Making Walls Quiet

A review of various fallacies, issues, and successful assemblies

Quiet Solution

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Over the years, many techniques have been used to enhance the transmission loss through residential and commercial walls. Many of these require unusual or difficult construction techniques that may not be followed accurately by an installer. As technology has given way to new materials, the more exotic construction techniques can be reduced back to standard single wood or steel stud construction. Furthermore, new technology allows easy, fast, and low cost retrofitting in existing structures (including homes and offices) where the old drywall does not have to be removed to achieve large increases in Sound Transmission Class ratings.

The advent of high quality audio systems and home theaters has changed the environment completely. Where hotels, motels, homes, condos and apartments previously only needed to deal with isolating a neighbors voice, we all must now contend with loud movies coming from next door, even when they simply have a good television. Given today's needs for high quality transmission loss in walls, it is important to rethink the original standards of STC 34 walls and start thinking about raising the transmission loss by 20dB - 30dB or more to provide a high quality living environment for all.

Of course, with good progress over the years have also come many fallacies. Even today, some merchants sell a variety of materials to unsuspecting contractors and homeowners based on fallacies which have been pervasive for years. A few of these are:

Fallacy	**What they said**	**What it actually does**
Fill the wall with egg cartons	"Will improve loss by 10dB"	No measurable effect
Put acoustic insulation in wall	"Will fix everything"	Typically 3-4dB improvement
Put mass loaded vinyl under drywall	"Will improve loss by 27dB"	Actually 3-9dB
Add another layer of drywall	"Will stop the bass sounds"	Actually 2-3dB per layer
Use foam as a barrier	"Regarded as a great barrier"	Actually <2dB

As one can easily see, if we are trying to make a 30dB improvement, we won't get there with egg cartons and vinyl. And those are facts backed up by actual lab testing on finished assemblies. This booklet attempts to look at techniques that are proven to work and introduce the latest proven techniques. New products may reduce cost, labor, risk, liability and mistakes while improving STC ratings and reliability beyond older methods. Most importantly, as the above shows, actual lab and field testing on complete assemblies is important to prove how well a wall assembly works. Quiet Solution is committed to industry standard STC testing on complete assemblies and references independent lab tests throughout this booklet.

At the end of this document, there are several tables showing various construction techniques with a variety of methods and products, including older as well as newer technologies, and associated STC ratings and sources of tests. From this, one can determine how to achieve the transmission loss required with the easiest and least cost method.

What are STCs (and why are they important)?

Constrained-layer products using viscoelastic polymer materials can be exceptionally effective in reducing offensive sound and vibration coming through walls and ceilings. Think of an internally damped panel simply as a panel that resists vibrating, and thus doesn't transmit as much energy as an undamped panel.

To understand wall sound isolation, we need to understand the concept of "Sound Transmission Class" (STC). This is a method of gauging sound transmission loss through a wall, as set and regulated by the American Standards and Testing Materials (ASTM). The ASTM standard is accepted by architects, designers, manufacturers, contractors and distributors of acoustic building products. Specifically, STC testing is governed by ASTM E90 and E413 and has been updated and changed several times throughout the past 40 years. The latest version was approved in 2005. Earlier versions, especially those from before 1985, measure the transmission loss differently and STC values from such early versions may not be equivalent to todays results. Thus pulling an STC test from 1974 (for example) may not be valuable, and the results should be regarded as questionable at best when compared to the more recent standards.

The higher the STC rating, the greater the sound attenuation of the acoustic barrier. STC is essentially the average dB loss through a barrier across a range of frequencies (from about 125Hz to 4Khz) and fit to a curve. dB, or decibels is a measure of "how loud" a sound is. An STC rating is the average difference produced by a wall assembly, essentially measured in dB, between the sound in one area and the sound in an adjacent area over several frequency ranges (technically 1/3rd octave bands). Note that STC points do *not* add up. That is, adding a barrier (such as mass loaded vinyl) that has an STC of 26 to a wall that has an STC of 34 does *not* result in an STC of 60. It actually may only contribute a few dB to the assembly since it is simply adding mass to the entire assembly (for simplification, here we use STC points and dB interchangeably, which isn't exact, but a close-enough approximation for this overview). The concept of mass in loading walls is called "mass law" and it generally holds true that a doubling of the mass *of the entire assembly* will add 5-6dB of transmission loss.

Many people wonder what an acceptable STC rating for their wall is? This depends on what noises may be coming from adjacent rooms of course. The National Research Council of Canada completed an extensive survey of condo residents to determine noise-unhappiness with actual STC ratings of their walls. The result was complaints were reduced with walls at 50 or better, and almost non-existent with STCs of 60 or above. Here is a commonly accepted table of noise perception in walls:

For multi-family construction, the minimum IBC code is STC=50, however STC=60+ is recommended for party walls in higher quality construction such a hotels, townhomes, condos, and certainly quality home theaters. FHA recommendations for Luxury Grade 1 dwellings is also 55 to 60.

Perception	STC
Poor	30 - 39
Good	40 - 49
Better	50 - 59
Excellent	60 - 69

Note that humans perceive a doubling of sound as 10dB. As such, it takes a 10dB reduction to reduce the perceived "noise" by 50%, 20dB by 75% etc. By increasing a standard wall's STC from 34 to 64, we are adding ~30dB of transmission loss, which would provide an 88% reduction in perceived sound coming through the wall. This simple guide also demonstrates why adding items that only add (for example) 3dB to the transmission loss through a wall have little effect on perceived improvement in noise reduction (3dB is perceived as a 19% reduction in noise and considered barely noticeable by most humans). An excellent overview of decibels and sound propagation is contained in *Sound & Noise – Generation, Propagation, and Reduction,* a practical guide for making anything quiet – homes, condos, schools, factories, cars, SUVs, trucks, boats, RVs, appliances, machinery. This booklet is available free at www.quietsolution.com.

STC Example: Home Theater

A medium home theater produces sounds as loud as 100dB (and often 110dB). A typical "quiet room" is around 30dB to 40dB maximum background noise. So to have a reasonably quiet room at 40 dB adjacent to a loud home theater with a dB of 100, a wall would have to be rated with an STC of 60 (100–40=60).

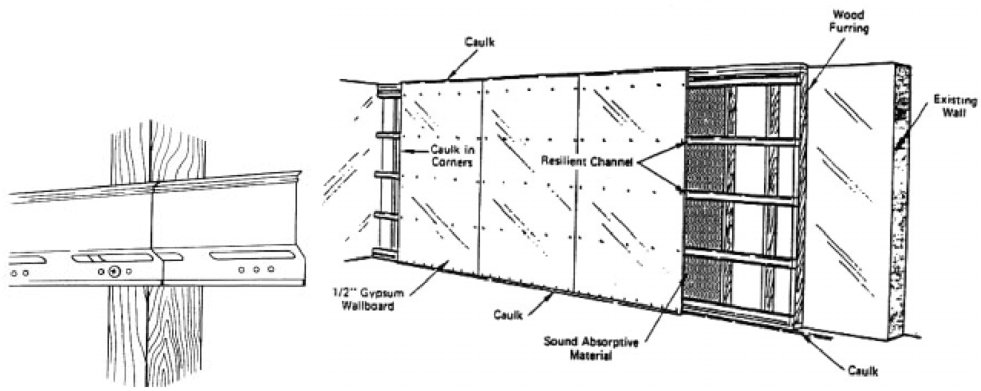
Typical existing wall construction (the most common method is wood stud construction with insulation and 5/8" drywall on both sides) has an STC rating of 30 to 34. A room built with standard construction walls adjacent to the Home Theater would have sound levels at 70dB (100dB minus 30dB), which is far too loud for conversation. However with a wall built to an STC of 60, the adjacent room would have sound levels of 40dB, about as about as quiet as a library.

Note: STC is an average number across a number of octave bands (frequencies) fitted to an agreed-upon curve. Most sound barriers, including those using viscoelastic materials, have a higher loss (performance) at high frequencies than at very low ones. So if you want to isolate speech or TV's, your actual perceived loss may be better than the nominal STC value at those frequencies. However, if you want to isolate a subwoofer, your loss may be less than the nominal STC value, so you would need a higher STC value to achieve better isolation. For those technophiles who might enjoy it – look at the "TL" curves from lab tests to see the assembly transmission loss at each frequency band.

Interior Walls Using Traditional Technologies

Walls with higher STC values have been achieved for years using a variety of construction techniques. Aside from the fallacies listed earlier, there are products that will work when used correctly.

A commonly used technique since the 1960s, on both wood and metal studs, is called Resilient Channel. These are metal channels that are placed at right angles to the studs. The drywall is then screwed into the channel, being very careful that no screws touch a stud directly. In this way, the drywall is isolated from the studs, thus carrying less noise and vibration to the outer wall.



The example above left shows a resilient channel, and on the right, installation of resilient channel in a wall to improve STC performance. When installed correctly, Resilient Channel typically improves STC ratings by about 8-14 points, depending on construction. An important note here is that resilient channel is easily “short-circuited”, so very careful construction techniques must be followed. For instance, no screws can ever touch a stud, drywall must not touch floors or adjacent walls or ceilings, no pictures or shelves can be hung on wall where the fastener screws into the studs, etc. If even one does, it can ruin any gain that would have been had. So very careful construction and usually review by the architect or acoustic engineer is required. Moreover, since the screws are placed into the drywall, it is impossible to “see” if one accidentally touched a stud or any other object other than the channel, so you never know for sure if you’ve met the requirements without acoustic measurements later. This has been one of the biggest drawbacks of this technique in that it isn’t a sure thing. Recent investigation (often due to litigation) has shown that resilient channel construction has a post-construction failure rate (STC designed value) of 90%. That is, the vast majority of walls constructed using RC in the field are not able to approach the original lab results or the expected isolation. A full discussion can be found in the whitepaper titled “Resilient Channels – A Proven Liability” available for free at www.quietsolution.com. Given litigation history and concerns regarding party walls, especially in multifamily, one must be at a minimum very careful using this technique. While resilient channel has fallen out of favor for commercial projects with potential liability, when installed properly can provide good results.

Other stud arrangements, such as staggered-stud and double-stud increase STC points as well (covered below) but can take up valuable space and can nearly double the labor costs in both wood and steel stud construction. However, both are effective in adding STC points to a new construction project (though neither is practical in a retrofit situation as they require tearing out the walls completely). For retrofit in existing construction, there have been few choices that didn’t require demolition. It should be noted that adding resilient channels to an existing wall (that is over the existing gypsum) will <u>not</u> increase STC values. There is not enough space between the old and new gypsum for RC to work effectively.

Also a variety of fiberboard-based products have been used to achieve better STC values. The most popular of these is Homasote®* SoundBarrier®*. This board can be used behind drywall to improve STC ratings by about 3–5 points. It is easy to use and inexpensive, but by itself will not result in STCs in the “Better” or “Excellent” range. Using traditional methods, one may combine several techniques to increase the STC by 20 points or more.

A new technique that is similar to RC is the use of “sound clips”. These work as well as RC, and in some cases produce better STC results than RC. These clips use a hat channel (a metal channel) attached to the clips which are attached to the studs. While this takes up more floor space than RC and requires more labor, the results can be better. The cost of the clips, channel, and labor can add about $3-$4/sq foot to a standard wall, according to a leading manufacturer of clips. This method also relies on panel isolation (like RC) and requires essentially the same careful construction methods as RC, since it could be shorted out in similar manners under some circumstances (that is the wall must be completely floating and not touch adjacent surfaces).

Acoustical engineering consultants are frequently called in to provide expert testimony in issues that result in mediation, arbitration and litigation. The failure rates and causes of failure have been accumulated over a growing body of such field investigations using STC measurement instrumentation. Often, the acoustical engineer has to invade the wall to find the culprit. Litigation on noise issues is becoming more frequent, and the cost of litigation and settlements are rising rapidly.

While using resilient channels is clearly appealing from a material cost perspective (ignoring litigation risk), homeowners and others may choose this and use it successfully by being very careful of the failure mechanisms. Here is a list compiled by acoustic engineers that one should be aware of before the project begins:

Summary

Resilient channels pose a significant risk of failure in floor/ceiling and party wall assemblies. Lab specifications showing STC 43-55 often result in field-tested STCs in the 34-38 range. Failures trigger litigation and warranty claims and damage the project brand, reputation, word of mouth and resale values.

1. **The original RC-1 used in most lab tests no longer exists.** USG stopped making the product in 1985. Most test results are based on STC tests conducted 10 or more years ago on different fabrications. As there is no standard for RC channel fabrication, the various resilient channels available vary greatly in their resilient (stiffness) characteristics. Using currently available RC channels that are often too stiff or that have holes the wrong size or shape results in reduced STC values. There are few current RC channels available that have recent test results based on their actual fabrication and design.

2. **Dead on arrival.** RC channels are thin and prone to damage from shipping or on-the-job storage. Any bend in the channel can cause shorting. We have multiple reports of damaged RC channels that are deployed because by the time the damage is perceived, it is too late to re-order.

3. **The RC channels are placed too close together.** If this happens, the composite stiffness of the wall will be too high and will result in reduced sound insulation.

4. **The RC channel is often drawn on the architectural plan and/or installed upside down.** In such instances, the weight of the drywall pushes the channel into the studs (instead of pulling it way from the studs when installed properly) thus causing a short circuit in the wall, resulting in poor sound insulation.

5. **The RC channel extends too far and touches an adjoining wall.** This error causes a short circuit in the wall resulting in radically degraded sound insulation.

6. **A screw is placed incorrectly.** While the drywall is being attached to the resilient channel, a screw that accidentally attaches into a stud or touches a stud at any point will short circuit the wall and result in poor sound insulation.

7. **Insufficient gap between the wall with the resilient channel and any adjacent wall**. If the drywall attached to the RC channel touches the drywall on the adjoining wall, the wall will be short circuited, resulting in reduced STC value.

8. **Drywall is not installed properly**. If the subcontractor adds drywall that is beyond spec (e.g. adding a layer of Type X to meet fire code), the resulting structure can sag, and the weight of the drywall on the resilient channel can cause the wall to touch the floor, causing a short circuit in the wall, resulting in poor sound insulation.

9. **Electrical junction boxes attached to the stud and to the wall.** This common error causes a short circuit in the wall and result in poor sound insulation. This mistake is easy to make with the faceplate, which must also be isolated, or by not cutting enough of the drywall away around the junction box. The same principle applies to ceiling attachments such as lighting and fans.

10. **Gaps around the junctions.** If junction boxes at the wall are sealed with standard caulk that hardens over time (instead of non-drying non-skinning acoustical sealant), or not sealed with anything, this will cause a short circuit (or air gap) in the wall, resulting in poor sound insulation.

11. **Resilient ceiling.** If the ceiling is also resilient, the walls and the ceiling cannot touch each other. To achieve this, it is recommended the walls be put up before the ceiling. This is counter to standard drywall installation practice.

12. **Actions of other subcontractors.** When RC channels are used in floor/ceiling assemblies involving stuffing materials into the open truss, the risk is magnified. Plumbing, HVAC and electrical materials are routinely attached inside the small cavities in ways that guarantee short-circuiting the RC channel.

13. **Green wood warping.** Most multifamily housing (such as west of the Mississippi River) is made of the less expensive green wood, which dries after installation. The drying process can distort the framing by as much as 1/2" in extreme situations; 1/4" is common. This torque can bring the RC channel in contact with other elements and cause a short-circuit.

14. **Moisture & humidity warping.** In high-humidity areas (such as the Eastern seaboard), humidity can bow and buckle drywall, 1/4" to 1/2" in many cases. This distortion can bring the RC channel in contact with other elements and cause a short-circuit.

15. **Foundation settling.** Foundation settling, the #3 cause of litigation, is a common occurrence. A 1/4" or 1/2" settling distortion can bring the RC channel in contact with other elements and cause a short-circuit.

16. **Language barriers.** The high incidence of RC failure contrasts with good results established in the top labs. This discrepancy points out the need to have highly trained, disciplined personnel supervising and performing the installation. In many construction crews, many of workers are foreign-born. The ability to communicate in English fluently, understand and execute written and verbal instructions for something as delicate as RC channels is required.

17. **Owner/tenant actions.** If, during the life of the property, the owner or tenant installs materials to the wall, such as a picture or lighting, the wall can easily be short circuited. In the case of hotels, many products are routinely attached to the walls for various reasons, including anti-theft and seismic restraint: bed head-board, writing desks, open shelving system, closet shelving, refrigerator, safe, sconces, mirrors, paintings, bathroom shelving, television wall stands, decorative wall hanging, crown molding, baseboard, wainscoting. For rigidity and security, these products are attached to the studs by screws, which invariably cause a short circuit and significantly reduce the STC rating of the wall. Similarly, if RC channels are used in ceiling construction, any lighting (including track lights and ceiling fans) introduced post construction could reduce the ceiling's STC value. Also, any retrofit for new communication technology, that requires a junction box to be attached to the wall will significantly reduce the wall's STC value. This is particularly risky because the location of the studs and RC channels is hidden and difficult to find post construction. Either the wall or ceiling has to be left alone for the life of the property or significant post-construction risk occurs.

18. **Furniture.** If the owner (or hotel guest) moves heavy furniture (e.g. bed, desk) against the wall with force, it can cause the resilient channel to bend slightly and touch the studs, thus causing a short circuit in the wall, reducing the wall's STC value.

Other factors driving up risk:

19. **Availability**. The current shortage of steel (i.e. China) has forced RC channels into allocation.

20. **Inspections**. In several states, RC channels have developed such a contentious reputation that a special inspection must be completed before the wall or ceiling can be closed up. Scheduling a special inspection can take several days.

Similarly, fiberboard products, which work by adding mass and often isolating the outer layer of gypsum, can be short-circuited in a similar fashion, so care must be taken when using these products.

Mass loaded vinyl barrier (typically in sheets or rolls of 1lB/sqft) has been around for several years and has gained popularity with hobbyists and those building home recording studios. As stated earlier in this paper, MLV typically demonstrates an STC of 27 alone. Turns out a little published fact is that a single sheet of gypsum board also shows an STC of 24-28 depending on thickness. SO in fact, in comparison to another layer of gypsum, the stand-alone STC value of each raw material is similar.
There have been very few people willing to test and publish the STC results, including TL curves, for complete assemblies using MLV. In early 2005, lab tests were conducted at Western Electro Acoustic Labs to test a single stud assembly with MLV laid in behind the 5/8" gypsum. The test resulted in a wall with an STC of 43. About a 9 point improvement above the wall without MLV. Again, individual

STC values of wall components cannot be added, and assemblies must be measured as completed assemblies. A more in-depth discussion of MLV tests and tradeoffs is available in the white paper "Mass Loaded Vinyl Performance Review" at www.quietsolution.com.

Good Design Rules for all wall types

1. Seal all air gaps and around each panel with an appropriate acoustic sealant
2. Do not place junction boxes back to back and seal each appropriately

Remember: even a small air gap, less than an inch, can reduce transmission loss by 20 STC points or more through (what otherwise would be) a high quality wall assembly.

STC Comparisons for Wall Construction

In the past, older technologies utilizing fiberboard (such as Homasote®* SoundBarrier®* 440) or Vinyl barriers have been used to gain improvement in STC values. It is again important to emphasize that STC values of individual materials do *not* add up. That is, adding a 27-STC vinyl barrier to a wall that has an STC of 34 does *not* result in an STC of 61. Table 1 summarizes the results you can expect from using various techniques based on actual independent lab results.

	STC	
Construction Method - 2x4 wood studs, R13, with:		
5/8" Drywall both sides	34	Note 4
Double 1/2" Drywall on both sides	38	Note 4
1lb Vinyl under 5/8" drywall	43	Note 5
Resilient Channel 24" OC, ½" drywall	43	Note 4
Homasote®* SoundBarrier®* under 5/8" drywall under both sides	45	Note 1
Resilient Channel 24" OC, 5/8" drywall	48	Note 4
QuietRock Serenity QR-530 on 1 side, std. 5/8" opp. side	**52**	Note 4
QuietRock Solitude QR-530 over 5/8" gyp on both sides	**56**	Note 5
Construction Method - 8" Cinder Block Wall	43	Note 2
Construction Method – 3.5" steel studs, R13, with:		
5/8" Drywall both sides	45	Note 4
Resilient Channel 24" OC, ½" drywall	49	Note 4
Homasote®* SoundBarrier®* under 5/8" drywall both sides	51	Note 1
QuietRock Serenity QR-530 both sides	**54**	Note 5

Table 1: STC Comparison

Note 1: STC data provided by Homasote®*
Note 2: STC data provided by Schundler Corp.
Note 3: STC data provided by mass law calculation
Note 4: STC data provided by National Research Council of Canada
Note 5: STC data provided by independent lab testing at National Research Council and Western Electro Acoustic Labs

Interior Walls Using QuietRock™

The QuietRock line of engineered products is a sound isolation system designed to replace standard drywall in any wall (or ceiling) construction including wood or steel studs. QuietRock is a multi-layer laminated gypsum wall product from Quiet Solution, Inc.

One major advantage of QuietRock is the ability to use **standard construction techniques** and still achieve high STCs, without the limitations of standard materials. This is also the first technology for walls that cannot be “short-circuited”, thus reducing litigation concerns post construction. This eliminates the need for expensive, difficult non-standard construction techniques. The wall need-not be “floating”. Simply screw it together, just like standard drywall. All too often, an architect or acoustical consultant designs a high STC wall, only to discover that a contractor did not carefully follow the exact (and sometimes difficult) installation instructions, hence not achieving the desired result.

One can use QuietRock panels just like any other gypsum or drywall product. The panels can be cut and attached to the wall just like drywall. The only difference is that a QuietRock panel is an “internally damped” product which uses constrained-layer damping in several layers inside the panels. It comes in several performance grades and various sizes (see individual specs for exact data), yet is available as thin as 5/8”, just like regular drywall and weighs about the same.

Standard Construction Method

The diagram below represents standard 2” x 4” - 16” OC construction between two rooms. QuietRock is effective over both wood and metal standard studs.

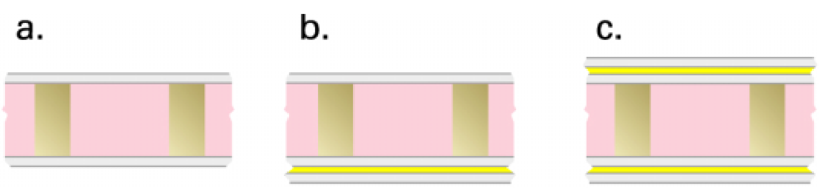


Figure 1: Three Scenarios

a. Represents existing/typical construction. Using 16” O.C. studs this wall has an average STC rating of 30. Using 24” O.C. steels studs (25 gauge), this same wall has an average STC rating of 42. Adding R-13 fiberglass batt adds another 3-4 points to the STC rating.

b. Represents that same wall with QuietRock Serenity QR-530 on one side. The STC rating (the amount of sound isolation from one side to the other) is improved by 18dB over (a), to 52 (with R13 insulation).

c. Represents that same wall with QuietRock Serenity QR-530 on both sides and R13 insulation. The STC rating can be improved by 20dB over (a) to 54. Using QuietRock Solitude QR-540 improves these numbers by another 3-5 STC points.

*Homasote and SoundBarrier are registered trademarks of Homasote Company.

Alternative Construction Methods

The beauty of QuietRock is that it can be used with standard 2x4 wood framing or standard single 3.5" steel studs and achieve very high isolation. Optionally, it can also be used with alternative framing techniques, which can improve the isolation characteristics even further for high quality needs, such as high-end multifamily, theaters, hotels etc. These techniques require more time and attention to detail to achieve additional results.

Below is an example of staggered stud construction. This technique can add another 3-7 dB of isolation over standard stud construction.

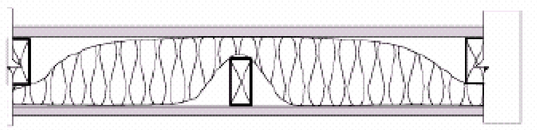


Figure 2: Staggered Stud Construction

Below is an example of double stud construction. This technique can add another 3-5 dB of isolation over staggered stud construction.

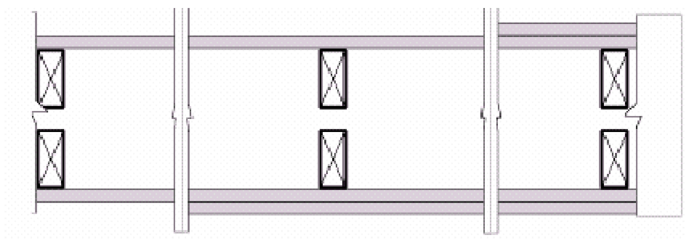


Figure 3: Double Stud Construction

Staggered and double stud construction may be used with standard drywall or with QuietRock panels to improve performance. Care must be taken to not allow any connections between the separated studs (such as pipe straps, electrical or mechanical fasteners). Doing so can reduce the wall to single-stud performance.

Designing with double stud rows can result in STCs of 51–58 depending on spacing and stud type using standard gypsum wallboard. Again, take care to not "short-circuit" the studs with anything.

On average, replacing standard gypsum in any wall configuration with QuietRock QR-530 on one side will add 8-20 additional STC points. This has been shown in hundreds of lab and field tests in small studio, home theater and very large multifamily projects since 2003. QR-530 is also fire rated and UL Classified for use in all of the above assemblies.

Using QuietRock in New Wall Construction

QuietRock drywall is used and attached just like regular drywall.

1. Choose your preferred construction method (Figures 1-3), such as standard 16" – 24" OC wood frame or 16-24" O.C. steel stud frame; staggered stud frame; or double stud frame. QuietRock works with wood and steel framing.
2. Attach QuietRock to the studs using #6 or #7 Bugle Head 1½" or 2½" drywall screws (depending on QR model). Use coarse thread for wood studs and fine thread for metal studs. Hold the panel in place until at least four screws are set.
3. Optionally, before putting up the adjacent panel, seal each seam between panels, and more importantly at floor and ceiling, and around electrical boxes with QuietSeal QS-350. QuietSeal will remain soft forever, i.e. not dry.
4. Tape, texture, paint or wallpaper as normal.

Using QuietRock with Existing Wall Construction (Retrofit)

QuietRock can also be used directly over existing drywall construction *without removing the original drywall*. Follow the instructions below for this application:

1. Attach QuietRock through the original drywall and into the studs using #8 or #10 Bugle Head 1 ½" - 2½" drywall screws (use coarse thread for wood studs and fine thread for steel studs). Hold the panel in place until at least four screws are set.
2. Seal at floor and ceiling, and around electrical boxes with QuietSeal QS-350. QuietSeal will remain soft forever, i.e. not dry.
3. Tape, texture, paint or wallpaper as normal.

Wood Stud Summary

Table 2 summarizes the results you can expect from using the different construction techniques outlined above with wood studs. Select the one that most closely matches your goals and budget.

Construction Technique	STC	% Noise Reduction versus standard wall (perceived volume)
Over Existing Wall (retrofit)		
Standard Interior Wall with 5/8" drywall on both sides with insulation (baseline)	34	0%
Add QuietGlue + Drywall to one side	42	43%
Add QuietGlue + Drywall to both sides	46	56%
Add (screw in) QuietRock QR-520 “Relief” to one side	48	62%
Add (screw in) QuietRock QR-520 ”Relief” to both sides	50	67%
Add (screw in) QuietRock QR-530 “Serenity” to one side	53	73%
Add (screw in) QuietRock QR-530 “Serenity” to both sides	56	78%
Add (screw in) QuietRock QR-540 “Solitude” to one side	56	78%
Add (screw in) QuietRock QR-540 “Solitude” to both sides	59	82%
New Construction (standard 2x4 16" OC wood frame with R-13 insulation and acoustic sealant)		
QuietRock QR-520 “Relief” on one side	47	59%
QuietRock QR-520 “Relief” on both sides	49	65%
QuietRock QR-530 “Serenity” on one side	52	71%
QuietRock QR-530 “Serenity” on both sides	54	75%
QuietRock QR-540 “Solitude” on one side	54	75%
QuietRock QR-540 “Solitude” on both sides	58	81%
New Construction (staggered stud wood Studs with R-13 insulation and acoustic sealant)		
QuietRock QR-520 “Relief” on one side	51	69%
QuietRock QR-520 “Relief” on both sides	54	75%
QuietRock QR-530 “Serenity” on one side	58	81%
QuietRock QR-530 “Serenity” on both sides	61	85%
QuietRock QR-540 “Solitude” on one side	62	86%
QuietRock QR-540 “Solitude” on both sides	65	88%
New Construction (double stud wood Studs with R-13 insulation and acoustic sealant)		
QuietRock QR-520 “Relief” on one side	60	84%
QuietRock QR-520 “Relief” on both sides	63	87%
QuietRock QR-530 “Serenity” on one side	63	87%
QuietRock QR-530 “Serenity” on both sides	66	89%
QuietRock QR-540 “Solitude” on one side	67	90%
QuietRock QR-540 “Solitude” on both sides	70	92%
QuietRock QR-530 “Serenity” 2 layers on both sides	74	94%

Table 2: Summary of dB Loss Using Various Techniques Using Wood Studs

Quiet Solution conducts continuous rigorous testing of its products and assemblies using high-quality independent test labs that use industry-standard testing procedures and techniques. Most of the above combinations have been verified by National Research Council in Canada and/or Western Electro-Acoustical Labs (Santa Clarita, CA) using ASTM E-90 and E-413 specifications for STC testing. Copies of these independent lab reports are available online.

Steel Stud Wall Summary

Table 3 summarizes the results you can expect from using the different construction techniques outlined above with steel studs. Select the one that most closely matches your goals and budget.

Construction Technique	STC	% Noise Reduction (perceived volume)
Std Interior Wall - 5/8" drywall both sides + R13 on 3.5" steel studs (baseline)	45	0%
New Construction (3.5" with 24" OC steel studs with R-13 insulation and acoustic sealant)		
QuietRock QR-530 on one side	52	65%
QuietRock QR-530 on both sides	54	73%
QuietRock QR-540 on one side	54	71%
QuietRock QR-540 on both sides	61	78%

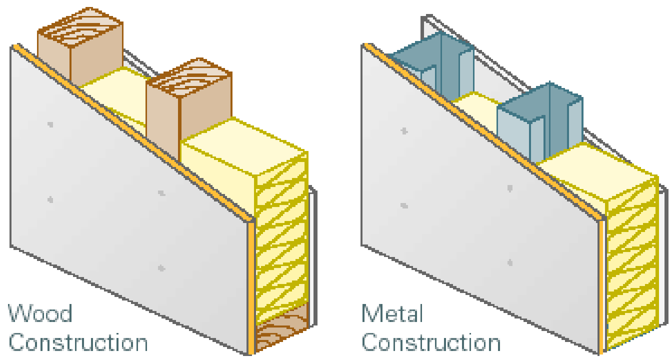
Standard interior wall on steel studs, STC data provided by National Research Council of Canada, Publication IRC-IR-761

Table 3: Summary of dB Loss Using Various Techniques Using Steel Studs

Common Assemblies:

No Excuse Lowest Cost Single Wall

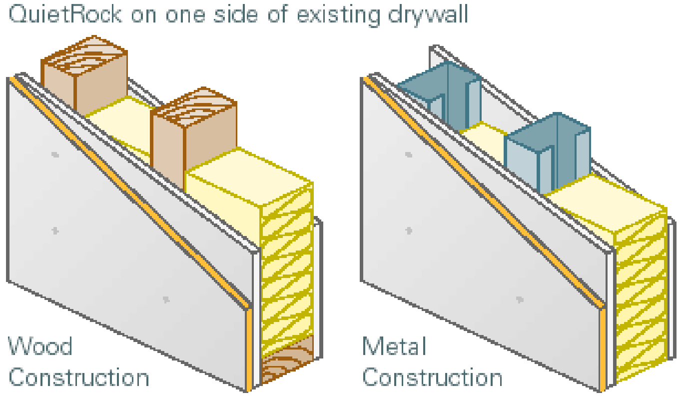
QuietRock on one side



Standard Drywall	STC: 34	
QR-520 Relief	STC: 47	Fire: 1Hr
QR-530 Serenity	STC: 52	Fire: 1Hr
QR-540 Solitude	STC: 54	Fire: 2Hr

Remodeling & Rehab Quick Fix

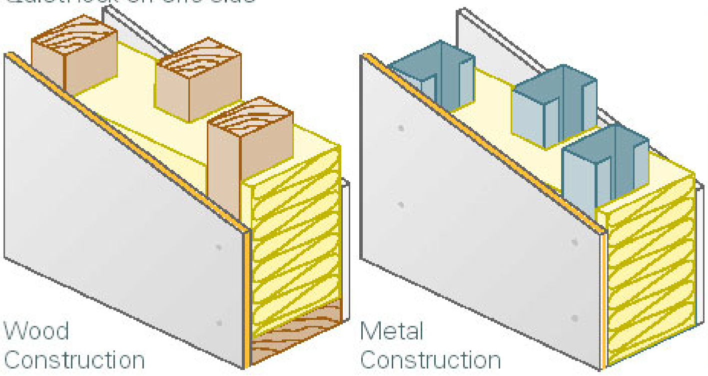
QuietRock on one side of existing drywall



Standard Drywall	STC: 36	
QR-520 Relief	STC: 48	Fire: 2Hr
QR-530 Serenity	STC: 53	Fire: 1.5Hr
QR-540 Solitude	STC: 56	Fire: 2Hr

Staggered Demising Wall

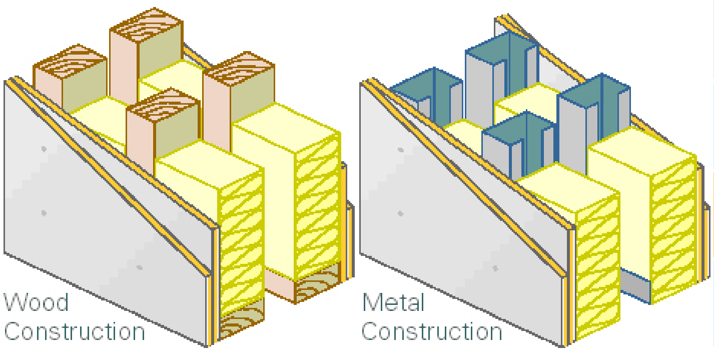
QuietRock on one side



Standard Drywall	STC: 47
QR-520 Relief	STC: 51 Fire: 1Hr
QR-530 Serenity	STC: 58 Fire: 1Hr
QR-540 Solitude	STC: 62 Fire: 2Hr

Highest STC Demising Wall Theater Walls

Double layer of QuietRock on both sides



Standard Drywall	STC: 66
QR-520 Relief	STC: 72 Fire: 2Hr
QR-530 Serenity	STC: 74 Fire: 2Hr
QR-540 Solitude	STC: 77 Fire: 4Hr

Conclusion

Consumers and office workers are happier with quiet environments. Interior walls measuring in the 30s are no longer acceptable for most situations, especially home theater, home recording and multifamily. As a minimum, setting an STC target of 50s or ideally the 60s results in happier homeowners, apartment dwellers, and office workers. With new technologies, such as QuietRock, it is becoming easier than ever to raise STC ratings with less labor, lower cost, minimal effort, low risk, lower liability and a high confidence of success.