



Airflow Direction Inc.

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Hospital Airborne Infectious Isolation Room (All) & Protective Environment Room (PE) Pressure Parameters* June 23, 2009

* Please note: this table is intended as a general knowledge base only and is not to be materially relied upon as ADI® strongly suggests a state-licensed registered professional engineer be consulted along with all applicable code authorities having jurisdiction.

SOURCE	MIN ROOM Delta P (in. w.c.) ¹	MIN ROOM Delta CFM ¹	SEAL ROOM & DOORS	ROOM PRESSURE MONITORING
ASHRAE JOURNAL ²	0.01 to 0.05 or higher ^{2a}	(150 – 400) ^{2b}	walls, ceiling, penetrations, light fixtures, doors ^{2c}	Ball-in-tube Visual-Only & Visual plus Alarm with failsafe mode ³
AIA/HHS GUIDELINES ⁴	0.01 ^{4a}	not stated	walls, ceiling, floor & penetrations ^{4b}	Verification of airflow direction can include a simple visual method such as a smoke trail, ball-in-tube, or flutterstrip. ^{4c}
ANSI/ ASHRAE/ ASHE STANDARD ⁵	0.01 ^{5a}	not stated	Room envelope shall be sealed to limit leakage air flow at 0.01 in. w.c. differential pressure across the envelope ^{5b}	Permanently installed device and/or mechanism to constantly monitor the differential air pressure between the room and adjacent spaces of the room... a local visual means shall be provided to indicate whenever negative [positive] differential pressure is not maintained. ^{5c, 5d} Simple visual methods such as smoke trail, ball-in-tube, or flutterstrip shall be permitted for verification of airflow direction ^{5e}
ASHRAE JOURNAL ⁶	0.01	No particular air volume, instead, refers to the [HVAC] designer to use ASHRAE's leakage equation to obtain the minimum room differential pressure	Room envelope shall be sealed to limit leakage air flow at 0.01 in. w.c. differential pressure across the envelope	Not addressed



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SOURCE	MIN ROOM Delta P (in. w.c.) ¹	MIN ROOM Delta CFM ¹	SEAL ROOM & DOORS	ROOM PRESSURE MONITORING
ASHRAE HANDBOOK ⁷	0.01 ^{7a}	not stated	not stated	Simple visual methods such as smoke trail, ball-in-tube, or flutterstrip shall be permitted for verification of airflow direction ^{7b}
ASHRAE DESIGN MANUAL ⁸	0.01 ^{8a,b}	100 reasonable; actual uses leakage equation calculation ^{8a,b}	Coordinate with architect to seal room to allow 0.01" w.c. ^{8a}	Airborne Infectious Isolation Room may or may not have an electronic pressure monitoring and control system; a mechanical means of measuring the pressure relationship, however, is required for all new rooms. ^{8c} Maintaining positive pressure requires daily or continuous monitoring of pressurization. ^{8b}
CDC ⁹	+0.01-0.03 ^{9a,i} -0.01 ^{9b,h}	125 ^{9c,d}	Ensure that rooms are well-sealed. 0.5 sq. ft. leakage ^{9e,f,g}	monitor air pressure periodically, preferably daily, with audible manometers or smoke tubes at the door (for existing All rooms), or with a permanently installed visual monitoring mechanism. ^{9h} Maintain airflow patterns and monitor these on a daily basis by using permanently installed visual means of detecting airflow in new or renovated construction, or by using other visual methods (e.g., flutter strips or smoke tubes) in existing PE units. ^{9j}
JC ¹⁰	0.001 ^{10a} 0.01 ^{10b}	not stated	walls, ceiling, floor & penetrations ^{10a,b}	Verification of airflow direction can include a simple visual method such as a smoke trail, ball-in-tube, or flutterstrip. ^{10a,b}

FOOTNOTE REFERENCES

1. "in. w.c." = inches of water column differential pressure (value of differential pressure is negative for All rooms (air into room) and positive for PE rooms (air out of room)).
"CFM" = cubic feet per minute of airflow.
2. *Room Pressure for Critical Environments*, B. Wiseman, P.E., ASHRAE Journal, February 2003, www.ashrae.org
 - a. pg. 39: minimum room differential pressure of 0.01 to 0.05 " w.c. or higher are preferred.



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- b. *pg. 39*: best approach is to have 400 cfm differential capacity and the ability to throttle down to 150 cfm differential to obtain a minimum of 0.01" w.c. differential pressure. Note the air balance spec of a negative room vs. a positive room.
 - c. *pg. 39*: use top, side and bottom door seals; gasket lay-in tile ceilings; use non-air-return light fixtures; seal wall penetrations above ceiling; account for other air supply and exhaust interactions such as toilet exhaust.
3. Airflow Direction Incorporated's BAULIN-TUBE® indicator provides a failsafe mode of checking the operation of the indicator each time you open and close the room door. Open the door to the negative room and the ball should fall out to the corridor; close the door and the ball should go into the room. Adjust tube pitch for the desired room pressure. www.airflowdirection.com
4. *Guidelines for Design and Construction of Health Care Facilities*, 2006 Edition, The American Institute of Architects, ISBN: 1-57165-013-X, <http://www.fgiguilines.org/>
 - a. Section 2.1 General Hospitals: Table 2.1-2, footnote 11. Negative pressure (air into All room) and positive pressure (air out of room) for PE room.
 - b. Section 2.1 General Hospitals: Airborne Infectious Isolation Room (All) subsection 3.2.2.4(2)(a) and Protective Environment Room (PE) subsection 3.2.3.4(2)(a).
 - c. Section 2.1 General Hospitals: Table 2.1-2, A11-Appendix to footnote 11.
5. *Ventilation of Health Care Facilities*, ASHRAE/ANSI/ASHE Standard 170-2008, American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., www.ashrae.org
 - a. Section 7.2.1.f and section 7.2.2.d.
 - b. Section 7.2.1.e and section 7.2.2.a.
 - c. Section 7.2.1.a.
 - d. Section 7.2.2.b.
 - e. Table 7-1, note n.
6. *Ventilation Standard for Health Care Facilities*, P. Ninomura, P.E., R. Hermans, P.E., ASHRAE Journal, October 2008, www.ashrae.org. This article is a good introduction to the latest publication on ventilation standards for health care facilities: ANSI/ASHRAE/ASHE Standard 170-2008.
7. *2007 ASHRAE Handbook-Applications Health Care Facilities*, , Ch. 7, American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., www.ashrae.org
 - a. Table 3, footnote q.
 - b. Table 3, footnote z.
8. *HVAC Design Manual for Hospitals and Clinics*, 2003, American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., www.ashrae.org.
Note: document's foreword disclaims "this document is not a standard or a guideline. It is a design manual."



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- a. Section 12.3.4
 - b. Section 12.3.5
 - c. Section 3.2.2
9. *Guidelines for Environmental Infection Control in Health Care Facilities*, 2003, Centers for Disease Control and Prevention,
<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5210a1.htm>
- a. Figure 1, footnote bullet 2
 - b. Figure 2, footnote bullet 1
 - c. Figure 1, footnote bullet 3
 - d. Figure 2, footnote bullet 2
 - e. Figure 1, footnote bullet 4
 - f. Figure 2, footnote bullet 3
 - g. Sections III.D.2 and IV.A.2
 - h. Section IV.A.1
 - i. Section III.D.5
 - j. Section III.D.6
10. *The Joint Commission – Environment of Care Standards*:
<http://www.jointcommission.org/standards/>.
- a. As of the printing of this paper the Joint Commission Environment of Care Standards for the HVAC parameters for Airborne Infectious Isolation Rooms and Protective Isolation Rooms reference the 2001 Edition of the AIA *Guidelines for Design and Construction of Health Care Facilities*.
 - b. As of the printing of this paper the Joint Commission is currently updating to the 2006 AIA Guideline Edition.