Formal Interpretations

***Guidelines for Design and Construction of Health Care Facilities*, 2006 edition**

Decisions published here were rendered after a six-person panel of members of the Health Guidelines Revision Committee (HGRC) reviewed the request and consensus was achieved. These decisions are considered formal interpretations of the 103-member HGRC, but they are not binding for those states that reference the Guidelines. Rather, they are advisory in nature and are intended to help the user and the adopting authority having jurisdiction (AHJ) maximize the value of the Guidelines.

Further comments from members of the Interpretations Committee have been added to some of the formal interpretations. These comments are not to be considered as part of the formal interpretation but rather as explanatory information offered to help those who use the Guidelines.

Formal interpretations are rendered on the text of the requested edition of the Guidelines. However, any interpretation issued shall apply not only to the requested edition but also to any other edition of the Guidelines in which the text is identical, except when deemed inappropriate by the HGRC.

In all cases, it is important to remember that the ultimate interpretation of information contained in the Guidelines is the responsibility of the state authority having jurisdiction.

The procedure for developing formal interpretations is handled by the Facility Guidelines Institute. Please read the "Rules for Requesting a Formal Interpretation" (posted on the FGI Web site) before forwarding a question. Also on the FGI Web site is an electronic form for requesting a formal interpretation.

This document has been printed from the Web at www.fgiguidelines.org/interpretations.html. Interpretations are compiled continuously, and this summary document is periodically updated.

GENERAL COMMENTS

This information is provided in response to a general question about use of the *Guidelines for Design and Construction of Health Care Facilities* content.

The Guidelines is not intended to be used as a specification. The recommendations set forth in the document are the result of a consensus process and are based on the best information available to the Health Guidelines Revision Committee (HGRC) at the time the current edition was written. When considering equivalent alternatives to the specific language of the Guidelines, due diligence must be performed to show the authority having jurisdiction (AHJ) that the outcomes of the equivalent system or design approach will meet the intent of the section in question. This is clearly stated in Sections 1.1-1.2.2.4, 1.1-1.3.4, and 1.1-1.3.5.

The Guidelines are intended to be a set of minimum recommendations that can be exceeded based on the clinical need of the patient or the desires of the health care organization. The HGRC

understands that “one size does not fit all conditions” and that some patient-related activities and special organizational needs will require designs to exceed the recommendations of this document. However, unless modified by the AHJ, the minimums in the document shall be met at all times for newly constructed spaces. This is clearly stated in Section 1.1-1.3.2.

Sections of the Guidelines referenced just above:

1.1-1.2.2 Disclaimers

1.1-1.2.2.4 Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstance.

1.1-1.3 How to Use These Guidelines

1.1-1.3.2 Minimum Standards for New Facilities
Each chapter in this document contains information intended as minimum standards for designing and constructing new health care facility projects.

1.1-1.3.2.1 Standards set forth in these Guidelines shall be considered as minimum.

1.1-1.3.2.2 Insofar as practical, these standards relate to desired performance or results or both.

1.1-1.3.4 Other Codes
These Guidelines address certain details of construction and engineering that are important for health care facility design and construction, but they are not intended to be all-inclusive, nor shall they be used to the exclusion of other guidance. When applicable, other details of construction and engineering that are part of good design practice and building regulation shall be consulted in addition to these Guidelines.

1.1-1.3.5 Deviations
These Guidelines are not intended to restrict innovations and improvements in design or construction techniques. Accordingly, authorities adopting these standards as codes may approve plans and specifications that contain deviations if it is determined the applicable intent or objective has been met. Final implementation of these Guidelines may be subject to requirements of the authority having jurisdiction.

REQUEST

Guidelines edition: **2006** *Paragraph reference:* **2.1-10.2.2.4**

Question 1: Is it the intent of Guidelines Section 2.1-10.2.2.4 to limit the diffuser face velocity upper value to a maximum of 35 fpm even in a special procedure OR designed for orthopedic, transplant, cardiac, or other specialty rooms such as interventional radiology, robotics, etc.? Or, is this range a minimum suggested range for general operating rooms, permitting the design engineer, working with the clinical team, to increase the fpm upper limit based on past designs and successful surgical outcomes?

2.1-10.2.2.4 operating and delivery rooms

(1) Air supply

(a) In new construction and major renovation work, air supply for operating and delivery rooms shall be from non-aspirating ceiling diffusers with a face velocity in the range of 25 to 35 fpm (0.13 to 0.18 m/s), located at the ceiling above the center of the work area. Return air shall be near the floor level, at a minimum. Return air shall be permitted high on the walls, in addition to the low returns.

(b) Each operating and delivery room shall have at least two return-air inlets located as far from each other as practical.

(c) Turbulence and other factors of air movement shall be considered to minimize the fall of particulates onto sterile surfaces.

(2) Temperature. Temperature shall be individually controlled for each operating and delivery room.

(3) Ventilation rates

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

(b) During unoccupied hours, operating and delivery room air change rates may be reduced, provided the positive room pressure is maintained as required in Table 2.1-2.

(4) Standards for special procedures. Where extraordinary procedures, such as organ transplants, justify special designs, installation shall properly meet performance needs as determined by applicable standards. These special designs should be reviewed on a case-by-case basis.

Response: The goal of Section 2.1-10.2.2.4 is to make sure that a laminar flow of air is over the surgical site and that the supply air is not being excessively forced downward over the site at a rate that will overcome the natural thermal plume of the patient. This section of the Guidelines was based on a "typical" OR design with standard equipment and personnel around the surgical site. The HGRC derived the new recommendations from studies conducted by the National Institutes of Health. A report summarizing the results of these studies was published in several journals: 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).

The abstract of this report clearly points out that "the results show that ventilation systems that provide laminar flow conditions are the best choice, although some care needs to be taken in their design. A face velocity of around 30–35 fpm is sufficient from the laminar flow diffuser arrays provided that the size of the diffuser array is appropriate." The reported conclusions of these studies also state that "the practice of increasing the ACH to high levels results in excellent removal of particles via ventilation, but it does not necessarily mean that the percentage of particles that strike surfaces of concern will continue to decrease."

The HGRC concluded there is not an absolute correct number for ACH or a face velocity at the diffuser array in an operating room. The recommendation in the Guidelines is for a minimum of 15 ACH (with an appendix note increasing the ACH to 20-25 for specialty operating rooms). ASHRAE, on the other hand, recommends a minimum of 25 ACH in specialty operating rooms. Any ACH rates above these minimal values may create excessive turbulence in the OR and thus need to be evaluated for how particulates may be disturbed by this high rate of air movement. In addition, the health care organization may want to evaluate the additional air changes based on heat removal, surgical staff comfort, humidity control, energy conservation, reduction of the patient's thermal plume, and control of particulates within the surgical site.

Question 2: Is it the intent of Guidelines Section 2.1-10.2.2.4 to prohibit ceiling-mounted returns (low-level returns are, of course, required) in lieu of returns mounted high on the wall to increase the air mixing in the room and aid in the reduction of particulates?

Response: The intent is not to prohibit the use of ceiling-mounted return/exhausts as long as they are used in addition to the required low wall grilles. (However, care must be taken that the location of ceiling grilles does not disrupt the primary airflow over the sterile area.) This arrangement is supported by the above-referenced studies, which concluded the following: "In a room that provides a laminar flow regime, a mixture of exhaust location levels works better than either low or high level locations only. However, the difference is not significant enough that the low or high level location systems are not viable options." This conclusion makes no reference to the exhaust location being high on the wall or located in the ceiling. Therefore, if the proper exhaust mixture can be achieved by an exhaust grille located in the ceiling, this would be considered to meet the intent of Section 2.1-10-2.2.4.

Question 3: Can the low-level returns required in Section 2.1-10.2.2.4 be used to provide waste anesthesia gas scavenging? Or is the requirement of Section 2.1-10.2.4.3 to have a separate mechanical ventilation or vacuum system for this purpose?

Response: The low-level returns are not to be used for or considered in the calculations of the anesthesia gas-scavenging system. The low-level returns are to support the proper movement of air within the operating room (laminar flow). A gas-scavenging system is a dedicated system that can be either vacuum or mechanical in nature.

Question 4: If the answer to the first part of question number 3 is no, can the return air of the low- and high-level returns required in Section 2.1-10.2.2.4 be recirculated back to the air handler, mixed with a percentage of fresh air, and then supplied back to the ORs?

Response: The intent of Table 2.1-2 is to permit the exhaust of the OR to be returned to the ventilation system and recirculated to that OR and other areas served by that system. The reason the table states "no" for the column "returned by means of room units" is to prohibit use of a through-the-wall or permanently installed in-room recirculating system that does not take the return air back to a centralized unit to be mixed with outside air and refiltered.

Question 5: If the answer to question number 4 is yes, can a portion of the air from the hybrid return system (low- and high-level returns) be directly recirculated through ceiling return grilles with HEPA filtered supply diffusers?

Response: Yes, recirculating a portion of the OR air through HEPA filters will typically provide an environment that exceeds the normal OR filtration requirements and could have some energy conservation value if the return air duct run is lengthy. The key is to make sure enough fresh air is being introduced into the environment; the minimum number of air changes to accomplish this is at least 3 air changes of outdoor air per hour.

REQUEST

Guidelines edition: **2006** *Paragraph reference:* **Table 2.1-2**

Question: Some AHJs have interpreted the "--" in Table, 2.1-2, Ventilation Requirements for Areas Affecting Patient Outcomes, to mean the air movement relationship must be neutral. Other people's understanding of the table is that the "--" means there is no requirement. The dashes in Table 2.1-2 and in Footnote 2 of the table could be interpreted to mean that all rooms with a "--" must be kept neutral regardless of VAV use or that there is no requirement and that VAV may be allowed to cause rooms listed with a "--" to become either positive or negative (the degree of which is subject to other codes and standards like NFPA 90A) due to fluctuations in a VAV system. What does the "--" in the table indicate?

Response: Neutral pressure is very difficult to maintain in the real world. All rooms will be slightly positive or slightly negative. It was not the intent of the HGRC for "--" to mean "neutral"; rather, the intent was to indicate no specific requirement. To clarify this in the published document, during the 2010 Guidelines revision cycle, the HGRC has approved changes to the text in Table 2.1-2 based on the following definitions:

- N—a room maintained at a negative pressure with respect to adjacent spaces
- P—a room maintained at a positive pressure with respect to adjacent spaces
- NR—a room with no specific pressure requirements, may be positive or negative with respect to adjacent spaces

The relevant proposed text changes are the addition of this text in Footnote 2—"KEY: N—negative pressure relationship; P—positive pressure relationship"—and the following note at the top of Table 2.1-2—KEY: NR—no requirement. It is proposed that the dashes ("--") in the table be replaced with "NR."

The use of VAV systems for patient rooms and other ancillary spaces not requiring constant volume has been promoted by the Guidelines for at least four editions and is an essential element in designing a health care facility that is energy efficient.