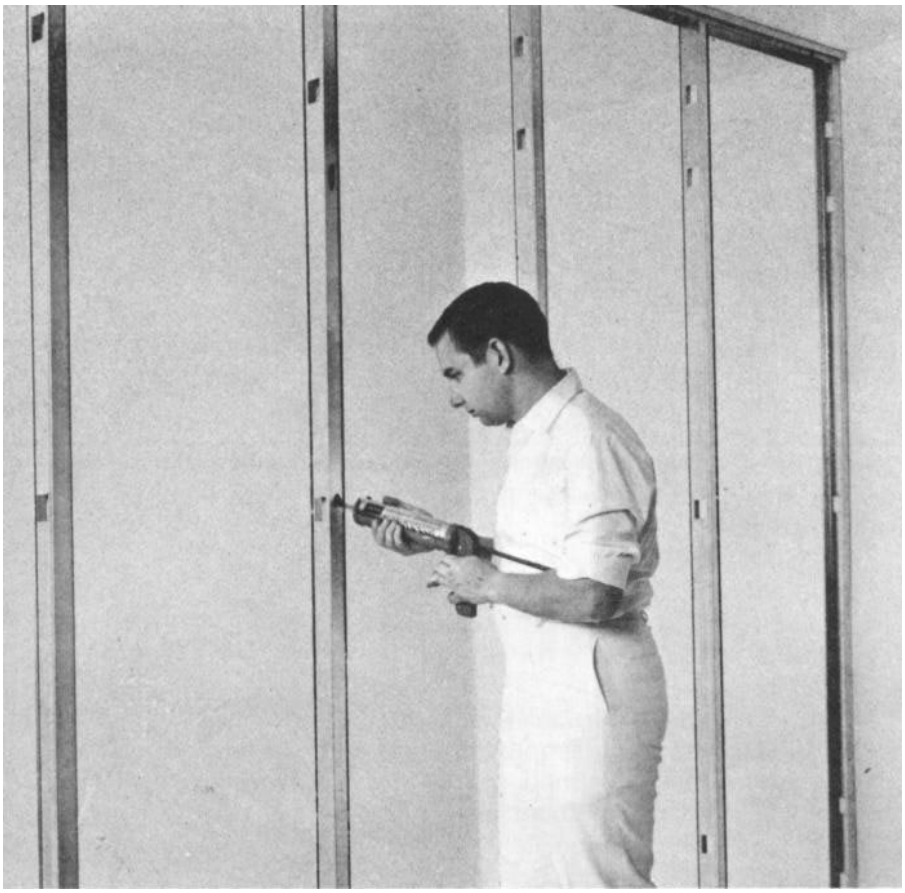

Transmission Loss: Drywall Partitions

The facts about steel vs. wood studs; does sound absorption batts help; effect of increasing the thickness of gypsum board.

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Drywall construction has made such inroads that today there is rarely a new building that does not contain gypsum board. In single and multi-family dwellings, schools, stores, office buildings, architects and owners have found drywall partitions acceptable even though the requirements for acoustical separation, in some cases, have been as high as STC 55 or even STC 60.

Some knowledge of what improves drywall construction sound transmission loss can be helpful to a contractor in many ways.

This article provides such information as derived from a series of 90 transmission loss tests conducted at the National Research Council in Canada and published as Building Research Note No. 66 by Dr. T. D. Northwood of N.R.C.

The basic drywall partition consists of studs, either wood or light gauge steel channels, with gypsum board on each side secured to the studs by nails, self-tapping screws or adhesive. The studs are held in place at top and bottom by wood plates or steel channels.

Conventionally, the wood studs are 1-5/8" by 3-5/8" in dimension, spaced 16" or 24" on center. Steel studs are 2-1/2" or 3-5/8" in depth and are usually spaced on 24" centers. The space between the studs may be filled with rockwool or glass fiber batts varying in thickness from 1/2" to 3".

Joints are finished with tape and a joint compound to provide a smooth, joint-free appearance. Tight seals at the entire periphery are essential and are usually achieved by means of one or more caulking beads.

When a very high degree of acoustical separation is desired or specified, a second layer can be laminated to one or both sides of the partition using joint compound applied with a special applicator in strips 5/6" wide by 5/8" thick, spaced about 2" apart.

Results Are Tested

Obviously all of these application details were not arrived at haphazardly—they all result from a great deal of research, tests and experiments and legitimate questions can be asked as to the reasons for these procedures and what will happen when changes are made.

Before proceeding with these questions, however, it should be noted that sound transmission loss tests of drywall partitions are made in a uniform manner by laboratories in the U.S. and Canada in accordance with ASTM E90, "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions". The test data used in this article were conducted under either the 1966 or 1971 versions of this standard.

Although transmission loss tests are conducted at 16 frequencies over a range of 125 to 4000 hertz, it is usual to use a single number (STC) derived from the test data in accordance with another ASTM Standard, E413-70T, "Determination of Sound Transmission Class".

Q: Are steel studs better than wood studs?

A: Studs play an important part in the transmission loss of drywall

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partitions. Since lightweight steel channel studs are less rigid than wood studs, they transmit much less acoustical energy from the gypsum board on one side to the gypsum board on the other side of the stud.

2 x 4 wood studs 24" o.c., 1/2" gypsum board two sides = STC 35

3-5/8" steel studs 24" o.c., 1/2" gypsum board two sides = STC 37

2 x 4 wood studs 24" o.c., 5/D8" gypsum board two sides = STC 36

3-5/8" steel studs 24" o.c., 5/8" gypsum board two sides = STC 39

Q: Will rockwool or fiberglass insulation improve the transmission loss of drywall partitions?

A: The installation of sound absorption materials between the studs definitely improves the transmission loss performance.

Because, of the springy flexibility of the steel stud, the improvement is greater with the steel stud than with wood studs. Tests conducted of 2 x 4 wood studs and 3-5/8" steel stud partitions, both spaced 24" on center, with and without 2" sound absorption material, showed the following results:

2 x 4 studs with 1/2" gypsum board, no insulation = STC 35

2 x 4 studs, 1/2" gypsum board with 2" insulation = STC 40

Improvement = 5 STC

3-5/D8" steel studs with 1/2" gypsum board, no insulation = STC 37

3-5/8" steel studs, 1/D2" gypsum board with 2" insulation = STC 46

Improvement = 9 STC

Q: Is the thickness of the insulation an important factor?

A: Insulation thickness is not very critical, however, a minimum of 2" thickness is recommended.

Q: What improvement can be expected from using 5/8" thick instead of 1/2" thick gypsum board?

A: Substituting 5/D8" thick for 1/2" thick gypsum board increases the mass or weight of the partition and thus increases the transmission loss. The improvement varies between 1 and 2 STC independent on whether wood or steel studs are used or whether sound absorption is present between the studs.

Q: How important is the taping and joint compound procedure at the joints?

A: The labor consuming application of tape and joint compound at gypsum board joints is required primarily for cosmetic reasons. Assuming that the gypsum board joints are not open, the same transmission loss results can be achieved by applying masking tape to the joints.

Q: How important is caulking?

A: Caulking is a must! It is essential that one or more beads of caulking be applied to seal the space between the edge of the gypsum board and the floor, ad-

jacent walls and the ceiling. Applying the caulking beads between the floor, wall and ceiling channels and the connecting surface will be satisfactory providing the gypsum board covers the channel flange. Plastic or wood base should not be depended upon to seal the space between the bottom of the gypsum board and the channel flange. Also, use the non-hardening types of caulking recommended for acoustical sealing of drywall constructions.

Q: Is Type X (fire resistant) gypsum board better than standard gypsum board?

A: The tests conducted at N.R.C. indicated no difference in acoustical performance between the same thickness of conventional gypsum board and Type X board. This was also the case for vinyl covered board of the same thickness.

Q: How much improvement can be expected by laminating two layers of gypsum board?

A: While adding mass to a partition by laminating double layers of gypsum board to one or both sides theoretically should improve the performance, it is a trend of diminishing returns. One additional layer on one side is quite beneficial, however, the second layer on the other side seems to add little or nothing to the acoustical performance.

2 x 4 studs, no absorption, 1/2" gypsum board each side = STC 33

Same construction, **after adding 1 additional layer on one side only** = STC 37

Same construction, **after adding an additional layer on both sides** = STC 37

3-5/8" steel studs, 2" sound absorption, 1 layer 1/2" gypsum board each side = STC 46

Same construction, **after adding 1 additional layer on one side only** = STC 50

Same construction, **after adding an additional layer on both sides** = STC 51

Q: How about flanking paths?

A: The flanking of sound around the partition is always a problem and a discussion of flanking paths and how to detect them was included in Vol. 1, No. 1, December 1974 issue of Construction Dimensions in an article entitled, “Partition Complaints”. It should be emphasized that unless special precautions are taken in wood joist and truss floor construction, the flanking path through the gypsum board ceiling, over the top of the partition and down through the ceiling on the other side can substantially reduce the acoustical separation provided by a well constructed drywall partition.

In summary, worthwhile improvements can be obtained by installing a drywall partition with steel studs instead of wood studs and by installing 2" sound absorption material between the studs. 5/8" gypsum board will also provide better results than 1/2" gypsum board and caulking is all important and must be done properly without gaps. Laminate another layer of gypsum board on one side for even greater transmission loss.