RPG DIFFUSOR SYSTEMS, INC.

Tech Topic: Mass Versus Damping Layer in Multilayer Walls and Ceilings
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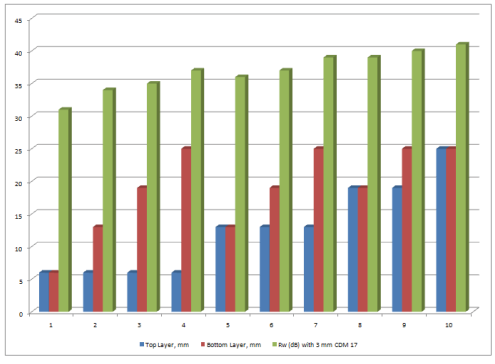
It is common practice for wall structures to contain 1 lb/sf mass loaded vinyl between layers of gypsum and plywood. A typical wall may consist of 5/8 drywall/3/4" plywood/1 lb/sf vinyl/5/8" drywall. Is the vinyl contributing anything to performance?

Mass Law: This law indicates a doubling of the mass will increase the TL by 3 dB. Therefore the wall without the vinyl weighs 7 lb/sf and the wall with the vinyl weighs 8 lb/sf. This 14% increase will minimally improve TL.

Variable Impedance Multiple Layering: In fact we are not really dealing with a mass-air-mass system here and would do much better addressing this wall/ceiling as a variable impedance surface, where we are using layers of different impedance with internal damping. Therefore, instead of using a mass loaded vinyl layer, more improvement can be achieved by replacing this with a damping layer. This will introduce a jump in the impedance to break up the wave field entering and leaving the damping layer, as well as internal constrained layer damping.

Example: An example of the improved Transmission Loss can be seen when comparing two layers of 6 mm (0.24") plywood with and without a 3 mm (0.12") constrained internal damping layer of CDM 29, 15 and 17 (See CDM Test Information Sheet at the end). The corresponding Rw (dB) (Equivalent to STC) can be seen to increase from 18 dB for the untreated plywood to 29, 30 and 31 dB, respectively for the CDM 29, 15 and 17 damping layers.



The graph at the left shows the Transmission Loss Rw(dB) for a variety of plywood thickness/3 mm damping layer/plywood thickness laminations. For example, a constrained layer lamination of 13 mm plywood/3 mm CDM 17/19 mm plywood has an Rw(dB) = 37.

Conclusion: The transmission loss data indicate that adding a damping layer in a multilayer wall or ceiling construction, provides significantly more improvement in TL than adding a mass loaded vinyl layer.

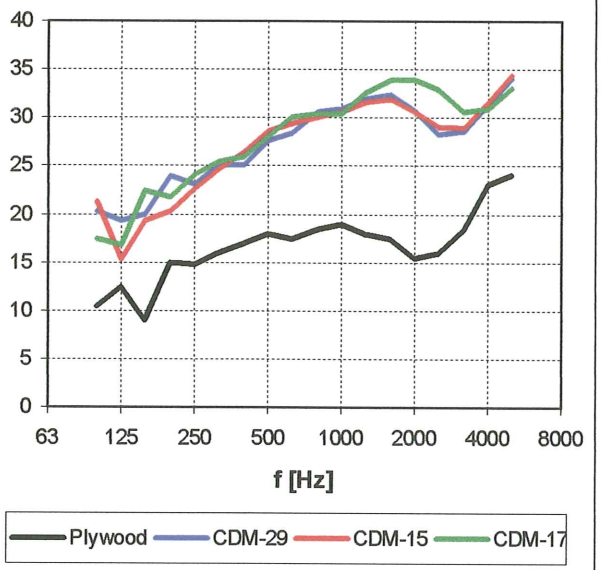
Test info sheet

AIRBORNE NOISE TRANSMISSION LOSS

CDM-ISO-CORE

Core Material	Panel Composition	Overall thickness [mm]	Surface weight [kg/m²]	Rw [dB]	Thermal conductivity k [W/m²K]
Plywood	Plywood (15mm)	15	8.4	18	13.3
CDM-29	Plywood (6mm) + CDM-29 (3mm) + Plywood (6mm)	15	9.4	29	7.4
CDM-15	Plywood (6mm) + CDM-15 (3mm) + Plywood (6mm)	15	8.3	30	10.7
CDM-17	Plywood (6mm) + CDM-17 (3mm) + Plywood (6mm)	15	9.5	31	12.7

Measurements [dB]				
f [Hz]	Plywood	CDM-29	CDM-15	CDM-17
100	11	20	21	18
125	13	19	15	17
160	9	20	19	22
200	15	24	20	22
250	15	23	23	24
315	16	25	25	25
400	17	25	26	26
500	18	28	29	28
630	18	28	29	30
800	19	31	30	30
1000	19	31	31	30
1250	18	32	32	33
1600	18	32	32	34
2000	16	31	31	34
2500	16	28	29	33
3150	19	29	29	31
4000	23	31	32	31
5000	24	34	34	33



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