

The Quiet Hospital

HIPAA and AIA Standards Help Control Noise, Improve Healing

by Michael R. Yantis

Research continues to link a quiet hospital environment with improved patient healing and medical staff satisfaction. In today’s high-tech healthcare facilities, however, controlling noise is a growing concern.

In terms of architecture, one of the most important challenges is to reduce speech levels between adjacent spaces such as patient rooms, nursing stations, and patient intake and discharge areas. In recent years, the American Institute of Architects (AIA) Academy of Architecture for Health (AAH) has developed guidelines for design and construction of hospitals. Many design teams are using these guidelines to help meet noise-control standards established in the Health Information Portability and Accountability Act (HIPAA).

When referenced in tandem, these design guidelines can help project teams better understand the relationship between architecture and background noise, guide the selection of wall and floor materials, and improve overall acoustical performance.

Standard Practice

To comply with HIPAA standards for patient privacy, healthcare providers must have physical safeguards in place to protect a patient’s medical information from intentional or unintentional eavesdropping.

Since HIPAA standards are not quantitative, there is still some confusion about how to best apply them for optimal acoustical performance

in exam rooms, patient rooms, and patient check-in and discharge areas. Thus, the AIA/AAH

Table 1: Sound Transmission Limitations in General Hospitals

	Airborne Sound Transmission Class(STC) ¹	
	Partitions	Floors
<i>New Construction²</i>		
Patient room to patient room	45	40
Public space to patient room ³	55	40
Service areas to patient room ⁴	65	45
Patient room access corridor ⁵	45	45
Exam room to exam room	45	—
Exam room to public space	45	—
Toilet room to public space	45	—
Consultation rooms/conference rooms to public space	45	—
Consultation rooms/conference rooms to patient rooms	45	—
Staff lounges to patient rooms	45	—
<i>Existing Construction²</i>		
Patient room to patient room	35	40
Public space to patient room ³	40	40
Service areas to patient room ⁴	45	45

¹Sound Transmission Class (STC) shall be determined by tests in accordance with methods set forth in ASTM E90 and ASTM E413. *Where partitions do not extend to the structure above, sound transmissions through ceilings and composite STC performance must be considered.*

²Treatment rooms shall be treated the same as patient rooms.

³Public space includes corridors (except patient room access corridors), lobbies, dining rooms, recreation rooms, and similar space.

⁴Service areas include kitchens, elevators, elevator machine rooms, laundries, garages, maintenance rooms, boiler and mechanical equipment rooms, and similar spaces of high noise. Mechanical equipment located on the same floor or above patient rooms, offices, nurses stations, and similar occupied space shall be effectively isolated from the floor.

⁵Patient room access corridors contain composite walls with doors/windows and have direct access to patient rooms.

Source for Table 1: AIA 2006 Guidelines for Design and Construction of Hospital and Health Care Facilities (11/1/04)

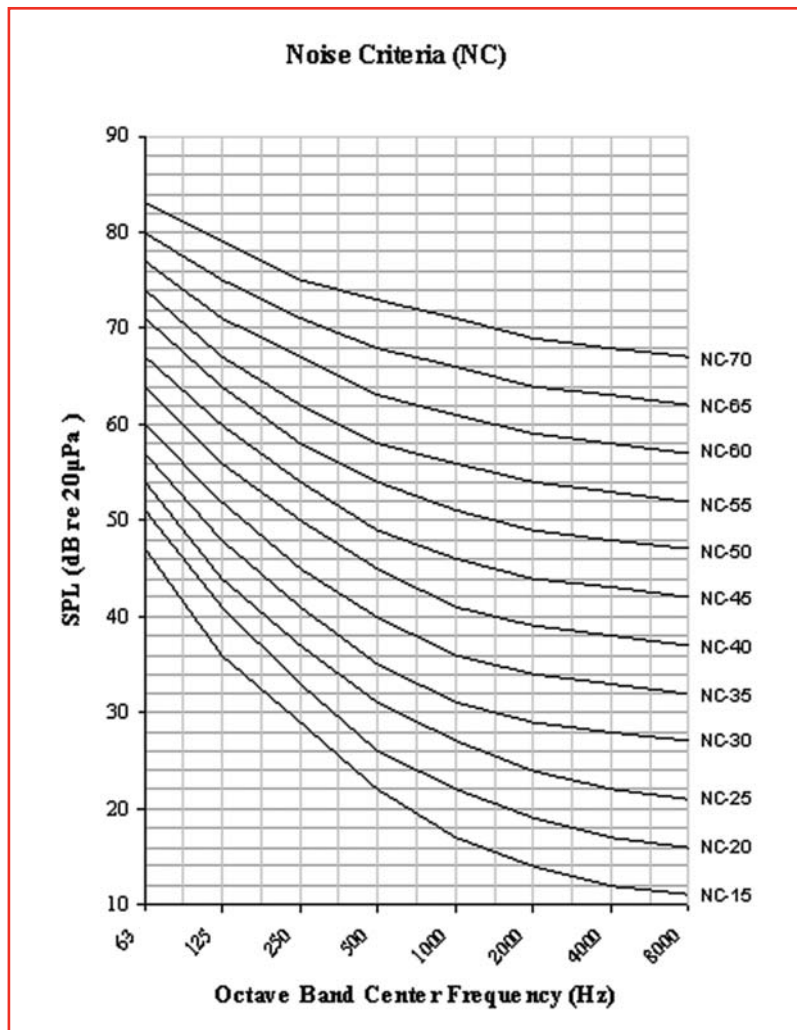


FIGURE 2: NOISE CRITERIA CHART

standards are being used as a benchmark for sound transmission limitations in hospital design.

The AIA/AAH consists of approximately 3,000 architects from both the private and the public sectors who have a particular interest and/or expertise in the design of healthcare facilities. Its mission is to “improve the quality of healthcare through design by developing, documenting, and disseminating knowledge; educating healthcare architects and other related constituencies; improving the design of healthcare environments; and promoting research.”

The AAH has established a table of noise standards for various hospital spaces (*Figure 1*). Wall-assembly requirements are given in terms of Sound Transmission Class (STC).

Sound Transmission Class

- STC is the classification used to define the amount of noise reduction provided by a wall or floor assembly, particularly in the speech range of frequencies.
- Every wall, floor, and ceiling performs differently at different frequencies (pitch). Heavy walls such as poured-in-place concrete or concrete block tend to stop low-frequency noise better than lightweight walls do. As such, it is beneficial to use these types of walls around mechanical rooms. Framed walls perform well in the middle frequencies and are therefore a common choice to separate spaces where speech is the primary source of noise.
- To simplify the description of a wall and its capacity to reduce noise, acousticians assign a single number—designated STC—to the overall acoustical performance of the wall, ceiling, or floor. STC’s single-number rating is intended to represent the amount of sound reduced when speech is the source of noise. Compared with

low values of STC, high values indicate the assembly is better at reducing speech noise.

Background Noise

An element of speech-privacy design that is often neglected is background noise. Background noise is necessary to meet HIPAA requirements because it helps mask sound that intrudes from an adjacent space. In order to reduce the chances of hearing nearby conversations to HIPAA requirements, the AIA/AAH standards assume that an “average” background noise level is present in a room where speech could intrude. For most hospitals with typical HVAC systems, this is a good assumption. However, as the industry moves toward green design in hospitals and considers reduc-

ing the amount of forced-air ventilation in favor of natural ventilation, the assumptions of “average” background noise levels may no longer be valid.

Background noise is most often described in terms of its Noise Criteria, or NC, level. NC represents a family of equal loudness versus frequency curves for human hearing. The Noise Criteria chart (*Figure 2*) shows the family of NC curves in a hospital. As shown, human hearing is not as sensitive at low frequencies, so an equal loudness curve is higher at low frequencies than it is at high frequencies, when hearing is more sensitive.

It may seem intuitive that a higher background noise level is required to mask higher intruding speech levels and a lower background noise level is needed to mask low intruding speech levels. This creates a relationship between the voice level of the talker, the capacity of the assembly to reduce noise (STC), and the background noise in the receiving space to help mask the intruding speech (NC).

This relationship can be expressed as a rule of thumb for STC and NC in assembly design to meet HIPAA standards:

Normal voice level: $NC + STC = 77$

Raised voice level: $NC + STC = 83$

This equation takes into account a five-point STC discrepancy typically found between the laboratory performance of an assembly and its performance in a healthcare facility. The result in the receiving room is a reduction of intruding speech to a “barely audible” level.

If we assume an average background noise level in a healthcare facility of NC 35, the STC of the assembly must be 42 for normal voices and 48 for raised voices. By way of comparison, the AIA/AAH standard sets a benchmark of STC 40-45 for hospitals, including administrative offices.

Figure 1 shows the AAH’s STC standards for room adjacencies.



ACOUSTICAL DESIGN OF THE FAMILY BIRTHING CENTER AT SAINT CHARLES MEDICAL CENTER IN BEND, ORE., INCLUDED ACOUSTICAL SEPARATION BETWEEN AND AROUND THE ROOMS OF THE NEONATAL INTENSIVE-CARE UNIT. PHOTO CREDIT: CALLISON ARCHITECTURE/CHRIS EDEN.

Building Materials

The selection of building materials has a tremendous impact on acoustical performance in hospitals.

Walls with a single layer of sheetrock on each side of metal studs and insulation in the cavity produce an STC of 45 if the metal studs are 25 gauge. However, many contractors and architects prefer heavier 20- to 22-gauge studs to reduce wall deflection.

A common misconception is that heavier-gauge studs do a better job of stopping noise penetration, when in fact relatively lightweight 25-gauge studs perform better than heavier-gauge studs. This is due to a spring action in the lightweight stud, similar to that provided with a resilient channel. When this stud is attached to sheetrock, the spring action disconnects the structural connection between both sides of a wall.

If heavier-gauge studs are needed, typical tables of STC values for wall assemblies cannot be used. These tables are consistently valid only for 25-gauge studs unless a heavier gauge is expressly identified in the assembly. The STC value for heavier-gauge studs is always less than is documented for 25-gauge studs. The decrease in STC for heavier studs varies with stud width, but is approximately 5 STC points for 3–5/8-inch studs.

Instead of using heavy-gauge studs, we often ask the architect or contractor to consider using wider 25-gauge studs to increase the stiffness of a wall while preserving the acoustic properties of the assembly. For example, a 6-inch, 25-gauge stud could be used in place of a 4-inch, 22-gauge stud to achieve the same stiffness but superior acoustic performance. This is most often the best value and more cost-effective than adding extra layers of sheetrock to improve the acoustic performance of the thinner, heavier-gauge wall.

Planning

In addition to reducing speech levels in hospital patient spaces, there are a number of special considerations in the acoustics of a medical facility. These all require careful planning during the early stages of design.

The location of HVAC and electrical equipment must be determined carefully due to its high noise levels. The location of neonatal intensive-care units (NICUs) is a particularly important consideration because of its greater need for quiet. Then there is the noise generated from other sources, such as paging systems, vibration from helicopters, and magnetic resonance imaging (MRI) equipment, that must be considered during planning.

It is, therefore, best to engage acousticians early in the design process, especially with regard to structural noise and vibration requirements of equipment rooms, surgery rooms, and MRI suites.

The following are additional planning considerations to help control noise in hospitals as well as to avoid increased costs due to poor acoustical performance:

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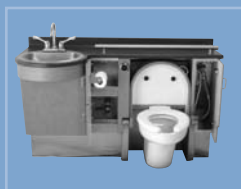
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siphoning off resources from the community hospital. Also, despite the moratorium on limited-service hospitals in place at the time of the survey, 20% of respondents reported a limited-service facility under development in their area.

Copies of the report are available on the AHA Web site, www.aha.org.

Hospitals Embracing Information Technology

While 9 out of 10 hospitals are using or considering adopting health information technology (IT) for clinical uses, most hospitals (especially small or rural hospitals) cite cost as a considerable barrier to broader implementation, according to a study released by the American

Hospital Association (AHA).

The results from more than 900 hospitals show that IT use falls along a broad spectrum, ranging from hospitals just getting started to those already using sophisticated IT systems. While most are still in the beginning stages, the survey shows that hospitals are making investments in IT, largely to make gains in the safety and quality of patient care. Some of the technologies and systems being used include bar-coding devices, computerized physician-order entry, and electronic health records (EHR).

Result of the survey suggest that the use of health IT in patient areas is evolving as hospitals adopt specific technologies based on their needs

and priorities. Factors such as hospital size and location are related to the level of use, as is a hospital's financial status.

Hospitals with the greatest use of IT had higher average margins, and those with positive margins utilize IT at a higher rate. Hospitals also remain committed to ongoing investment in IT. Those that reported the least amount of IT use plan on spending a greater share of capital on IT moving forward. Among surveyed hospitals, 53% reported sharing patient-specific information with physician offices, laboratories, and even school clinics to improve coordination of care.

The report can be viewed online at www.ahapolicyforum.org.

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- Avoid locating surgery areas near mechanical rooms, parking garages, or streets with heavy truck traffic.
- Locate patient rooms as far away from mechanical rooms as possible. If these adjacencies cannot be avoided, then solid-grouted concrete masonry walls with furred gypsum wall board on the patient-room side should be used.
- Allow sufficient space in equipment rooms. Cramped equipment rooms produce higher noise levels outside of the room.

Other Considerations

The following suggestions can improve overall acoustic performance in healthcare facilities:

- Noise is most successfully controlled at its source. Staff should be trained to maintain low voice levels whenever possible.
- Ongoing education about reduced noise levels in NICUs should include low vocal efforts; use of quiet medical equipment, cabinets, and drawers; muted pagers and cell phones; and control of the hospital's overhead-paging system so it is not audible in the NICU.

- Nursing stations are now being designed with innovative arrangements that move openings and doors away from direct exposure to patient rooms. Another way to reduce noise at nursing stations is to encourage the use of phones with headsets.
- Close patient room doors in order to reduce noise from hallways and nursing stations. To ease patient concern, let them know that they are being continuously monitored even though their door is closed.
- Turn off the overhead-paging system at nighttime, and limit its use to areas other than patient rooms and hallways. Other types of personnel-locator and communication systems are now available that virtually eliminate the need for paging within healthcare facilities.
- Purchase new or modify existing medical equipment to allow for volume control of alarms and other sounds associated with medical equipment.
- In patient rooms, use pillow speakers for TVs, radios, and intercom communication.



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