Quieting the World...

* Residential Music Studio *

Pre-Construction (Sound Isolation using Acoustiblok)

This paper will give you the fundamentals of isolation techniques used to contain the sound created in a "Live" music rehearsal studio. We will also list the step-by-step instructions on how to implement Acoustiblok materials within your build. This is to help you achieve the highest levels of attenuation when utilizing Acoustiblok materials.

Getting Started

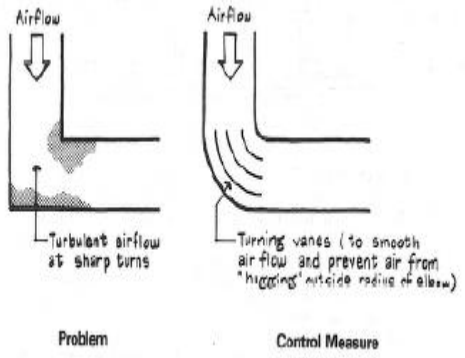
The first thing to consider is what type of standard construction materials are being used in the home. Is the framing of the house wood, or metal? This will determine what type of fasteners and tools you will need to install the different treatments. Wood studs will be easier to work with, but will not offer better resilience to sound transmission. Metal studs transfer less sound due to their lighter and more flexible make up.

1 HVAC Design and Elements

This is a critical part of the studio to take into consideration. Any vent, duct, or penetration in our barrier system needs to be considered when designing the foundation of the sound isolation system. Since the studio will need to be sealed off from the rest of the home, a dedicated air-conditioning system has to be designed for the studio. This will prevent sound in the studio and noise from outside the studio from bleeding into either area.

1.1 Ducts and Returns

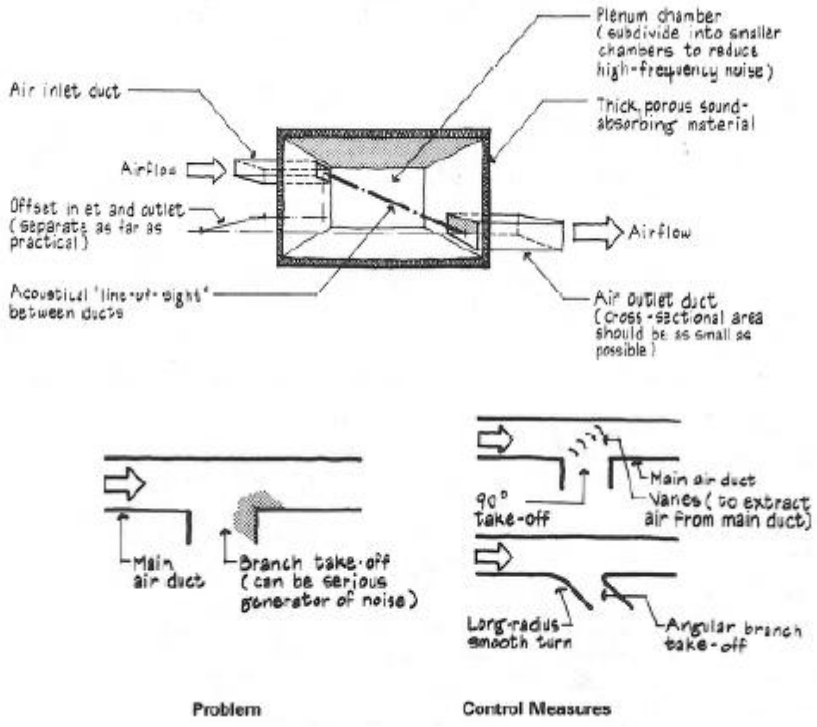
All the incoming vents and return vents should be constructed using insulated duct board (not flexible duct systems). Flanking sounds can be absorbed more efficiently within the constrained fiberglass of the interior walls of rigid duct board, whereas flexible duct systems have good thermal qualities but will not absorb the majority of sound within the duct. Radiuses should be used, not right angles. This will prevent turbulence noise from increasing (see graphic below).



Smooth turns should be used!

1.1.1 Silencers and Junctions

To prevent excessive sound from exiting the studio, (a lined- plenum silencer), should be fabricated and installed on the incoming and return vent. See graphic below:



Branched take offs (junctions) should be curved or Chamfered!

1.1.2 Acoustiblok Duct Wrap

To prevent noise from existing the ductwork from the studio and flanking into the attic or between floors of the home, Acoustiblok can be wrapped around the ductwork once your silencers are in and the ductwork is complete.

This is a more cost effective and easier way to solve this problem than using metal/fiberglass lined ducts. This application will also give higher levels of attenuation of sound escaping the ductwork than metal/fiberglass lined ducts.

- Cut Acoustiblok in lengths easy to manage, wrap around the duct and use Acoustigrip tape to secure the wrap in place. Continue this the entire length of the duct.
- Cover the backside of all vent boxes and any metal branch takeoffs.

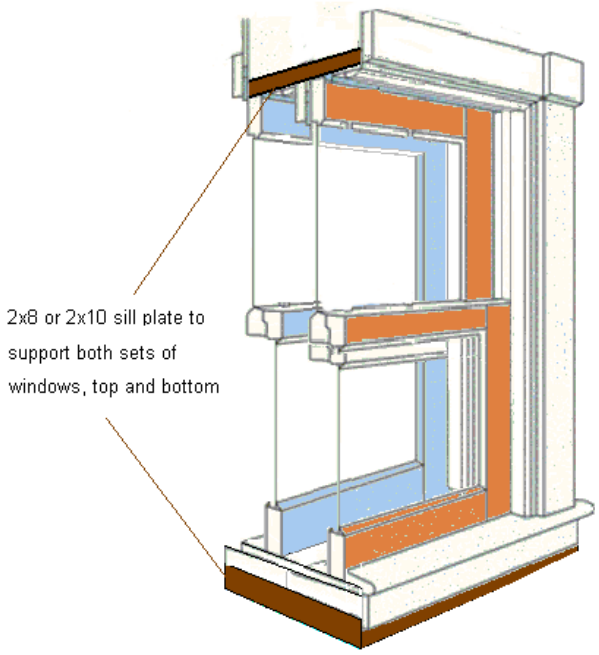
Image of Above Application:

2 Windows & Doors

These are two more critical components of a residential studio that always seem to get ignored. If more than 12% of the overall barrier system has a much poorer STC (sound transmission class), it will compromise the entire barrier by as much as 30%. So to ignore these two areas of your studio is like throwing all the money you spent on the walls, ceiling, and floor out the window! We will start with the windows.

2.1.1 Windows

The first step would be to specify the thickness of the window framework. Most residential homes would have a 2x4-window opening in the façade of the home. We recommend a 2x6 or 2x8. This will allow for a double window installation. This is a value packed way to increase the STC of the window locations of the studio. There are several options for this type of treatment. Double pane windows can be used for the inner and outer window or double and triple argon filled window assemblies can be used for both. This type of treatment creates air gaps between each pane of glass and this is what helps minimize the sound transmission from one pane to the next. This type of application also allows for the extra thickness of the walls that we will highlight further in this document.



2.1.2 Windows Plugs

If a double window solution is not feasible or beyond the budget, a window plug can be fabricated and fitted to most standard windowsills. See the Graphic Below:

The above graphic shows a way to create a window plug that is very effective by incorporating Acoustiblok and simple construction materials into a removable solution for studio windows. This requires two layers of Acoustiblok, 6lb. fiberglass duct board, ¾ plywood or ¾ HDF, 1 pr. of handles.

*Cut plywood/HDF just shy of the size of the window opening.
*Cut two pieces of Acoustiblok the same size.
* Create a spacer-frame (1 ½" thick), and screw it to the first piece of plywood/HDF. It only needs to be about 2" wide (this creates space for the fiberglass duct board, and keeps the Acoustiblok from touching the fiberglass).
*Cut the fiberglass duct board and glue it to the side of the plywood/HDF plug you screwed the frame to (only on the inside of the frame).
*Glue one of the pieces of Acoustiblok to the opposite side of the plug that you glued the fiberglass duct board to (this will be the inside of your plug, toward the inside of the studio).
* Screw the other piece of Acoustiblok over the top of the fiberglass and directly to the spacer-frame (this will be the finished side of the plug that goes toward the outside of the window).
* Mount the handles to the solid side, staple weather stripping to the entire perimeter of the plug, and you are done!

2.1.3 Doors

Doors may be treated in many different ways depending on budget. The ideal solution is to purchase an engineered studio door and frame assembly. This is the easiest, but most costly way to handle the door situation. A door in the high 50-60STC would be preferred.

The other way would be to modify a prefabricated door and frame assembly. This can be done by purchasing a fiberglass exterior door with a frame and threshold that seals. Once you have purchased your door, modify it by laminating both sides of the door you purchased with Acoustiblok 32 oz. This will increase the internal damping of the door assembly and increase the STC (lower the sound level traveling through the door). This is the simplest solution.

If you want to raise the STC of the door assembly more, double the treatment. This would be done by using a 2x10 as the rough door frame- out (the extra depth of the door frame would reside inside the studio), and use two of the door assemblies we have described above. The first door would open toward you, and the second would open into the room. This would decouple the inner door from the outer space and reduce the transmission of sound from the studio. The extra depth of the door frame can have trim molding return to the inner walls of the studio for a finished look.

The other thing to remember is to fill all gaps between the door frame and door opening in the framing with flexible closed cell foam. This can all be concealed with the door frame molding (most interior doors have a major air gap behind the door frame molding.)

3 Walls & Ceiling

This is where Acoustiblok will show its true capabilities. Acoustiblok is like a curtain, or flexible membrane that attaches to the framing of the studio. The reason Acoustiblok works so well is that it is very heavy, flexible, and airtight! Our unique formula for Acoustiblok gives you the only flexible membrane that is U.L. classified in over 400 standard wall, floor, and ceiling construction assemblies. We will start with the walls.

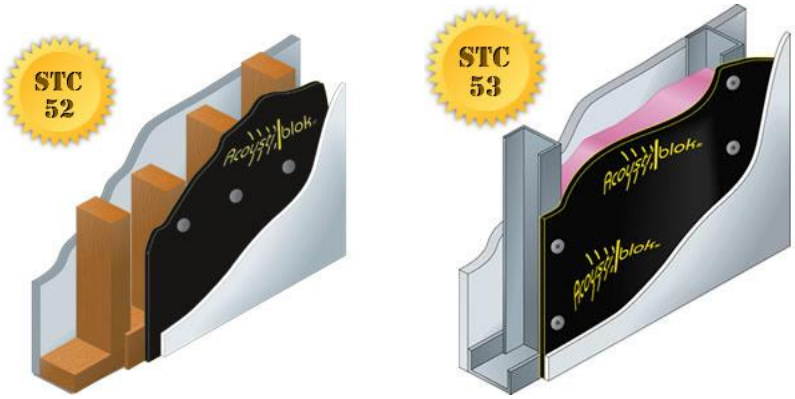
3.1.1 Walls

The first thing is to figure out all the areas that may leak sound out of the studio. Use Acustiputty pads to seal the back of all J boxes (electrical boxes). Now use Acousticaulk to fill all the air gaps where the romex (electric wire) penetrates the J boxes. Make sure that there are not any J boxes backed up to J boxes from connected rooms.

Now install Mineral wool insulation in all the stud bays (you can buy this from any home improvement center) to reduce cavity resonance in the stud bays.

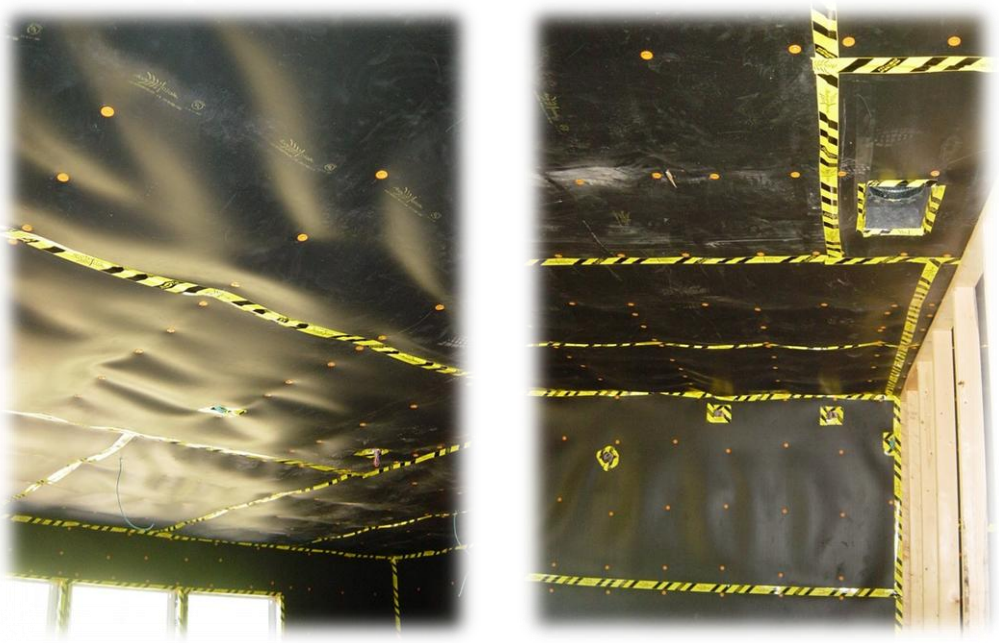
Now use one or two layers of Acoustiblok attached directly to the studio's studs. We recommend you install Acoustiblok in a horizontal manner. This will allow you to start in a corner of the room and work your way around the lower part of the room minimizing seams (leave a little bit of play in the material from stud to stud). Use flange head screws for metal studs or nails and washers for wood studs. Space your screws about every 16"apart (the less screws you use, the less points of transmission). Use Acoustigrip tape to secure overlapping seams. Now, repeat the same application around the top of the room. Any material that may be needed to fill the gap from the top run to the lower run should be installed in the same manner.

Now find all the J boxes, window frames, door frames, electrical stub outs and cut out around them using a utility knife. Use Acousticaulk and Acoustigrip tape to seal around the cuts.



3.1.2 Ceiling

Treat the ceiling in the same manner as the walls. The only difference here is making sure there are not any can lights used. Use track lighting, or any type of lighting that mounts within the room. Preferably, lights that will not rattle or buzz due to the airborne sound being created in the studio.



Ceiling installation on wood studs

3.1.3 Drywall Installation

Option #1

Install resilient channel horizontally at 24” centers on all walls from floor to ceiling. When installing resilient channel on the ceiling, place them on 16” centers. Then install 3/8” Gypsum (drywall) to the resilient channel, making sure you use short screws that only pierce the drywall and resilient channel, not the studs. (This decreases the mechanical transmission of the sound into the studs)

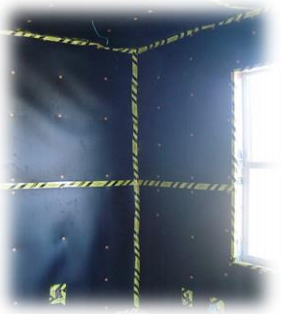
Acoustiblok with Resilient channel

Option #2

Install 3/8” Gypsum (drywall) directly to the studs on top of the Acoustiblok.
(This will still give you all the benefits of the Acoustiblok membrane.)

When installing the drywall, line each edge of each sheet with Acousticaulk sealant. This is to increase the overall STC of the wall and ceiling assembly. If you are using resilient channel, make sure you do not crush the channel when screwing the drywall to it.

When installing the drywall, leave a 1/8” gap from all walls and ceiling. Do not let the walls or ceiling touch each other. This allows all the boundaries to move freely and not couple with each other. This is very important and prevents excessive flanking. Now fill all the gaps with a bead of Acousticaulk.



Acoustiblok without resilient channel

4 The Floor

The best way to treat a floor in a studio is to decouple the inner floor from the existing subfloor to minimize vibration (bass guitar) and impact (the kick drum). The other thing to consider is resonance, and airborne transmission. Decoupling and building a resilient floor will require a close look at some build details. Typically, you need about 3-4 inches of height, multiple layers, and engineering the doorways. The different layers allow you to minimize the noises I've mentioned earlier. Acoustiblok is essential in lowering the resonance of the floor assembly and forms an airtight barrier to tackle airborne sounds and noises.

- Install resilient standoffs on the existing subfloor.
- Install fiberglass absorption material on the floor around the standoffs.
- Install a layer of Acoustiblok on top of the standoffs (an entire mat).
- Place spacer shims around the entire perimeter of the studio.
- Use tongue and groove plywood 3/4'", build floor on top of standoffs & AB.
- Install ¼" tongue & groove plywood on top of ¾" (run seams opposite direction).
- Remove the perimeter shims and seal the gap from the floor to the walls with Acousticaulk.
- Install a layer of Acoustipad on the entire new floor.
- Install the heaviest carpet pad you can purchase.
- Install a long cut pile carpet (shag, thick piles of any kind).
- Install baseboard that barely sits on top of the carpet.
- You are done!

The above is a very effective floor assembly that will tackle most of the frequency ranges that are created in a rehearsal studio and impulsive sounds from percussion instruments. You can build a similar floor minus the resilient layer and new subfloor layers, but the impulsive sounds and vibration will travel with more efficiency. Percussion instruments will be the biggest challenge in residential, budget-oriented studios.

Summary

Acoustiblok barrier material is unique in its make-up and a simple, yet effective solution for reducing airborne sound transmissions by an audible 80-90%. The information included in this paper is to raise awareness of all the aspects that need consideration when attempting to isolate a small to medium sized, residential rehearsal studio in a home. There are several other types of studios, and several other things that may need to be engineered when designing, building, and using these spaces. If you have specific needs and acoustical requirements for your studio, we highly recommend retaining the services of an experienced acoustical consultant that specializes in your type of requirements.

We sincerely hope this paper has enlightened you on some of the "not" so obvious things to consider when designing the isolation of your studio. The interior of the studio will also need to have attention paid to certain aspects of the acoustical feel and function of the studio. The references listed below will help you immensely with the topics I have brought up, as well as the architectural acoustics for the interior of your studio.

References

- Architectural Acoustics — M. David Egan
- Masters Handbook of Acoustics — F. Alton Everest
- Handbook for Sound Engineers (third edition) — Ballou
- AAD Consulting — S. Saathoff