



# Fire Protection Products



BROADCAST NO. 05-1012  
3M Fire Protection Products

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**TITLE: ACOUSTIC BENEFITS OF 3M FIRESTOP PRODUCTS**

The 2000 International Building Code (IBC), Section 1206, and the 2003 and 2006 International Building Code (IBC), Section 1207, require that all walls, partitions and floor/ceiling assemblies separating dwelling units from each other or from public or service areas must have a minimum Sound Transmission Class (STC) rating of 50 dB for air-borne noise. A minimum STC rating of 45 dB is allowed if field-tested. The 2003 and 2006 International Residential Code (IRC) Appendix K, Section AK101 and AK102 requires that all wall and floor/ceiling assemblies that separate dwelling units must have an STC Rating of 45dB when tested in accordance with ASTM E 90. Obtaining the required STC rating can be accomplished by selecting wall and floor ceiling assemblies that meet the building code STC requirements, and working to ensure that all openings in the assemblies are properly sealed. It is also important to ensure that flanking sound and impact sound is addressed. Flanking sound is sound that travels around or through a wall or floor/ceiling assembly by an alternate path of least resistance. Impact sound is sound which travels through an assembly by direct transmission through the assembly. Impact sound is measured by use of the Impact Insulation Class (IIC) rating. Flanking and impact sound will not be addressed in this technical bulletin.

The STC rating for a wall or floor/ceiling assembly is determined by testing the assembly for its sound transmission characteristics in accordance with ASTM E 90 or E 336 and then following ASTM E 413 to calculate the STC Rating. The STC rating provides an acoustical rating for the assembly across the frequency range from 125 Hertz to 4000 Hertz, which is the range of typical human speech. It is important to note however, that the STC rating can easily be reduced by the presence of unsealed openings in these assemblies. For example, based on ASTM C 919 a total unsealed opening size as small as 1.4 square inches in a wall section 8 ft. tall by 12 ft. 6-inches wide will reduce the STC rating of the wall from 60 dB to 39 dB. The most common types of openings are: Joints (Head of Wall, Bottom of Wall, and Wall to Wall), the annular space around Through Penetrations (Cables, Pipes, Vent Ducts, etc.), and Electrical Switch and Outlet Boxes.

3M Firestop Products can be used to seal the openings in the wall and floor/ceiling assembly to simultaneously provide firestopping and an acoustical seal. The STC ratings for the 3M Firestop Products were calculated by using the Transmission Loss Mass Law, based on the density of the cured product, and ASTM E 413. This approach provides the maximum STC Rating for the product at a given thickness. For acoustical purposes, the ideal sealant is one which provides excellent adhesion, high elongation/flexibility, and which has a high dry film density. The STC rating for the Fire Barrier CS-195+ Composite Sheet, the Interam E-54-A Mat and I-10A Mat was determined by internal sound tests and calculated in accordance

**Product & System Recommendations for Optimal Acoustical Performance:**

- For Joints such as Head-of-Wall, Bottom-of-Wall, and Wall-to-Wall in Wood Construction applications the recommended products for sealing are FireDam 150+ Caulk or Fire Barrier 1000 NS Silicone Sealant. Install in accordance with the appropriate tested and listed firestop system.
- For Joints such as Head-of-Wall, Bottom-of-Wall, and Wall-to-Wall in Concrete Construction with Steel Studs and for Through Penetration applications, install in accordance with the appropriate tested and listed firestop system using the product chart provided below as a guide for selection of the firestop system with the best acoustical properties.
- For acoustical sealing of standard two-gang and four-gang electrical switch and outlet boxes, install the Moldable Putty Pad over the electrical box in accordance with the CLIV tested and listed system. After the gypsum wallboard has been installed, apply FireDam 150+ Caulk or Fire Barrier 1000 NS Silicone Sealant around the perimeter of the electrical box at the electrical box/gypsum interface to a minimum depth of 5/8-inch. **Note:** Placement of electrical boxes within the same stud cavity will greatly diminish acoustical performance and is not recommended. If this does occur, sound attenuation insulation is recommended within the stud cavity to help improve acoustical performance. Please note that 3M does not have a fire test solution for back-to-back placement of electrical boxes.

The following tables list the STC rating of 3M Firestop Products and some common building materials. Please note that based on the Transmission Loss Mass Law discussed above, when the thickness of a monolithic material or product such as caulk, sealant, putty or spray doubles, that the STC rating will only increase by 6 dB. Conversely, if the thickness is reduced in half, the STC rating will decrease by 6 dB.

| Product – Caulk, Sealant, Putty        | STC Rating (in decibels – dB) at the following Thickness: |                    |                  |                      |
|--|---|--------------------|------------------|----------------------|
|  | 1/2-inch Thickness  | 5/8-inch Thickness | 1-inch Thickness | 1 1/4-inch Thickness |
| FireDam 150+ Caulk                     | 38  | 40                 | 44               | 46                   |
| Fire Barrier CP 25WB+ Caulk            | 36  | 38                 | 42               | 44                   |
| Fire Barrier IC 15WB+ Caulk            | 37  | 39                 | 43               | 45                   |
| Fire Barrier 1000 N/S Silicone Sealant | 35  | 37                 | 41               | 43                   |
| Fire Barrier 1003 SL Silicone Sealant  | 35  | 37                 | 41               | 43                   |
| Fire Barrier 2000 Silicone Sealant     | 36  | 38                 | 42               | 44                   |
| Fire Barrier 2000+ Silicone Sealant    | 35  | 37                 | 41               | 43                   |
| Fire Barrier 3000 Silicone Sealant     | 34  | 36                 | 40               | 42                   |
| Moldable Putty Stix                    | 35  | 37                 | 41               | 43                   |

| Product                              | Thickness in Inches | STC Rating (in decibels – dB) |
|--------------------------------------|---------------------|-------------------------------|
| FireDam Spray 100                    | 1/16-inch           | 15                            |
| Fire Barrier CS-195+ Composite Sheet | 0.28-inch           | 31                            |
| Fire Barrier FS-195+ Wrap Strips     | 2-inch              | 48                            |
| Fire Barrier Moldable Putty Pad      | 1/8-inch            | 23                            |
| Fire Barrier Ultra GS Wrap Strips    | 2-inch              | 46                            |
| Interam E-5A-4 Mat                   | 0.4-inch (1-Layer)  | 34                            |
| Interam E-5A-4 Mat                   | 0.8-inch (2-Layer)  | 40                            |
| Interam E-5A-4 Mat                   | 1.2-inch (3-Layer)  | 43                            |
| Interam E-5A-4 Mat                   | 1.6-inch (4-Layer)  | 46                            |
| Interam E-5A-4 Mat                   | 2.0-inch (5-Layer)  | 48                            |
| Interam I-10A Mat                    | 3/16-inch           | 26                            |

| Common Building Materials                  | Thickness in Inches | STC Rating (in decibels – dB) |
|--|---------------------|-------------------------------|
| Glass – Flat Plate <sup>1</sup>            | 1/4-inch            | 29                            |
| Gypsum Wallboard <sup>2</sup>              | 1/2-inch            | 28                            |
| Gypsum Wallboard <sup>3</sup>              | 5/8-inch            | 29                            |
| Mineral Wool Insulation 4-pcf <sup>4</sup> | 2-inch              | 8                             |
| Mineral Wool Insulation 8-pcf <sup>4</sup> | 2-inch              | 15                            |
| Plywood <sup>2</sup>                       | 5/8-inch            | 21                            |
| Plywood <sup>5</sup>                       | 3/4-inch            | 28                            |
| Steel – Flat Plate <sup>6</sup>            | 3/16-inch           | 35                            |

<sup>1</sup> Data obtained from “A Touch of Glass” by John Storyk, EQ Magazine

<sup>2</sup> Data obtained from Institute for Research in Construction, Canadian National Research Council

<sup>3</sup> Data obtained from product manufacturer.

<sup>4</sup> Data obtained from manufacturers literature. Acoustical tests of Mineral Wool Insulation were conducted with fibers running parallel with wall studs (i.e. perpendicular to acoustic test apparatus). These STC Ratings do not apply to most firestop systems, because the Mineral Wool Insulation in most firestop systems is installed with the fibers running perpendicular to the wall and/or parallel with the joint.

<sup>5</sup> Acoustical properties of this material was given by or calculated from data furnished by the Acoustical and Insulating Materials Association

<sup>6</sup> Data obtained from acoustical product manufacturer

As an example of how this information would be applied, assume that an 8 ft. tall by 12 ft. 6-inch wide section of a gypsum wallboard assembly with an initial STC Rating of 60 dB has a ¼-inch tall bottom of wall joint on both sides of the wall and a 4-inch x 4-inch electrical outlet box installed. The total opening size of the joint and electrical box is 54 sq. inches. Due to the presence of the openings, the STC of the wall would have dropped from 60 dB to 28 dB. If the bottom of wall joint is sealed using FireDam 150+ Caulk on both sides of the wall and if the electrical outlet box is sealed using a Moldable Putty Pad with FireDam 150+ Caulk, the Composite STC Rating of the wall can be improved/increased to an STC of 51 dB.

**Note:** Due to the wide variety of factors that can affect the STC Rating of a wall or floor/ceiling assembly, such as construction methods and flanking sound, 3M cannot guarantee the results that will be obtained in any specific application.

Please contact your local 3M Fire Protection Products Representative for assistance in estimating the STC of acoustically de-rated walls and floor/ceiling assemblies, as well as the Composite STC of the assembly after the firestop system has been installed. Please contact the product manufacturer for information on the STC Rating of various fire-rated wall and floor/ceiling assemblies.

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