

Flooring Sound Suppression – a Guideline for SMC Owners

Prepared by the Board and MMM July 2018

Introduction

The purpose of this document is to provide Owners with an overview of the basics of noise transmission and explain the rationale for the HOA requiring that Owners remodeling and installing certain “hard” flooring install a soundproofing underlay as part of the installation. The document has been prepared jointly between MMM and the Board and is based on readily available literature on sound suppression.

Noise Transmission

There are two fundamental types of noise that can be transmitted between building structures. The first is airborne noise such as voices or music. These sounds pass between rooms and dwelling Units on the same level, and bi-directionally between floors. The second type of noise transmission is “impact noise”, typically felt by Owners living directly below an occupied unit. Many Owners will testify that living in a multi-occupancy building can be very noisy and disruptive. Airborne noise such as Tv’s, music and loud conversation can often be heard in some form or another. In addition, for those living below an occupied unit, the impact noise from very step, bump and crash on the floor can be heard from above.

The HOA has established rules to limit the impact of airborne noise on neighbors, including “quiet hours”, the ability for Owners to complain to the Property Manager or local police if necessary, and the option to levy fines for unacceptable levels of airborne noise. More problematic is the reduction of “Impact Noise” within the property, which is not so easily managed by similar rules and controls. The HOA has therefore decided to require the installation of sound suppression measures whenever any Owners on the upper floors replace the flooring on a common floor/ceiling.

Noise Rating System

Sound control standards were developed to regulate the amount of noise allowed to penetrate through common walls and floors within dwellings, provide guidance for the sound transmission properties of new construction, and to compare product qualities of soundproofing materials. Under the current sound rating system, the higher the number the better sound suppression quality. In other words; adjacent rooms become increasingly quiet as the rating number increases.

There are two separate rating systems. The Sound Transmission Class (STC) rating applies to airborne noise. The Impact Isolation Class (IIC) rating applies to impact noise. For reference, some examples of reference sound ratings and their likely impact are provided below:

STC Sound Ratings

- 25 - normal speech easily understood
- 30 - normal speech audible but not intelligible

- 35 - loud speech audible and fairly understandable
- 40 - loud speech barely audible but not intelligible
- 45 - loud speech barely audible
- 50 - shouting barely audible
- 55 - shouting in audible

IIC Sound Ratings

- IIC-STC 70 Virtually Sound Proof
- IIC-STC 60 Superior Sound Proofing
- IIC-STC 50 International Building Code
- IIC-STC 40 Sound Proofing below most codes

Many properties are now requiring sound control ratings in the high 50's or low 60's range. Local municipalities can have different rating requirements. Impact sound complaints are common on floor-ceiling assemblies that meet the bare minimum requirement of 50 decibels IIC.

Common Guidelines to use when selecting the proper IIC rating for your space (Ref 2):

- IIC 50 – The least amount of impact sound transmission reduction considered effective. Some occupants would be dissatisfied with this level of sound transmission.
- IIC 60 – Considered a medium level of impact sound transmission reduction.
- IIC 65 – Considered a high level of impact sound transmission reduction that would satisfy most occupants.

It is important to understand that IIC and STC tests are not typically carried out for individual components of a flooring assembly, but for the whole floor/ceiling structure, from the surface of the floor covering material in the upper unit all the way through the ceiling in the unit below. Nevertheless, the added benefit of particular soundproofing element or layer within a typical flooring system can be determined, and this is referred to as the Delta IIC (Δ IIC).

The Delta IIC rating shows what the product adds to the structural assembly in terms of isolating impact footfall noise. The Delta IIC test starts by testing a full assembly, typically six to eight inches of concrete, with nothing above or below the concrete. Then an underlayment installs directly to the concrete, and the same test repeats. The Delta IIC rating is the performance gain between the first and second test. A higher number shows better performance. *The Delta IIC rating is the best rating to consider when comparing the performance of different types of underlayment.* It keeps the manufacturers from promoting misleading results obtained by using materials or methods of isolation that the average assembly does not use. Misleading results are most often found with claims of 60 IIC or above using materials less than 1/2" thick. They achieve their astronomical rating with decoupled ceilings and considerable additional mass but will claim their thin underlayment is what achieved that IIC rating. If the IIC rating is

unreasonably high, then ask to see a Delta IIC rating. If they cannot provide a Delta IIC rating, then *ignore the advertised ratings*.

It is also important to note that because the IIC scale measures sounds that are within the range of a human voice, the scale does not include noises that are below 100 Hz. This can include the light "thudding" often heard when someone walks across a floor with a lightweight joist system in the room above. Though these thuds are a very low range, they still can be bothersome to the person in the room below. The IIC also does not account for the squeaking, rattling, or crunching sounds that are the result of walking on a loose joist construction. (Ref 2).

Reducing Impact Noise Transmission

It is difficult to find examples that illustrate the impact of various flooring options on a subfloor similar to our construct, which is thought to be (top to bottom) a 1 ½ inch layer of gypcrete, ½" plywood, 10" joists and 5/8 gypsum. Nevertheless, Appendices 1 (Ref 2) and 2 (Ref 1) illustrate the impact of various types of floor coverings on a standard floor construct. In reviewing these and other examples, it is clear that the combination of carpet and underlay is one of the most effective ways to reduce impact noise, while the installation of tile, vinyl or hardwood directly onto the subfloor has minimal to no reduction. The addition of a resilient soundproofing layer below hardwood flooring, for example, can bring significant reduction in impact noise transmission (e.g. Appendix 1, example X gives an estimated 15 unit increase in IIC values).

HOA soundproofing requirements during remodeling

Based on the available information, the HOA is requiring that Owners, during the installation of any new flooring, with the exception of carpet and underlay, install a soundproofing pad of ΔIIC 20 or greater below the tile, vinyl, hardwood or similar flooring that they are installing. These soundproofing pads are available from a variety of suppliers to suit all types of "hard" flooring, and are relatively inexpensive to purchase and install. Other more elaborate solutions are available, but these were considered by the Board to be too expensive and disruptive to ask Owners to install as part of a remodel.

A 3/16" mat flooring underlayment will give both better IIC and SCT performance. Installing this under the new flooring will add a Delta IIC of about 20 to the flooring components. Being a continuous layer, it also suppresses the STC sound as well. (It is often recommended to use an acoustic sealant around the perimeter of the mat).

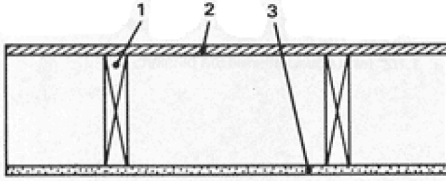
While an additional soundproofing mat is not required when a carpet plus pad is being installed, a pad of appropriate thickness needs to be used beneath the carpet to ensure effective reduction in sound transmission. Based on available data, a pad of 3/8" or greater thickness should be sufficient.

References:

1. US Department of Housing and Urban Development, Noise Notebook, Chapter 4 Supplement, [Sound Transmission class guidance](#).
2. [FindAnyFloor.com, IIC Rating](#).

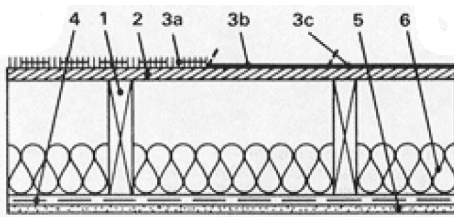
Appendix 1 (from Ref 1): IIC values of different flooring constructions

A. Simplest flooring construct: IIC is 32



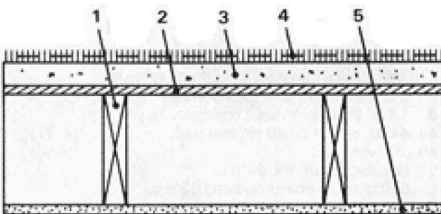
1. 2x8" wooden joists, 16"o.c.
2. 7/8" tongue and groove nailed to joists.
3. 3/8" gypsum nailed to joists.

B. More elaborate flooring structure). Example shows the benefits of carpet (c., IIC 69) vs. vinyl flooring (b., IIC 45, C., IIC 43



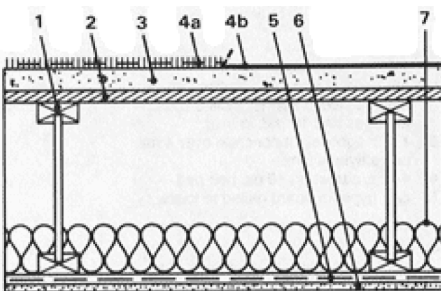
1. 2x8" wooden joists, 16"o.c.
2. 19/32" tongue and groove plywood nailed with 8d nails 6"o.c. at edges and 10"o.c. in field.
3.
 - a. 44 oz. carpet on 40 oz. hair pad.
 - b. .075" sheet vinyl.
 - c. 1/16" sheet vinyl.
4. Resilient channels, 24"o.c.
5. 5/8" gypsum board screwed 12"o.c.
6. 3" thick sound attenuation blanket.

C. This flooring may be the closest example to our construction. The IIC for this construct, including carpet and pad, is 66. With hard flooring instead of carpet, the IIC is likely to be closer to 40-45 (see example B. above)



1. 2x8" wooden joists, 16"o.c.
2. 5/8" tongue and groove plywood nailed to joists with 8d nails 6"o.c. at edges and 10"o.c. in field.
3. 1 5/8" lightweight concrete over 4 mil. polyethylene film.
4. 44 oz. carpet on 40 oz. hair pad.
5. 5/8" gypsum board nailed to joists.

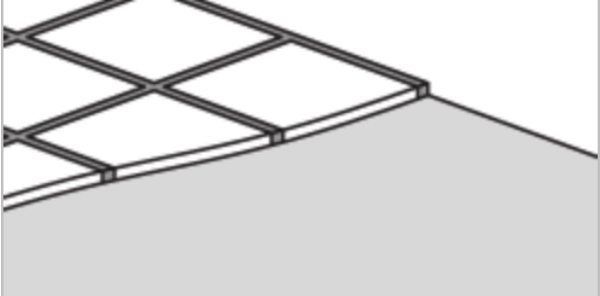
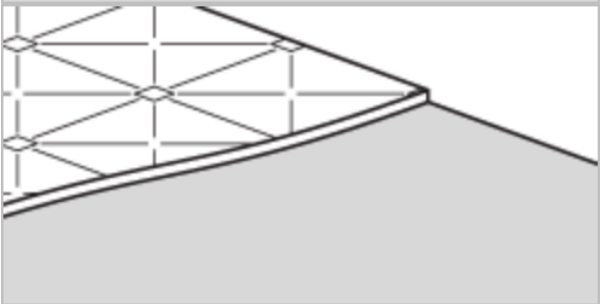
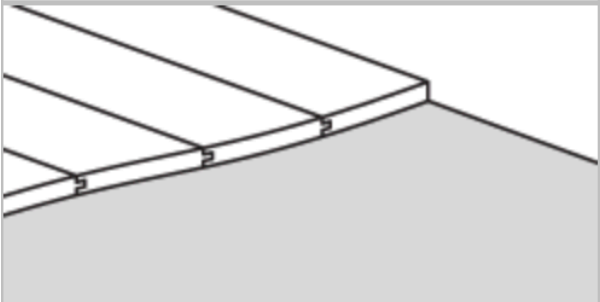
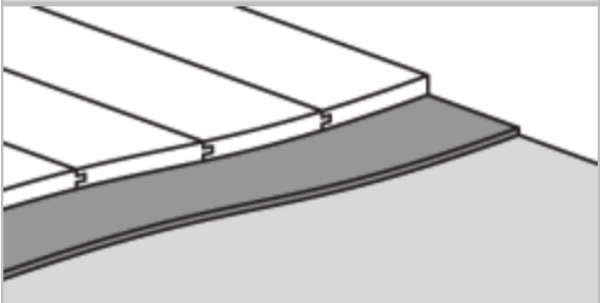
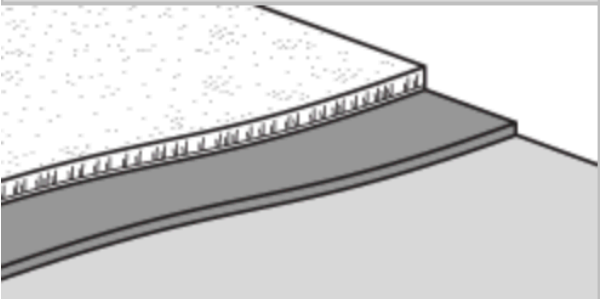
D. Another example showing the better soundproofing of carpet plus pad vs. vinyl flooring. IIC for a. is 77, for b. is 50.



1. Plywood web I-beams 12" deep and 24"o.c.
2. 3/4" plywood sub floor nailed with 6d nails 6"o.c. at edges and 10"o.c. in field.
3. 1 1/2" thick lightweight concrete, 15 psf.
4.
 - a. 44 oz. carpet on 40 oz. hair pad.
 - b. .07" vinyl tile.
5. Resilient channels, 24.o.c.
6. 5/8" gypsum board screwed 12"o.c.
7. 3" thick sound attenuation blanket.

Appendix 2 (From Ref 2): IIC values of different flooring constructions

IIC values of different coverings on top of a 150mm concrete slab. Hard flooring materials give little benefit in terms of an increased IIC, but even a thin (5mm, ~1/4”) resilient (i.e. soundproofing) underlayment helps considerably. Carpet plus underlay is very effective.

	<p>None, or ceramic or marble tile</p>	<p>28</p>
	<p>Vinyl flooring</p>	<p>35–40</p>
	<p>Hardwood flooring</p>	<p>30–35</p>
	<p>9–mm–thick hardwood on 5–mm–thick resilient layer</p>	<p>45–50</p>
	<p>Carpet and underlay</p>	<p>75–85</p>