



LATICRETE and Sound Control

TDS 163

In the not too distant past, sound control was an afterthought both during the construction of a new building and afterwards. In most cases, it was considered normal and expected to be able to hear when the upstairs occupant(s) were present. Over time, knowing that the people upstairs were present became an annoyance, so architects and contractors were tasked to see if there was any way to help keep things quiet. Since those days a plethora of products and innovations have been developed to control contact noise on the floor above.

We often hear two acronyms when discussing sound control; IIC and STC. We now hear of 2 more acronyms; Δ IIC and FIIC.

Impact Insulation Class (IIC) – refers to a positive rating number that is used to compare and evaluate the performance of floor and ceiling construction in isolating impact noise. The IIC rating is used for specifying minimum sound control performance of assemblies in construction. Higher numbers refer to more effectiveness. Δ IIC and/or IIC are measured using either ASTM E2179 “Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors” or ASTM E492 “Standard Test Method of Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine”. These test methods measure impact sounds on a floor surface through the use of sophisticated monitoring equipment.

Delta IIC (Δ IIC) – the actual IIC Value added to the floor/ceiling assembly for a particular flooring assembly installed on top of the actual floor construction. This value shows how much better a flooring assembly will perform, in terms of IIC, when using the sound control underlayment. For example, a tile installation system incorporating 170 Sound & Crack Isolation Mat adds a Δ IIC of 16 to a typical 6” (150mm) thick concrete floor, that in itself carries an IIC rating of approximately 28, means that the rating for this floor will be 44 IIC.

Field IIC (FIIC) – a positive rating number that is used to evaluate the performance of a floor construction and the associated structure derived from field impact sound measurements in accordance with ASTM E1007 “Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures.” It is important to note that building codes allow for a difference (generally a lower rating in the field) of 5 points between laboratory (IIC) and field (FIIC) testing results.

Sound Transmission Class (STC) – refers to a positive rating number that is used to measure the effectiveness of sound isolation of audible, air-borne sound. STC is measured using ASTM E90 “Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements”. This test measures air-borne sound (e.g. voices, TV, stereos, etc...). In most cases, sound control underlayments in general, have extremely marginal or no affect on STC. The predominant factor for STC reduction is the mass of the structure, in other words, the greater the structural mass, the greater the STC performance. As stated in the TCNA Handbook for Ceramic Tile Installation “STC values are in large part influenced by the solid mass of the structure but are also dependent on isolation and resilience within the structure.”

Sound that travels through the air causes walls, floors, ceilings, windows, and everything in the room to vibrate. It is this vibration that we hear in adjoining rooms and spaces above and below the source of the sound. For optimal STC performance the wall and floor constructions would have to be completely isolated from each other with acoustical rated materials, and, have sound absorbing material installed on or within the walls. Once again, the mass of the structure will be the largest determining factor for sound control performance in the STC class. Floor finishes, including carpet, vinyl, wood, tile, stone, or other finish material, will provide no enhancement to STC performance.

Floor construction plays a major role in the final ratings for both IIC and STC. In fact, good floor construction and installation may be able to achieve required sound control ratings, per required code, all by itself. A properly designed and specified ceiling assembly will then be able to add more sound control properties to the installation.

The overall IIC will be affected by the construction of the floor (e.g. concrete thickness, concrete density, reinforcing steel, acoustical ceiling panels in the ceiling below, and more...) and underlayment – see Table 1 on following page for more information. This means that laboratory tests (IIC) should not be used as the final qualifying performance measure for the FIIC performance of any given floor. Testing should be conducted on site, by trained and licensed personnel, to determine the FIIC rating. For more information on laboratories certified to perform this type of testing please visit <http://ts.nist.gov/standards/scopes/acots.htm>. It is important to understand that the type and thickness of the tile or stone being installed may affect the Δ IIC number. While the minimum value may change from project to project, based on building owner’s requirements or local building codes, a typical target is ≥ 50 IIC or ≥ 45 IIC when field tested (2018 International Building Code, Section 1206.3).

The following is subjective data (should not be used as a statement of actual conditions) and provides an idea as to how people **may** respond to impact noise;

| IIC Rating | Response |
|------------|--|
| 50 | 80% of people will not be bothered (may hear nuisance noise) |
| 55 | 90% of people will not be bothered (may hear nuisance noise) |
| 60 | 100% of people will not be bothered (may hear nuisance noise) |
| 65 | 100% of people should not be bothered (minimal nuisance noise) |
| 70 | 100% of people should not be bothered (no nuisance noise) |

Interesting Sound Control Facts;

1. The Δ IIC of a sound control product will not crossover to different flooring constructs. For example, an installation of 170 Sound & Crack Isolation Mat has a Δ IIC of 16 when installed over a 6” thick concrete floor but will not have that same value when installed over a wood floor.
2. Δ IIC numbers are not cumulative when using multiple sound control products. In other words, simply adding the Δ IIC of two products will not be linear and achieve a rating of the sum of both products. For example, adding the Δ IIC of 170 Sound & Crack Isolation Mat (Δ IIC 16) and 125 TRI MAX® (Δ IIC 14 with a ¼” x 3/8” (6mm x 9mm) trowel and Δ IIC 16 with a 1/2” x 1/2” (12mm x 12mm) trowel) will not equal a sum total of Δ IIC 30 or 32. Determining the final IIC rating will require onsite testing performed to ASTM E989 “Standard Classification for Determination of Impact Insulation Class (IIC).
3. An IIC rating of 58 will generally eliminate foot fall noise (noise generated by walking)
4. An IIC rating of 70 generally means that nobody will be able to hear any impact noise
5. Bare feet can transmit more impact sound than high heels, just at a different frequency.
6. Sound control products should not be selected based only on field testing results. Laboratory tests are a more accurate model for predicting performance in a variety of applications and construction types. Field tests are accurate only for the site where the tests are being performed.

LATICRETE is currently offering two sound control products that will provide superior performance in relation to IIC.

125 TRI MAX is a revolutionary, ANSI A118.12 compliant anti-fracture/thin-set product that provides excellent sound transmission protection while simultaneously protecting the tile or stone finish from non-moving, non-structural cracks up to 1/8” (3mm) in the substrate from transferring through to the tile or stone finish. 125 TRI MAX exceeds the ANSI A118.12 standard for crack suppression and has a Δ IIC 14 when installed with a ¼” x 3/8” (6mm x 9mm) trowel and Δ IIC 16 when installed with a 1/2” x 1/2” (12mm x 12mm) trowel when tested per ASTM E2179 “Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors.” 125 TRI MAX is also rated as “Extra Heavy” as tested per ASTM C627 “Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson Type Floor Tester” by the Tile Council of North America (TCNA).

170 Sound & Crack Isolation Mat is a high performance, ANSI A118.13 compliant acoustical underlayment designed to reduce impact noise from transmitting through tile, stone and other hard surfacing materials. 170 Sound & Crack Isolation

Mat also prevents non-moving, non-structural cracks up to 1/8" (3mm) in the substrate from transferring through the tile or stone installation. 170 Sound & Crack Isolation Mat is 1/8" (3mm) thick rubberized membrane and is comprised of 88.5% post-consumer recycled materials and 0.9% pre-consumer recycled materials. 170 Sound & Crack Isolation Mat provides a ΔIIC of 16 when tested per ASTM E2179 "Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors" and is also rated as "Light" as tested per ASTM C627 "Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester" by the Tile Council of North America.

Table 1:

| Concrete Slab Thickness | No Sound Rated Ceiling | Sound Rated Suspended Ceiling* | In Lab IIC** | In Field IIC |
|-------------------------|------------------------|--------------------------------|--------------|--------------|
| 6" | X | | 26 to 30 | 24 to 32 |
| 8" | X | | 28 to 32 | 25 to 35 |
| 6" | | X | 45 to 52 | 33 to 48 |

* Suspended Sound Rated ceiling composed of: 7" plenum, 3" of insulation, resilient channels, 5/8" Type X gypsum wallboard panels.

** Tests were conducted in several different labs. Hence, the range of values for each slab thickness shows the variance between labs, not a variance in the test results within a single lab.

Table 1 excerpted from TCNA Handbook for Ceramic, Glass and Stone Tile Installation as well as Methods and Materials Standards Association (MMSA) Bulletin 4. For more information on this chart please visit www.mmsausa.com.

For more information on sound rated floors please refer to the current edition of the TCNA Handbook for Ceramic, Glass and Stone Tile Installation.

Technical Data Sheets are subject to change without notice. For latest revision, check our website at <https://laticrete.com>
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