green building acoustics

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With only a few exceptions, as noted later in this article, a search for the word "acoustics" in LEED Canada documents inevitably comes up with the message "no results". This may seem surprising to many designers, and particularly to acoustical consultants since acoustics is an important aspect of indoor environmental quality. The absence of acoustic criteria is not only surprising, it is also unfortunate, since many of the energy efficient design features that qualify a building as "green", can actually be detrimental to good acoustics. Furthermore, many acoustic measures that were readily accepted as being necessary in the past are now being sacrificed in order to maximize LEED points for energy efficiency, thermal comfort, and other design requirements. The end result is that complaints of poor acoustics, particularly lack of speech privacy and excessive noise, have become more common place in new buildings.

Some of the most common acoustic problems associated with green design, include:

- insufficient sound absorbing material
- large operable windows for improved day lighting and fresh air ventilation
- very low background noise levels due to reliance upon natural ventilation or under-floor air distribution systems
- a tendency to design large open spaces with less partitioning between adjacent areas.

Insufficient sound absorbing treatment, particularly in large rooms, degrades speech intelligibility, reduces speech privacy and increases general noise levels but these detrimental factors are often overlooked for a variety of reasons. For example, a suspended acoustic ceiling may interfere with radiant heating, it may conceal efforts to maximize the use of wood, it may restrict the height of exterior windows, or it may be perceived as less durable and sustainable than a hard finish such as concrete. Solutions to such problems often involve compromises and trade-offs. In the case of a radiant heat ceiling, it may be possible to suspend a number of acoustic "clouds" with large enough separations between them to allow adequate heat transfer between the radiant ceiling and the room or, where there is a desire to maximize window height and/or expose a wood deck roof, it may be possible to provide a partial suspended ceiling that stops short of the exterior wall, thereby exposing more window and some of the wood deck.

Large windows which rely on operable sections for fresh air ventilation may be acceptable on relatively quiet sites but in the presence of heavy road traffic or other exterior noise sources, the building occupants will be exposed to excessive interior noise levels unless they decide to keep the windows closed and suffer from inadequate ventilation. The solution in such cases may be to reduce the window area and utilize an acoustically superior glazing system on the noise exposed façade and locate operable windows on façades which can be shielded from the exterior noise source. Relocating operable windows may not be practical in some situations in which case, alternate means of providing fresh air ventilation should be investigated.

Too little background noise can also cause problems, namely a lack of acoustic privacy. Whereas traditional HVAC systems generally provide a relatively steady and continuous level of masking noise, more energy efficient systems utilizing natural ventilation or under-floor distribution systems can result in very low levels of background noise. This can be detrimental, particularly in open area offices, where the objective is to maximize speech privacy between work areas so that office workers at one end of the room are not distracted by the conversations of co-workers at the other end of the room. In some situations, this may even require installation of a sound masking system and, although some systems are more energy efficient than others, they all increase energy consumption to some degree. Although it is not suggested that energy efficient ventilation systems should be avoided for these reasons, the potential acoustic implications should be recognized and considered.

Resolving potential acoustical problems in the design of green buildings is challenging and almost always involves compromises and trade-offs between conflicting requirements. Most importantly, acoustical requirements must be considered from the very beginning of the project through to its completion, in parallel with all of the other disciplines. This approach would be greatly encouraged if acoustic performance were added to the LEED score card. With two notable exceptions, there has been little indication to date of this happening in Canada. One exception is the opportunity to claim 1 point under the rating system for LEED Canada for New Construction, under Innovative Design, for applying "strategies or measures that are not covered by LEED such as acoustic performance". The other exception is found in the LEED Canada for Existing Buildings Operations and Maintenance 2009 rating system which offers a 1 point credit for implementing an occupant comfort survey and collecting responses about thermal comfort, acoustics, indoor air quality, lighting levels, building cleanliness and other occupant comfort issues. This latter reference to acoustics acknowledges that acoustics is a factor to be considered, even though LEED Canada for New Construction makes little mention of acoustics. Recent developments in the United States are more encouraging, where LEED for Schools offers an additional point for enhanced acoustic performance as does a draft version of LEED for Healthcare, which is very close to being formally adopted in the U.S. DQ

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