NOISE CONTROL AND TIMBER FRAMED BUILDINGS

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SUMMARY

This paper discusses noise control in relation to:
- New Zealand Building Code requirements.
- Product and System testing for airborne and impact sound.
- Performance Systems.
- Importance of getting it right on site.

NZBC REQUIREMENTS FOR AIRBORNE AND IMPACT SOUND

The object of the NZBC requirements is to prevent undue noise transmission from other occupancies or common spaces to the habitable spaces of household units. NZBC Clause G6 requires:
- Airborne - Sound Transmission Class - STC 55 (through walls mostly).
- Impact - Impact Insulation Class - IIC 55 (through floors mostly).

It also defines:
- Household unit - Home for one household, excludes temporary accommodation.
- Habitable space – Space for living (lounge, bedroom), excluding service areas (kitchen, bathroom, corridor, garage etc).

The scope of the NZBC requirements is thus narrow and applies only to apartments and the living areas within these. Unlike our neighbours in Australia, New Zealand does not require noise control for temporary accommodation such as hotels, hostels and motels. Building controls in some European countries go even further, requiring minimum levels of noise control between rooms within houses.

Verification Method VM1 to NZBC Clause G6 states that field test results shall be within 5dB of the performance requirement. Market interpretation is that FSTC 50 and FIIC 50 comply where "F" stands for a field test rather than a laboratory test. NZBC Clause G6 (1992) is under revision and draft for public comment is now available. It proposes:
- A shift from laboratory testing of components to field testing of finished construction.
- The requirements for FSTC 50 and FIIC 50 (field) could increase by dB points.
- To introduce a correction factor for low frequency noise which will have the effect of increasing on-site performance requirements by another 5 to 10 dB points.
- To introduce general requirements will be introduced to protect against environmental noise.

ENVIRONMENTAL NOISE CONTROL

This relates to the noise perceived within a habitable space due to noise sources outside the building, as illustrated in Figure 1 below. The example shows an external noise source generating 65 dB. For an internal comfort level set at 35 dB, the external façade needs to provide a loss system equivalent to 65 dB – 35 dB = 30 dB.

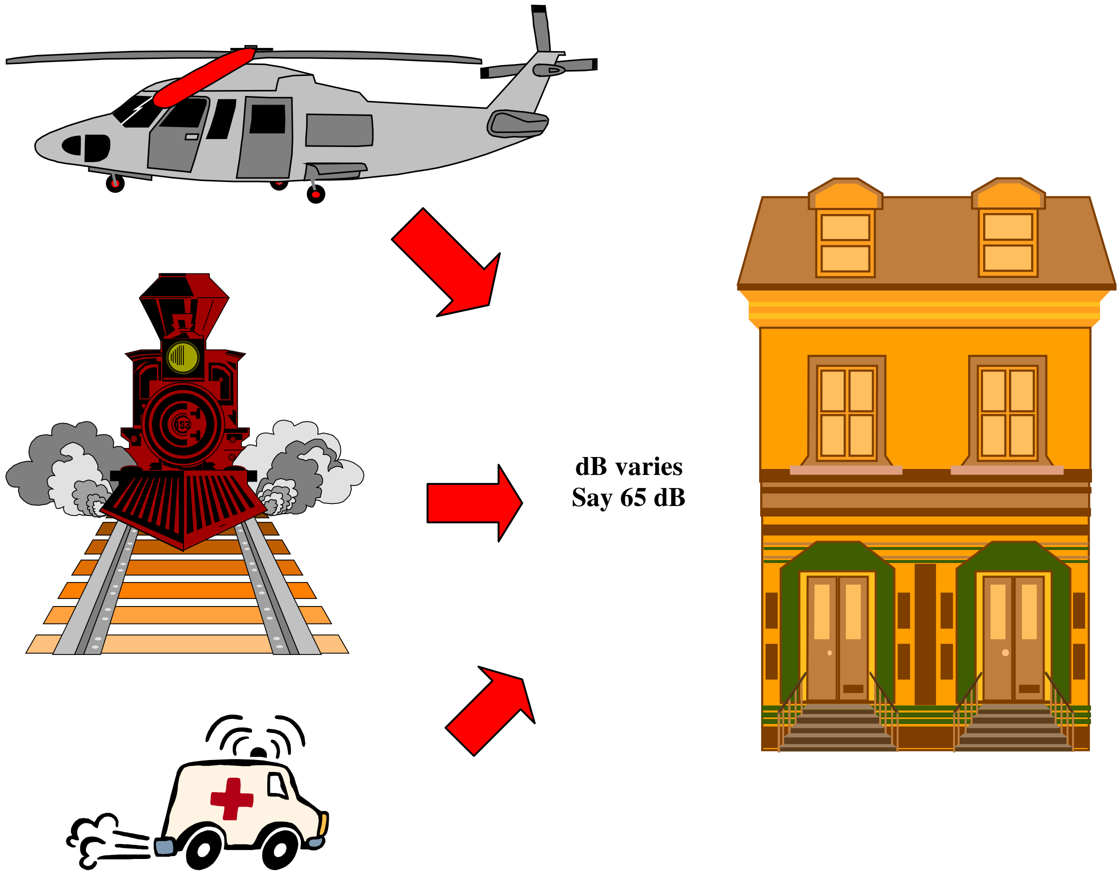

Figure 1: *Environmental noise impinging on a dwelling.*

NOISE CONTROL – GENERAL

Note that:

- Noise control is NOT sound proofing.
- Noise control is a reduction of sound expressed in decibels (dB).
- Over a range of frequencies (Hz) from low (bass) to high frequency (soprano opera singer).
- STC and IIC are presented as a convenient single figure numbers, which can be misleading.

DESIGNING FOR NOISE CONTROL

Important factors in noise control are:

- Mass - the weight of the wall or floor/ceiling system.
- Insulation - the inclusion of a sound absorbing material in the cavity.
- Isolation - separating frames or separating linings from the framing by means of resilient rails or clips.
- Separation - Physical distance / cavity width.
- Damping - e.g. incorporate rubber mounts that dampen noise vibrations.
- Elimination of sound leaks in the construction.
- Correct construction of junctions to prevent flanking paths.

WHAT IS STC?

- Sound Transmission Class (airborne noise).
- Measured in dB loss across a wall or floor/ceiling system.
- Customers often demand more than NZBC requirement.

SINGLE FIGURE STC

STC means Sound Transmission Class and is concerned with airborne noise. When tested "pink" noise is generated on one side of a noise control assembly. Pink noise is noise with the same level of loudness over the full range of frequencies being tested. The noise transmitted is measured and the transmission loss is the difference between the noise generated and that received. STC is determined after matching the test results to a "best fit" reference curve over a 125 – 4000 Hz frequency range as shown in Figure 2. Therefore different test curves could give the same STC. Note that performance below 125 Hz is ignored, but this is perceived as an annoying boom- boom noise by occupants. This is a deficiency of the STC rating. STC represents the loss in transmission through the wall and therefore the higher the STC the better.

GIB® provides specification sheets, which emphasise that noise control is the result of several components being installed correctly. GIB Noiseline® or cavity infill on its own, does not provide noise control. Careful attention to detail is required.

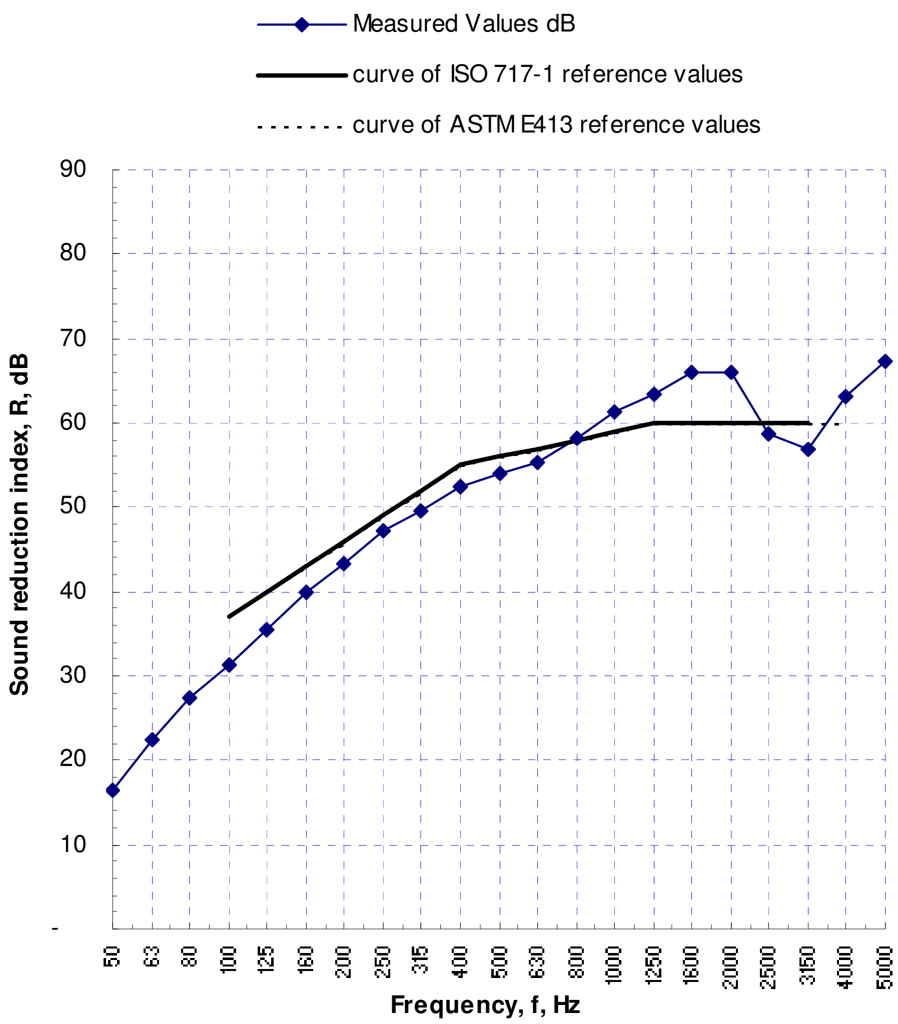

Figure 2: *Determining STC rating by fitting the standard curve test results*

WHAT IS IIC?

IIC means Impact Insulation Class and is concerned with structure borne noise. It is the measured dB loss across a floor/ceiling structure using a standard 'tapping machine' and is intended to simulate impact noises such as scraping chairs, falling objects and footfall noise. The concept of IIC is illustrated in Figure 3. The noise transmitted is recorded as shown in Figure 4. Like STC, IIC is a single figure "best fit" to a reference curve. Note that, as with STC, low frequencies below 100 Hz are ignored. Customers often demand more than NZBC requirement.

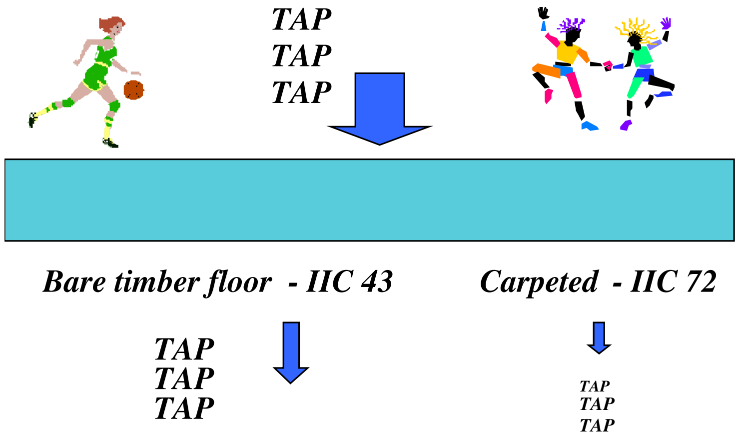

Figure 3: *Illustration of IIC concept*

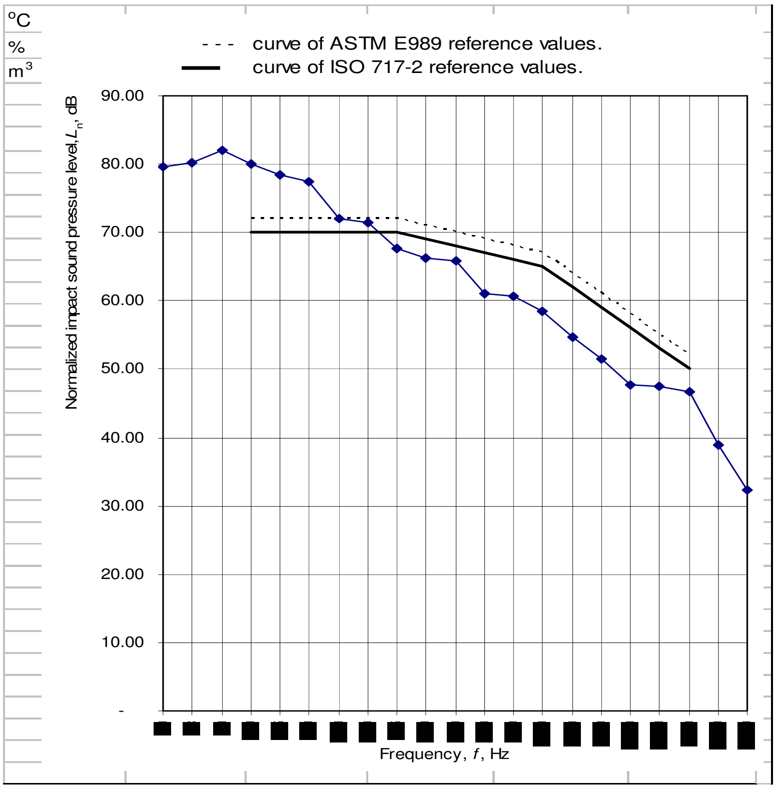

Figure 4: *Best fit of test record to a standard curve determines IIC rating*

IIC 55 (lab) is very difficult to achieve with bare or tiled timber floors and IIC 50 on site is possible with difficulty. Particular problems are:

- Human footfall occurs in the LF range, outside the test measurements.
- Timber framed floors perform poorly against footfall.
- Concrete floors fare much better, but have a high frequency problem which is easier to solve.
- The footfall problem on timber floors is an issue and challenge facing the timber industry.

Incremental improvements can be made using flooring overlays and resilient supports. Examples are given below. It must be recognised that these improvement can lift floor performance over the on site requirement of IIC 50, but can still fall short of customer expectations.

Winstone Wallboards manufactures GIB® Sound Barrier® for timber floors. This is placed between the particleboard flooring and the strip timber flooring (Figure 5).

For suspended ceilings Winstone Wallboards provides a “GIB® Quiet Clip” that has the effect of improving low frequency performance for both STC and IIC (Figure 6).

Figure 5: GIB® advertisement for their Sound Barrier.

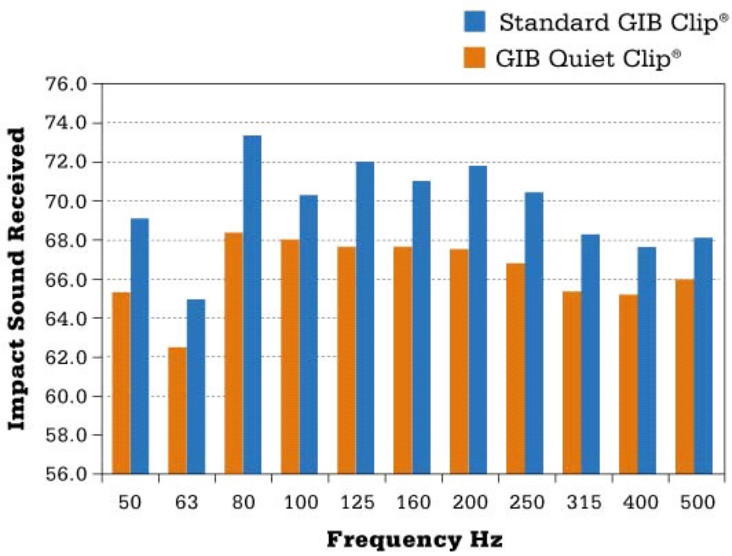

Figure 6: *Reduction in sound transmission achieved by use of the GIB® Quiet Clip.*

WHAT NOT TO DO ON SITE

Finally and from experience, here is some advice on things not to do on-site. This list is by no means exhaustive and when in doubt pick up the phone and not the hammer!

- Change from the specifications.
- Substitute components (different battens, clips, etc).
- Substitute wall/ceiling linings (change in mass/stiffness will change STC.
- Change specified cavity insulation (changes sound absorption characteristics).
- Connect double frames (reduces STC / use GIB Quiet Ties).
- Fix through resilient rails into framing (reduces STC).
- Use un-tested penetrations.
- Create flanking paths (get these checked out !).