EDITORIAL

Good Hearing or Consensus-Based Design?

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For more than 100 years, the basic requirements for good hearing have been studied and refined extensively to establish guidelines that can be used reliably in building design and construction. Taking a school classroom as a particular example, speech intelligibility – referring to the capability for each pupil to understand and communicate with the teacher – is now only gradually being included in minimum building requirements for classrooms.

Following a public outcry by irate parents and others calling attention to the prevalence of unsatisfactory school hearing conditions, and through sustained efforts by a select group of dedicated consultants a U.S. national standard for schools was enacted. (It is ANSI S12.60-2002, Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools.) Intended in part to replace a motley array of published criteria, it elicited surprisingly strong opposition from school boards and sections of the building industry as being too costly, and to this day it remains only an advisory standard. Consequently, 10 years after its adoption, school hearing conditions have not really improved much.

Typically, conditions for good hearing in any space can be evaluated and predicted by three easily measurable criteria:

- Background noise level
- Acoustical separation between adjacent spaces
- Persistence of sound within each space

Each one is well founded on scientific analysis, defined by a formal standard and identified as a physical property that can be readily applied to the design and construction of the classroom, namely: noise criteria, sound transmission loss, and reverberation time.

Each of these properties is commonly referred to by a single-number rating for simplicity and convenient inclusion in contract documents. With each level of simplification, however, there is a significant loss of information as to the intent and details of the standard, which is readily seen in the way that professionals often tend to confuse abbreviations such as NC and NRC. Enough examples have been built to confirm that hearing conditions could generally be enhanced at reasonable cost if the already none-too-stringent standards set by ANSI S12.60-2002 became mandatory for new or remodeled classrooms. Nevertheless a designer with a budget in mind and having only a rudimentary understanding of acoustical needs could arbitrarily decide that the proposed criteria are too stringent and, therefore, more expensive than necessary.

However, nothing stands still, and the constantly evolving marketplace has adopted the development of new building yardsticks to meet the important challenges of our time, with strong emphasis on conservation of energy, sustainability and environmental quality. Under the aegis of the U.S. Green Building Council (USGBC), these clearly long-overdue considerations have been included with other relevant building criteria into a single comprehensive classification system for a given type of building – such as schools – whose collective merits are categorized on an ascending scale of LEED (Leadership in Energy and Environmental Design) ratings.

What are the rewards of attaining a high LEED rating? Recently reviewed USGBC literature claims that it sets the industry gold standard, emphasizing qualities that enhance marketability, e.g. energy efficiency, recycling, use of environmentally friendly materials and so on. But this does not necessarily result in a proven method to meet specific needs, which in the case of a classroom should always enable the child to hear well. Each of these categories should be allowed to stand on its own merit without the compromise of being forced into a mold shaped by not necessarily well-informed consensus. In short, what good is a high-LEED assessment if the child cannot hear the teacher clearly?

Consider background noise level in a classroom, over which a conversation must be clearly audible. It has been well documented that a level of around 30 dBA is both desirable and attainable. In the ANSI committee deliberations, a maximum level of 35 dBA (i.e. 5 decibels higher) was accepted as reasonable, despite its being challenged as too costly. However, we find in the compendium of LEED criteria that the maximum background noise level allowed for a classroom is 45 dBA. Coincidentally, this is the level at which background noise starts to become effective as a device for actually reducing speech intelligibility. Using the LEED-enhanced option of reducing the allowed level to 40 dB – and also complying with the ANSI sound transmission loss standard – earns only one rating point out of a possible 100 to the LEED assessment of the project.

Until relatively recently, it was common for a designer to work with a consultant to ensure that the many arcane rules sanctified in building codes, school standards and the like were integrated with the overall design so that inherent limitations of single-number ratings such as STC (Sound Transmission Coefficient) or NRC (Noise Reduction Coefficient) were taken care of.

Now, however, due to aggressive marketing by suppliers who openly offer design solutions, there is less incentive to engage a consultant. The outcome is quite predictable, because some intricacies of building construction – of putting the pieces together – that still require both experience and understanding can be easily overlooked.

The resulting deficiencies may not be caught during construction due to other cost-cutting policies such as a design-build contract. So the occupants are left to cope with built-in shortcomings for the life of the school.

By all means, let us take full advantage of the research, design and coordination resources that were not available to us 50 years ago. But let these advances be exploited to heighten design understanding and to improve schools, not to trivialize well-defined requirements through ignorance or the undoubted convenience of political consensus. S/V

"To the vast majority of mankind, nothing is more agreeable than to escape the need for mental exertion . . . To most people nothing is more troublesome than the effort of thinking.

— James Bryce,
The American Commonwealth, 1888

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