SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

WHEN SOUND IS "GREEN"

Many of us have been there more than a few times - the hotel with the paper thin walls. After the party down the hall quiets down and the 4:10 am train makes it way out of town, you finally get two or three hours of sleep before the morning alarm.

Most of us learn from these experiences, shrug them off, and are more careful about where we stay next time around. However, if the current trends continue to gain momentum, building codes and standards are likely to address these types of issues more directly by significantly boosting the requirements for quieter hotels, schools, offices and other similar types of buildings.

The emergence of acoustics as a characteristic of sustainability

The International Building Code (IBC) and most other major model codes have long required some minimum acoustic performance from buildings, but not without controversy over whether providing a quiet environment is a life safety issue that belongs in a building code. The debate heated up several years ago within the International Residential Code (IRC) to the point where opponents of acoustics requirements in building codes successfully modified the IRC to remove all acoustic requirements and place them in an optional appendix. More recently, however, the emergence of "green" codes and standards is taking acoustic protection requirements in the opposite direction.

The growth of voluntary green programs and standards at first glance seems like a great idea to help protect the environment. Who can argue with individuals voluntarily building more sustainable buildings, or with the development of standards to support voluntary programs? As more and more mandatory programs develop and make their way into building codes, however, these issues take on a higher level of importance. That is where we stand with acoustic requirements. Somewhere along the line, advocates for "green" building have broadened the definition of sustainable to include acoustic performance in buildings. Furthermore, they have successfully expanded the scope beyond noise from adjacent connected dwellings to address reduction of noise generated outside of buildings and between other use groups.

Advocates for "green" building have broadened the definition of sustainable to include acoustic performance in buildings.

Major players on the green scene

Whether one agrees with advocates that claim a quieter building is more sustainable or not may be immaterial at this point. The major players who develop and promote codes and standards all have jumped into the green building business and are debating the merits of acoustic provisions. *See the sidebar on the next page for a rundown on the main players.*

Which code or standard will impact the CFS industry most? The jury is still out on that question as the various products jockey for position over the next few years. However, as far as mandatory adoption of green codes by local or state jurisdictions goes, it seems likely that the IgCC has the upper hand due to its affiliation with the International Code Council. However, even within the IgCC there is overlap as it includes the NGBS and 189.1 as compliance options by reference. Regardless of which document you may see as a requirement in the future, similar acoustic issues will arise.

Current acoustic requirements and trends

Participants in the construction industry are generally familiar with the requirements in building codes. Most residential codes are based on the International Residential Code that governs single family homes, townhouses, and similar smaller residential buildings. The 2012 IRC only requires sound protection between dwelling units if a local jurisdiction specifically adopts Appendix K of the code. A minimum Sound Transmission Class of 45 is required in Appendix K to reduce air-borne sound between different dwelling units. An impact Insulation Class (IIC) rating of at least 45 is required to address structural-borne sounds. The major building materials including cold-formed steel (CFS) can easily meet these requirements with fairly standard construction.

The International Building Code is the major model code that most states adopt to regulate larger residential and commercial buildings. Section 1207 of the 2012 IBC addresses sound transmission requirements. Unlike the IRC, the IBC requirements are mandatory for buildings covered by the code. Similar to the IRC, the IBC limits sound transmission requirements to minimize noise in a dwelling from adjacent dwellings. However, the IBC goes a step further and includes protection of dwellings from noise generated from public adjacent spaces in a building.

The IBC requires an STC of 50 and an IIC of 50, slightly higher than the IRC requirements but still within the range of typical CFS assemblies. The IBC allows a reduced STC and IIC of 45 if the rating is based on a field test as opposed to the more conventional laboratory test.

OITC: The new kid on the block

If the IBC and IRC requirements are basically covered with conventional CFS assemblies in use for decades, one might ask what is the big deal? As we mentioned above, recent green codes and standards have expanded on sound requirements in three major ways:

1. Expanding the scope to address more occupancy types (e.g., schools),
2. Increasing the STC and IIC requirements over the IBC and IRC requirements, and
3. Increasing the scope to address noise from outdoor sources (commonly called OITC).

All of these are significant issues but the last item may be present the most difficulty for CFS buildings simply because the industry has not performed OITC

The "Green" Building Documents to Know

The U.S. Green Building Council (USGBC) was one of the first to develop a green building program. Its leadership in Energy and Environmental Design (LEED) covers a range of land develop and building types. Although a voluntary program, it has appealed to many private and government owners and has made its way into their specifications, effectively becoming mandatory on those projects where it is specified.

USGBC later joined with ASHRAE to develop a green building standard that could be adopted by reference in specifications or in a building code. The ASHRAE 189.1 standard is written in mandatory language specifically for this reason. Although LEED addresses houses and commercial buildings, 189.1 is only for commercial buildings.

On the residential side, the NAHB teamed up with the International Code Council to develop the National Green Building Standard. It only applies to residential occupancies. Not to be left out of the commercial market, the ICC later published the International Green construction Code (IgCC).

Except for the ASHRAE 189.1 standard, these different green building documents differ from traditional buildings in that not all of their requirements are mandatory. Most provide some mandatory requirements and then an assortment of extra options. The number of options to be met depends on the level of performance selected by the owner or jurisdiction adopting the code or standard. The NGBS does not address acoustics beyond the requirements in the "regular" building codes.

(outdoor to indoor transmission class) tests. There are few published assembly OITC tests for a designer to reference. Currently, none of the major reference documents (e.g. like the Gypsum Association Fire Design Manual) report OITC ratings. This is not due to neglect but rather attributable to the fact that there has not been incentive to conduct them until now.

"Green" acoustic requirements

Describing the major green codes that are written specifically for adoption as a building code – The International Green Construction Code (IgCC) and ASHRAE 189.1, and LEED – and their specific requirements would require a significant amount of space to address them in a comprehensive manner. Instead, the following is a summary of the most significant requirements from these documents. Even though LEED is not specifically addressed here, the general issues are similar in those program requirements too.

The 2012 IgCC requirements for Acoustics are covered in Section 807 of the code. The IgCC consists of mandatory requirements and jurisdictional requirements. The jurisdiction selects the requirements and, in some cases, the specific level of performance. For example, with energy performance, the jurisdiction selects a specific performance target. With acoustics, the jurisdictions either checks "yes" or "no" to indicate if the requirements of Section 807 apply. Unlike the appendices in other code documents, the jurisdictional requirements are a central part of the IgCC and thus it is probable that most if not all jurisdictions adopting the code will select the acoustics requirements.

The main differences between the IBC and the IgCC acoustic requirements are related to the applicability (scope) and the minimum STC requirements. Whereas the IBC limits acoustic requirements to a minimum STC and IIC in dwellings adjacent to other spaces in a building, the IgCC expands the scope to include an STC of 60 for walls and floor-ceiling assemblies that separate Group A and F from one another or from B, I, M, or R occupancies. An STC of 50 is required to separate B, I, M, and R occupancies from each other. Further, floor-ceiling and wall assemblies in Group R condominiums must be separated from other dwellings and B, I, and M occupancies by an STC of 55.

The IgCC also expands the applicability of STC ratings to include walls and floor/ceiling assemblies surrounding mechanical/electrical equipment rooms. Depending on the specific equipment, the STC may be as high as 60.

Although the IgCC also expands the scope in a similar way over the IBC for structure-borne noise, the corresponding IIC ratings of 50 are in line with the IBC. Thus, the significant issues for the CFS industry are the added costs to reach an STC of 55 or 60 for certain assemblies identified in the IgCC.

The acoustic requirements in the ASHRAE 189.1 (189) standard include those related to expanded scope and higher STC ratings as in the IgCC. However, 189 goes further with the introduction of OITC requirements and associated testing. In one short paragraph in Section 8.3.3.1, 189 introduces for the first time a requirement to protect buildings from noise generated outdoors from such sources as expressways, airports, and general everyday noise. Certain buildings are exempt such as stadiums, parking structures, and storage facilities, but most buildings are required to have exterior wall and roof –ceiling assemblies with an OITC of 40 or greater or a composite STC rating of 50 or greater.

Although theses OITC ratings are not considered excessive, it remains to be seen how assemblies, including CFS walls, will perform under the OITC test conditions. The assemblies must be specifically tested to ASTM E1332, which is a different test than for an STC rating.

Conclusions and recommendations

At some point in the future, most CFS designers will be faced with higher STC and IIC ratings for dwellings and other buildings that had previously been exempt from acoustic provisions. The impact will be higher costs for some assemblies compared to unrated assemblies. Fortunately there are some resources that identify assemblies with IIC and STC ratings in the current ranges specified in most green

standards or codes. Examples include the Gypsum Association's Fire Resistance Design Manual (GA-600) and the Steel Framing Alliance's fire and sound searchable directory available at http://www.steelframing.org/PDF/fire/SFAFire-Acoustic-Guide-Version-8-August-2009.pdf.

With the OITC, the industry is in need of test data. This is a challenge for the industry to address in the coming years as green requirements move from voluntary to mandatory. SFIA has identified this as a priority and is working with the Steel Framing Alliance, Canadian Steel Construction Council, American Iron and Steel Institute and the Steel Stud Manufacturers Association to develop an approach to address these and other acoustic issues in a coordinated effort.

- *Authored by Mark Nowak, M Nowak Consulting, LLC. E-mail: mark@mnowak.net.*