During the last decade the dramatic increase in home office workers, the popularity of home entertainment centers and the “cocooning” trend have placed increased emphasis on the need for noise control in residential construction.

Well thought out home design, when combined with recommended construction techniques and the proper use of noise control insulation can help to reduce room-to-room transfer of sound.

What is Sound

Sound is produced by a vibrating object that causes air particles around the object to also vibrate. These vibrating particles create what are commonly called sound waves.

In a home, telephone conversations, television, radio, HVAC equipment, appliances and the activities of children are common sources of sound.

Sound has two major characteristics: loudness, measured in decibels; and pitch, measured as frequency or cycles per second.

Most sound is transmitted both by air and by the materials it strikes. For example, speech is transmitted by air until it strikes a wall and becomes structureborne.

Acoustical Control

Eliminating acoustical problems in residential construction requires an understanding of three basic sound control options: controlling noise at the source, controlling noise along its path and controlling noise at the receiver.

Controlling noise at the source requires building a sound control enclosure, reducing the noise level being produced or moving the noise source away from areas requiring privacy.

Controlling noise along its path requires adding sound absorbing materials to the room containing the sound source to reduce sound reverberation.

Finally, controlling noise at the receiver requires building interior walls designed to provide acoustical privacy. This is the most common noise control option for residential construction.

Design Requirements

Noise control in residential construction begins by designing the interior layout with privacy in mind.

Design interiors to isolate or control all sound sources. Do not locate home offices in high traffic or noise areas. Locate home entertainment centers away from areas requiring privacy. Select quiet HVAC equipment and appliances.

Plan interior layouts to stagger doorways. Utilize solid core doors with thresholds and seals for rooms requiring privacy.

All back-to-back wall penetrations such as electrical outlets, plumbing connections and vanities should be avoided.

Drywall must be installed to eliminate acoustical “leaks” around walls and at floor or ceiling assemblies.

At corners and ceiling joints, walls should be framed and drywall installed to close all potential sound paths.

Always stagger multiple layers of drywall to eliminate potential sound leaks.

Drywall tape and joint compound will effectively seal corners, if framing and drywall are properly installed.

Seal walls at top and bottom plates on both sides with a non-hardening permanently resilient caulk, such as a butyl rubber-based compound. Caulking should also be used to seal openings around all thru-wall penetrations (see Figures 10-12).

Further Reading

For more information on Quieting Interior Walls, the following sources maybe helpful:

• Owens Corning Noise Control Design Guide, publication 5-BL-21971.

For information on Owens Corning QuietZone® noise control products, visit us on the web at www.QuietZone.com.
Noise Control System

Construction Details

**Interior Partitions**
The desired level of interior partition noise control can be provided by selecting an appropriate wall assembly. Detailed acoustical wall assemblies performance data can be found in Owens Corning publication 5-BL-17956. A brief synopsis follows:

**Single Stud Walls**
Single wood stud walls can provide excellent acoustical performance by utilizing insulation, resilient channels and multiple layers of drywall. Depending upon construction, single wood stud walls provide STC values from 34-56 (see Figure 1).

**Staggered Stud Walls**
Staggered stud walls provide superior acoustical wall performance. Staggered stud walls provide STC values from 43 - 55 depending on insulation thickness and number of drywall layers (see Figure 2).

**Double Stud Walls**
Optimum acoustical wall performance can be achieved by utilizing two rows of studs, each on their own base plate. Double wood stud walls provide STC values from 45 - 64 depending on insulation thickness and number of drywall layers (see Figure 3).

**Framing Considerations**
When installing interior framing care must taken to prevent sound leaks. Proper framing is necessary to close sound paths and reduce sound transfer from room-to-room. Adding wood blocking between joists above partition walls can reduce noise transfer through the ceiling over the top of the partition wall and into the adjacent room. Additional framing details are shown under Drywall Installation.

**Plumbing Noise**
Minimize noise from plumbing, bath fixtures and dishwashers by isolating noise sources from areas requiring privacy. Eliminating noise also requires the proper selection and installation of piping, dishwashers and bathroom fixtures. A number of installation recommendations follow:

- Isolate all piping from framing with resilient mounts or hangers to eliminate “hammering” noise when turning water on or off.
- Use oversize supply and drain pipe to reduce pressure and minimize flow noise. Insulate all plumbing chase walls.
- Provide air chambers and insulate to prevent water “hammering” noise.
- Use quiet dishwashers, water with cast iron waste water piping in place of lightweight plastic pipe to substantially reduce plumbing noise (see Figure 4).
- Use cast iron waste water piping in place of lightweight plastic pipe to substantially reduce plumbing noise (see Figure 4).
- Batts should fit snugly between studs or joists.
- Carefully fabricate insulation to fit tightly around any thru-wall penetrations.
- Never leave voids in the cavity. Fill cavity length with insulation.
- Insulation should not be used by itself to seal or plug a wall penetration.
- Always use caulking, gaskets or gypsum board to seal wall penetrations (see Figure 7).

**Drywall Installation**
The proper installation of drywall and resilient channels is critical to maximizing partition wall acoustical performance.

Resilient channels can be used between drywall and wood studs to improve acoustical performance. Resilient channels and hangers must be installed according to manufacturer’s recommendations. Improperly installed resilient channels are useless. Do not drive screws securing the drywall into the wood studs (see Figure 8).

Multiple layers of drywall can also be used with insulation and resilient channels to provide higher levels of performance (see Figure 9).

Insulation Installation
Proper installation of acoustical insulation is important for full noise control performance. The following construction suggestions should be helpful in maximizing wall performance:

- Batts should fit snugly between studs or joists.
- Carefully fabricate insulation to fit tightly around any thru-wall penetrations.
- Insulation should not be used by itself to seal or plug a wall penetration.
- Never leave voids in the cavity. Fill cavity length with insulation.
- Always use caulking, gaskets or gypsum board to seal wall penetrations (see Figure 7).