HIGH-RISE PEACE & QUIET

TILE and STONE systems can deliver the privacy condo buyers expect.

LAB and FIELD TESTS put a number on effectiveness.

NATIONAL STANDARDS define guidelines for sound control success.

By Dale Kempster

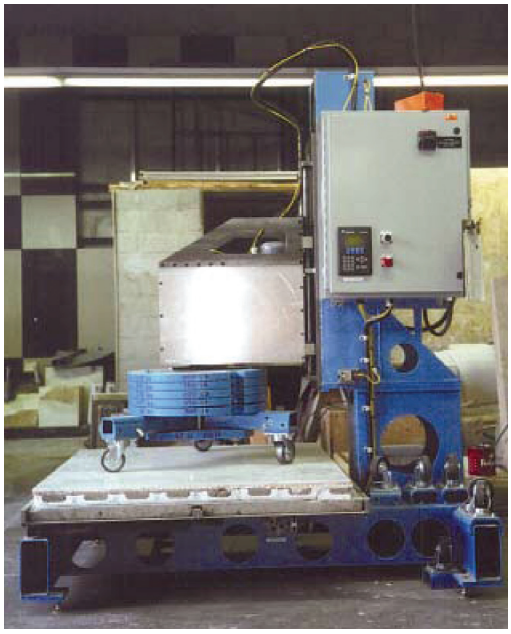
SHANGRI-LA, a high-rise condominium now under construction in Vancouver, is designed to be that city's tallest building, at 62 stories. The first eight floors will be a hotel, and the balance of the floors will be luxury condominiums. In Toronto, a building similar in size and stature will commence later this year.

This reflects a trend of baby boomers purchasing or renting luxury units and is composed of people accustomed to living in single-family dwellings where they had no neighbors living above them, making noise and disrupting their privacy. Now, these same individuals will have neighbors that may play music, have an elaborate home theater, walk in high heels, have young ones playing on the floor, etc. I am sure you get the idea. Therefore, if there is little sound control designed into the floors and walls, this will result in a noisy living environment, complaints, and, in some cases, litigation. This has given rise to the discipline of building acoustics.

TWO TYPES OF RATINGS are used for sound-control. There is airborne sound, identified as Sound Transmission Class (STC). This includes talking, music and other noise that comes through the air. The second class is impact sound, identified as Impact Insulation Class (IIC), and includes such functions as walking, dropping objects and vacuuming the floor. These class numbers are a logarithmic calculation, and the higher the number, the higher the sound control.

In Canada, the National Building Code (NBC) only requires all multi-family construction have a minimum rating of 50 STC, but in the case of IIC, it is only a recommendation, not a requirement. This is unlike our neighbors to the south, where they normally require a minimum of 50 IIC, no matter which building code they subscribe to.

Initially, you may think it is odd 50 IIC is not alsoa requirement by the NBC, but it seems there is a method to the madness. Most acoustic consultants are



A universal floor tester that can conduct the Robinson Floor Test ASTM C627 actually showing a floating floor system.

Testing standards in flooring

The government of Canada has certified a number of standard tests for the benefit of consumers and builders.

ASTM E90 / ISO 140-3 is for the measurement of airborne sound transmission through walls, floors and other building elements.

ASTM E492 / ISO 140-6 provides for the measurement of impact sound transmission through a floor using a standard tapping machine.

ASTM E2179 / ISO 140-8 addresses measurements of reduction in impact sound due to a floor covering

ASTM C423 sets sound absorption measurements

For more information, visit
http://irc.nrc-cnrc.gc.ca/ie/services/standard_tests_e.html

of the opinion a 50 IIC, especially in a luxury condo, is too low and most people would not be satisfied with the amount of noise still penetrating their living areas. The general consensus is that 60 IIC or greater would be preferable, but it is a difficult challenge to achieve, especially when it come to such hard surfaces such as tile, stone or terrazzo.

To keep focused and not too technical, let's discuss only the intricacies of concrete floor slabs, not woodframe construction. That will be left for another article. Typically, when it comes to concrete slabs, obtaining an STC of 50 is easy by varying the thickness of the slab. In the newly revised 09 30 00 Manual, from the Tile, Terrazzo, Marble, Association of Canada (TTMAC), a new section addresses sound-control floors and stipulates that a slab of 150mm (six inches) thick already has an STC of 52, whereas that same slab only has an IIC of 28. Thickening the slab is not a solution, since the IIC only increases marginally (32 IIC) at 200mm (8 inches) and 34 IIC at 250mm (10 inches). The challenge, as you can see, is how to achieve at least a 50 IIC, if not closer to a 60.

THIS IS WHERE YOU HAVE TO BE CAREFUL. In most highrise construction today, there are very few dropped ceilings being used. In this case, "dropped ceilings" means having a plenum (void between the concrete and the ceiling panels) of approximately 225mm to 300mm (nine to 12 inches) deep, hangers and channels to attach the gypsum ceiling panels to below. In some cases there have been manufacturers of different underlayments for sound control that claim very high IIC ratings — in the high 50s or low 60s. Unfortunately, they often do not indicate there was a dropped ceiling of some sort present. As well, some manufacturers have added sound-absorbing insulating batt and doubled up the ceiling panels in order to achieve these high IIC numbers.

THE GOOD NEWS is that recently a new standard was created, chaired by Alf C. Warnock, Ph. D., of the National Research Council of Canada, called ASTM E-2179-03e. This test method, unlike other lab tests such as E989/E492, actually gives a contribution number for strictly a bare, 150mm (six-inch) slab and the product assembly above, with no dropped ceiling below. The contribution number derived by this test provides an excellent way to evaluate different products, and to determine whether additional key components, such as a dropped ceiling and insulation, are needed.

For instance, with ASTM E2179, the slab already has been predetermined to be 28 IIC and if XYZ product is tested and receives a 21 IIC or lower, when you add them together you know now you are below the recommended 50 IIC, and far below an ideal 60 IIC. At this point, you need to determine if a dropped ceiling is an option, which, if it is an existing building, it probably is not. If a dropped ceiling is not an option, the most effective method to establish a high IIC rating is to install a floating floor system. This can be accomplished by first applying a resilient material such as foam pad, shredded rubber (typically recycled tires) or mineral wool, then a layer of light-weight

The Type 3207 tapping machine uses five hammers, each weighing 500g and operating at 2Hz, dropping from a height of 40mm, giving an operating frequency of 10Hz. Three extendable legs with rubber feet support the unit during operation.

concrete, mortar-bed or gypsum concrete 15mm (5/8 inch) or thicker, onto which the tile, stone or terrazzo is installed. A floating floor system can typically contribute anywhere from 24 to 34 IIC, easily putting the floor higher than a 50 IIC.

Another aspect is that most of the materials being used for sound control need to be resilient to be effective, and may not be able to support a hard, rigid material such as tile or stone. It is extremely important to make sure the material in question has been tested by ASTM C-627, commonly known as the Robinson Floor Test. The TTMAC possesses such a tester and can test any given system to determine whether it meets a minimum of a Residential Rating.

The test is conducted by having three wheels on a carriage that rotates about its center on a 120 x 120 cm (four-inch-square) pad. By varying the weight and the hardness of the wheels, a series of service levels can be determined. For a residential rating, three cycles of 900 revolutions each must be completed, starting at 136 kg (300 pounds). After each cycle, another 136 kg is added to a maximum of 408 kg (900 pounds).

TO PASS THE TEST, the system must not show any cracked, pulverized, or popped grout. As well, the tile cannot be cracked, or crushed. Make sure all materials used are similar to those to be used in your application. For example, if epoxy grout or mortar was used in the test, epoxy grout or mortar must be used in your installation to be assured the assembly will survive.

In all, to make an educated selection of the appropriate sound-control material, it is imperative to ask for the IIC ratings, preferably done by ASTM E2179-03. If IIC ratings are not available, find a rated floor assembly that resembles as closely as possible your situation. If the rating is missing or different in any of the key components, such as the size of the plenum, insulation, etc., then another system may be preferable.

Another option, especially for new construction, is to have a field test conducted. This can be done by using a tapping machine such as a Bruel & Kjaer 3207 Tapping Machine under accordance of ASTM E1007-04. The test should be conducted before the system is installed, as well as after, to get an accurate calculation of the sound-control contribution of the system in consideration.

LET'S FACE IT. These new, high-rise, multi-family units can be extremely expensive, and most owners will not want to hear their neighbors. With a little understanding of what the test data means and what to look for, a buyer can make a good decision on the sound-control system appropriate to his or her situation and find a personal Shangri-La. For more in-depth information on this topic, as well as tile and stone installation in general, contact the TTMAC and purchase a copy of the revised 2006-2007 09 30 00 manual.

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