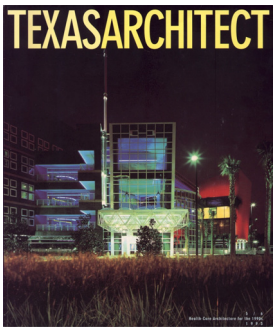
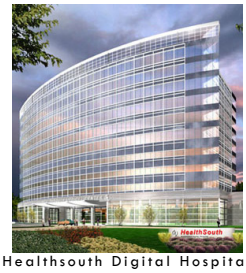


For more information visit
JEAcoustics on the web at
www.JEAcoustics.com

Nebraska Medical Center
Center for Clinical Excellence
Univ. of Nebraska, Omaha, NE

Texas Heart Institute - Denton
A Cooley Building, Houston, TX

Memorial Hermann Hospital
New Pavilion, Houston, TX



Healthsouth Digital Hospital
Birmingham, AL

Wake Forest University
Comprehensive Cancer Center
Winston-Salem, NC

Rockingham Memorial Hospital
Wellness / Rehabilitation
Center, Harrisonburg, VA

Halting Hospital Noise

PRACTICE Hospitals provide year-around, around-the-clock residential and sleeping accommodations for patients. But they also generate and are surrounded by noise that creates unacceptable intrusions. The architect planning and designing hospitals needs to be aware of the potential problems that noise can create. Noise can come from nearby highways and roadways, airplane and helicopter overflights, building cooling towers, emergency generators, and construction equipment used for hospital additions or adjacent buildings. Architects of a new facility need to evaluate potential noise levels, durations, and the time of day of acoustic events, and respond with appropriate siting, orientation, choice of shell materials, and other building-planning parameters.

Patients lose rest and are distressed by noise intrusions from noisy corridors, nurses' stations, and adjacent patient rooms. Evaluation of existing facilities for renovation should include investigation of wall construction, interior-partition to exterior-wall intersections (at window mullions, knee walls, wall-mounted heating/air conditioning units, etc.), above-ceiling constructions (open-ceiling plenum or head-wall closures, ducts, pipes, and conduits), and other elements. Even though corridor and room configurations may be replications of previously successful designs, careful examination of the corridor, toilet, entry, room, and furniture layouts can lead to acoustical privacy improvements. Similar concerns should guide planning for doctors' offices and examination rooms.

Not only patient areas but sensitive diagnostic equipment within hospital buildings must be protected from noise and mechanical vibration. Scanning electron microscopes, magnetic resonance imagers, CAT scanners, laser devices, and other crucially needed equipment can be badly compromised by structure-borne vibration or low-frequency airborne sound—at levels of vibration one to three orders of magnitude below what human tactile sense can detect. Structures therefore must be planned for stiffness, low deflection, and relatively high natural frequencies. In many cases, provision of suitable structural systems in high-technology and clean-room spaces, such as laboratories and surgical suites, can increase size and depth of structural members, affecting clear-span or floor-to-floor dimensions. Imaging systems and other such equipment are often used with or near clean rooms, in which air is purified by moving large volumes through filtration systems. Clean-room fans are powerful sources of compromising low-frequency noise. Planners must expect to provide generous mechanical support spaces for clean-room areas, and oversized duct layouts to accommodate sound attenuation devices. In the early phases of architectural and financial planning the additional costs and complications of this additional space should be considered in the building layout and spatial relationships between functional areas. In addition, worker- and patient-occupied spaces should be considered when locating and orienting large openings, including overhead doors, inlet and exhaust mechanical louvers, and rooftop stack exhausts. Adequate space should be programmed in early planning for the additional ceiling plenum and mechanical chase volumes consumed by vibration isolation, and, in some areas, seismic-restraint systems.

Hospitals, laboratory and medical research facilities often require support shops for fabrication of prosthetic devices and experimental apparatuses, or for maintenance of research, diagnostic, and patient-care equipment—places where sawing, grinding, metal-impact, and fastening procedures are performed. These must be separated from all other hospital spaces, particularly administrative and patient areas, to keep noise intrusion to a minimum. In addition, the hospital planner needs to consider the long-term effects of noise in central plant and machine-shop areas on the employees. In the early planning process, selection of equipment, arrangement of primary noise sources, and provision of quiet spaces within high-noise areas can prevent worker-hearing damage, create long-term working efficiencies beyond simple hearing protection, and avoid future expensive modifications and retrofits.

In the practice of engineering noise- and vibration-control solutions for health-care and medical-research facilities, our acoustical consulting firm has encountered each of these problems. Early recognition by the architectural planner of the demands of integrating new technology into the medical facility will allow innovative and well-conceived design solutions to replace the band-aid approach (pardon the pun) of the past. *Jack B. Evans, PE*

Jack B. Evans is principal of Jack Evans & Associates, Inc., an acoustical consulting firm specializing in control of architectural, mechanical, and environmental noise and vibration.