indicated temperature. This is usually applicable when patients may be undressed and require a warmer environment. Nothing in these guidelines shall be construed as precluding the use of temperatures lower than those noted when the patients' comfort and medical conditions make lower temperatures desirable. Unoccupied areas such as storage rooms shall have temperatures appropriate for the function intended. See Figure 2.1-1 for a graphic representation of the indicated ranges on a psychrometric chart. Shaded area is acceptable range.

**NOTE:** The psychrometric chart shown on page 132 is Figure 2.1-1.

**Table 2.1-3 Filter Efficiencies for Central Ventilation and Air Conditioning Systems in General Hospitals**

Notes . . .

2. MERV = minimum efficiency ~~rating~~ reporting value. . . .

## CHAPTER 2.4, REHABILITATION FACILITIES

### 2.4-9.2.4 HVAC Air Distribution . . .

#### 2.4-9.2.4.4 Air outlets and inlets

(1) Fresh air intakes . . .

(2) Relief air . . .

(3) Exhaust outlets from areas that may be contaminated shall be above roof level, arranged to minimize recirculation of exhaust air into the building, and directed away from personnel service areas.

~~(3)~~ Gravity exhaust . . .

## CHAPTER 3.1, OUTPATIENT FACILITIES

### 3.1-7.1 Plumbing

#### 3.1-7.1.1 General

**3.1-7.1.1.1** Applicability. . . . See Section ~~3.3-6.1~~ 3.3-5.1 for requirements for small primary (neighborhood) outpatient facilities.

### 3.1-7.2 Heating, Ventilating, and Air-Conditioning (HVAC) Systems

#### 3.1-7.2.1 Applicability

These requirements . . . . See Section ~~3.3-6.2~~ 3.3-5.2 for requirements for small primary (neighborhood) outpatient facilities. . . .

#### 3.1-7.2.3 Ventilation Requirements for Specific Locations

##### 3.1-~~7.2.3.1~~ Operating rooms

\*(1) Air supply . . .

(3) Ventilation rates

\*(a) Operating room ventilation systems shall operate at all times, except during maintenance and conditions requiring shutdown by the building's fire alarm system.

##### ~~3.1-A7.2.3.1 Ventilation for operating rooms~~

~~a. The operating and delivery room ventilation systems should operate at all times to maintain the air movement relationship to adjacent areas. The cleanliness of the spaces is compromised when the ventilation system is shut down. For example, airflow from a less clean space such as the corridor can occur, and standing water can accumulate in the ventilation system (near humidifiers or cooling coils).~~

##### 3.1-A7.2.3.1 (1) Air supply for operating rooms

ab. The recommended air change rate in an operating room is 20 to 25 air changes per hour (ACH) for ceiling heights between 9 feet (2.74 meters) and 12 feet (3.66 meters).

**b.** The system should provide a single directional flow regime, with both high and low exhaust locations.

**c.** A face velocity of around 25 to 35 fpm (0.13 to 0.18 m/s) is sufficient from the non-aspirating diffuser array provided the array size itself is set correctly. The non-aspirating diffuser array size should be set appropriately such that it covers at least the area footprint of the table plus a reasonable margin around it. In the cited study, this margin is 21 inches (53.34 centimeters) on the short side and 12 inches (25.40 centimeters) on the long side.

**d.** If additional diffusers are required, they may be located outside this central diffuser array. Up to 30 percent of the central diffuser array may be allocated to non-diffuser items (medical gas columns, lights, etc.).

**Note:** The ~~above conclusions recommended ventilation rates in the previous paragraph~~ were derived from studies conducted by the National Institutes of Health: [Farhad Memarzadeh and Andrew P. Manning, titled "Comparison of Operating Room Ventilation Systems in the Protection of the Surgical Site" \(Memarzadeh ASHRAE Transactions 2002, Vol. 108, pt. 2\)](#) and [Farhad Memarzadeh and Zheng Jiang, "Effect of Operation Room Geometry and Ventilation System Parameter Variations on the Protection of the Surgical Site \(Memarzadeh-IAQ 2004\).](#)

### **3.1-A7.2.3.1 (3)(a) Ventilation rates for operating rooms**

~~The operating and delivery room ventilation systems should operate at all times to maintain the air movement relationship to adjacent areas. The cleanliness of the spaces is compromised when the ventilation system is shut down. For example, airflow from a less clean space such as the corridor can occur, and standing water can accumulate in the ventilation system (near humidifiers or cooling coils).~~

## **3.1-7.2.5 HVAC Air Distribution . . .**

### **3.1-7.2.5.4 Air outlets and inlets**

#### **(1) Fresh air intakes**

(a) Fresh air intakes shall be located at least 25 feet (7.62 meters) from exhaust outlets of ventilating systems, combustion ~~equipment stacks vents (including those serving rooftop air-handling equipment)~~, medical-surgical vacuum systems, plumbing vents, or areas that may collect vehicular exhaust or other noxious fumes. (Prevailing winds and/or proximity to other structures may require greater clearances.)

(b) ~~The requirement for a 25-foot (7.62-meter) separation also pertains to the distance between the intake and the exhaust and/or gas vent off packaged rooftop units.~~

~~(c)~~ Plumbing and vacuum vents that terminate at a level above the top of the air intake may be located as close as 10 feet (3.05 meters).

~~(c)~~ The bottom of outdoor air intakes serving central systems shall be as high as practical, but at least 6 feet (1.83 meters) above ground level or, if installed above the roof, 3 feet (~~0.91~~ 44 centimeters) above roof level.

(2) Relief air. Relief air is exempt from the 25-foot (7.62-meter) separation requirement. Relief air is defined as air that otherwise could be returned (recirculated) to an air handling unit from the occupied space, but is being discharged to the outdoors to maintain building pressure, such as during outside air economizer operation.

~~(3)~~ Exhaust outlets. . . .

~~(3)~~ Gravity exhaust. . . .

~~(4)~~ Construction requirements. . . .

## CHAPTER 4.1, NURSING FACILITIES

### 4.1-10.2.4 HVAC Air Distribution . . .

#### 4.1-10.2.4.3 Air outlets and inlets

(1) Fresh air intakes

(a) Fresh air intakes shall be located at least 25 feet (7.62 meters) from exhaust outlets of ventilating systems, combustion ~~equipment stacks~~ vents (including those serving rooftop air-handling equipment), medical vacuum systems, plumbing vents, or areas that may collect vehicular exhaust or other noxious fumes. (Prevailing winds and/or proximity to other structures may require greater clearances.)

(b) Plumbing and vacuum vents that terminate at a level above the top of the air intake may be located as close as 10 feet (3.05 meters).

(c) The bottom of outdoor air intakes serving central ventilating systems shall be as high as practical, but at least 6 feet (1.83 meters) above ground level or, if installed above the roof, 3 feet (91.44 centimeters) above roof level.

(2) Relief air. Relief air is exempt from the 25-foot (7.62-meter) separation requirement. Relief air is defined as air that otherwise could be returned (recirculated) to an air handling unit from the occupied space, but is being discharged to the outdoors to maintain building pressure, such as during outside air economizer operation.

(3) Exhaust outlets. . . .