



GALLOWAY ACOUSTICS

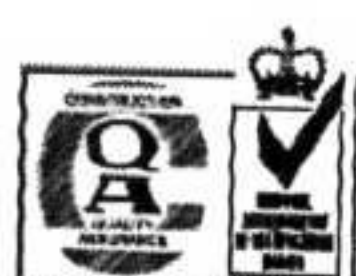
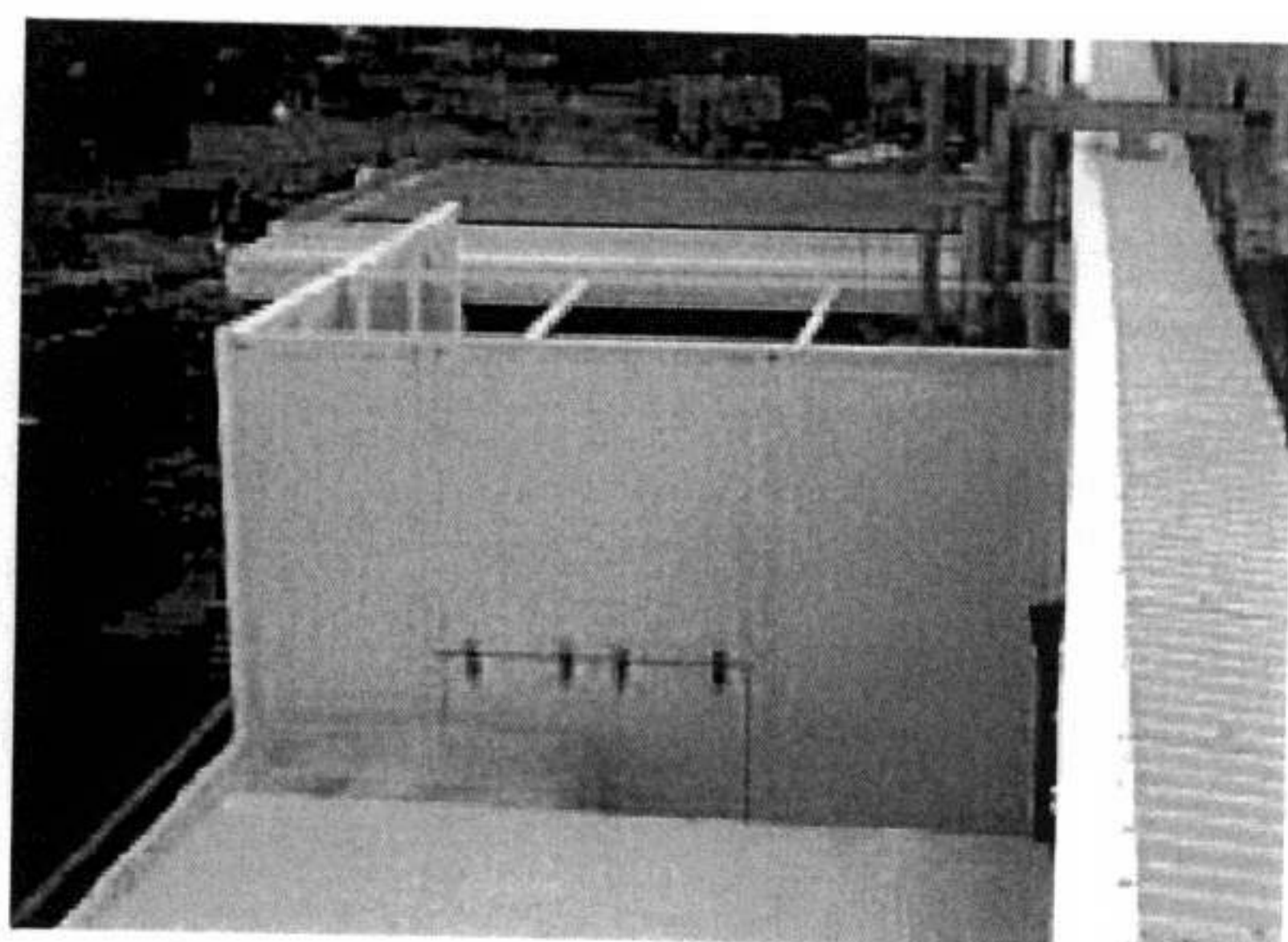
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AUGUST 2002	



ACOUSTIC ENCLOSURES & SCREENS

Other product ranges available from Galloway Acoustics are:

- Rectangular Silencers
- Cylindrical Silencers
- Acoustic & Non Acoustic Louvres
- Special Ducting Components
- Metal Acoustic/Fire Doors
- Acoustic Materials
- Vibration Isolators
- Inertia Bases
- Floating Floors
- Acoustic Consultancy/Design
- On Site Technical Services



Introduction

With the advent of more onerous legislation relating to noise pollution and a greater awareness of the dangers to health of over exposure to excessive noise levels, the whole issue of noise control is ever expanding.

Hence the control of unwanted noise associated with industrial machinery and building services equipment is a huge problem and one which can be more expensive than originally envisaged when the purchase of industrial machinery is planned and building services schemes are designed.

Often an initial commercial evaluation may deem such capital expenditure as unproductive and hence "dead" money. Whilst this may seem the case, some of the long term effects of noise exposure are reduced employee health, resulting in an increase of absenteeism, reduced worker efficiency and poor verbal communication on the shop floor, the results of which can add heavily to the operating overheads of a business. At the other scale, external noise pollution can cause poor relationships with local residents, which can often lead to management time being consumed in an effort to resolve such situations, which ultimately if not actioned, can lead to an unwanted entanglement with the local environmental health department.

Galloway Acoustics feel the early inclusion of acoustic assessment in any new scheme that may involve potential noise control issues, can only be a "common sense" approach. We are always on hand to assist you in ensuring that this task is carried out both efficiently and professionally.

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Standard Construction Specifications and Designs available

Galloway Acoustics enclosure/screen systems are based upon five standard panel designs coded 1 to 5, type 1 being of the lowest acoustic performance and type 5 the highest. The differences between panels 1 and 5 are created by the application of varying infill components into the standard panel thicknesses.

Standard panels are manufactured from pre-galvanised sheet steel. Enclosed within the panel and retained by 0.7mm perforated sheet would be acoustic media Attenufill based on a composite Rockwool LR45 (45kg/m³) slab infill protected by a durable layer of glass fibre tissue with a fibre diameter some 12.5 microns thick, glued to the rockwool face.

Attenufill properties are as follows:-

Operating Temperature - suitable for a maximum continuous operating temperatures up to 850°C.

Fire Performance - non-combustible when tested in accordance with BS476 Part 4 1970 Class O to Building Regulations achieving Class 1 (surface of very Low Flame Spread) when tested in accordance with BS476 Part 7 1987 and are required indices of performance to BS476 Part 6 1981.

Thermal Conductivity - Tested in accordance BS874

Thermal conductivity W/mk					
Mean Temperature °C					
10	25	50	100	150	200
0.033	0.035	0.038	0.049	0.061	0.079

Durability - Attenufill is inert, non-hygroscopic, rot-proof, odourless, vermin proof and does not encourage the growth of fungi, mould or bacteria.

Sound Absorption Co-efficients at Frequency Hz

		125	250	500	1000	2000	4000	NRC
LR45	50mm	0.25	0.65	1.05	1.10	1.05	0.95	0.96
	75mm	0.50	1.05	1.20	1.15	1.10	0.95	1.13
	100mm	0.80	1.15	1.20	1.15	1.15	1.00	1.16

NRC (Noise Reduction Co-efficient) average co-efficient over the frequency range 250 - 2000 Hz inclusive.

The panel types 1 to 5 can be incorporated into three construction systems primarily aimed at different applications.

These are:-

H-Frame - A cost effective industrial enclosure/screen system with a versatile number of panel connection methods.

Pentapost - High acoustic performance system with a quality aesthetic appearance. Used primarily for enclosure/screen systems that require architecturally pleasing details (fixings can be hidden) coupled with good acoustic performance.

Frameless/Site Assembly System - Primary applications for this system are internal constructions, many of which require differing aesthetic finishes applied to the internal/exposed panel face such as audiology rooms, recording studios, music practice rooms, permanent room partitions. Other applications include large industrial enclosures such as automotive spray paint booths.

General

All of the above systems can be used for either external or internal applications. Each system can incorporate a complete turn key design including such features as windows, single and double leaf doors, access panels, entry plates, ventilation (forced and natural), electrical services (i.e. lights and fire alarms), load bearing support steelwork and many aesthetic finishes.

The acoustic performance of both the H-Frame and Pentapost designs have been tested using a 75mm thick panel for all five available panel types. The frameless/site assembly system was tested using a 100mm thick panel, again across all five-panel types. In our opinion and as indicated during these tests the difference in panel performances for the same panel type from 75 to 100mm is marginal and as such performance figures for 75mm panels can be used where a 50mm panel thickness is required.

It is important to note that Galloway Acoustics have tested each panel type /construction system and not just a solid panel. Thus the figures shown which include at least 2 panel joints in the test system (acoustic weak spots) can be considered worst case results and hence reflect a 'real life' situation.

The acoustic tests were carried out at Salford University to a UKAS accredited standard and in accordance with BS EN ISO 140-3 1995. The results can be seen on following pages.

Construction Options

The following show some of the basic options available, many of which can be seen on the enclosure and screen-coding sheet that follows this section.

- M** Acoustic infill encapsulated in a hermetically sealed Melinex bag (no glass fibre tissue is used in this case).
- GLW** Glass fibre tissue to all surfaces of acoustic media.
- PP** Polyester powder paint to any standard BS or RAL colour, with standard definition of gloss level being: -

Gloss	80%
Semi-gloss	60%
Matt	30%

Variations to the above levels to BS standards could be +/- 10% i.e. 70-90% for gloss.

Unless otherwise advised Galloway Acoustics will use a standard 60% or semi-gloss finish.

E	Denotes Enclosure	M	Acoustic media encapsulated within a hermetically sealed melinex bag
S	Denotes Screen	GLW	Glass Cloth Wrap to all faces of acoustic media
50/75/100	Panel Thickness – please specify	SS	Support Steelwork
1-5	Panel System Performance – 1 is lowest, 5 is highest	PP	Polyester Powder Painted to any standard BS or RAL colour
H	H-Frame System Standard (internal application)	SPF	Other paint finishes to be specified
H/FS	H-Frame System Fully Sealed (external application)	SD	Single Door
P	Pentapost (internal/external application)	DD	Double Door
SA	Site Assembly System Double Seal Neoprene (internal application)	WI	Windows
SA/FS	Site Assembly System Single Seal Neoprene Fully Sealed (external application)	EP	Entry Plates
B	Denotes bolt together connections for SA or SA/FS system	AP	Access Panels
CL	Denotes Camlock connections for SA or SA/FS system	NS	Non standard – refer to Drawing and Schedule
PG	Pre-Galvanised Sheet Steel construction		
ALI	Aluminium Sheet construction only		
ST/ST	Stainless Steel construction (steel type ie. 304 or 316 to be determined)		
FFS	Fenland Firespray finish		

An example of the coding system is as follows:-

An acoustic enclosure constructed using the pentapost frame system with the highest panel performance using a pre-galvanised sheet steel 75mm thick panel inclusive of a sealed melinex bag complete with polyester powder paint finish, single door, window and access panel would be:

E-75-5-P-PG-M-PP-SD-WI-AP

Acoustic Design, Selection & Contract Procedure

Unlike selecting other traditional acoustic components such as silencers and louvres, enclosure and screen acoustic calculations and product design are often more complicated, with many varying factors having to be considered. This may involve both the effective ventilation of the machinery/equipment being treated and of the vibrational effects emanating from that very plant upon the acoustic treatment being proposed.

Galloway Acoustics Technical Sales Staff are on hand to assess your project details, carry out full acoustic calculations, including on site assessment and measurement of existing equipment that requires acoustic consideration and both select and design the right system for the application in question, all of which is ultimately (subject to a contract being placed with Galloway Acoustics for the equipment offered) backed by Professional Indemnity Insurance cover.

In addition to the design services offered, Galloway Acoustics can provide a professional and skilled installation service. This is complimented by comprehensive Public and Employers Liability Insurance and Working Practices compliant with all relevant and current COSHH and Health at Work Safety Standards. Detailed Method Statements are provided for each specific project undertaken by Galloway Acoustics. All contracts are project managed by an experienced engineer who will co-ordinate the design for approval, manufacture, despatch and "on site" installation programme.

Attenuation due to Screen

Additional Path Difference	63	125	250	500	1k	2k	4k	8k
-0.30	1	0	0	0	0	0	0	0
-0.20	2	1	0	0	0	0	0	0
-0.10	3	2	1	0	0	0	0	0
-0.05	3	3	2	1	0	0	0	0
-0.01	4	4	4	3	3	2	1	1
0.00	5	5	5	5	5	5	5	5
0.01	5	6	6	6	7	8	8	8
0.05	7	7	8	9	10	12	13	13
0.10	7	8	9	10	11	14	16	16
0.20	8	9	10	11	14	16	19	19
0.30	8	9	10	13	16	18	20	20
0.40	9	10	12	14	17	20	22	22
0.50	9	10	12	15	18	20	23	23
1.00	11	12	14	18	20	23	25	25
2.00	14	15	18	20	24	27	29	29
3.00	15	17	20	22	25	28	30	30
4.00	16	18	20	24	26	30	31	31
5.00	16	18	21	25	27	30	32	30

Note: The sound reduction index of the screen system/construction must be higher than the screening effect required or the envisaged noise reduction will not be achieved.



GALLOWAY ACOUSTICS

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ATTENUATE[®] SILENCERS

ENCLOSURE ACOUSTICS CALCULATION

Project: CATALOGUE EXAMPLE

EN: XXXX

STEP		RECEIVER IN FREE FIELD (Enclosure reverb. Field Contribution)											
1		Source Sound Power Level			dB		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
		Enc. Type	1	ACOUSTIC	Volume	75	m ³ If enclosure is acoustic, reverb. level ignored above 500Hz						
		Enclosure Dimensions: w= 5 m h= 5 m l= 3 m											
2		Enclosure Room Correction					Near Field Corr					1	
3		Reverberant Sound Pressure Level (SPL rev)					-10	-12	-14	-21	0	0	0
4		Subtract Enclosure SRI					70	63	60	52	0	0	0
5		Enclosure Area Correction (10logA-6)		A =	14	m ²	23	24	29	40	44	48	51
6		Enclosure SWL (=SPL rev+10logA-6-SRI encl.)					52	44	36	17	-39	-43	46
7		Dist. Correction, Encl. Centre to Receiver			3.5	m	22	22	22	22	0	0	0
8		Enclosure Directivity Correction											
9		Add 0, 3, 6 or 9dB Surface Directivity			3	dB	3	3	3	3	0	0	0
10		Subtract Encl. Near Field Correction					-2	-2	-2	-2	-2	-2	-2
11		Subtract Screening Correction											
12		Direct SPL at Receiver					32	24	16	-3	-41	-45	-48

		RECEIVER IN FREE FIELD (Enclosure Direct Field Contribution)			63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
a	Source Sound Power Level	dB			80	75	74	73	72	72	69
b	Subtract Enclosure SRI				23	24	29	40	44	48	51
c	Dist. Correction, Source Centre to Receiver	3.5	m		-22	-22	-22	-22	22	22	22
d	Source Directivity Correction										
e	Add 0, 3, 6 or 9dB Surface Directivity	0	dB		0	0	0	0	0	0	0
f	Subtract Source Near Field Correction				-2	-2	-2	-2	-2	-2	-2
g	Subtract Screening Correction				0	0	0	0	0	0	0
h	Direct SPL at Receiver				33	27	21	9	4	0	0
j	Total Direct SPL at Receiver in Free Field				35	29	22	9	4	0	0
* obtained by log. Addition of Step 12 and Step h.											

		RECEIVER IN REVERBERANT FIELD (Enclosure Reverb. And Direct Field Contribution)								
STEP		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz		
i	Source Sound Power Level	dB		80	75	74	73	72	72	69
ii	Subtract Enclosure SRI	23	24	29	40	44	48	51		
iii	Enclosure SWL (due to Encl. Direct Field)	57	51	45	33	28	24	18		
iv	Enclosure SWL, see step 6 (due to Encl. Rev. Field)	52	44	36	17	-39	-43	-46		
v	Total Encl. SWL (log. Addition of step iii and iv)	58	52	46	33	28	24	18		
vi	Volume of Reverberant Area	2000	m ³		-19	-19	-19	-19	-19	-19
vii	Rev. Time of Reverberant Area	1	secs		0	0	0	0	0	0
viii	Reverberant SPL at Receiver	39	33	27	14	9	5	0		
**ix	Total SPL at Receiver	41	34	28	15	10	6	3		
** Obtained by log. Addition of Step i and viii										

Resultant Single Figure dBA = **23 dBA**

ACTION REQUIRED

No further action required to achieve NR30.
Use enclosure type E-100-3-SA

NR70	91	83	77	73	70	68	66
NR65	87	78	72	68	65	62	61
NR60	83	74	68	63	60	57	55
NR55	79	70	63	58	55	52	50
NR50	75	65	59	53	50	47	45
NR45	71	61	54	48	45	42	40
NR40	67	57	49	44	40	37	35
NR35	63	52	45	39	35	32	30
NH30	59	48	40	34	30	27	25
NR25	55	44	35	29	25	22	20

Completed By: M. Decibel

Date: XXXXX

H-Frame System

There are two types of H-Frame system designs. One is a standard based on integral neoprene compression seals between panel to panel and panel to frame connections. The other being based on a single neoprene compression seal in conjunction with a mastic/silicone (fully sealed system) seal applied to the front and back of the joint. Predominantly the fully sealed system is used for external applications. However as the acoustic performance is higher than the standard, can be used for internal applications requiring a slightly higher level of performance where a H-Frame system is the preferred panel jointing system.

Acoustic Performance Figures

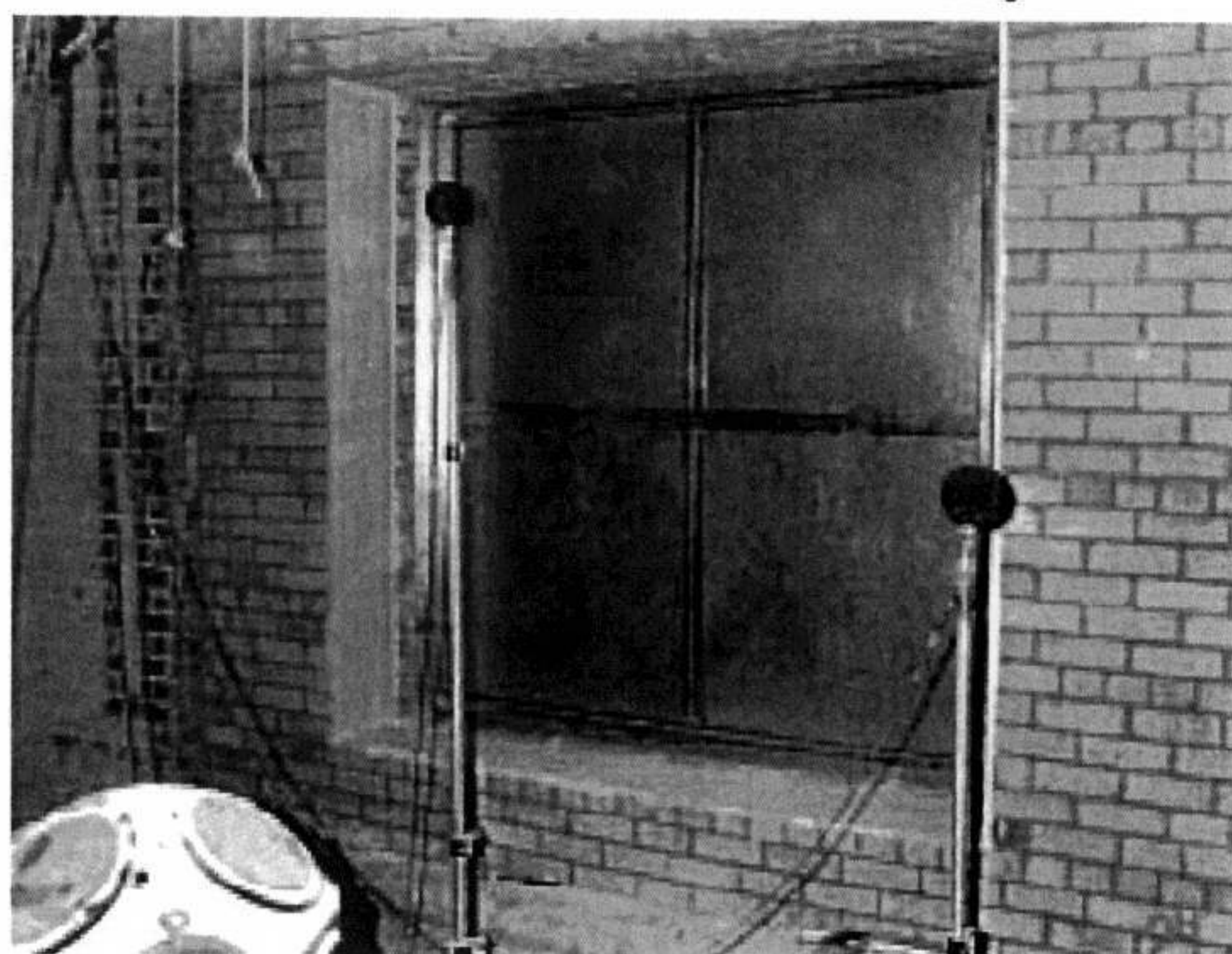
H-Frame Standard - Sound Reduction Index

Panel System	Fr	63	125	250	500	1k	2k	4k	8k	RW
E50/75-1-H	dB	16	18	22	29	31	34	36	35	31
E50/75-2-H	dB	17	19	24	31	30	35	37	36	32
E50/75-3-H	dB	22	22	27	33	33	37	40	39	35
E50/75-4-H	dB	22	23	29	36	40	43	45	44	37
E50/75-5-H	dB	24	25	30	36	40	43	45	44	39

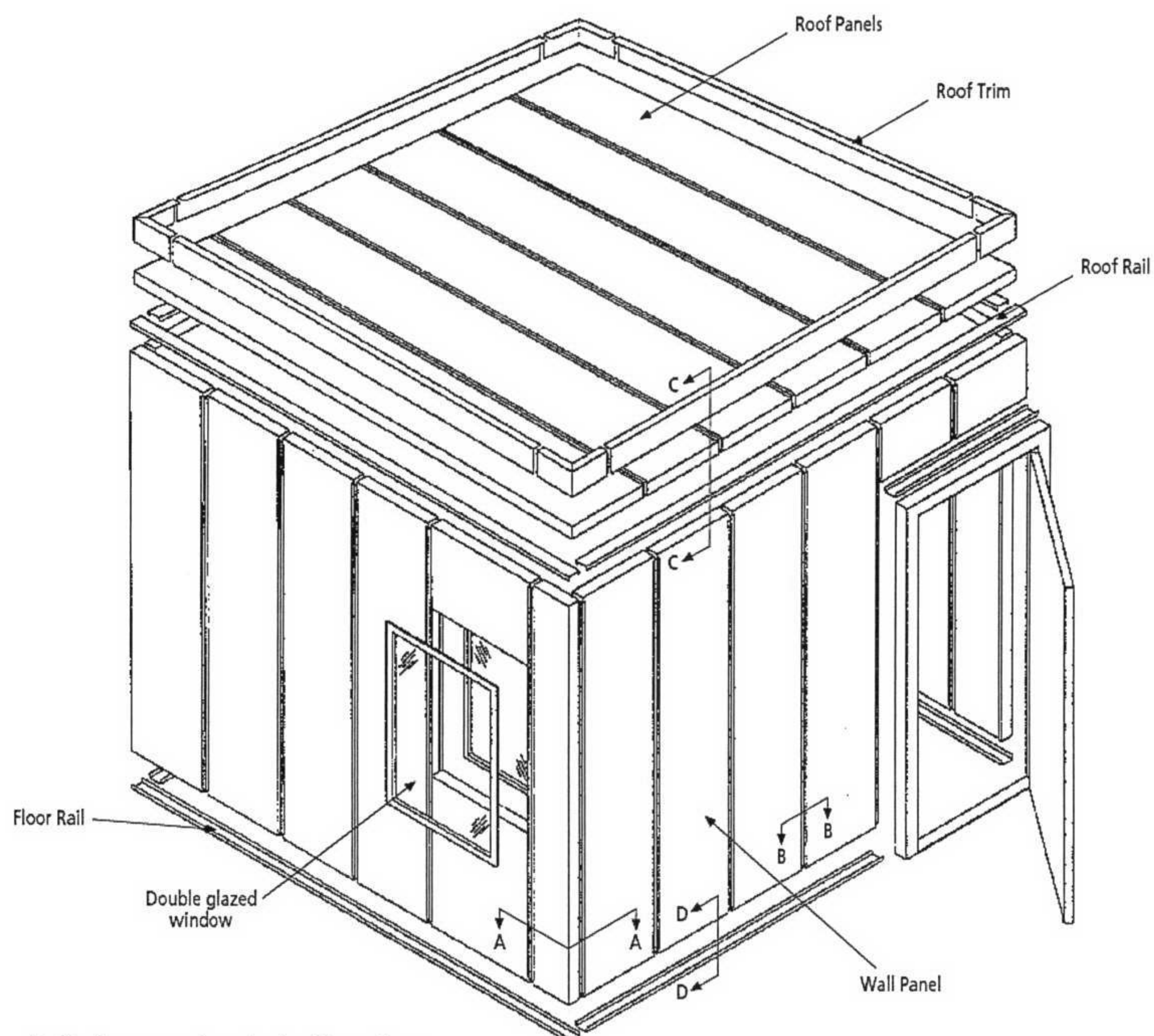
H-Frame Fully Sealed - Sound Reduction Index

Panel System	Fr	63	125	250	500	1k	2k	4k	8k	RW
E50/75-1-H/FS	dB	17	19	25	34	43	50	52	51	37
E50/75-2-H/FS	dB	19	21	27	37	46	52	54	53	39
E50/75-3-H/FS	dB	22	23	29	37	46	52	54	53	43
E50/75-4-H/FS	dB	23	24	30	41	47	52	54	53	43
E50/75-5-H/FS	dB	25	26	32	42	47	53	54	53	44

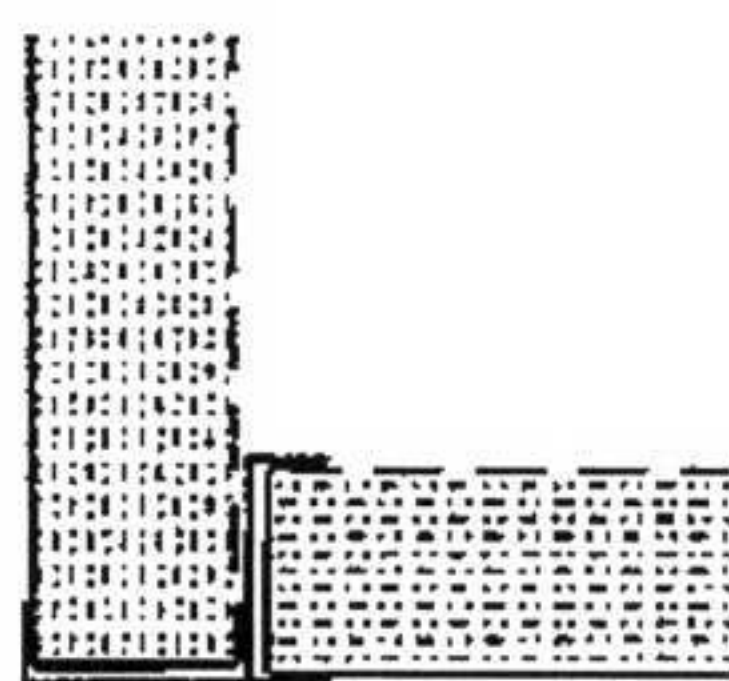
H-Frame acoustic testing



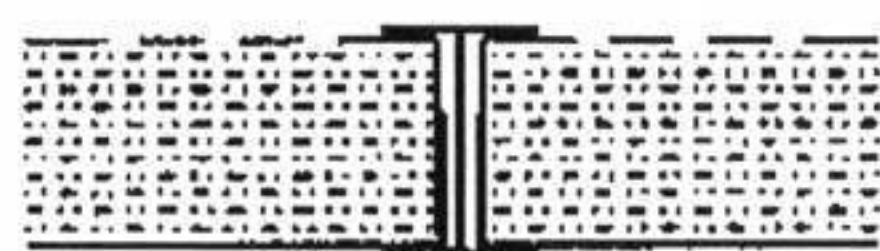
H-Frame Panel Construction



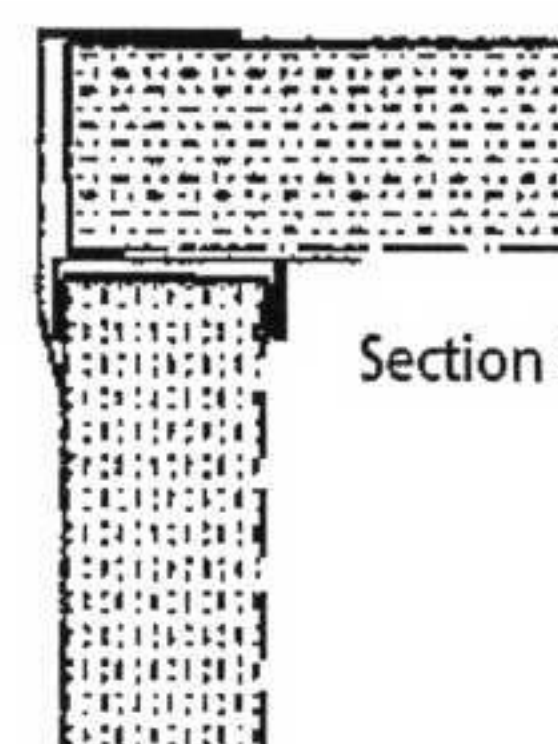
Bolted, screwed or riveted together system based on H-Frame Steelwork Support System



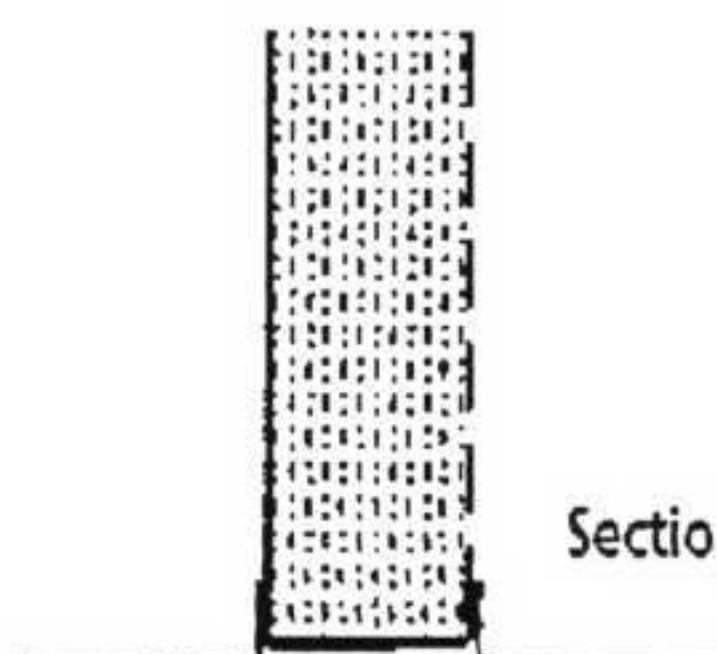
Section A-A



Section B-B



Section C-C



Section D-D

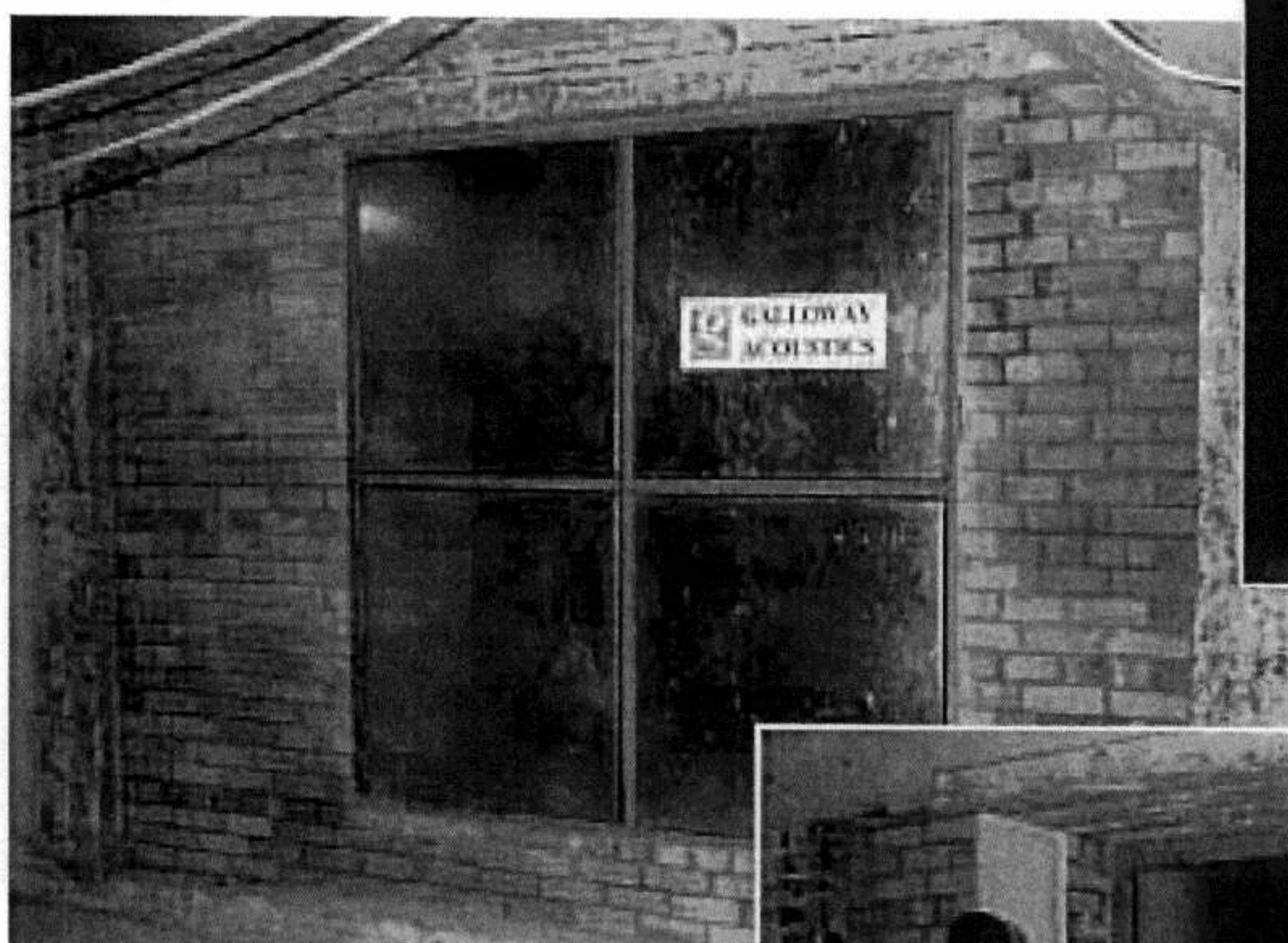
Pentapost Frame System

The pentapost frame system has one standard design based on integral neoprene compression seals fitted between panel to panel and panel to frame connections. The system is aimed at providing a pleasing aesthetic appearance and more readily demountable construction for applications such as equipment enclosures for high maintenance machinery and the OEM market.

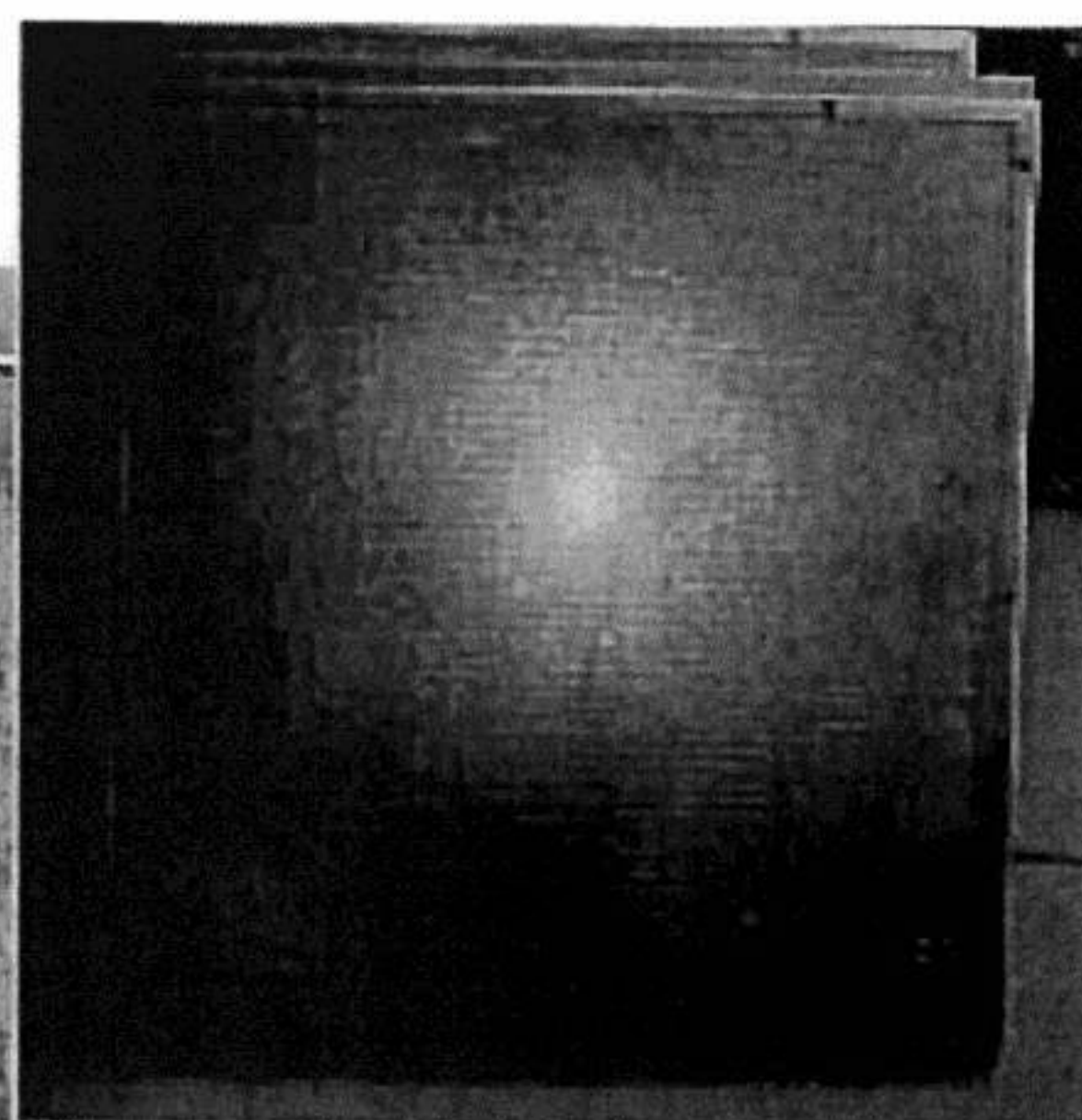
Acoustic Performance Figures

Pentapost Frame System - Sound Reduction Index

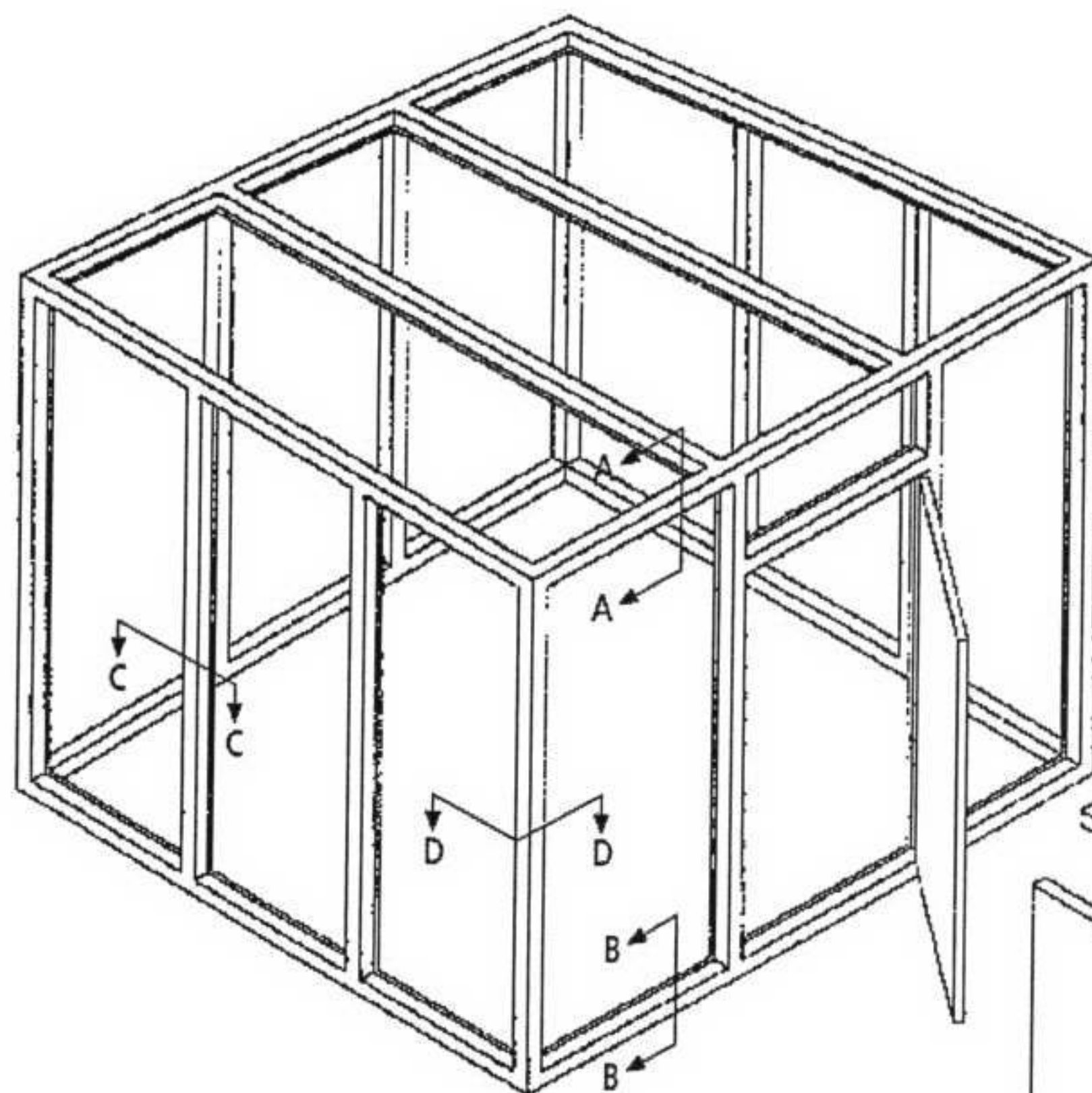
Panel System	Fr	63	125	250	500	1k	2k	4k	8k	RW
E50/75-1-P	dB	17	19	24	30	36	44	44	43	34
E50/75-2-P	dB	18	20	25	32	38	44	45	44	36
E50/75-3-P	dB	21	23	29	35	38	44	45	44	38
E50/75-4-P	dB	22	24	30	35	38	44	45	44	38
E50/75-5-P	dB	23	25	31	36	38	44	45	44	39



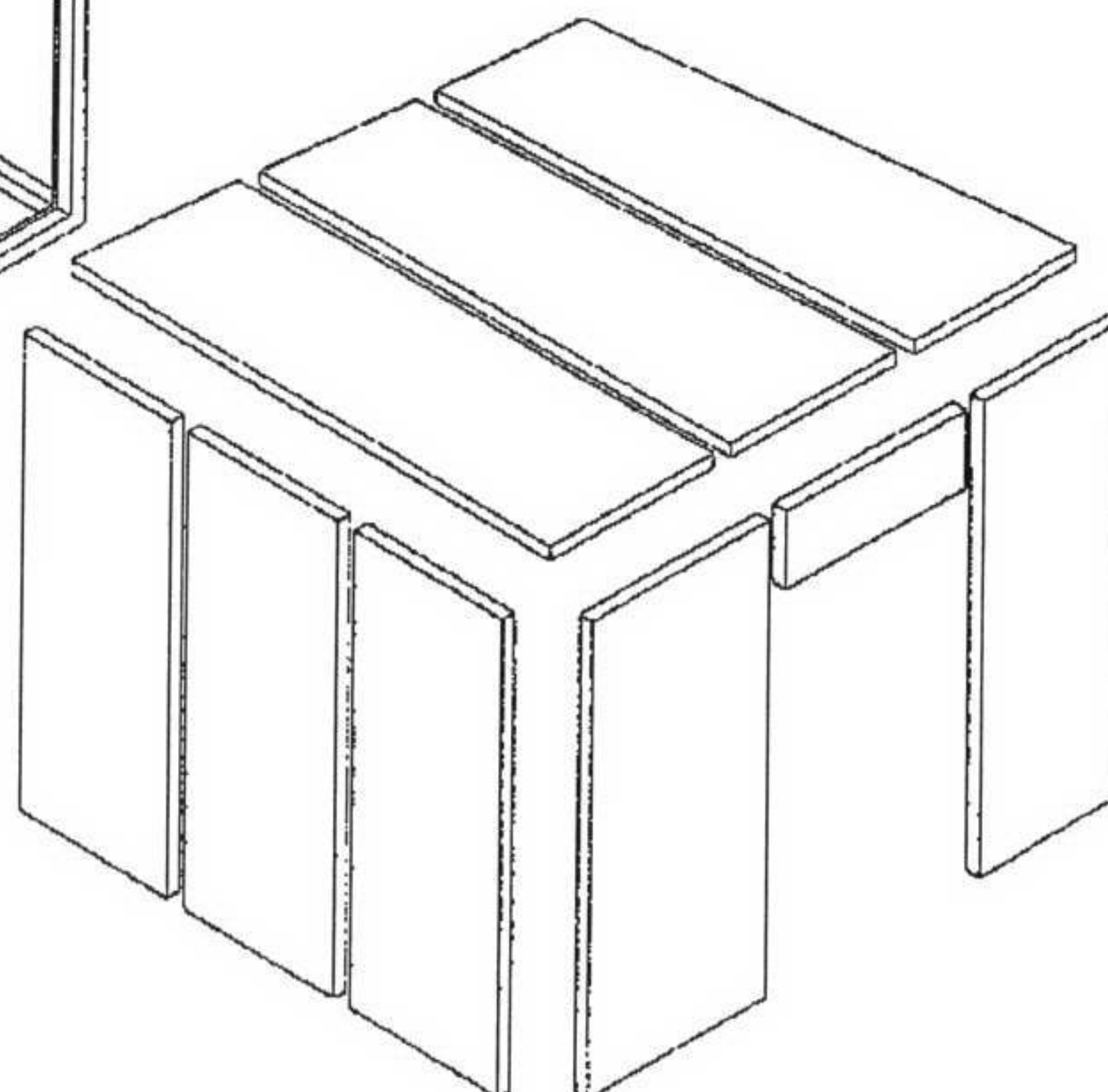
Pentapost Frame acoustic testing



Pentapost Frame Panel Construction

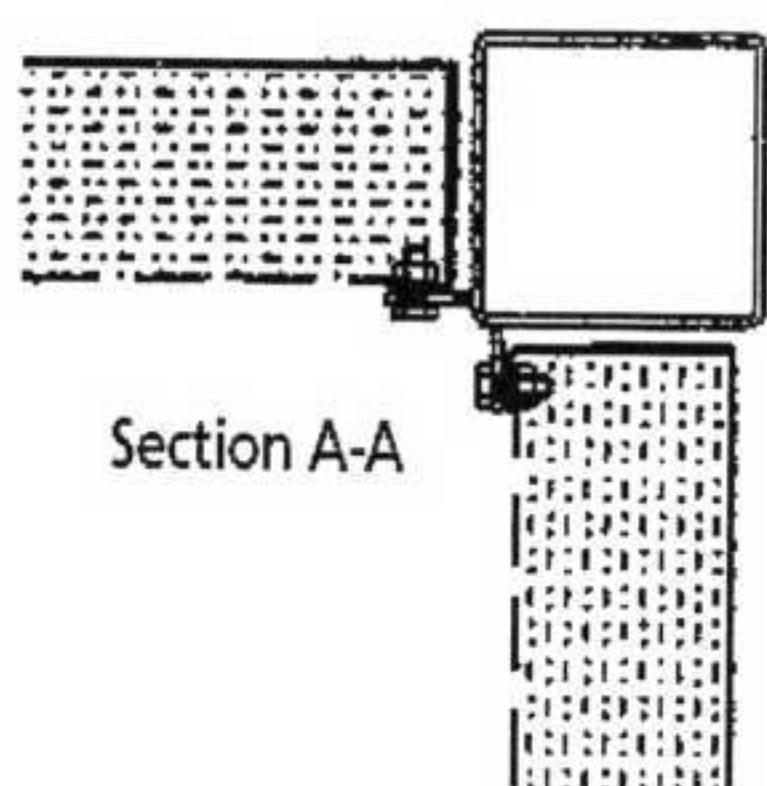


FRAMEWORK LAYOUT

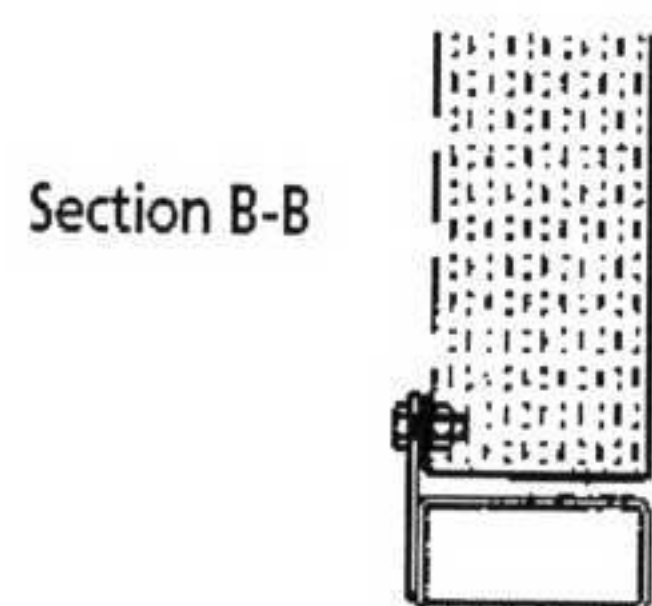


PANEL LAYOUT

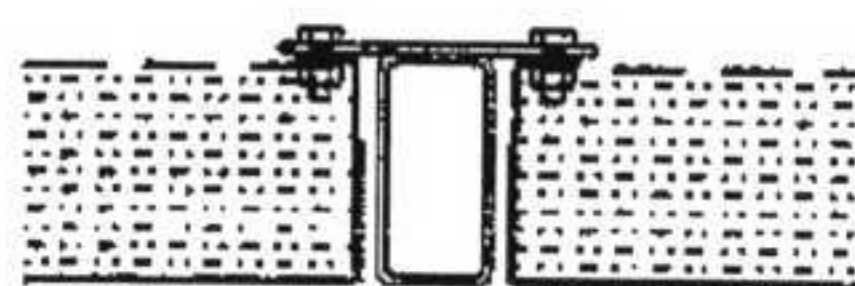
This system is generally a bolt together construction



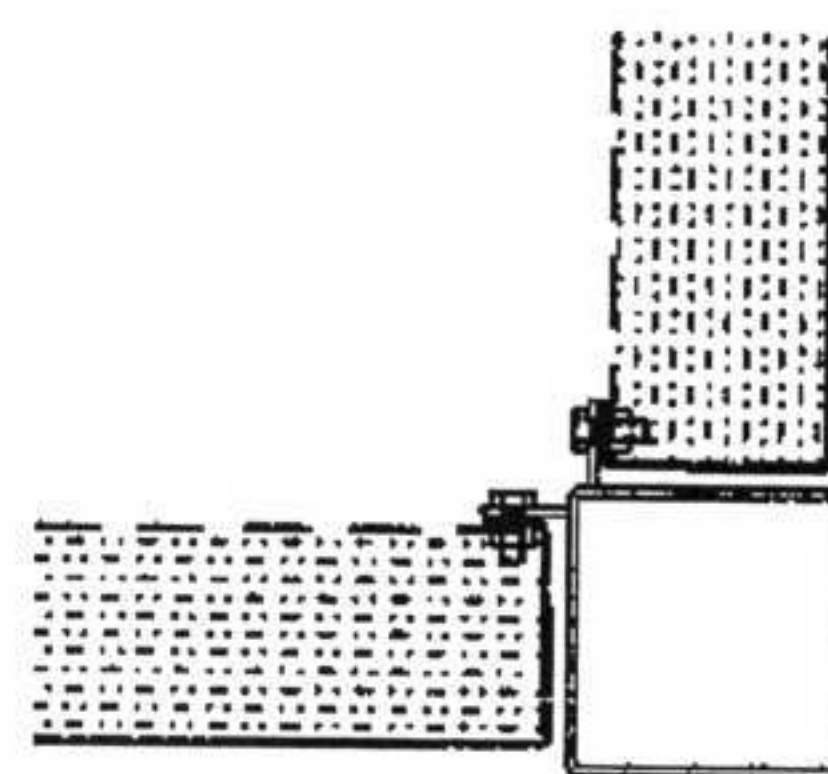
Section A-A



Section B-B



Section C-C



Section D-D

Frameless/Site Assembly System

There are two types of Frameless/Site Assembly system designs. As with the H-Frame these are based on a standard which in this case is a double high performance neoprene compression seal system. The second is for external applications and includes a single, low-performance neoprene compression seal system in conjunction with a mastic/silicone weather seal applied to the external face of all joints.

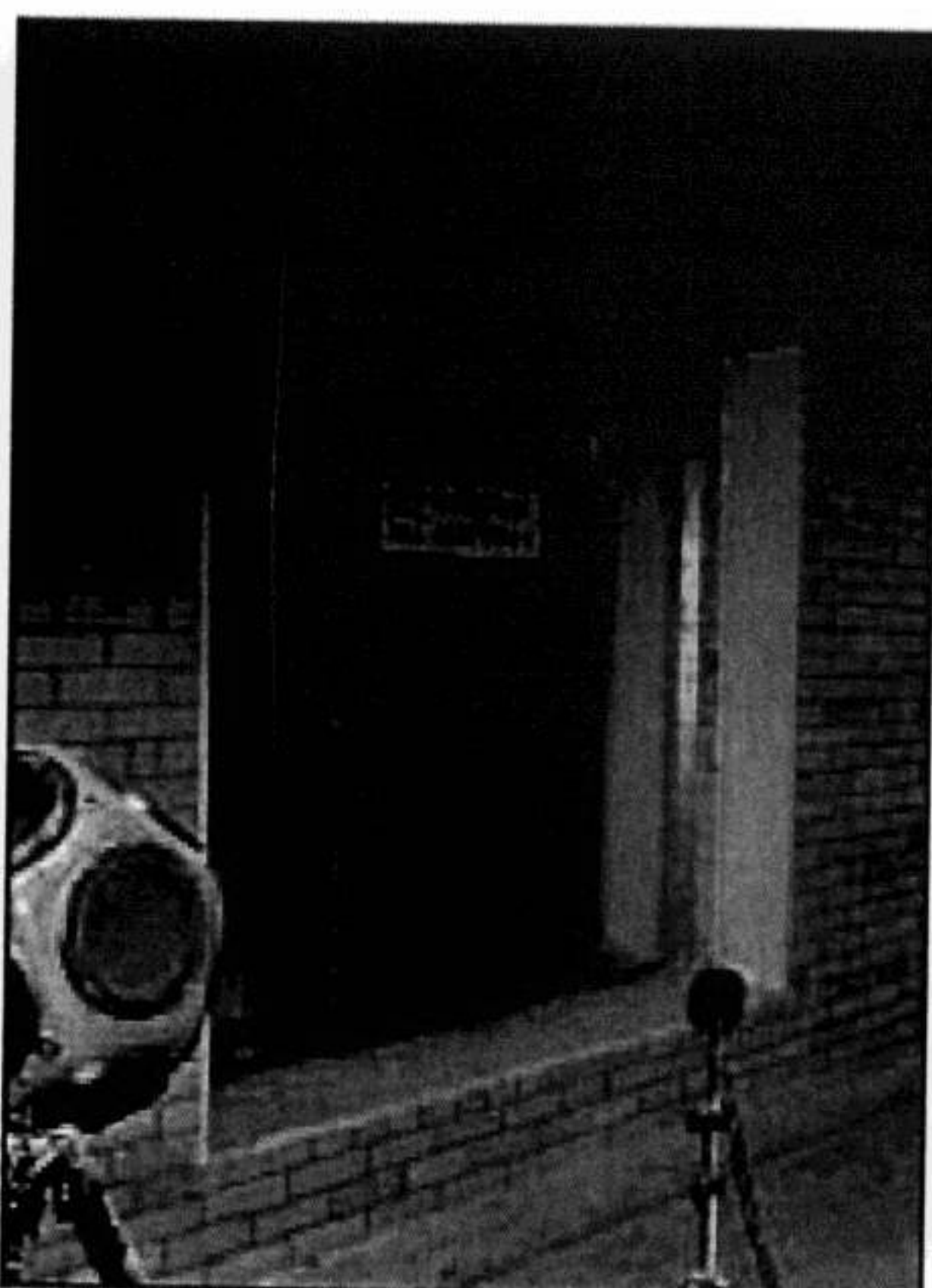
Acoustic Performance Figures

Sound Reduction Index

Panel System	Fr	63	125	250	500	1k	2k	4k	8k	RW
E-100-1-SA	dB	19	19	24	36	44	48	50	49	38
E-100-2-SA	dB	21	21	27	38	45	48	51	50	40
E-100-3-SA	dB	23	24	29	40	45	48	51	50	41
E-100-4-SA	dB	23	25	31	42	47	49	51	50	43
E-100-5-SA	dB	24	27	32	42	47	49	51	50	44

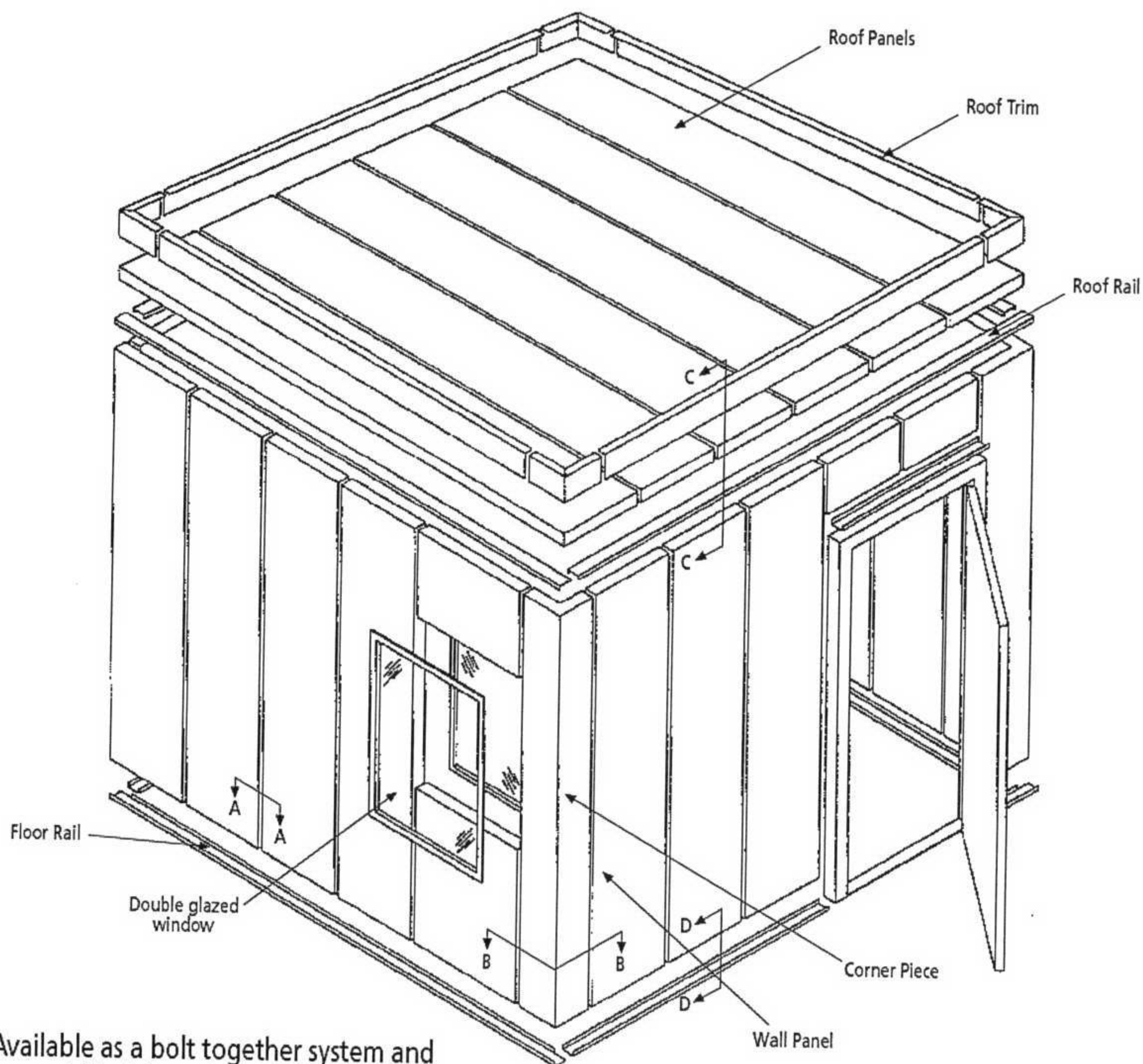
Sound Reduction Index

Panel System	Fr	63	125	250	500	1k	2k	4k	8k	RW
E-100-1-SA/FS	dB	19	19	24	36	43	47	47	46	37
E-100-2-SA/FS	dB	20	20	25	37	44	47	46	45	38
E-100-3-SA/FS	dB	22	22	27	39	45	50	49	48	41
E-100-4-SA/FS	dB	23	23	28	40	47	51	51	50	42
E-100-5-SA/FS	dB	24	24	30	41	47	51	51	50	43



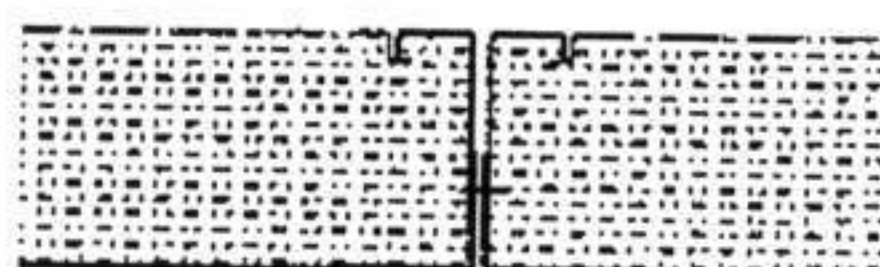
Frameless/site assembly acoustic testing

Frameless/Site Assembly Panel Construction

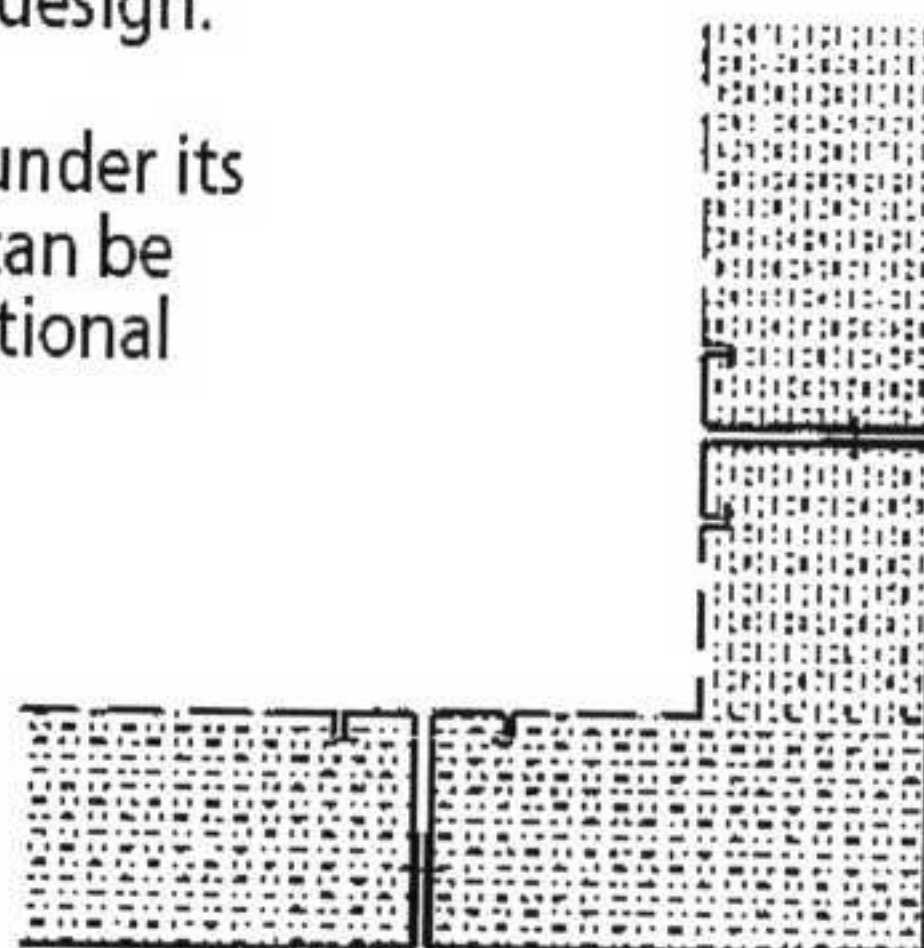


Available as a bolt together system and as a quicklock fastening system. Standard panel thickness is 100mm. Also available in 75mm thick panels and other thicknesses as a non standard design.

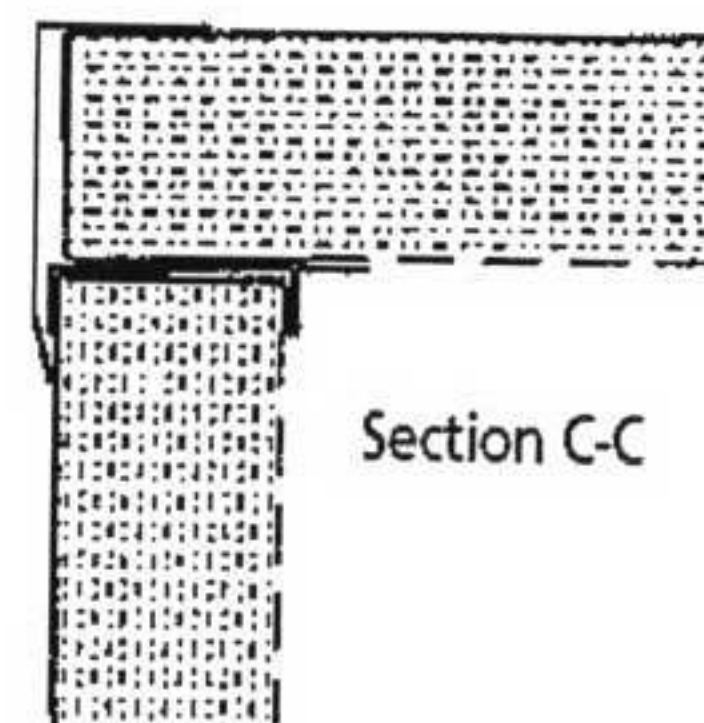
This system is self supporting under its own weight. Structural loads can be imposed but may require additional support steelwork.



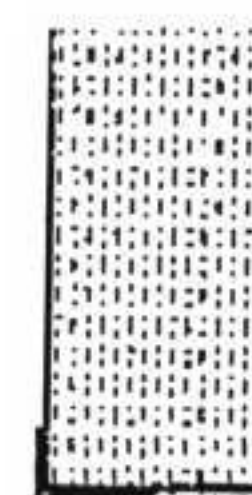
Section A-A



Section B-B



Section C-C



Section D-D

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