Sounds

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A Newsletter from **Stewart Acoustical Consultants** and **F.C.Schafer** CONSULTING

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Making our World Sound Better Since 1979

Merry Christmas and Happy New Year!

From left to right (Staff and Team members based in North Carolina)– Noral Stewart, Rodell Means, Fred Schafer, Joe Bridger, and Richard Honeycutt. We have additional affiliates now in Massachusetts, Virginia, and of course Mathew George of MMGAC in Bangalore, India.

Cary Theater – Built in 1946, the Cary Theater at 122 East Chatham Street in Cary was home to Cary's first indoor movie theater. It recently went through extensive renovation along with a substantial addition, and opened its door this year. Stewart Acoustical Consultants was the acoustical consultant for the renovation. In addition to the room acoustics and HVAC noise control, efforts were made to isolate the theater from the nearby train crossing. The theater is now set up for live performances of music, drama, comedy and improv as well as films. Our local NC-ASA chapter arranged a tour of the facility with other project team members including TCC, the owner, and the builder.

Inside This Issue:

Lower Cost, Green, Acoustical Doors

Two factors have combined to reduce the cost of acoustical doors, especially those in the range of STC 35-45. The first major factor is a new core material based on rapidly renewable agriculturally grown materials that is not only low-cost but also provides LEED points. This is the Rigicore material developed by Creative Composites. This company was recently purchased by door manufacturer VT Industries, but the core is available to other door manufacturers. The other factor is the greater use of adhesive applied fin-type seals rather than compression seals. Traditionally adjustble compression seals have been considered the best for critical applications, though they do require careful adjustment.

Fin type seals were originally developed for lower performance situations, but they have been found to perform well especially when used in pairs for the higher performance cases. The original high-performance fin seals were developed Door and Hardware Systems Inc. Other manufacturers now offer similar seals.However, two factors are critical. One is the quality of the adhesive and the care in preparation of the surface wher the seal is applied. The other is that the door be properly centered in the opening so there is and even gap around the sides.

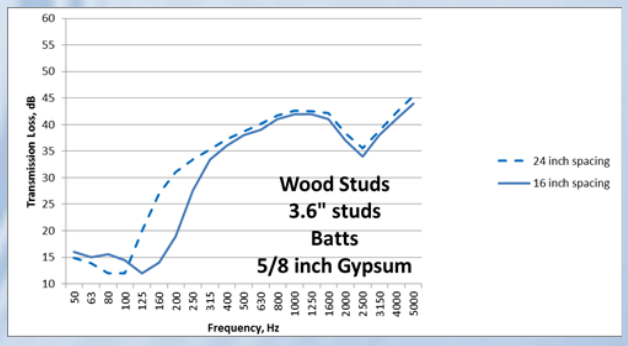
New Instrument – Casella 633 – We are pleased to announce the acquisition of a new instrument. The Casella 633 is a Type 1 precision instrument with octave-band filters for use in continuous outdoor monitoring. It offers several advantages over the Larson-Davis 700's we have previously used for such measurements. It is full Type 1 precision with much more memory allowing operation for longer periods and the storage of octave band data and not just overall levels. If desired, the instrument can also be set up with two levels of time periods with statistical data, for instance 5 minute "profile" periods and hourly intervals. It also can be set up to record the sound of loud events for identification. Combined with the Bruel & Kjaer 2250, this gives us two highly sophisticated monitoring instruments. The Casella instruments are also readily available for rental from several sources which gives us the flexibility to rent additional instruments for projects that require monitoring several locations simultaneously.

Build a Better Wall – Part 2 –

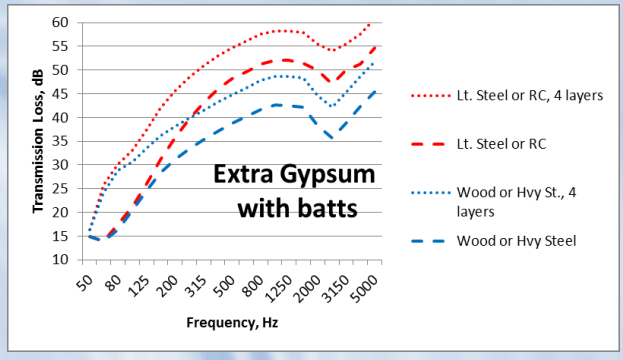
In our last issue (available at www.sacnc.com/newsarchive or by clicking here), we discussed how various factors affected the sound blockage of partitions built of studs and panels, including the effects of panel weight and stiffness, cavity depth, absorption in the cavity, and type of stud or use of resilient attachment. In this issue we will primarily concentrate on some high peformance partitions. However, first let us mention how these example transmission loss curves were obtained and then continue with and amplify a point mentioned at the end of the article in the last issue about wood studs on 16 inch centers.

The curves shown here with some modification were generated using INSUL Version 7. INSUL is a program commonly used to compute the Transmission Loss of partitions. It had been observed Version 7 and earlier would typically give about the right STC for partitions, but would in many cases overpredict the transmission loss at low frequencies and and underpredict that at high frequencies. Version 8 is now out and it has adjusted to come closer to typical measured results in many cases. It also addresses the issue of wood studs on 16 inch centers. However, some questions have been raised about some of the results from Version 8. This article will continue with curves primarily computed with Version 7 but modified in some cases to better match typical measured results.

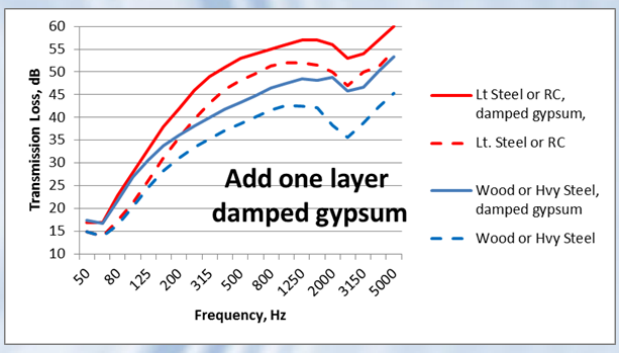
Though not explicitly indicated, the examples with studs in the last issue were based on a stud spacing of 24 inches. When the stud spacing is reduced to 16 inches, more sound is transmitted, or the transmission loss is reduced. For light gauge steel studs or studs with resilient channel to attach the gypsum to one side, this effect is relatively small and primarily at higher frequencies. However, especially for wood studs and to a lesser extent for heavy gauge steel studs the reduced spacing has a much stronger effect at low frequencies. In addition to the mass-air-mass resonance at low



frequencies, there is a structural resonance related to the overall stiffness of the assembly. When the studs are very stiff as wood and closely spaced, this resonance increases to a higher frequency above 125 Hz and significantly reduces the performance at 125 Hz. In the chart on Page 2 this structural resonance has been introduced for both the 24 and 16 inch spacing to illustrate the effect.

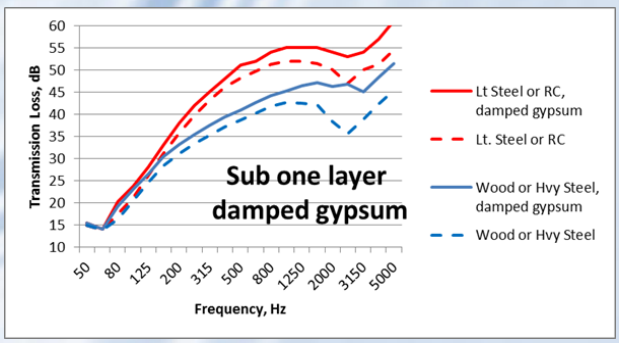


Now, let us shift back to a 24 inch stud spacing and curves generated without this structural resonance effect. The curves at right illustrate the effect of adding and extra two layers of gypsum to the wall. There is a significant improvement with greater improvement at lower frequencies because the mass-air-mass resonance is shifted to a lower frequency. This greater improvement may not be as great as shown on wood studs due to the low-frequency structural resonance.

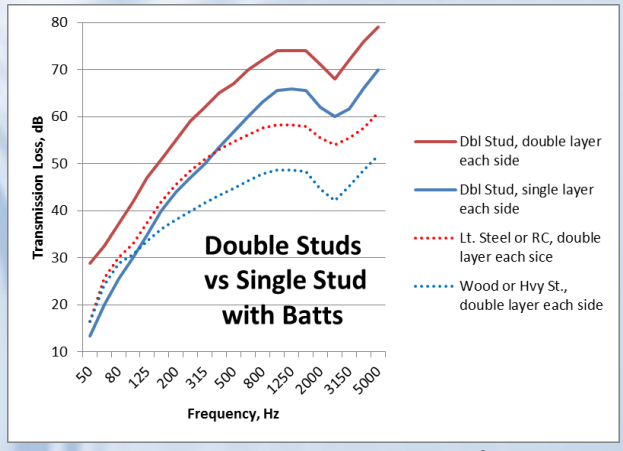


There are now a number of damped gypsum products available such as QuietRock, Soundbreak, and Suppress. These primarily help damp the dip at the coincidence frequency. The chart at right illustrates what happens when one layer of this type product is added to one side of a partition. There is benefit at all frequencies due to the extra weight, but more benefit at the higher frequencies, especially for the wood or heavy steel studs without resilient channel. The benefit on light gauge studs or resilient channel is not much more than the benefit of adding another layer of regular gypsum.

Now consider the effect of substituting one of the damped gypsum products for regular gypsum. The chart at right shows the effect of substituting a damped material for one layer of gypsum on one side of the partition. There is of course less benefit than for adding it, but there is benefit especially at the higher frequencies and more so for the wood or heavy gauge steel stud without resilient channel.

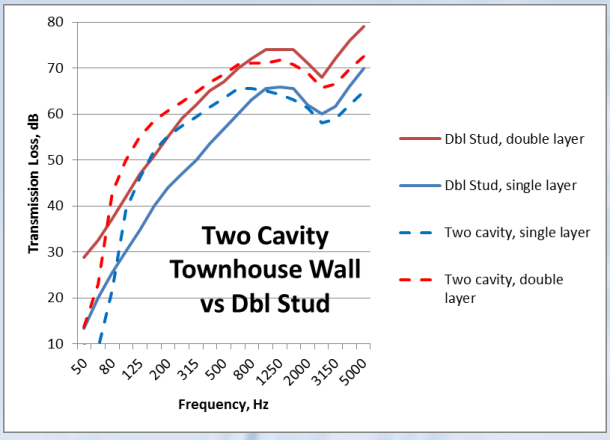


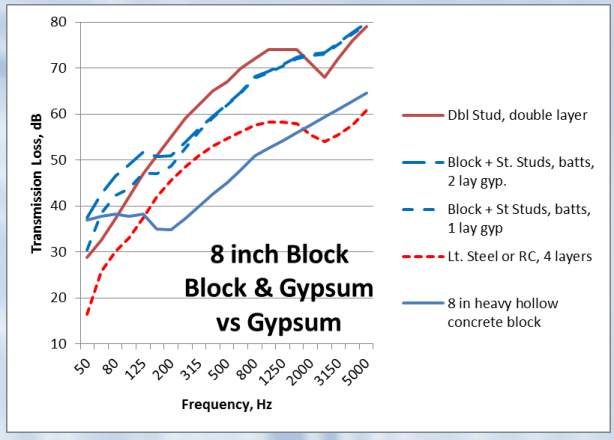
Next, consider going to double studs on separate base plates giving a cavity of about 8 inches with batts. Results are shown at right. The lack of connection and larger cavity allows a single layer of gypsum on each side to have about the same performance as a double layer on a single stud. It will be better at higher frequencies but not quite as good at lower frequencies. A double layer on each side gives a very good wall.



A popular partition for townhouses today takes the double stud wall and spreads the studs a little further apart, then inserts two layers of one-inch thick gypsum in the middle held away from the studs by resilient clips. One might think that this extra gypsum would improve the partition and it does at some frequencies. However, having the two smaller cavities weakens the partition at the lower frequencies as shown at left below.

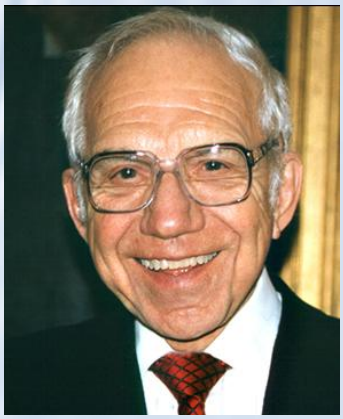
Finally, consider a masonry block wall, and such walls with one or two layers of gypsum on studs with batts compared to a stud wall and double stud wall. This is illustrated at right below. The block wall is strong at low frequencies, but has a weak region at mid frequencies compared to a stud wall, becoming better than the stud wall again in the region of the coincidence frequency of the stud wall. Adding the gypsum to the block wall makes it more comparable to the double stud wall, slightly





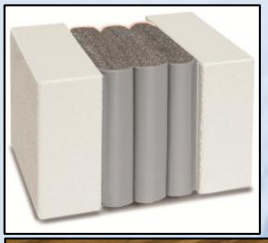
weaker at many frequencies but better at low frequencies. However, notice that with the gypsum added, the block wall can be weakened at low frequencies.

Happy 100th Birthday Leo Beranek! – Leo turned 100 on September 15, 2014. A major celebration was held on September 19 with a concert by the Boston Symphony at Symphony Hall. It is impossible to begin to discuss all that Leo has accomplished in this short space. While he has probably contributed more to acoustics than anyone else over the past 100 years, he will probably be remembered more 100 years from now for the role his firm had in building the first four nodes of the Internet. His Autobiography Riding the Waves – A Life in Sound, Science, and Industry, available from Amazon, is an inspiring read.

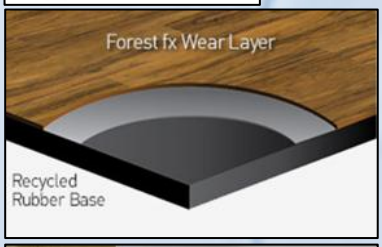


New email address for Noral Stewart – Noral will be phasing in a new email address over the next few months, adding an "s" to "noral" to become "norals". Please update your records.

Acoustical Product News



EMSEAL provides a wide variety of sealing systems for sound, fire, and water that can be used to seal joints in partitions or between partitions or floors and exterior curtain walls. This includes some products to seal partitions to windows or window mullions. However, any time a partition is perpendicular to another be very careful of flanking through the continuous surface including windows or leakage through mullions.



Ecore has introduced a line of commercial flooring solutions for locations such as hospitals where there is concern not only for footstep sound transmission downward, but also for the sound generated in the floored space by footsteps or carts rolling down a corridor for instance. These products have a luxury vinyl tile or other surface bonded to a recycled rubber base.

Pliteq has introduced a footer and header isolation system of pad and grommet that provides another option where such is required.