

# A Guide for Residential Sound Control Using Fiber Glass Insulation



# CertainTeed



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## Introduction

A disturbing and ever-present problem in contemporary living is the increasing proliferation of unwanted sound or noise.

The sounds produced by a constantly growing number of modern conveniences, i.e., television sets, stereos, dishwashers, air conditioners, radios, and the like, are spurring concerned doctors and psychologists to warn us of the extensive damage noise can cause to our mental health and physical well-being.

Fortunately, we can design and build to keep noise under control—in stores, offices, motels, and even in our homes.

This brochure has been prepared to help you select the wall and floor/ceiling system best suited to reduce sound transmission.

# Sound Ratings

## Airborne Sound

The STC or sound transmission class is a single number rating used to indicate the effectiveness of an entire construction assembly (partition, wall, floor/ceiling) in resisting the passage of airborne sound. The rating is determined using ASTM E 413, "Classification for Rating Sound Insulation," from sound transmission loss values (measured in decibels) that are obtained by tests conducted in accordance with ASTM E 90 "Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions." The higher the STC rating, the better the sound insulation performance of the construction.

For multi-family dwellings, building codes require minimum STC ratings for partition, wall, and floor/ceiling constructions that separate certain building areas and occupancies. These ratings are usually based on multiples of five, such as 45, 50, 55 and 60. If a partition has an STC rating between 45 and 50, there is usually little concern whether the test results were 46, 47, 48 or 49, as all four ratings would meet a minimum rating of 45. However, the partition would not be acceptable for an STC 50 requirement.

The National (BOCA) and Standard (SBCCI) Building Codes, for example, require an STC 45 for partitions and floor/ceiling separating living units from other living units, public spaces, and service areas. The Uniform Building Code (ICBO) requires an STC 50 (45 if field tested). An indication of the approximate effectiveness of constructions with various STC ratings in blocking passage of loud speech is shown in the following chart:

## STC Ratings

Sound Transmission Class (STC)	Speech Audibility*	Noise Control Rating
15 to 25	Normal speech easily understood.	Poor
25 to 35	Loud speech easily understood. Normal speech 50% understood.	Marginal
35 to 45	Loud speech 50% understood. Normal speech faintly heard, but not understood.	Good
45 to 55	Loud speech faintly heard, but not understood. Normal speech usually inaudible.	Very Good
55 and up	Loud speech usually inaudible.	Excellent

\*Given a typical background noise level of 30 dB on the "listening" side.

## Impact Sound

In addition to the STC rating, which concerns airborne sound, floor/ceiling assemblies are also rated for impact sound resistance. Impact sound is structure-borne sound transmitted when one body strikes another, such as in the case of footsteps and falling objects. A single number, the impact insulation class (IIC), is used to describe impact sound performance. The IIC is determined using ASTM E 989, "Classification for Determination of Impact Insulation Class (IIC)" from test data obtained in accordance with ASTM E 492, "Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine." As with STC ratings, a higher number indicates better performance. Cushioning the impact with carpet and pad is one of the most effective methods of isolating impact noise. The use of fiber glass insulation with a resilient ceiling attachment will increase the sound insulation for both airborne and impact sound. (Note: carpet and pad do not significantly increase the STC rating.) The Basic/National (BOCA) Building Code requires a minimum IIC of 45 for floor/ceilings separating living units from other living units, public spaces, are service areas. The Uniform Building Code (ICBO) requires a minimum IIC of 50 (45 if field tested).

## Sound Control Practices

In addition to the specific sound rated construction assemblies detailed in this guide, certain construction practices are recommended to reduce sound transmission.

To obtain maximum benefit with sound rated constructions, the perimeter of the construction must be sealed with caulking wherever it is not completely sealed by normal construction methods (e.g., tape and joint compound). In general, penetrations such as service lines (e.g., plumbing and gas lines), electrical outlets, and medicine cabinets should be minimized. If penetrations are necessary, openings should be caulked airtight. If medicine cabinets are installed, they should be surface mounted and if electrical boxes are to be included on each side of the partition, they should not be installed “back-to-back” within the same stud space.

Plumbing noise can be reduced by using larger pipes or cast iron pipes, installing air chambers to eliminate water hammer, and by isolating pipes from structural framing with resilient rods. Doors of solid wood or mineral core provide better sound control than hollow core doors. Door frames and sills should be gasketed to seal tightly when doors are closed. Windows should have weatherstripping and double panes of insulating glass. The use of heavy curtains or draperies can help reduce sound transmission.

As with partition and wall construction, penetrations in sound rated floor/ceiling assemblies should be caulked airtight. Ceiling fixtures should be surface mounted, not recessed, and carpet and pad or resilient tile will greatly reduce impact sound transmission through these assemblies.

### Density and Sound Insulation

It is incorrect to assume that higher density insulation means improved sound insulation. Comparative tests conducted at nationally recognized sound laboratories show that varying the density of insulation, while maintaining constant thickness, does not have any significant effect on the STC rating of the construction. Additional tests have shown that thickness is the most important property when describing a cavity absorbing material.

Thickness affects the sound transmission loss at most frequencies and therefore affects the STC rating. More detailed information on this subject is contained in reports published in Volume 49, Number 2, 1971, page 385 and in Volume 53, Number 6, 1973, page 1530 of “The Journal of the Acoustical Society of America.”

### The Right Insulating Material

CertainTeed offers a complete line of insulation products made of one of the most dependable, durable, and effective materials—fiber glass. In addition to its thermal properties, fiber glass is also an excellent acoustical material.

The use of CertainTeed Building Insulation, CertaSound™ Sound Attenuation Batts for steel stud construction, CertaSound™ NoiseReducer™ Sound Control Batts for wood studs and CertaSound™ Acoustical Ceiling Batts in walls and ceilings can help to effectively control sound. InsulSafe® 4 and OPTIMA® blowing insulation for use in the Blow-In-Blanket® System (BIBS) also provides excellent acoustical performance. The illustrations that follow are representative of the more common applications of fiber glass insulation for acoustical purposes.

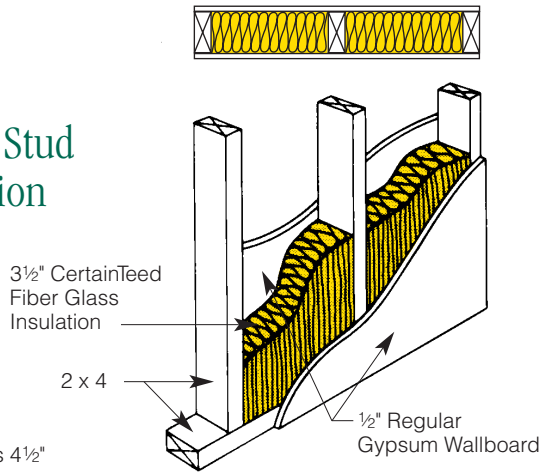
In addition to the previously mentioned products, CertainTeed offers other products that can be used for sound control. CertainTeed Fiber Glass Duct Liner, Duct Board, Duct Wrap and CertainTeed Commercial Board are also widely used for sound control.

### Major Research & Development Facility

CertainTeed’s research and development personnel are headquartered at Blue Bell, PA. Our experienced staff of scientists and technicians are responsible for the company’s testing program, including much of the data in this publication. Our laboratory has been certified ISO 25 by the Canadian General Standards Board.

# Building Insulation Assemblies

## 1 2 x 4 Wood Stud Partition



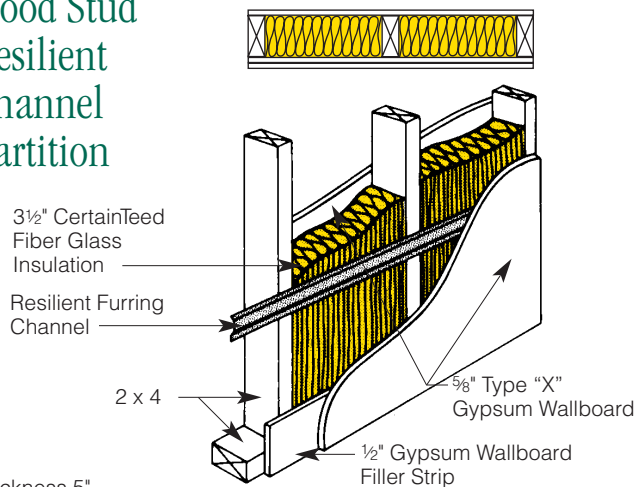
### Sound Rating

STC  
Test No.  
STC  
Test. No.  
Materials

### Construction Details

39  
RAL-TL94-305  
34 (no insulation)  
RAL-TL94-275  
2 x 4 Wood Studs 16" o.c.  
2 x 4 Wood Plates  
3 1/2" Fiber Glass Insulation  
1/2" Regular Gypsum Wallboard

## 2 Wood Stud Resilient Channel Partition

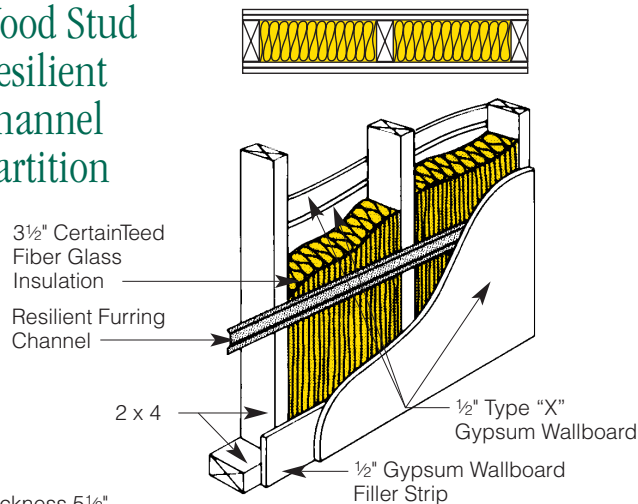


STC  
Test No.  
STC  
Test. No.  
Materials

50  
WHI ST-2  
46 w/1/2" Type "X"  
Gypsum Wallboard<sup>1</sup>  
TL-93-173  
2 x 4 Wood Studs 16" o.c.  
2 x 4 Wood Plates  
3 1/2" Fiber Glass Insulation  
Resilient Channel one side  
5/8" Type "X" Gypsum Wallboard

<sup>1</sup> Based on National Research Council of Canada data.

## 3 Wood Stud Resilient Channel Partition

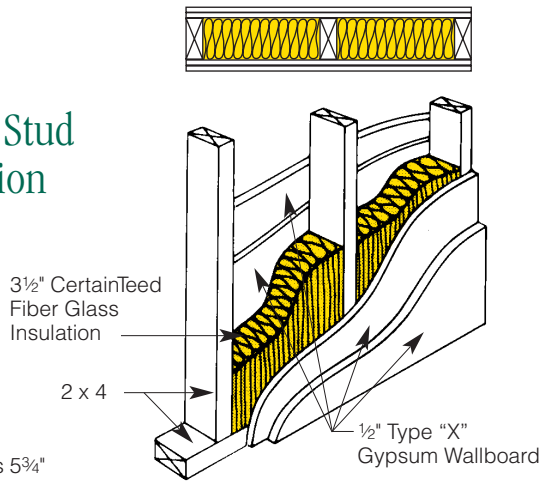


STC  
Test. No.  
Materials

51<sup>1</sup>  
TL-93-180  
2 x 4 Wood Studs 16" o.c.  
2 x 4 Wood Plates  
3 1/2" Fiber Glass Insulation  
Resilient Channel one side  
1/2" Gypsum Wallboard  
(2 layers nonresilient side)

<sup>1</sup> Based on National Research Council of Canada data.

## 4 2 x 4 Wood Stud Partition

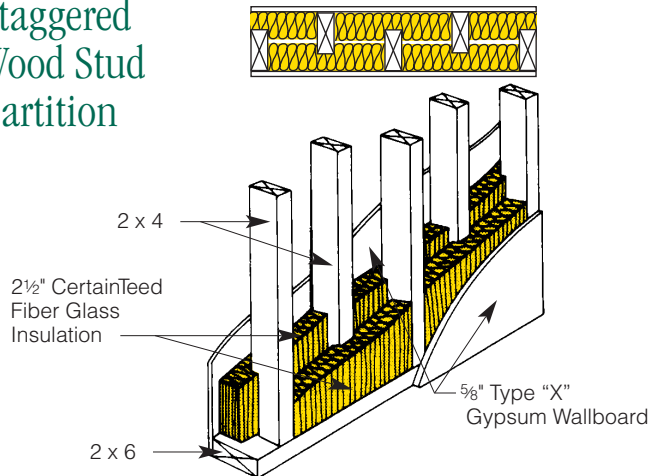


Thickness 5 3/4"

<b>STC</b>	45 <sup>1</sup>
<b>Materials</b>	2 x 4 Wood Studs 16" o.c. 2 x 4 Wood Plates 3 1/2" Fiber Glass Insulation 2 layers 1/2" Type "X" Gypsum Wallboard each side

<sup>1</sup> Based on NAIMA BI 405 data.

## 5 Staggered Wood Stud Partition

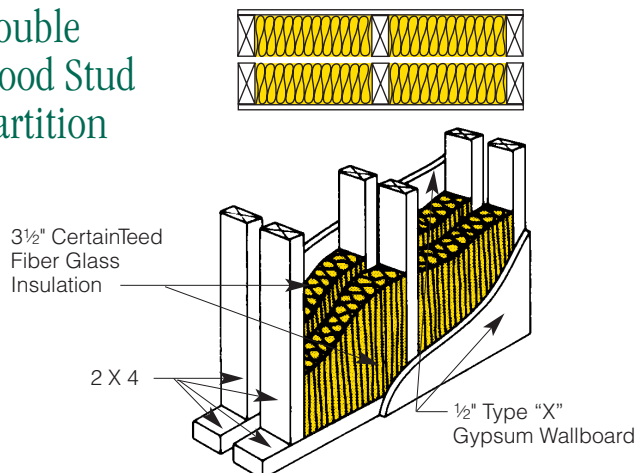


Thickness 6 1/2"

<b>STC</b>	50 <sup>1</sup>
<b>Test. No.</b>	TL-93-249
<b>Materials</b>	2 x 4 Wood Studs staggered 16" o.c. 2 x 6 Wood Plates 2 1/2" Fiber Glass Insulation 5/8" Type "X" Gypsum Wallboard

<sup>1</sup> Based on National Research Council of Canada data.

## 6 Double Wood Stud Partition

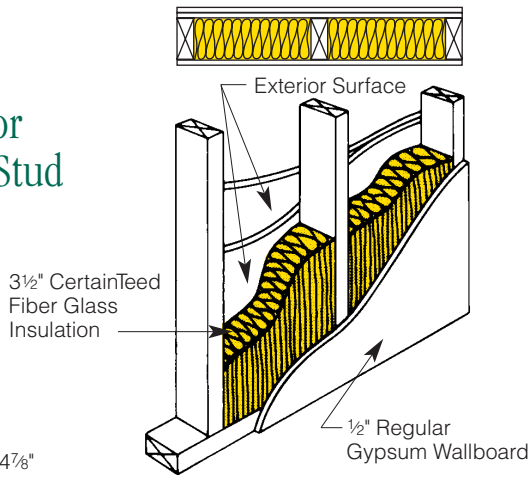


Thickness 9"

<b>STC</b>	58 <sup>1</sup>
<b>Test. No.</b>	TL-93-270
<b>Materials</b>	2 x 4 Wood Studs 16" o.c. (double row) 2 x 4 Wood Plates 3 1/2" Fiber Glass Insulation 1/2" Type "X" Gypsum Wallboard

# Building Insulation Assemblies

## 7 Exterior Wood Stud Wall



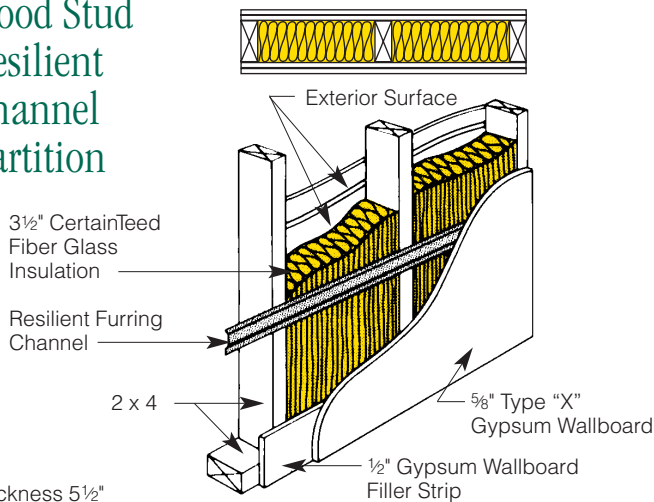
### Sound Rating

STC  
Test. No.  
Materials

### Construction Details

38  
RAL-TL94-301  
2 x 4 Wood Studs 16" o.c.  
2 x 4 Wood Plates  
3 1/2" Fiber Glass Insulation  
Interior Surface 1/2" Regular Gypsum Wallboard  
Exterior Surface 1/2" Plywood Sheathing Vinyl Siding

## 8 Wood Stud Resilient Channel Partition

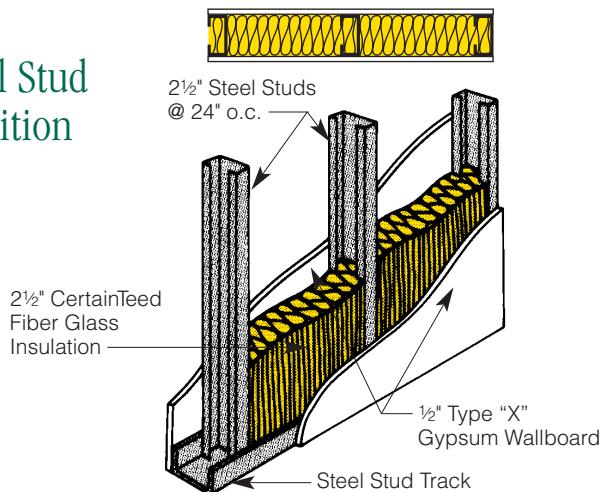


STC  
Materials

50<sup>1</sup> (Estimate)  
2 x 4 Wood Studs 16" o.c.  
2 x 4 Wood Plates  
3 1/2" Fiber Glass Insulation  
Interior Surface Resilient Channel 5/8" Type "X" Gypsum Wallboard  
Exterior Surface 1/2" Gypsum Sheathing 3/4" Exterior Plywood (per Model Code requirements)

<sup>1</sup> Based on CertainTeed Test, WHI ST-2.

## 9 2 1/2" Steel Stud Partition



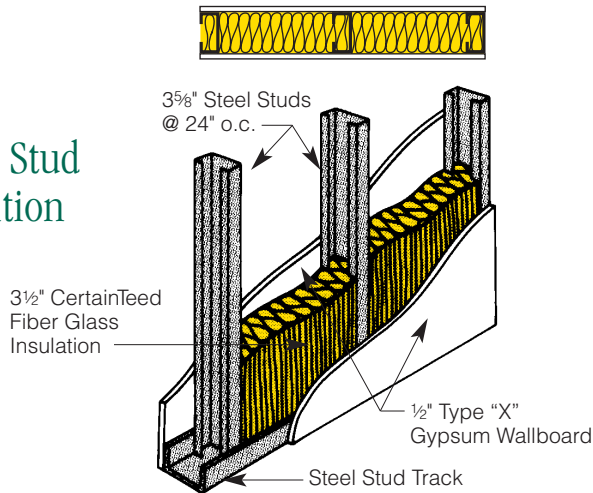
STC  
Test. No.  
STC  
Materials

45  
WHI 209-1  
47<sup>1</sup> w/5/8" Type "X" Gypsum Wallboard  
2 1/2" Steel Studs 24" o.c.  
2 1/2" Steel Stud Track  
2 1/2" Fiber Glass Insulation  
Resilient Channel one side  
1/2" Type "X" Gypsum Wallboard

<sup>1</sup> Based on NAIMA BI 405 data.



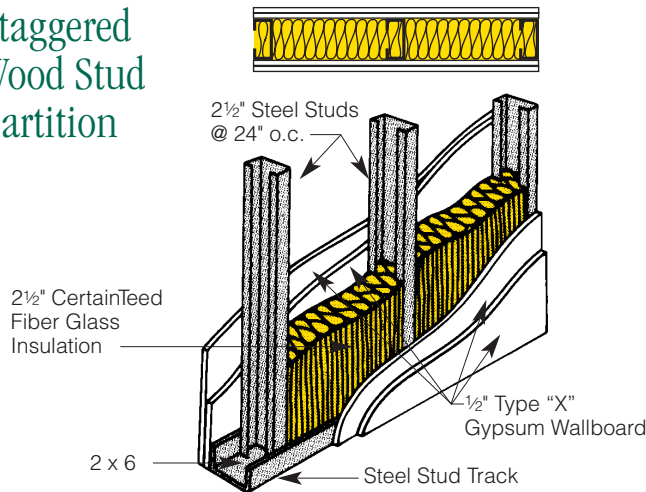
## 10 3 5/8" Steel Stud Partition



Thickness 4 5/8"

STC	46
Test. No.	WHI ST-4
STC	50 w/5/8" Type "X" Gypsum Wallboard
Test. No.	RAL-TL91-123
Materials	3 5/8" Steel Studs 24" o.c. 3 5/8" Steel Stud Track 3 1/2" Fiber Glass Insulation 1/2" Type "X" Gypsum Wallboard

## 11 Staggered Wood Stud Partition

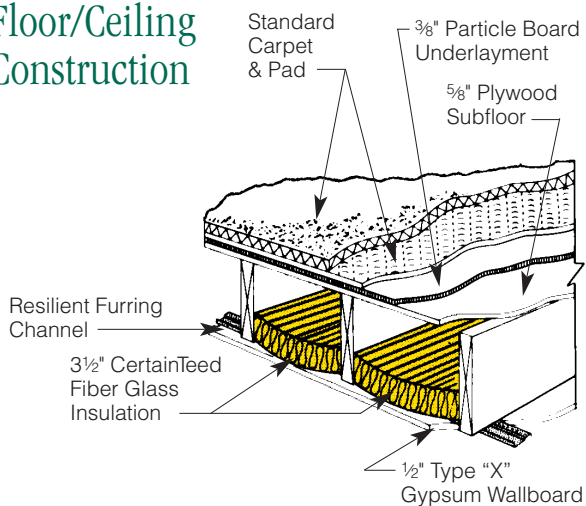


Thickness 4 1/2"

STC	54 <sup>1</sup>
Test. No.	RAL-TL94-305
Materials	2 1/2" Steel Studs 24" o.c. 2 1/2" Steel Stud Track 2 1/2" Fiber Glass Insulation 2 layers 1/2" Type "X" Gypsum Wallboard each side

<sup>1</sup> Based on NAIMA BI 405 data.

## 12 Floor/Ceiling Construction

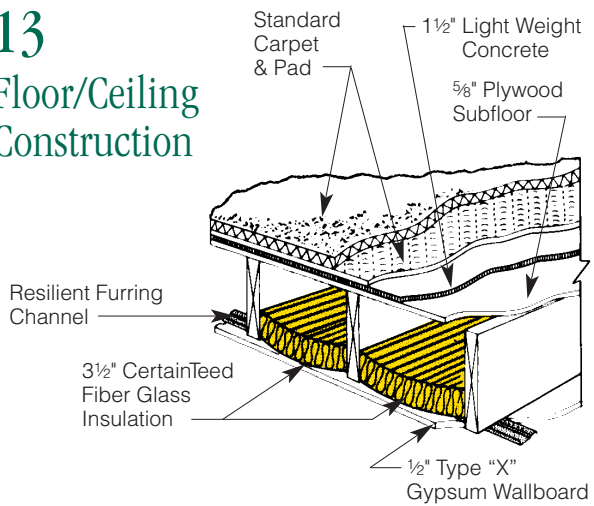


STC	53 <sup>1</sup>
IIC	73 <sup>1</sup>
Materials	2 x 10 Wood Joists 16" o.c. 3 1/2" Fiber Glass Insulation Resilient Channel 1/2" Type "X" Gypsum Wallboard 5/8" Plywood Subfloor 3/8" Particle Board Underlayment Carpet & Pad

<sup>1</sup> Based on NAIMA BI 405 data.

# Building Insulation Assemblies

## 13 Floor/Ceiling Construction



### Sound Rating

### Construction Details

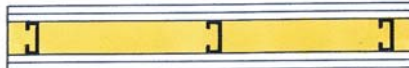
STC	58 <sup>1</sup>
IIC	74 <sup>1</sup>
Materials	2 x 10 Wood Joists 16" o.c. 3 1/2" Fiber Glass Insulation Resilient Channel 1/2" Type "X" Gypsum Wallboard 5/8" Plywood Subfloor 1 1/2" Light Weight Concrete Carpet & Pad

<sup>1</sup> Based on NAIMA BI 405 data.

# Fire Rated Wall Assemblies



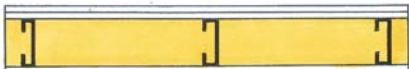
**Rating: 2 hour non-bearing (U 419)**  
 Double layer 1/2" Type X gypsum board  
 2 1/2" steel studs on 24" centers  
 2 1/2" Certainteed fiber glass insulation



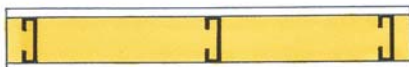
**Rating: 2 hour non-bearing (U 411)**  
 Double layer 5/8" Type X gypsum board  
 Min. 2 1/2" steel studs on 24" centers  
 2 1/2" Certainteed fiber glass insulation



**Rating: 1 hour non-bearing (U 419)**  
 Single layer 5/8" Type X gypsum board  
 Min. 3 1/2" steel studs on 24" centers  
 3 1/2" Certainteed fiber glass insulation



**Rating: 2 hour non-bearing (U 419)**  
 Double layer 1/2" Type X gypsum board  
 3 5/8" steel studs on 24" centers  
 3 1/2" Certainteed fiber glass insulation



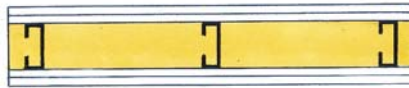
**Rating: 1 hour non-bearing (U 465 or U 419)**  
 Single layer 5/8" Type X gypsum board  
 3 5/8" steel studs on 24" centers  
 3 1/2" Certainteed fiber glass insulation



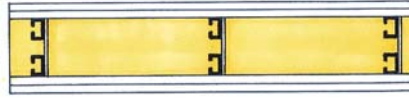
**Rating: 1 hour non-bearing (U 465)**  
 Single layer 5/8" Type X gypsum board  
 3 5/8" steel studs on 24" centers  
 3 1/2" Certainteed fiber glass insulation



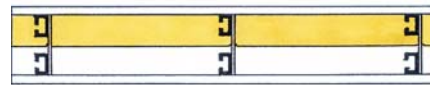
**Rating: 1 hour non-bearing (U 419)**  
 Single layer 5/8" Type X gypsum board  
 Min. 3 1/2" steel studs on 24" centers  
 3 1/2" Certainteed fiber glass insulation



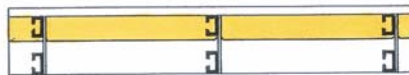
**Rating: 2 hour non-bearing (U 411 or U 419)**  
 Double layer 5/8" Type X gypsum board  
 3 5/8" steel studs on 24" centers  
 3 1/2" Certainteed fiber glass insulation



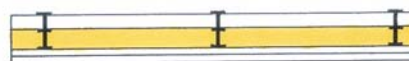
**Rating: 2 hour non-bearing (U 436)**  
 Chase wall: Double layer 5/8" Type X gypsum board  
 1 5/8" steel studs on 24" centers  
 Certainteed fiber glass insulation to fill cavity



**Rating: 1 hour non-bearing (U 420)**  
 Chase wall: Single layer 5/8" Type X gypsum board  
 1 5/8" steel studs on 24" centers  
 3 1/2" Certainteed fiber glass insulation



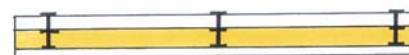
**Rating: 2 hour non-bearing (U 420)**  
 Chase wall: Double layer 5/8" Type X gypsum board  
 1 5/8" steel studs on 24" centers  
 2 1/2" Certainteed fiber glass insulation



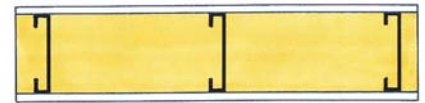
**Rating: 2 hour non-bearing (U 497)**  
 Shaft wall: Single layer 1" Type FSW gypsum board  
 one side, Double layer 1/2" Type FSW-G gypsum board  
 other side  
 2 1/2" steel I studs on 24" centers  
 1 1/2" Certainteed CertaPro Partition insulation



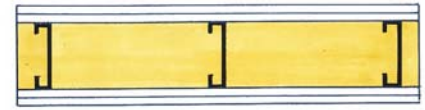
**Rating: 2 hour non-bearing (U 498)**  
 Shaft wall: Double layer (1" Type X + 1/2" Type FSW)  
 gypsum board on one side, Single layer 1/2"  
 Type FSW-G gypsum board on other side  
 2 1/2" steel I studs on 24" centers  
 1 1/2" Certainteed CertaPro Partition insulation



**Rating: 1 hour non-bearing (U 499)**  
 Shaft wall: Single layer 1" Type FSW gypsum board on  
 one side, single layer 5/8" Type FSW gypsum board on  
 other side  
 2 1/2" steel I studs on 24" centers  
 1 1/2" Certainteed CertaPro Partition insulation



**Rating: 1 hour non-bearing (U 465 or U 419)**  
 Single layer 5/8" Type X gypsum board on each side  
 6" steel studs on 24" centers  
 6 1/4" Certainteed fiber glass insulation



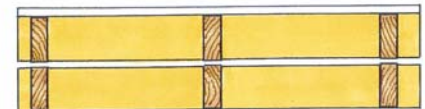
**Rating: 2 hour non-bearing (U 419)**  
 Double layer 5/8" Type X gypsum board on each side  
 6" steel studs on 24" centers  
 6 1/4" Certainteed fiber glass insulation



**Rating: 3/4 hour bearing (U 317)**  
 Single layer 1/2" Type X gypsum board on each side  
 2" x 4" wood studs on 16" centers  
 3 1/2" Certainteed fiber glass insulation



**Rating: 1 hour bearing (U 305)**  
 Single layer 5/8" Type X gypsum board on each side  
 2" x 4" wood studs on 16" centers  
 3 1/2" Certainteed fiber glass insulation



**Rating: 1 hour bearing (U 341)**  
 Single layer 5/8" Type X gypsum board on each side  
 2" x 4" double wood studs on 24" centers  
 2 layers 3 1/2" Certainteed fiber glass insulation

**NOTE:**

*Drawings for illustration purposes only. Refer to Underwriters Laboratories Fire Resistance Directory for assembly details and other options.*

# Availability and Technical Support

CertainTeed offers fiber glass insulation products for sale throughout the United States. The products are represented by the well-trained sales representatives and sales management personnel of CertainTeed's Insulation Group.

CertainTeed fiber glass insulation products are produced at five plants and shipped nationwide from those plants as well as three distribution centers.

For more information about CertainTeed insulation products, their availability and technical data regarding specific applications, contact your local CertainTeed representative or call 800-233-8990.

## Web Sites

For more information, visit these helpful web sites:  
[www.mysoundchek.com](http://www.mysoundchek.com)  
[www.naima.org](http://www.naima.org)

# CertainTeed

CertainTeed Corporation, P.O. Box 860, Valley Forge, PA 19482

**1-800-233-8990**

Visit our web site at: <http://www.certainteed.com> • Fax-on-Demand service: 1-800-947-0057

Customer Service 1-800-441-6720 • Fax 1-800-799-2381

CertainTeed was the first fiber glass insulation manufacturer to have all its manufacturing plants, R&D center and corporate headquarters registered to ISO 9000 standards.



A Saint-Gobain Company

