

Ventilation Requirements for Areas Affecting Patient Care in Hospitals & Outpatient Facilities

Area Designation	Air movement relationship to adjacent area ²	Minimum air changes of outdoor air per hour ³	Minimum total air changes per hour ^{4, 5}	All air exhausted directly to outdoors ⁶	Recirculated by means of room units ⁷	Relative humidity ⁸ %	Design temperature ⁹ (F°/C°)
Surgery & Critical Care							
Operating/surgical cystoscopic rooms ^{10, 11}	Out	3	15	—	No	30-60	68-73/20-23
Delivery room ¹⁰	Out	3	15	—	No	30-60	68-73/20-23 ¹²
Recovery room ¹⁰	—	2	6	—	No	30-60	70-75/21-24
Critical & intensive care	—	2	6	—	No	30-60	70-75/21-24
Newborn intensive care	—	2	6	—	No	30-60	72-78/22-26
Treatment room ¹³	—	—	6	—	—	—	75/24
Trauma room ¹³	Out	3	15	—	No	30-60	70-75/21-24
Anesthesia gas storage	In	—	8	Yes	—	—	—
Endoscopy	In	2	6	—	No	30-60	68-73/20-23
Bronchoscopy ¹¹	In	2	12	Yes	No	30-60	68-73/20-23
ER waiting room	In	2	12	Yes ^{14, 15}	—	—	70-75/21-24
Triage	In	2	12	Yes ¹⁴	—	—	70-75/21-24
Radiology waiting rooms	In	2	12	Yes ^{14, 15}	—	—	70-75/21-24
Procedure room	Out	3	15	—	No	30-6-	70-75/21-24
Nursing							
Patient room	—	2	6 ¹⁶	—	—	—	70-75/21-24
Toilet room	In	—	10	Yes	—	—	—
Newborn nursery suite	—	2	6	—	No	30-60	72-78/22-26
Protective environment room ^{11, 17}	Out	2	12	—	No	—	75/24
Airborne infection isolation room ^{11, 18}	In	2	12	Yes ¹⁵	No	—	75/24
Isolation alcove or anteroom ^{17, 18}	In / Out	—	10	Yes	No	—	—
Labor/delivery/recovery	—	2	6 ¹⁶	—	—	—	70-75/21-24
Labor/delivery/recovery/postpartum	—	2	6 ¹⁶	—	—	—	70-75/21-24
Patient corridor	—	—	2	—	—	—	—
Ancillary							
Radiology							
X-ray (surgical/critical care & catheterization)	Out	3	15	—	No	30-60	70-75/21-24
X-ray (diagnostic & treatment)	—	—	6	—	—	—	75/24
Darkroom	In	—	10	Yes	No	—	—
Laboratory							
General ¹⁹	—	—	6	—	—	—	75/24
Biochemistry ¹⁹	Out	—	6	—	No	—	75/24
Cytology	In	—	6	Yes	No	—	75/24
Glass washing	In	—	10	Yes	—	—	—

Ventilation Requirements for Areas Affecting Patient Care in Hospitals & Outpatient Facilities (continued)							
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Histology	In	—	6	Yes	No	—	75/24
Microbiology ¹⁹	In	—	6	Yes	No	—	75/24
Nuclear medicine	In	—	6	Yes	No	—	75/24
Pathology	In	—	6	Yes	No	—	75/24
Serology	Out	—	6	—	No	—	75/24
Sterilizing	In	—	10	Yes	—	—	—
Autopsy room ¹¹	In	In	—	12	Yes	No	—
Nonrefrigerated body-holding room	In	—	10	Yes	—	—	70/21
Pharmacy	Out	—	4	—	—	—	—
Diagnostic & Treatment							
Examination room	—	—	6	—	—	—	75/24
Medication room	Out	—	4	—	—	—	—
Treatment room	—	—	6	—	—	—	75/24
Physical & hydrotherapy	—	—	6	—	—	—	75/24
Soiled workroom or soiled holding	—	—	10	Yes	No	—	—
Clean workroom or clean holding	—	—	4	—	—	—	—
Sterilizing & Supply							
ETO-sterilizer room	In	—	10	Yes	No	30-60	75/24
Sterilizer equipment room	In	—	10	Yes	—	—	—
Central medical & surgical supply							
Soiled or decontamination room	In	—	6	Yes	No	—	68-73/20-23
Clean workroom	Out	—	4	—	No	30-60	75/24
Sterile storage	Out	—	4	—	—	70 (max)	—
Service							
Food preparation center ²⁰	—	—	10	—	No	—	—
Warewashing	In	—	10	Yes	No	—	—
Dietary day storage	In	—	2	—	—	—	—
Laundry, general	—	—	10	Yes	—	—	—
Soiled linen (sorting & storage)	In	—	10	Yes	No	—	—
Clean line storage	Out	—	2	—	—	—	—
Soiled linen & trash chute room	In	—	10	Yes	No	—	—
Bedpan room	In	—	10	Yes	—	—	—
Bathroom	In	—	10	—	—	—	75/24
Janitor's closet	In	—	10	Yes	No	—	—

Notes listed on following pages.

Ventilation Requirements for Areas Affecting Patient Care in Hospitals & Outpatient Facilities (notes)

¹ The ventilation rates in this table cover ventilation for comfort, as well as for asepsis and odor control in areas of acute care hospitals that directly affect patient care and are determined based on health care facilities being predominantly 'No Smoking' facilities. Where smoking may be allowed, ventilation rates will need adjustment. Areas where specific ventilation rates are not given in the table shall be ventilated in accordance with ASHRAE Standard 62, *Ventilation Standard for Acceptable Indoor Air Quality*, and ASHRAE Handbook - *HVAC Applications*. Specialized patient care areas, including organ transplant units, burn units, specialty procedure rooms, etc., shall have additional ventilation provisions for air quality control as may be appropriate. OSHA standards and/or NIOSH criteria require special ventilation requirements for employee health and safety within health care facilities.

² Design of the ventilation system shall provide air movement which is generally from clean to less clean areas. If any form of variable air volume or load shedding system is used for energy conservation, it must not compromise the corridor-to-room pressure balancing relationships or the minimum air changes required by the table.

³ To satisfy exhaust needs, replacement air from the outside is necessary. This table does not attempt to describe specific amounts of outside air to be supplied to individual spaces except for certain areas such as those listed. Distribution of the outside air, added to the system to balance required exhaust, shall be as required by good engineering practice. Minimum outside air quantities shall remain constant while the system is in operation.

⁴ Number of air changes may be reduced when the room is unoccupied if provisions are made to ensure that the number of air changes indicated is reestablished any time the space is being utilized. Adjustments shall include provisions so that the direction of air movement shall remain the same when the number of air changes is reduced. Areas not indicated as having continuous directional control may have ventilation systems shut down when space is unoccupied and ventilation is not otherwise needed, if the maximum infiltration or exfiltration permitted in Note 2 is not exceeded and if adjacent pressure balancing relationships are not compromised. Air quantity calculations must account for filter loading such that the indicated air change rates are provided up until the time of filter change-out.

⁵ Air change requirements indicated are minimum values. Higher values should be used when required to maintain indicated room conditions (temperature and humidity), based on the cooling load of the space (lights, equipment, people, exterior walls and windows, etc.).

⁶ Air from areas with contamination and/or odor problems shall be exhausted to the outside and not recirculated to other areas. Note that individual circumstances may require special consideration for air exhaust to the outside, e.g., in intensive care units in which patients with pulmonary infection are treated, and rooms for burn patients.

⁷ Recirculating room HVAC units refer to those local units that are used primarily for heating and cooling of air, and not disinfection of air. Because of cleaning difficulty and potential for buildup of contamination, recirculating room units shall not be used in areas marked 'No.' However, for airborne infection control, air may be recirculated within individual isolation rooms if HEPA filters are used. Isolation and intensive care unit rooms may be ventilated by reheat induction units in which only the primary air supplied from a central system passes through the reheat unit. Gravity-type heating or cooling units such as radiators or convectors shall not be used in operating rooms and other special care areas. See final note for a description of recirculation units to be used in isolation rooms.

⁸ The ranges listed are the minimum and maximum limits where control is specifically needed. 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.

⁹ 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.

¹⁰ National Institute for Occupational Safety and Health (NIOSH) Criteria Documents regarding *Occupational Exposure to Waste Anesthetic Gases and Vapors*, and *Control of Occupational Exposure to Nitrous Oxide* indicate a need for both local exhaust (scavenging) systems and general ventilation of the areas in which the respective gases are utilized.

¹¹ Differential pressure shall be a minimum of 0.01" water gauge (2.5 Pa). If alarms are installed, allowances shall be made to prevent nuisance alarms of monitoring devices.

¹² Some surgeons may require room temperatures that are outside of the indicated range. All operating room design conditions shall be developed in consultation with surgeons, anesthesiologists and nursing staff.

¹³ The term trauma room as used here is the operating room space in the emergency department or other trauma reception area that is used for emergency surgery. The first aid room and/or 'emergency room' used for initial treatment of accident victims may be ventilated as noted for the treatment room. Treatment rooms used for Bronchoscopy shall be treated as Bronchoscopy rooms. Treatment rooms used for cryosurgery procedures with nitrous oxide shall contain provisions for exhausting waste gases.

¹⁴ In a ventilation system that recirculates air, HEPA filters can be used in lieu of exhausting the air from these spaces to the outside. In this application, the return air shall be passed through the HEPA filters before it is introduced into any other spaces.

¹⁵ If it is not practical to exhaust the air from the airborne infection isolation room to the outside, the air may be returned through HEPA filters to the air-handling system exclusively serving the isolation room.

¹⁶ Total air changes per room for patient rooms, labor/delivery/recovery rooms, and labor/delivery/recovery/postpartum rooms may be reduced to 4 when supplemental heating and/or cooling systems (radiant heating and cooling, baseboard heating, etc.) are used.

¹⁷ The protective environment airflow design specifications protect the patient from common environmental airborne infectious microbes (i.e., Aspergillus spores). These special ventilation areas shall be designed to provide directed airflow from the cleanest patient care area to less clean areas. These rooms shall be protected with HEPA filters at 99.97 percent efficiency for a 0.30-micron sized particle in the supply airstream. These interrupting filters protect patient rooms from maintenance-derived release of environmental microbes from the ventilation system components. Recirculation HEPA filters can be used to increase the equivalent room air exchanges. Constant volume airflow is required for consistent ventilation for the protected environment. If the facility determines that airborne infection isolation is necessary for protective environment patients, an anteroom should be provided. Rooms with reversible airflow provisions for the purpose of switching between protective environment and airborne infection isolation functions are not acceptable.

¹⁸ The infectious disease isolation room described in these guidelines is to be used for isolating the airborne spread of infectious diseases, such as measles, varicella, or tuberculosis. The design of airborne infection isolation (AII) rooms should include the provision for normal patient care during periods not requiring isolation precautions. Supplemental recirculating devices may be used in the patient room, to increase the equivalent room air exchanges; however, such recirculating devices do not provide the outside air requirements. Air may be recirculated within individual isolation rooms if HEPA filters are used. Rooms with reversible airflow provisions for the purpose of switching between protective environment and all functions are not acceptable.

¹⁹ When required, appropriate hoods and exhaust devices for the removal of noxious gases or chemical vapors shall be provided (see Sections 7.31.D14 and 7.31.D15 and NFPA 99).

²⁰ Food preparation centers shall have ventilation systems whose air supply mechanisms are interfaced appropriately with exhaust hood controls or relief vents so that exfiltration or infiltration to or from exit corridors does not compromise the exit corridor restrictions of NFPA 90A, the pressure requirements of NFPA 96, or the maximum defined in the table. The number of air changes may be reduced or varied to any extent required for odor control when the space is not in use. See Section 7.31.D1.p.

Additional note on recirculating units; Recirculating devices with HEPA filters may have potential uses in existing facilities as interim, supplemental environmental controls to meet requirements for the control of airborne infectious agents. Limitations in design must be recognized. The design of either portable or fixed systems should prevent stagnation and short circuiting of airflow. The supply and exhaust locations should direct clean air to areas where health care workers are likely to work, across the infectious source, and then to the exhaust, so that the health care worker is not in position between the infectious source and the exhaust location. The design of such systems should also allow for easy access for scheduled preventative maintenance and cleaning. The verification of airflow direction can include a simple visual method such as smoke trail, ball-in-tube, or flutterstrip. These devices will require a minimum differential air pressure to indicate airflow direction.