ENOSH

SCIENCE CENTER

Acoustic Study
(Studio 2- Proposal 2).

Enoshmink Science Center

09-22-2023

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Contents

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I. Room Specifications.

Room Type: TV and broadcast studios (close microphone pickup only).

Background Noise: 10 (dB)

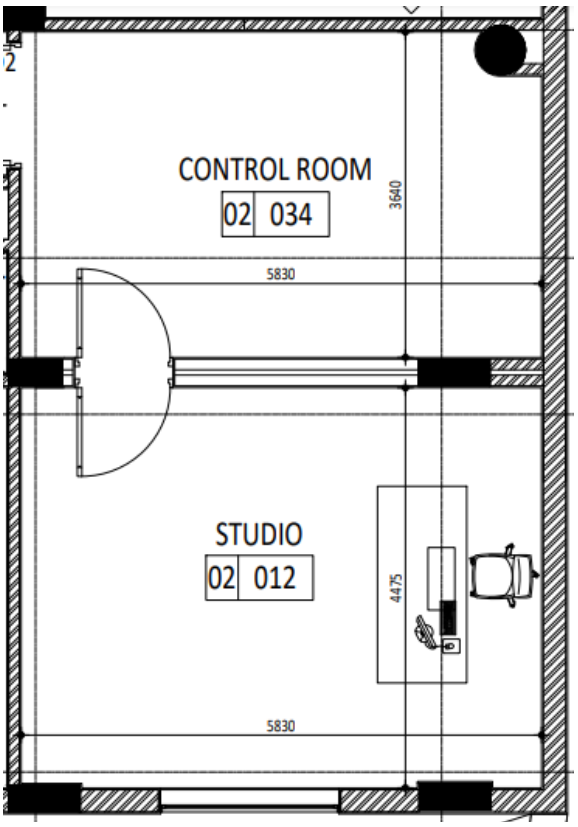
Room Length: 5.830(m)

Room Width: 4.425(m)

Room Height: 3.15(m)

Room Area: 25.8(m^2)

Room Volume: 81.26(m^3)



I.I TV and broadcast studios (close microphone pickup only). Technical Specs

25 dB

II. Sound Isolation Specifications.

Recommended ANSI Levels for Broadcast Studios (distant microphone pickup used).: 10 dB.

II.I Wall Damping Material.

- Wall Damping Material: Single Stud/Single Plate:One-Side Heavy.
- Material Density: 70 m^3/Kg.
- SPL: 85 dB.

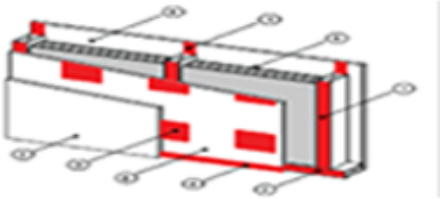


Figure 1: Wall Damping Material: <WDM>

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II.II Walls Isolation Thickness.

Walls	Isolation Thickness
Wall 1	0.11 (m)
Wall 2	0.15 (m)
Wall 3	0.11 (m)
Wall 4	0.15 (m)
Ceiling	0.08 (m)

II.III Sound Transmission Loss.

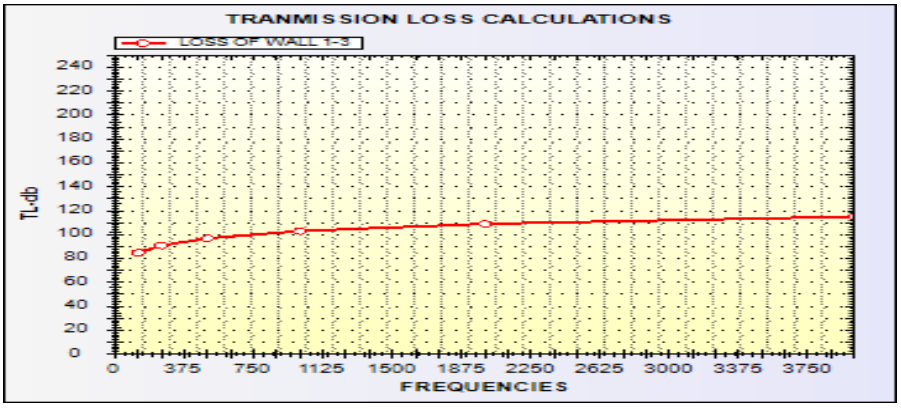

Figure 2: Transmission Loss Calculations for Wall 1&3.

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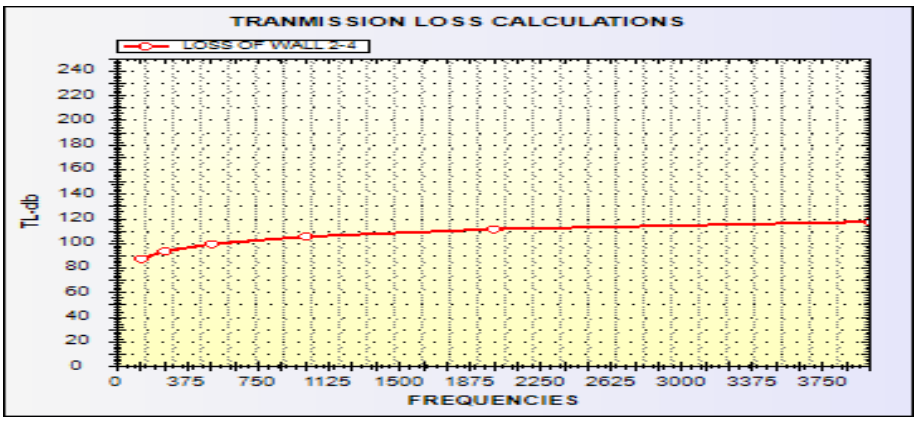

Figure 3: Transmission Loss Calculations for Wall 2&4.

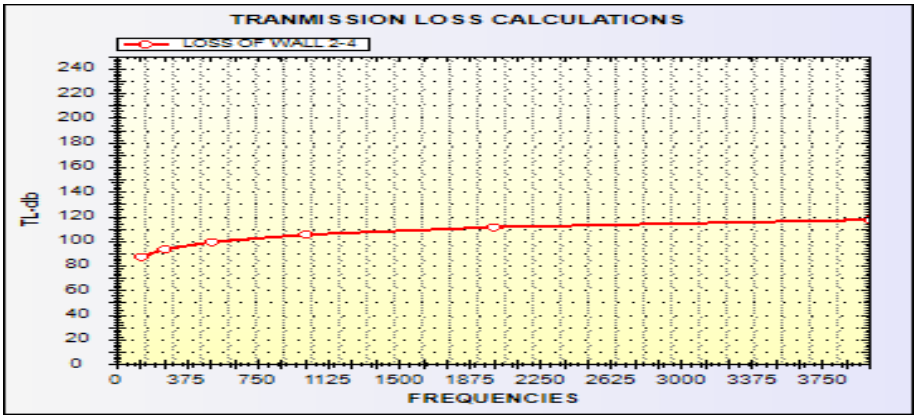

Figure 4: Transmission Loss Calculations for Ceiling.

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III. Room Treatment.

Walls	Isolation Thickness
Front Wall	gypsum_board
Back Wall	gypsum_board
Right Wall	gypsum_board
Left Wall	gypsum_board
Ceiling	gypsum_board
Floor	floors,linoleum,vinyl on concrete

III.I RT60 and Critical Area *Before* Adding Enosh Pallets

Frequencies (Hz)	125	250	500	1K	2K	4K
RT60	0.7	2.03	4.05	5.06	2.89	2.25
Critical Area	0.61	0.36	0.26	0.23	0.3	0.34

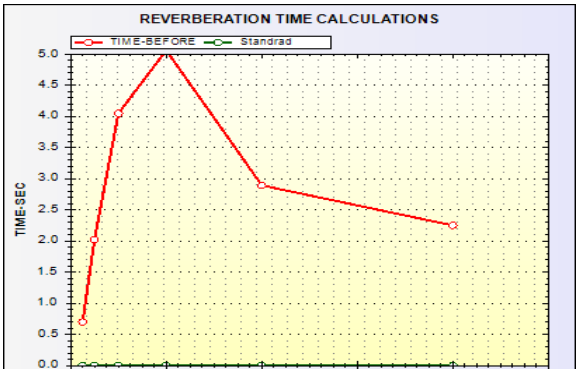

Figure 6: RT60 Before Adding Enosh Pallets.

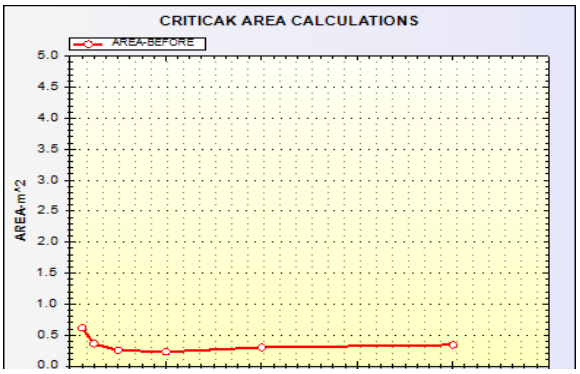

Figure 5: Critical Area Before Adding Enosh Pallets.

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III.II RT60 and Critical Area *After* Adding Enosh Pallets.

Enosh Ceiling:

Length: 5.830 m

Width: 4.425 m

Material Thickness: 2”

Enosh Pallets:

Number of Pallets: 10

Area: 2.579775 m^2

Material Thickness: 2”

Frequencies (Hz)	125	250	500	1K	2K	4K
RT60	0.43	0.27	0.19	0.19	0.2	0.2
Critical Area	0.78	0.99	1.16	1.19	1.16	1.15

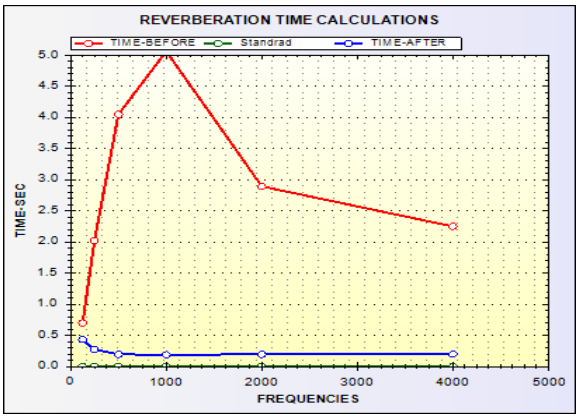

Figure 7: RT60 After Adding Enosh Pallets.

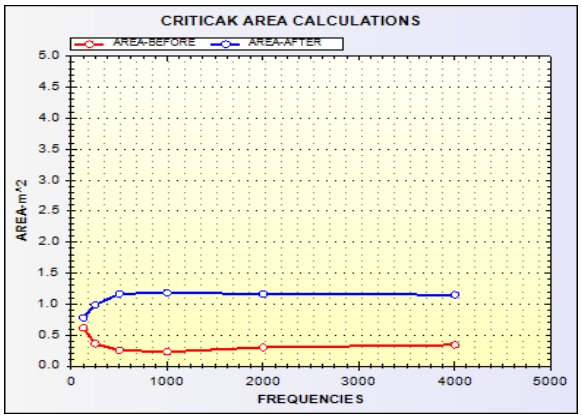

Figure 8: Critical Area Adding Enosh Pallets.

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IV. Standing Waves

Frequency	Length	Width	Height
F1	29.42	38.76	54.44
F2	58.83	77.51	108.89
F3	88.25	116.27	163.33
F4	117.67	155.03	217.78
F5	147.08	193.79	272.22
F6	176.5	232.54	326.67
F7	205.92	271.3	381.11
F8	235.33	310.06	435.56
F9	264.75	348.81	490
F10	294.17	387.57	544.44

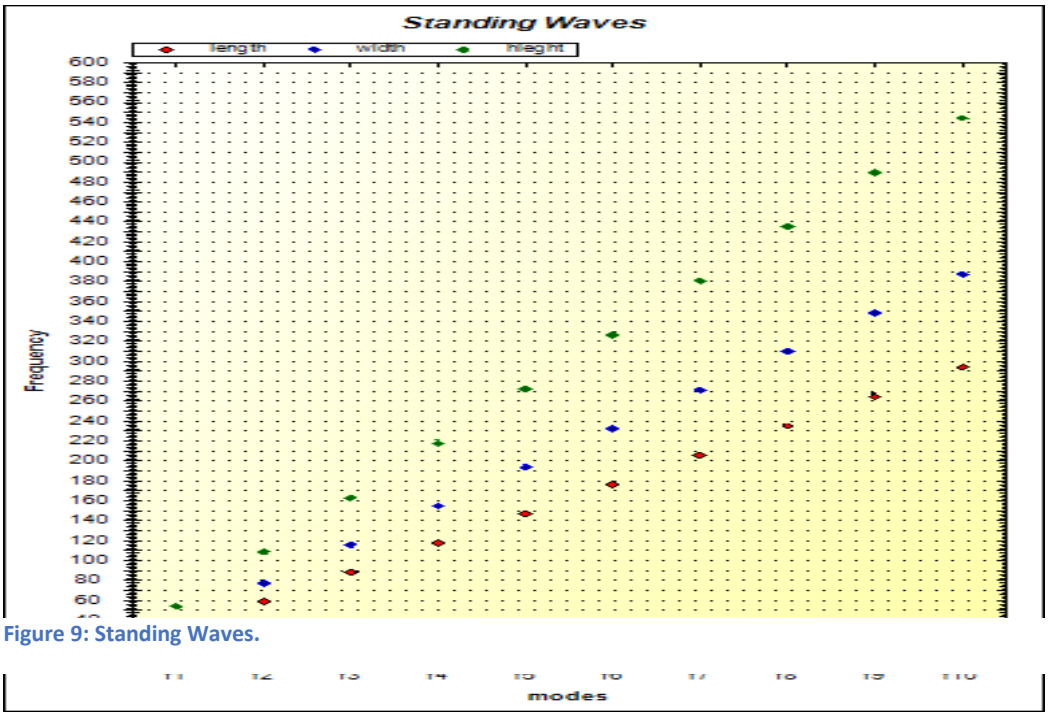

Figure 9: Standing Waves.

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V. Speech Intelligibility.

Frequencies (Hz)	125	250	500	1K	2K	4K
Articulation Loss of Consonants	8.58	5.36	3.85	3.72	3.87	3.94
STI	0.57	0.66	0.73	0.74	0.73	0.73

Conclusion

The first simulation is run for the enosh ASA model. It is found that the RT reaches 0.2 sec at 500 Hz and .19 s at 1 kHz. This is used as the baseline result. The more speech content to the sound, the lower the ideal RT in a room should be. Our panels' materials NRC is 0.8 as it reduce the background noise from 85 dB to 25 dB.

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Material list

ENOSH CEILING TILES

Offers your sound absorption to fit a standard drop ceiling grid system. These absorptive ceiling tiles are constructed of a 6.0 – 7.0 ib fiberglass core faced on one side with your choice of standard Guilford of Maine FR701, style 2100 fabric. The enosh ceiling tiles offer NRC ratings between .80 and 1.15 to help reduce the echo in an area.

FEATURES

- Class 1 fire rated
- Available in a variety of fabric facings (Guilford of Maine FR 701, Style 2100).
- Die cut to fit standard ceiling tile grid systems.

PRODUCT DATA:

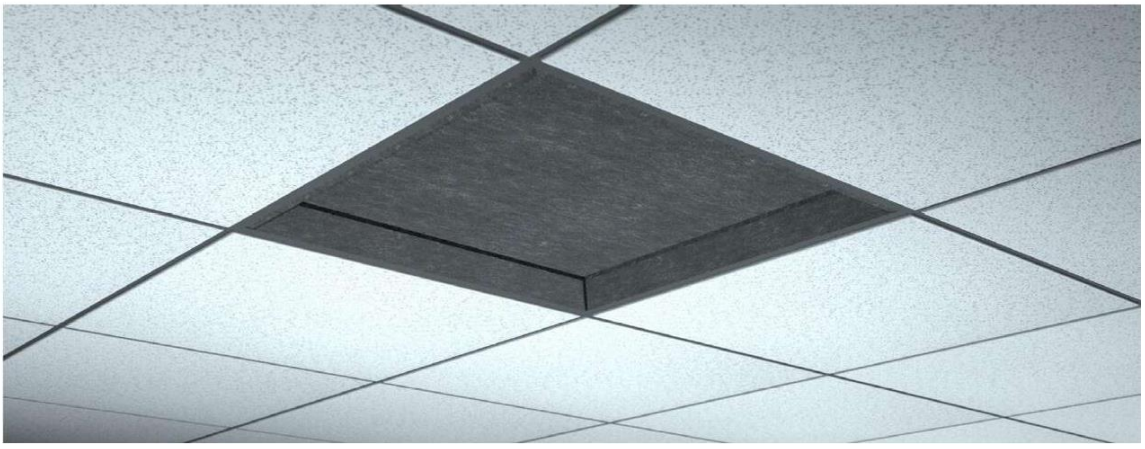
- Description: 6.0 - 7.0 lb pcf fiberglass core faced on one side with a Guilford of Maine FR 701, Style 2100 fabric.
- Available Thicknesses: 1inch OR 2 inch.
- Temperature Range: -20* to + 180* F
- Standard Sizes: 2" × 2" , 2" × 4" , or 30" × 54" (for above ceiling lights)
- Mounting System: Grid System, Molding, or Millwork by others.

APPLICATION:

These panels are typically used to add absorption to an area. By increasing the absorption in the room, the reverberation time in that area will be reducing.

SOUND ABSORPTION DATA (NCR VALUES)

OCTAVE BAND FREQUENCIES (Hz)							
product	125	250	500	1000	2000	4000	NRC
1" thick	.14	.27	.80	1.11	1.14	1.14	.85
2" thick	.22	.81	1.24	1.30	1.21	1.16	1.15



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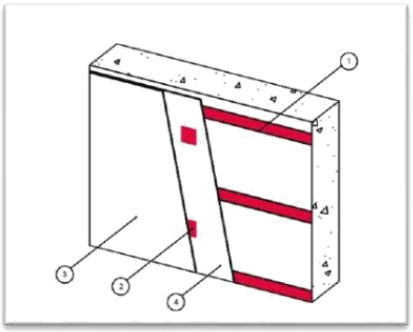
ENOSH WALL ISOLATION

ENOSH-WALL DAMPING CONSTRUCTION –When sound or vibration tries to pass through the walls, floor ceiling of a room, is causes those surfaces and the structure behind each of them to move. When a wall, floor or ceiling vibrates, it changes shape. If Wall Damp is located at the joints, between each of the parts that make up the wall, floor or ceiling, then any movement at all by the wall , floor or ceiling causes a distortion of the wall Damp .This distortion then absorbs energy and any vibration is quieted right down.

Wall Damp's benefits include superior structural damping, easy installation, compatibility with most existing wall systems and cost effectiveness.
Wall Damp is self-adhesive sound and vibration damping material. When applied between studs, joists, drywall and plywood of residential construction projects it produces calm rooms and quiet home, reminiscent of a good old lath and plaster home.

Dumped Block Wall:

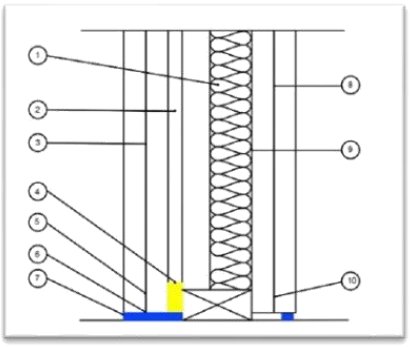
Wall Damped furring strips are applied to existing block wall (concrete wall, CMU wall, etc.) Two layers of wall boards are added with Wall Damp sandwiched in between.



1-WallDamp Strips on furring strips
2-WallDamp squares in between wall boards
3-First layer wall board
4-Second layer wall board

Section, Wall/Floor Detail

Insulation blanket
Damped resilient channel (Drc-1) screw to stud (with RC pad in between)
Wall Damp square between wallboards
Perimeter gasket on sole plate
Wall Damp strip around wall perimeter
Wall bearing felt
Acoustical sealant
Wall Damp square between wallboards
Wall Damp strip on face of joist
Wall Damp strip around wall perimeter



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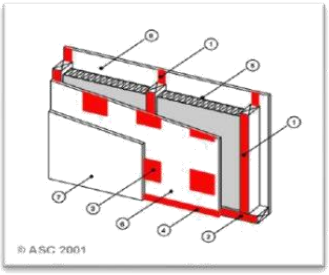
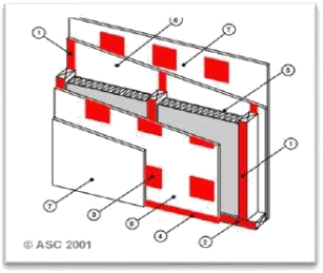
Single Stud / Single Plate: One-Side Heavy



Same as above, but a second layer of wall board is added to one side of the wall, with Wall Damp sandwiched between wall boards.

1. Wall Damp Strips on studs (both sides)
2. WallDamp Strips on plates (both sides)
3. WallDamp Squares between wall boards
4. WallDamp Strips between wall boards
5. Insulation batt in wall cavity
6. First layer wall board
7. Second layer wall board
8. Single layer wall board

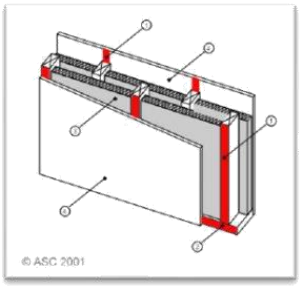
Single Stud / Single Plate: Two-Side Heavy



Same as above, but both sides of the wall have two layers of wall board, with WallDamp sandwiched between wall boards.

1. wall Damp Strips on studs (both sides)
2. wall Damp Strips on plates (both sides)
3. wall Damp Squares between wall boards
4. Wall Damp Strips between wall boards
5. Insulation batt in wall cavity
6. First layer wall board
7. Second layer wall board

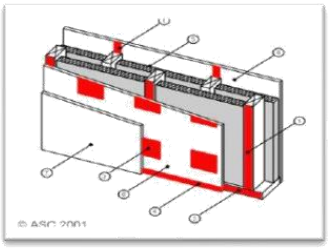
Double Stud / Single Plate: Standard



Wall Damp is added to faces of studs and plates in standard (single wall board), double stud, single plate (staggered studs) construction.

1. Wall Damp Strips on studs (both sides)
2. Wall Damp Strips on plates (both sides)
3. Insulation batt in wall cavity
4. Single layer wall board

Double Stud / Single Plate: One-Side Heavy



Same as above, but a second layer of wall board is added to one side of the wall, with Wall Damp sandwiched between wall boards.

Wall Damp Strips on studs (both sides)
Wall Damp Strips on plates (both sides)
Wall Damp Squares between wall boards
Wall Damp Strips between wall boards

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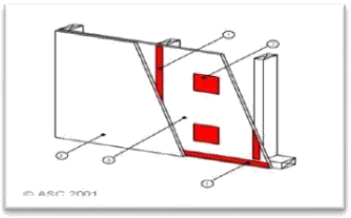
Damped Existing Stud Wall

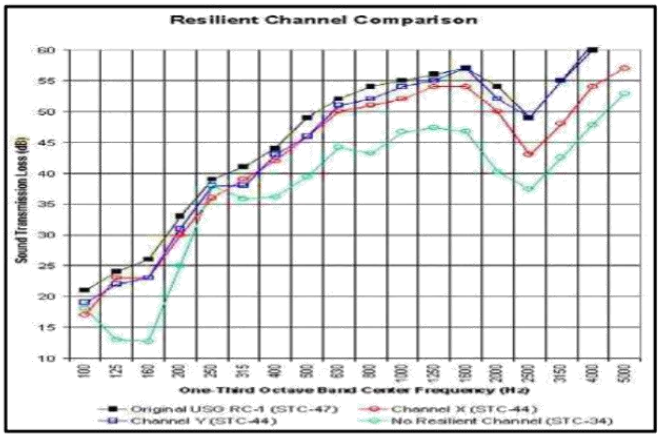
Wall Damp Strips and Squares are applied to existing wall, then a new layer of wall board is added.

1. Wall Damp Strips over locations of studs and plates
2. Wall Damp Squares over existing wall board
3. Existing wall board
4. Added second wall board



Providing excellent performance for a wide range of application such as :

- **Sound recording studios**
- **Cinema halls**
- **Broadcasting studios**



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Enosh Wall Panels

are your answer to your acoustical and aesthetic needs with their strong around absorbing performance, durability and eye-pleasing appearance. These panels are available in a wide variety of sizes, shapes and colors. They allow you to create an effective sound control treatment that is distinctly designed for your environment.

FEATURES:

- Class 1 Fire Rated.
- NCR Rating .85 - 1.15.
- Custom Sizing up to 1200mm' × 600mm' .
- 36Kg - 40Kg per cubic meter density.
- Various mounting system.
- Option for beveled, mitered or radius edges.

PANEL COMPONENT :

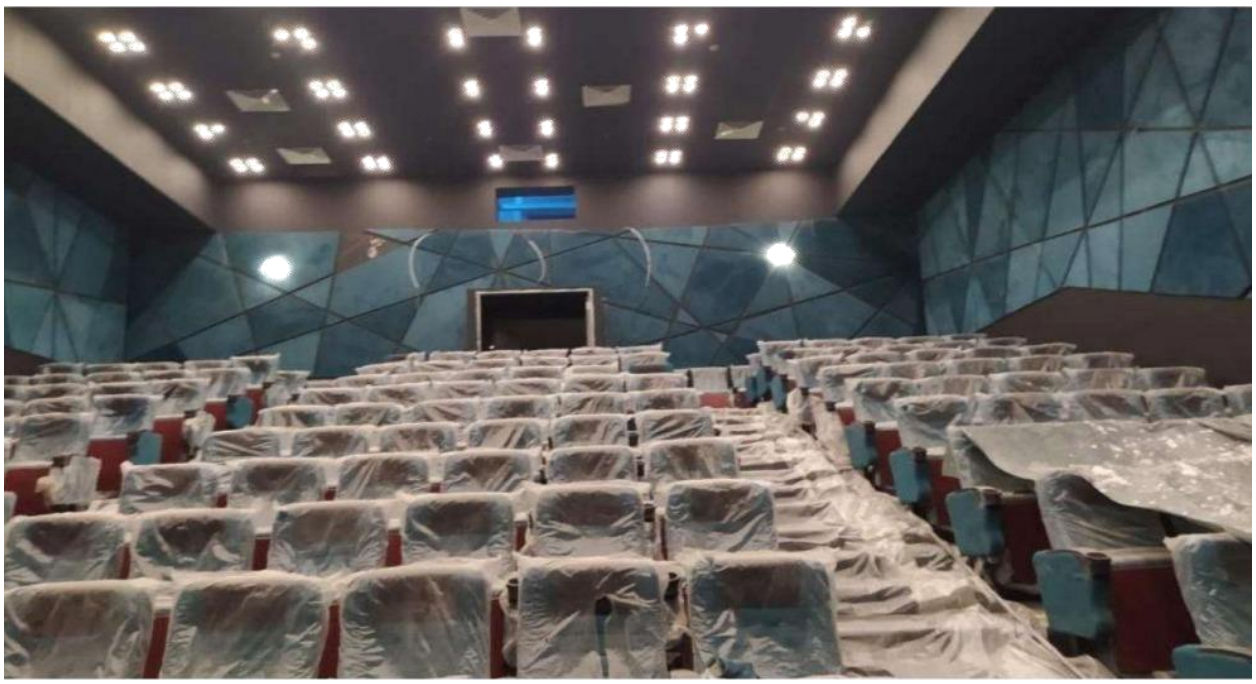
-Acoustic textile.
-Rock wool 5 cm .
-Engineering wood frame 5 CM.
-KLC Film.

APPLICATION:

- Houses of Worship.
- Tele conferencing & Video conferencing.
- Classrooms.
- Broadcast & Recording studios.
- Home theaters.
- Multi-Purpose rooms.

SOUND ABSORPTION DATA (NCR VALUES)

OCTAVE BAND FREQUENCIES (Hz)							
product	**125**	**250**	**500**	**1000**	**2000**	**4000**	**NRC**
1" thick	**.14**	**.27**	**.80**	**1.11**	**1.14**	**1.14**	**.85**
2" thick	**.22**	**.81**	**1.24**	**1.30**	**1.21**	**1.16**	**1.15**



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ENOSH PAINTING

Complete coverage for All your noise and vibration problems.
Enosh Painting as a high performance, viscoelastic coating Used to dampen vibration and reduce unwanted noise.
Vibration and noise energy is dissipated throughout the applied surface.

- Enosh painting is a VOC compliant, water based, non-toxic coating
- Enosh painting has excellent adhesion properties to all surface, including metal, fiberglass, and most plastics.
- Enosh painting is easily applied by using a sprayer, a brush or a roller.
- Clean up is quick with water.
- Use on air ducts, shroud, pump enclosures, engine enclosures, generator covers, sorters, chutes, hoppers, wherever you want to reduce noise.
- Meets or exceeds ASTM E-162, ASTM E-662 and ASTM E84 for surface flammability and smoke density.
- Can be used on all surfaces, including steel, aluminum and fiberglass.
- Will not chip or crack due to expansion or flexing of the substrate to which it is applied.\
- Saves labor, space and time.
- Covers 40 to 50 square feet per gallon at approximately 40 mil. thickness.
- Resistant to gas, oil, and most chemicals.
- Dries to a hard surface while retaining excellent elongation.
- Non-flammable, should it come in contact with flame and it's self-extinguishing.
- Dries to light grey color.

Sound recordings were taken with the blanket in place, time and location noted. The blanket was removed and the panels with Enosh paint installed and the sound readings re-taken from the same time of day

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Metal pump housing test results

condition	time	dBA	Distance	Location	500HZ	1K-HZ	2K-HZ	4K-HZ	8K-HZ	COMMENTS	Average
Enosh paint in place over 5 sides of pump running	9:15	74 77.2	6-10 Inches	top	73.5 70.7	67.8 73.8	68.1 70.5	63.2 65	58 60.4		66.12 68.08
Enosh paint in place over 5 sides of pump while pump running	9:15	75 75.5	2	Front	74.2 70.5	71.8 69.5	70.5 69.6	65.6 65.8	58.8 60.3		68.1 67.1
Enosh paint in place over 5 sides of pump while pump running	9:15	75 73.5	2	Right	73.2 69.9	78.5 70.8	70 66.7	68.4 64.3	62.5 59.9	Right side of pump as you face it over shuttle system of machine	70.52 66.3
Enosh paint in place over 5 sides of pump while pump running	9:15	75 72.5	2	Left	72.7 70	68.7 69	66.1 66.3	65 62.8	59.7 57.8	Left side of pump as you face it is approx. 10 from wall and desk	66.4 65.1

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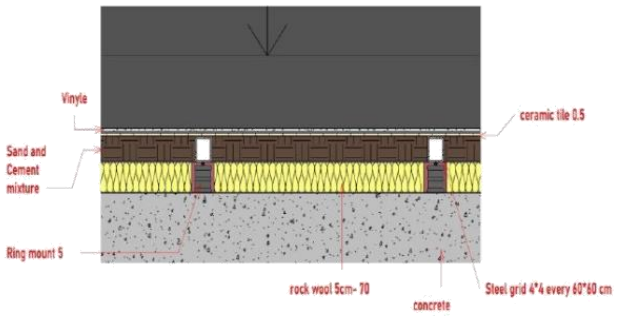
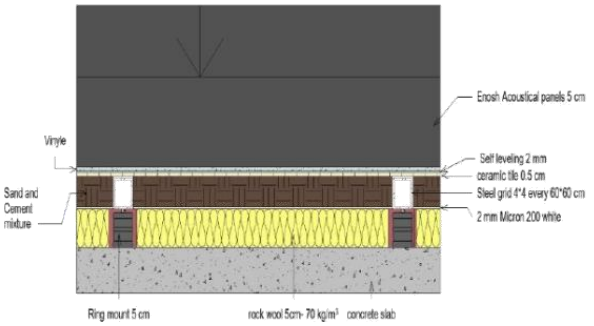
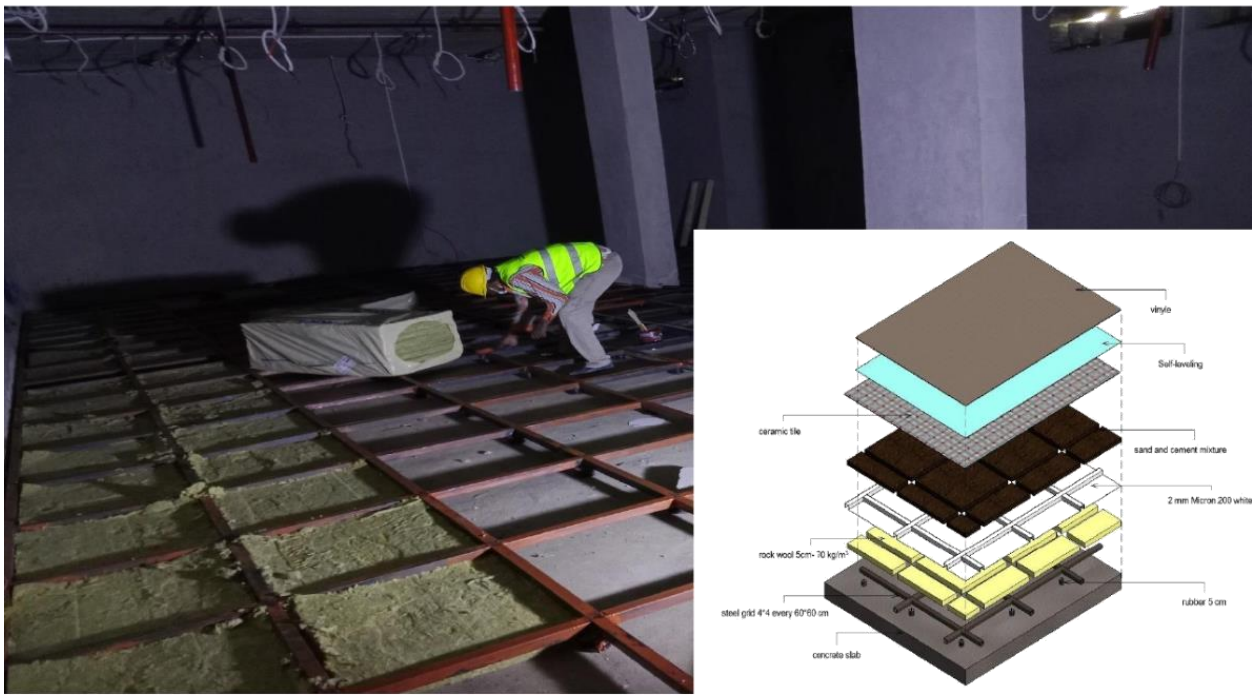
Floating Floor

Floating floors have become increasingly popular for many types of floor coverings.
Floating floors are flooring installations in which the flooring material "floats" over the subfloor and underlayment.
Due to its ease and simplicity, floating floor installation saves money and helps installation go a lot faster, making it a favorite method for DIYers. But a good floating floor installation requires a perfectly prepared subfloor, and in some instances, it can have a hollow feeling underfoot that is less pleasing than the solidity of nailed-down hardwood or bonded ceramic tile.







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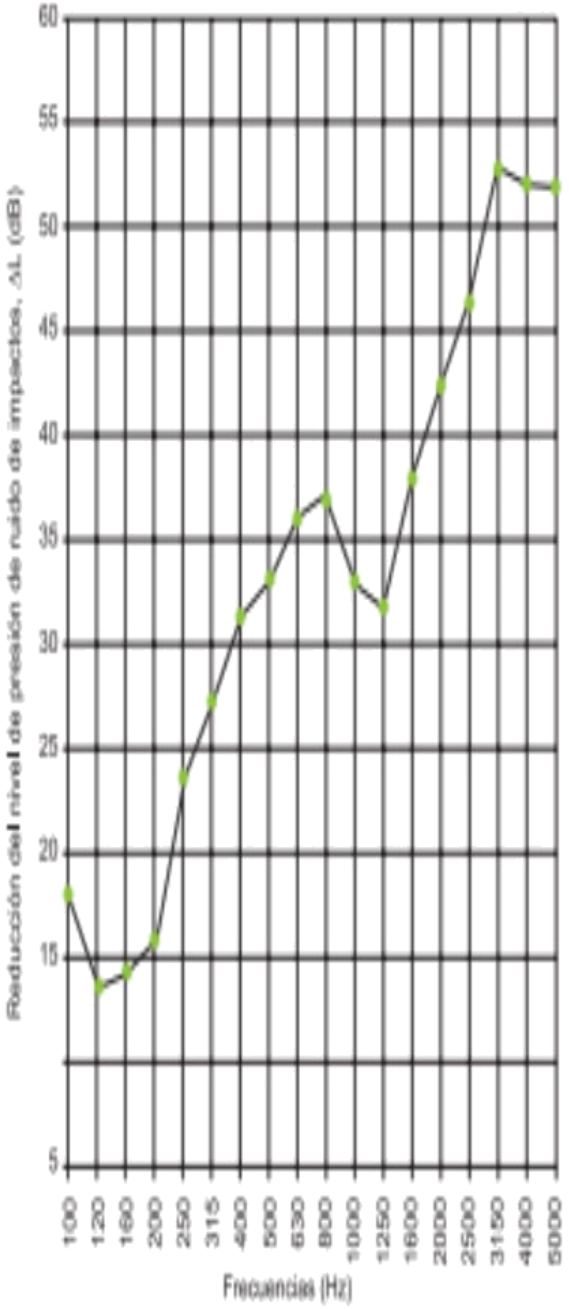

f (Hz)	L_n (dB)	$L_{n,0}$ (dB)	ΔL (dB)
100	47,2	65,1	17,9
125	46,9	60,5	13,6
160	53,2	67,5	14,3
200	49,5	65,3	15,8
250	41,8	65,4	23,6
315	37,3	64,7	27,4
400	34,5	65,9	31,4
500	34,3	67,5	33,2
630	31,9	68,0	36,1
800	32,9	70,1	37,2
1000	37,3	70,4	33,1
1250	38,9	70,7	31,8
1600	32,5	70,5	38,0
2000	27,8	70,3	42,5
2500	22,9	69,3	46,4
3150	15,3*	68,1	52,8*
4000	14,1*	66,2	52,1*
5000	11,6*	63,9	52,0*
$L_{n,w}$ / $L_{n,0,w}$	41	76	

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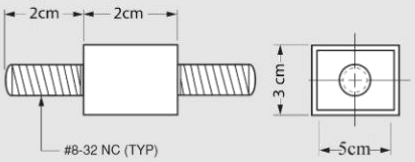
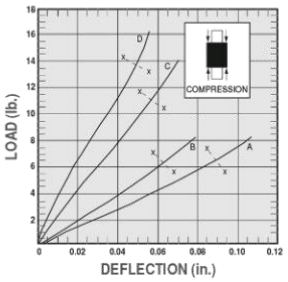
Rectangle Mounts – To 13.8 lbs.

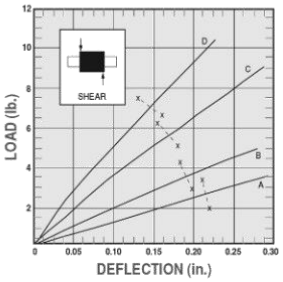


NOTE: Dimensions in ( ) are mm.

NOTE: Maximum unthreaded portion of stud does not exceed 1/16 inch (1.59 mm).

LOAD DEFLECTION GRAPHS
Deflections below the line x–x are considered safe practice for static loads; data above that line are useful for calculating deflections under dynamic loads.





Catalog Number	Mode	Maximum Load lb. (kgf)	Forcing Frequency in Cycles per Minute									
			1100	1250	1500	1750	2000	2250	2500	2750	3000	3600
			Minimum Load for 81% Isolation lb. (kgf)									
V10Z 1-321A	Compression	5.1 (2.3)	—	—	—	5.1 (2.3)	3.9 (1.8)	3.1 (1.4)	2.6 (1.2)	2.1 (1)	1.8 (0.8)	—
	Shear	2.6 (1.2)	2.4 (1.1)	1.8 (0.8)	1.3 (0.6)	.9 (0.4)	.7 (0.3)	.6 (0.27)	*	*	*	*
V10Z 1-321B	Compression	6.4 (2.9)	—	—	—	—	5.5 (2.5)	4.3 (2)	3.4 (1.5)	2.8 (1.3)	2.4 (1.1)	1.8 (0.8)
	Shear	3.6 (1.6)	3.4 (1.5)	2.8 (1.3)	1.9 (0.9)	1.4 (0.6)	1.0 (0.5)	.8 (0.4)	.7 (0.3)	.6 (0.27)	*	*
V10Z 1-321C	Compression	11.1 (5)	—	—	—	—	11.0 (5)	8.7 (3.9)	7.1 (3.2)	6.0 (2.7)	5.1 (2.3)	3.8 (1.7)
	Shear	5.7 (2.6)	—	4.9 (2.2)	3.6 (1.6)	2.9 (1.3)	2.2 (1)	1.8 (0.8)	1.5 (0.7)	1.3 (0.6)	1.1 (0.5)	.9 (0.4)
V10Z 1-321D	Compression	13.8 (6.3)	—	—	—	—	—	12.3 (5.6)	10.3 (4.7)	8.9 (4)	7.7 (3.5)	5.9 (2.7)
	Shear	7.1 (3.2)	—	7.0 (3.18)	5.1 (2.3)	3.9 (1.8)	3.1 (1.4)	2.6 (1.2)	2.1 (1)	1.8 (0.8)	1.6 (0.7)	1.2 (0.54)

*At these forcing frequencies, lesser loads will yield less than 81% isolation.

APPLICATIONS

- COMPRESSORS
- PUMPS
- BLOWERS
- TRANSFORMERS
- LIGHTWEIGHT MACHINES
- OFFICE EQUIPMENT
- MEASURING INSTRUMENTS
- SCALES

- Acoustical floating floar
- Acoustical floating ceiling
- Acoustical floaing wall

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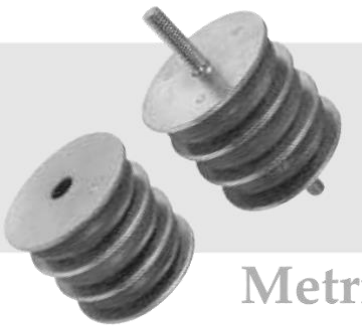
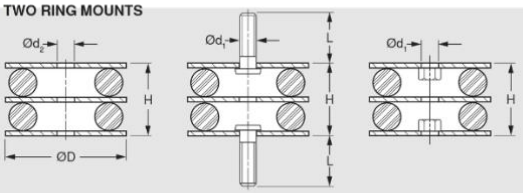
Ring Mounts



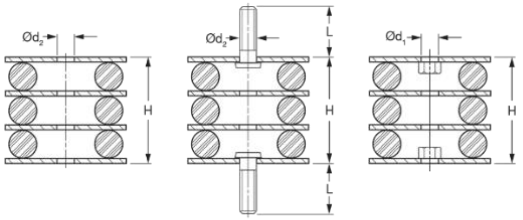
Metric

TWO RING MOUNTS



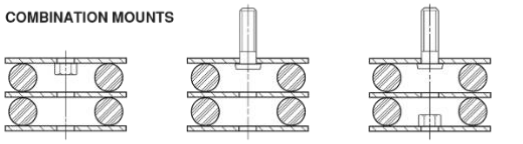
Style 2HH | Style 2BB | Style 2NN

THREE RING MOUNTS



Style 3HH | Style 3BB | Style 3NN

COMBINATION MOUNTS



Style HN | Style HB | Style BN

NOTE: These combination mounts shown above are also available with three rings.

FEATURES:
- Low natural frequency
- Constant natural frequency in a wide range of load
- Excellent stability
- Multiple layers are possible
- Very easy to install

CATALOG NUMBER DESIGNATION

V10Z47MRM □□□□□□

Load Code

Mounting Style: (see drawings at left)
HH, BB, NN, HN, HB or BN

Load Code No.	Rings	Load Range: Standard Load kgf	Standard Load lb.	Lower Limit... Upper Limit kgf	Lower Limit... Upper Limit lb.	Defl. with Std. Load mm	Defl. with Std. Load in.	*Nat. Freq. (cpm)	D mm	D in.	H mm	H in.	d_1 Thread	d_2 mm	d_2 in.	L mm	L in.
0602	2	75	165	25...100	55...220	11	.43	450	60	2.36	35	1.38	M8	11	.43	30	1.18
0603	3					15	.59	370			51	2.00					
0802	2	150	331	50...200	110...441	14	.55	380	80	3.15	46	1.81	M10	13	.51		
0803	3					20	.79	320			67	2.64					
1202	2	300	661	100...400	220...882	20	.79	310	120	4.72	66	2.60	M12	15	.59	35	1.38
1203	3					30	1.18	260			97	3.82					
1602	2	600	1322	200...800	440...1763	27	1.06	270	160	6.30	86	3.39	M16	19	.75	55	2.17
1603	3					41	1.61	220			126	4.96					
2302	2	1200	2645	400...1600	882...3526	38	1.50	230	230	9.06	114	4.49	M16	19	.75	55	2.17
2303	3					57	2.24	190			168	6.61					

*The natural frequency of 1 layer is 2 layers natural frequency x $\sqrt{2}$

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