LITEPANEL

BY LITECRETE PHILIPPINES

LIGHTWEIGHT CONCRETE SANDWICH WALL PANEL

Scan to visit our website

Scan to see videos & TDS

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Product Benefits

70% lighter than the normal concrete. A lightweight sandwiched panel that can be easily carried and installed.

The sandwich panel has 2 hours of fire protection. It meets the national standard for safety.

Live in comfort with the aerated concrete core. Rooms stay cooler saving you on energy costs.

Reduces sound transmission when used as a partition wall. Keep spaces quiet with ease.

The concrete core offers better pull out strength. Feel confident when installing appliances and cabinets.

Tongue and groove system allows 2-3x faster installation compared to other walling materials.

+63 917 700 2750
+63 908 812 3053
sales@liteblock.ph
www.litepanel.ph

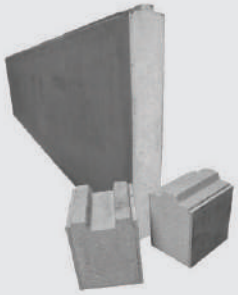
LITEPANEL

BY LITECRETE PHILIPPINES

FASTER • LIGHTWEIGHT • LOW COST • ECO FRIENDLY

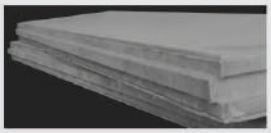
SAVE TIME AND MONEY ON YOUR NEXT PROJECT

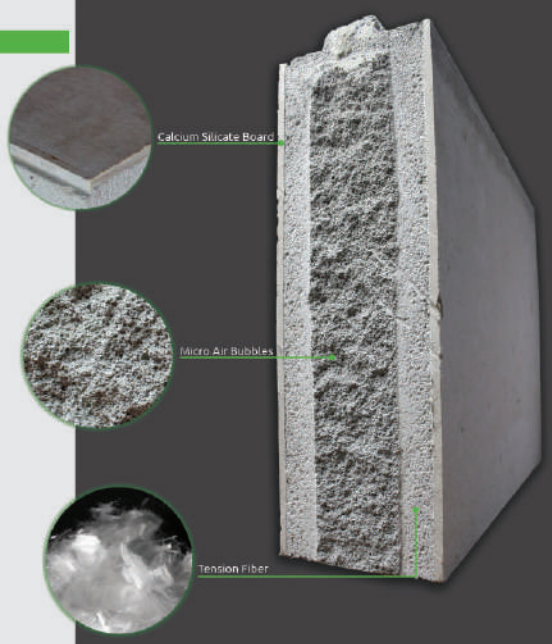
The product



Litepanel is an innovative lightweight walling product that is designed to increase efficiency and reduce installation time.

It is made out of lightweight concrete sandwiched between two calcium silicate boards. This gives its distinctive durability while maintaining a level and smooth surface.





installation

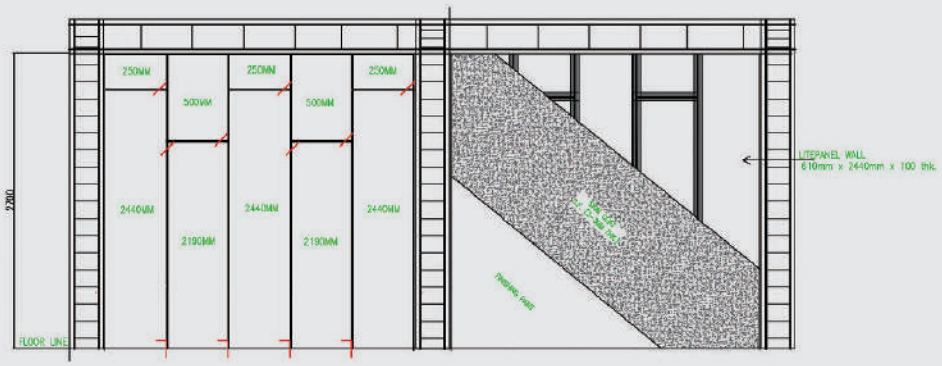


FIGURE 3 : 2700mm WALL HEIGHT

Litepanel size	
4"	0.61m x 2.44m x 0.1m
6"	0.61m x 2.44m x 0.15m
Weight per panel	
4"	115 kgs
6"	170 kgs
Raw materials	Sand, Cement, Tension Fiber, & Calcium Silicate Board
Dry density	750 kg/m^3
Compressive Strength	400-500 psi
Sound Insulation	STC -45dB to 50dB
Installation time	2-3x faster
Fire resistance	Over 2 hours fire rating
Water Absorption	Low water absorption

"Build 2-3x times faster than your typical walling material"

LITEPANEL
TECHNICAL DATA SHEET

PRODUCT DESCRIPTION:

LITEPANEL is a non-load bearing lightweight concrete sandwich panel. It offers better thermal insulation, sound proofing, and fire resistance than your typical walling material.

The innovative panel is intuitive in design which speeds up installation time.

SPECIFICATIONS:

Size: 0.61m x 2.44m x 0.1m
0.61m x 2.44m x 0.15m

RAW MATERIALS:

Air entrained mortar (sand & cement) + Tension Fiber and Calcium Silicate Board

CUSTOMER BENEFITS:

Quick to install | Economical | Thermal Insulation | Sound Insulation | Lightweight | Workable | Strong & Durable

PROPERTIES:

Color	:	Gray
Toxicology	:	Non-Toxic
Workability	:	Yes
Pullout Strength		
8mm Expansion Bolt	:	180.49 kg
10mm Expansion Bolt	:	204.96 kg
Compressive Strength (ASTM C513)	:	400-500 psi
Acoustical Test (ASTM E336)	:	STC -57 dB
Fire Rating (ASTM E119)	:	Over 2 Hours
Water Absorption (ASTM C1585-13)	:	6%
NSCP Standard	:	Passed
Weight		
0.61 m x 2.44m x 0.1m	:	115 kgs
0.61 m x 2.44m x 0.15m	:	167 kgs
Density	:	750 km/m3
Board	:	Calcium Silicate Board

INSTALLATION METHOD:

1. Marking lines for installation
Based on the given plan, layout the reference lines for Litepanels, doors, and window openings using visible marks on the floor, wall, slab, and soffit.

2. Applying Litepanel adhesive
Using a wet sponge, moisten the surface on which the adhesive is going to be laid on. Mix the adhesive well to minimize shrinkage. After, apply a layer of Litepanel Adhesive to the floor, wall and on the sides of the Litepanel. Ensure that all the joints are fully filled. The compaction is important since the adhesive, while hardening, tends to shrink slightly and thus pull away from the edges of the block.

3. Installation of Litepanel
Lay the first Litepanel into the right position. Lever from the bottom of the litepanel using crowbar to ensure tight adhesion. Use a 2M level to check the panel flatness and straightness.

4. Fixing Litepanel
Temporary fix the Litepanel with wooden wedges and place. After, drill a L shape, 9mmx180mmx75mm, 90° rebar dowel. Apply a concrete epoxy on the dowel before attaching it to the slab, column or soffit.

5. Cutting Litepanels
The standard size of Litepanel is 2440mm x 608mm x 100/150. When the wall height or length is smaller than the Litepanel size, cut the panel using circular saw or electric Sabre Cutter to the appropriate size and then install.

To install the second panel on top of the first, apply adhesive and then insert 180mm x 9mm dia. bar from a 45° position to fix both panels together. Connect the panel to the soffit by attaching an L shape 9mmx200mmx75mm, 90° rebar.

6. Do the similar procedure for the succeeding panels.

7. Applying PU sealant
The masonry should be cured for at least 3 days before applying Litepanel flexible sealant. For anti-crack tape/mesh tape (optional), allow the masonry to dry for 3 days before rendering over it. This is the best practice to minimize cracks.

8. Slotting and Wiring
An electric saw or grinder and chisel is used to cut and create grooves for switch boxes, wires and pipes. Any gaps left behind can be filled with Litepanel Adhesive.

9. Corner interlocking set-up of Litepanel is recommended unless otherwise specified.

10. Litepanel is in uniform size, walls built with them provide an even surface. Render the internal walls by adding a thin layer of fine skim coat (2-3mm).

11. Apply a layer of waterproofing on the external side of the walls to ensure weather proofing.

12. The structural support requirements of Litepanels must be followed to ensure proper weather proofing.

LITEPANEL
BY LITECRETE PHILIPPINES

ITEM DESCRIPTION	UNIT PRICE
LITEPANEL™ 3" (0.61m x 2.44m x 0.076m)	**P 1,818.68**
LITEPANEL™ 4" (0.61m x 2.44m x 0.10m)	**P 2,136.60**
LITEPANEL™ 6" (0.61m x 2.44m x 0.15m)	**P 2,922.47**
LITEPANEL™ Adhesive (25kg/bag)	**P 400.00**

SAMPLE COSTING PER SQM

LITEPANEL 3"

ITEM DESCRIPTION	QUANTITY	UNIT	COST/PANEL	TOTAL/SQM
LITEPANEL 3" (0.61m x 2.44m x 0.76m)	1	SQM	P 1,818.68	P 1,221.90
LITEBLOCK™ Adhesive (25kg)	4	KG	P 16.00	P 64.00

Total Price (per sqm) P 1,285.90

OTHER MATERIALS

Deform bar (10mm x 6m)	P 22.66
Concrete epoxy HV	P 12.00
Hardie Putty	P 85.47
Hardie Perforated Tape	P 6.25

Total Material Cost (VAT inclusive) P 1,412.28

LITEPANEL 4"

ITEM DESCRIPTION	QUANTITY	UNIT	COST/PANEL	TOTAL/SQM
LITEPANEL 4" (0.61m x 2.44m x 0.10m)	1	SQM	P 2,136.60	P 1,435.50
LITEBLOCK™ Adhesive (25kg)	4	KG	P 16.00	P 64.00

Total Price (per sqm) P 1,499.50

OTHER MATERIALS

Deform bar (10mm x 6m)	P 22.66
Concrete epoxy HV	P 12.00
Hardie Putty	P 85.47
Hardie Perforated Tape	P 6.25

Total Material Cost (VAT inclusive) P 1,625.88

LITEPANEL 6"

ITEM DESCRIPTION	QUANTITY	UNIT	COST/PANEL	TOTAL/SQM
LITEPANEL 6" (0.61m x 2.44m x 0.15m)	1	SQM	P 2,922.47	P 1,963.49
LITEBLOCK™ Adhesive (25kg)	5	KG	P 16.00	P 80.00

Total Price (per sqm) P 2,043.49

OTHER MATERIALS

Deform bar (10mm x 6m)	P 22.66
Concrete epoxy HV	P 12.00
Hardie Putty	P 85.47
Hardie Perforated Tape	P 6.25

Total Material Cost (VAT inclusive) P 2,169.87

LITEPANEL

BY LITECRETE PHILIPPINES

WORKING DRAWINGS W/ CONNECTION DETAILS

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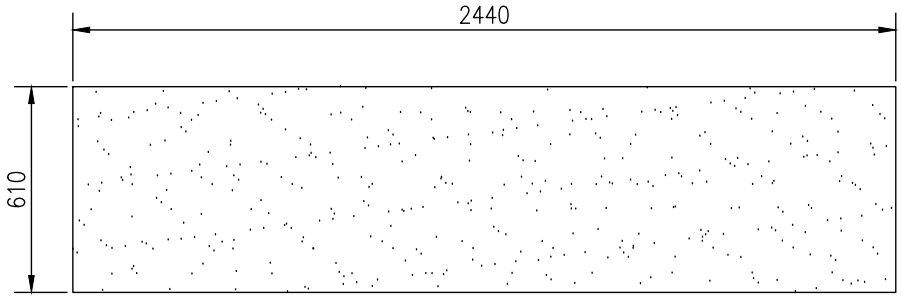
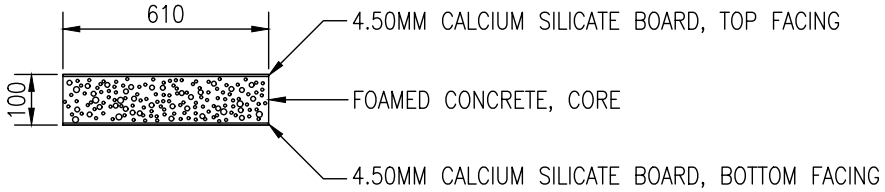


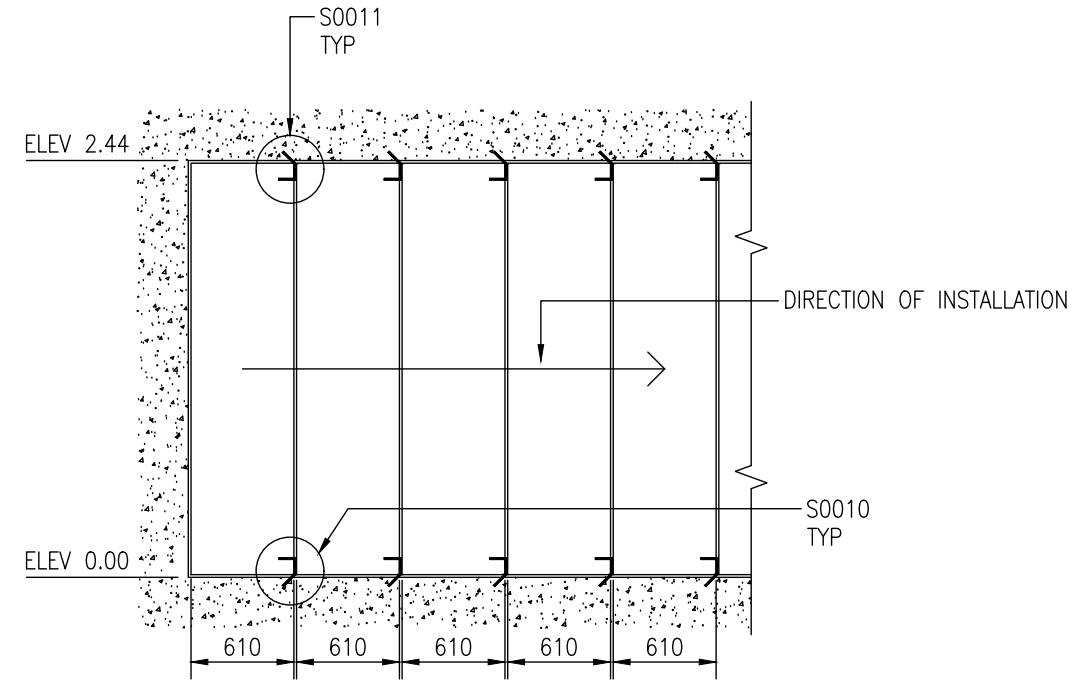
PLAN



CROSS SECTION

NOT DRAWN TO SCALE

S001	SANDWICH PANEL DIMENSIONS



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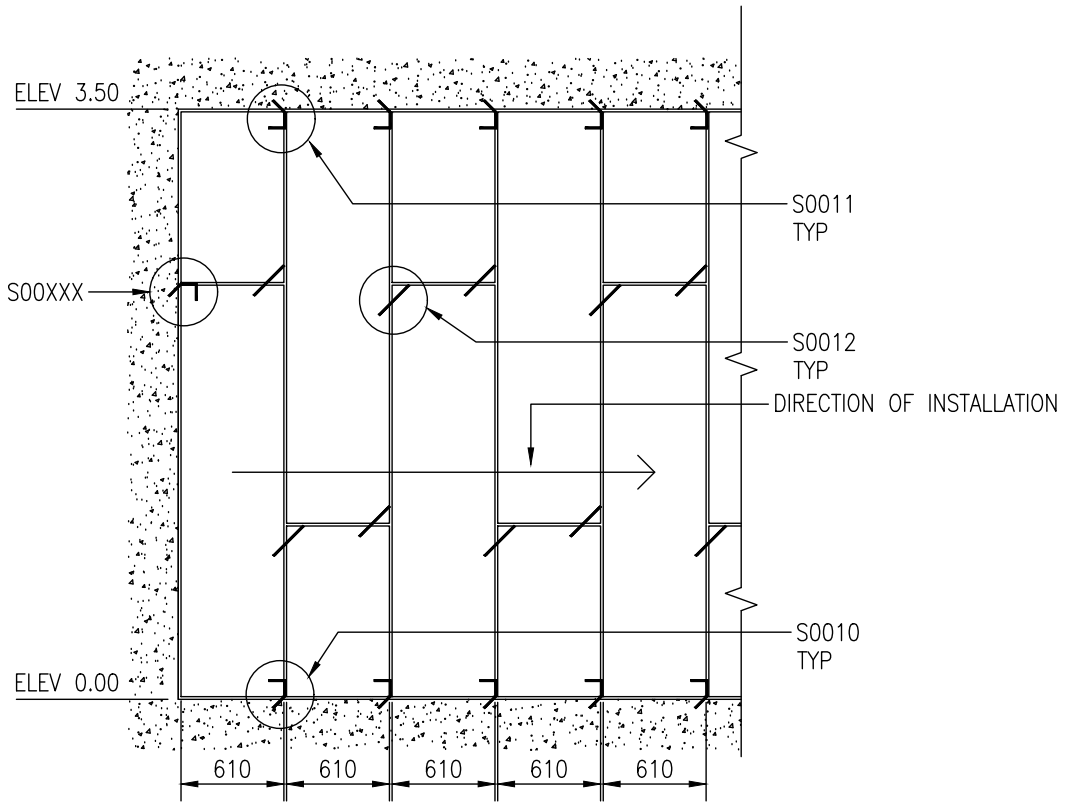
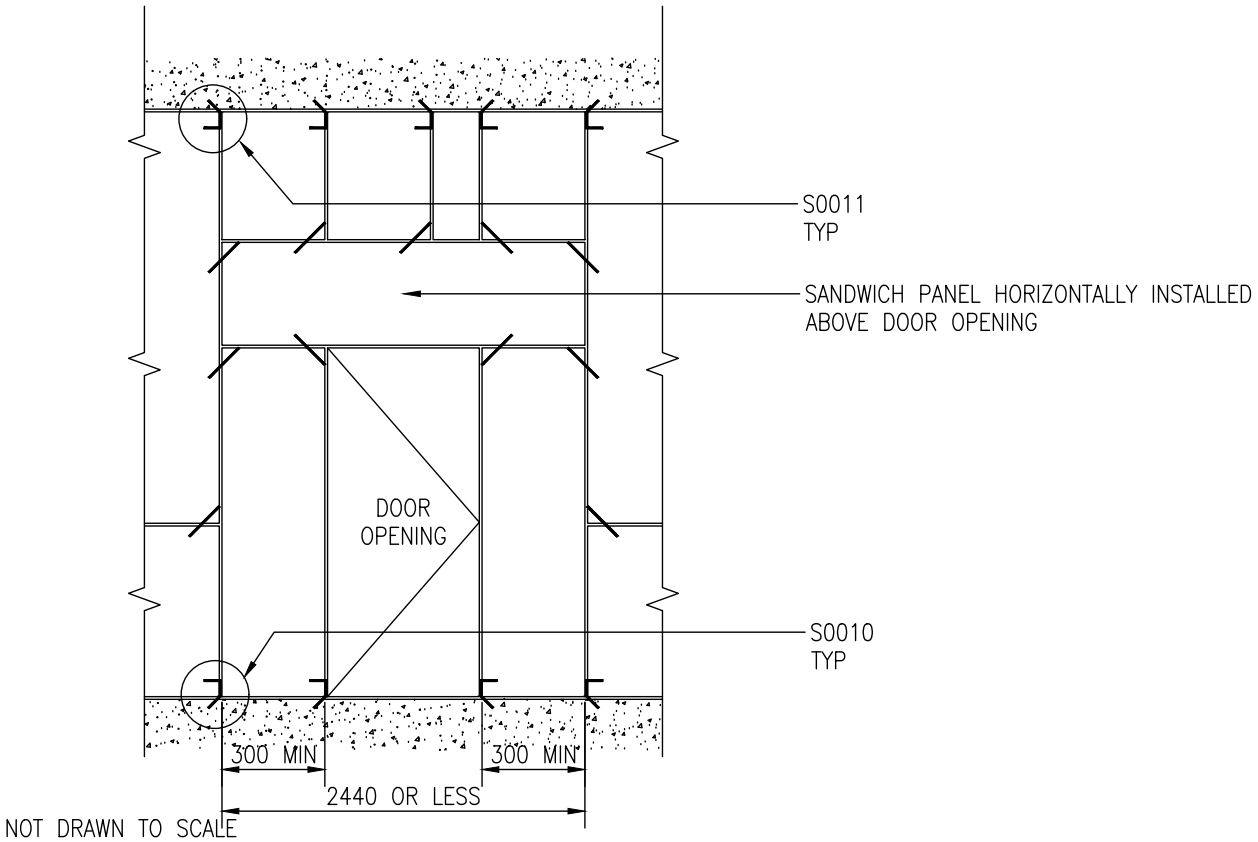
S002	SANDWICH PANEL ARRANGEMENT

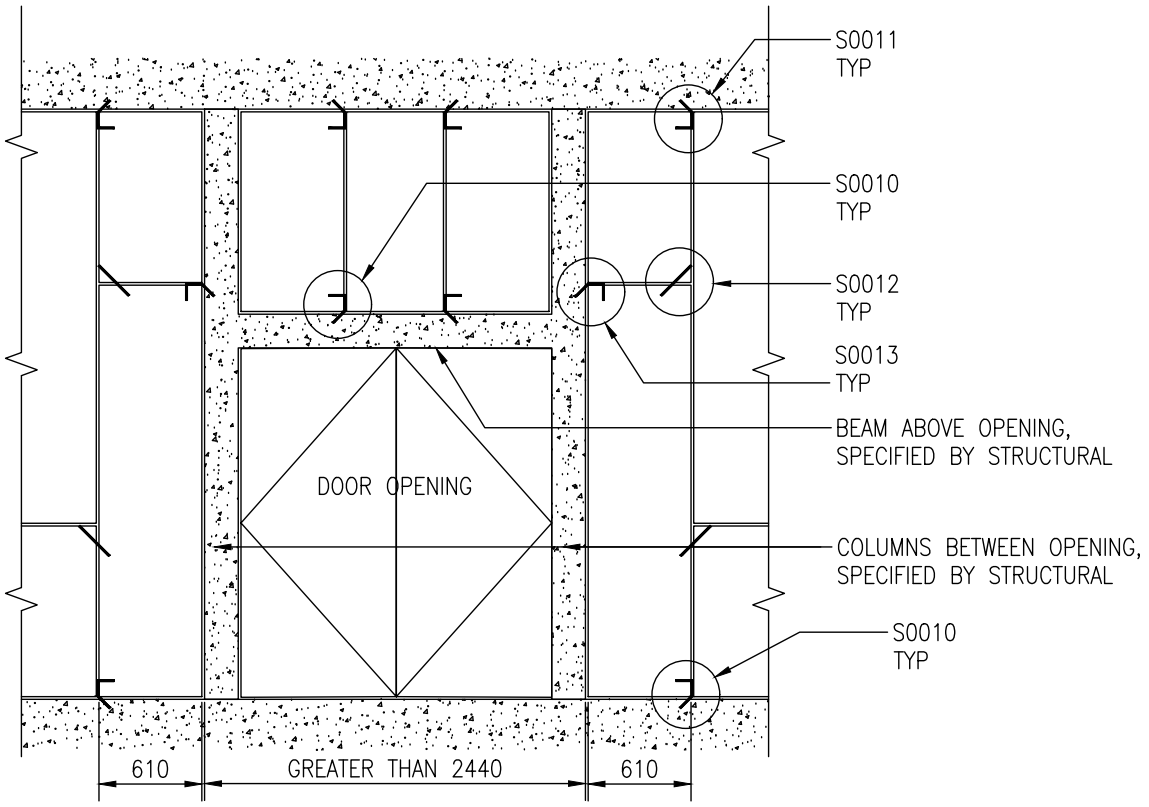


NOT DRAWN TO SCALE

S003	SANDWICH PANEL ARRANGEMENT

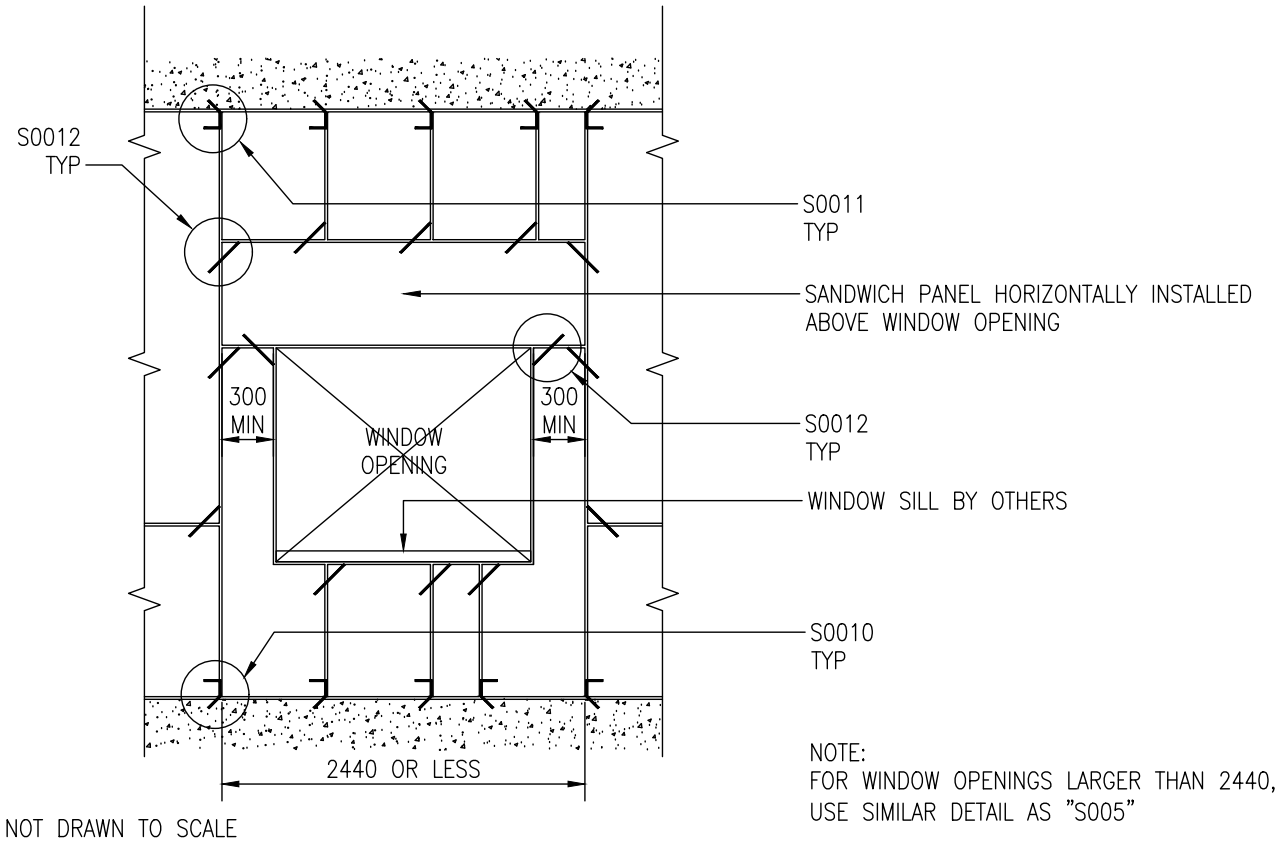


S004	SANDWICH PANEL DOOR INSTALLATION



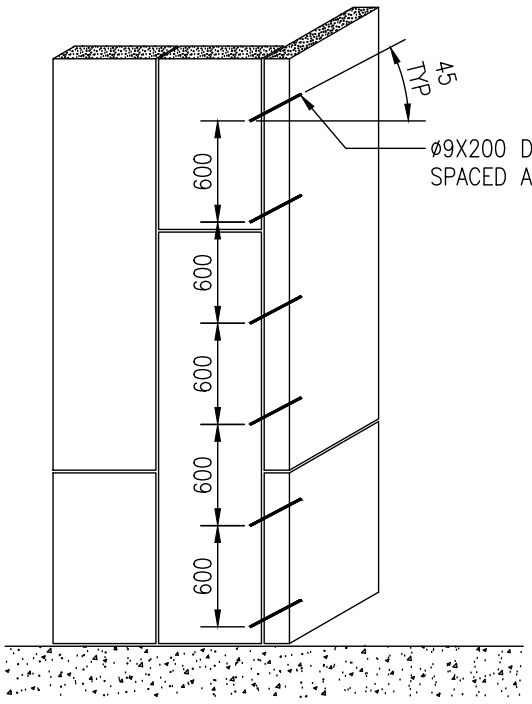
NOT DRAWN TO SCALE

S005	SANDWICH PANEL WIDE OPENING INSTALLATION

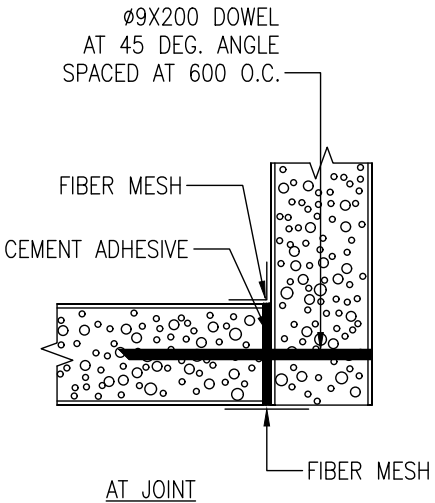


NOT DRAWN TO SCALE

S006	SANDWICH PANEL WINDOW INSTALLATION



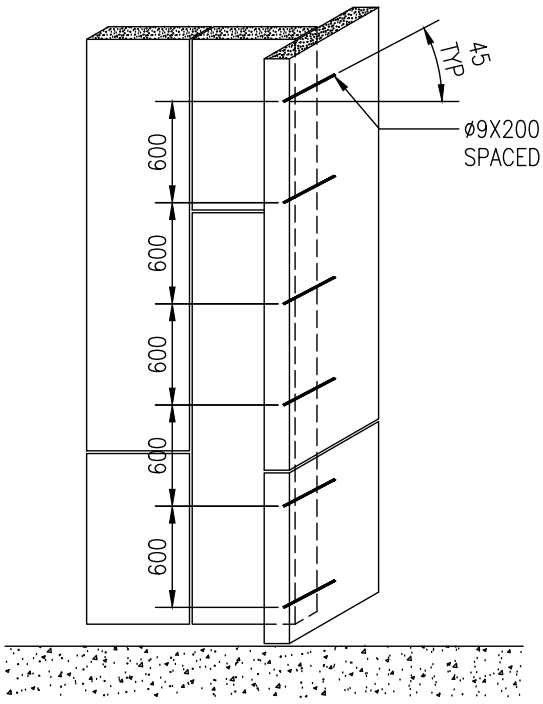
ELEVATION



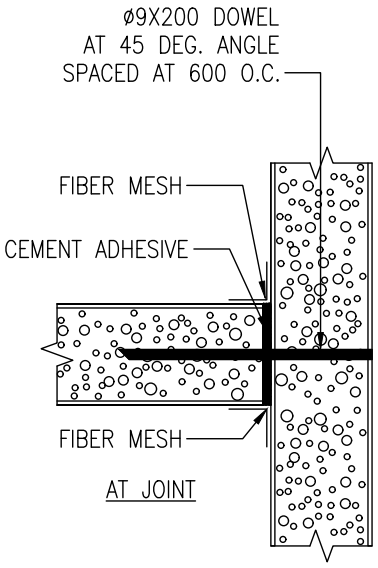
AT JOINT

NOT DRAWN TO SCALE

S007	SANDWICH PANEL AT "L" INTERSECTION OR JOINT



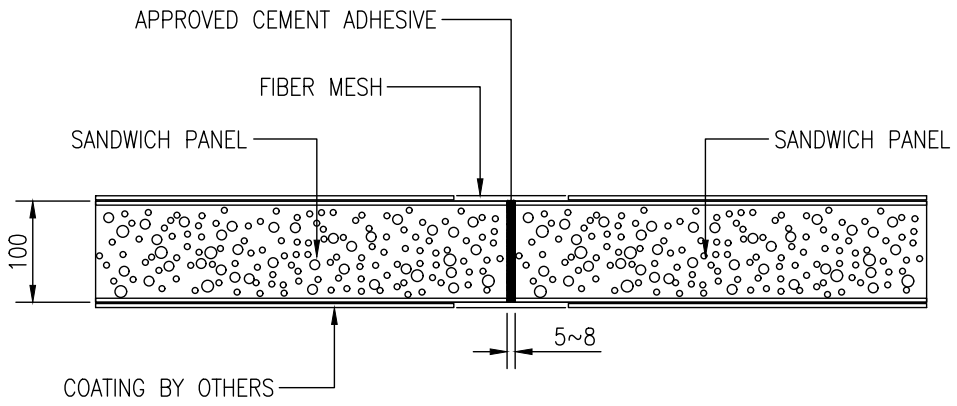
ELEVATION



AT JOINT

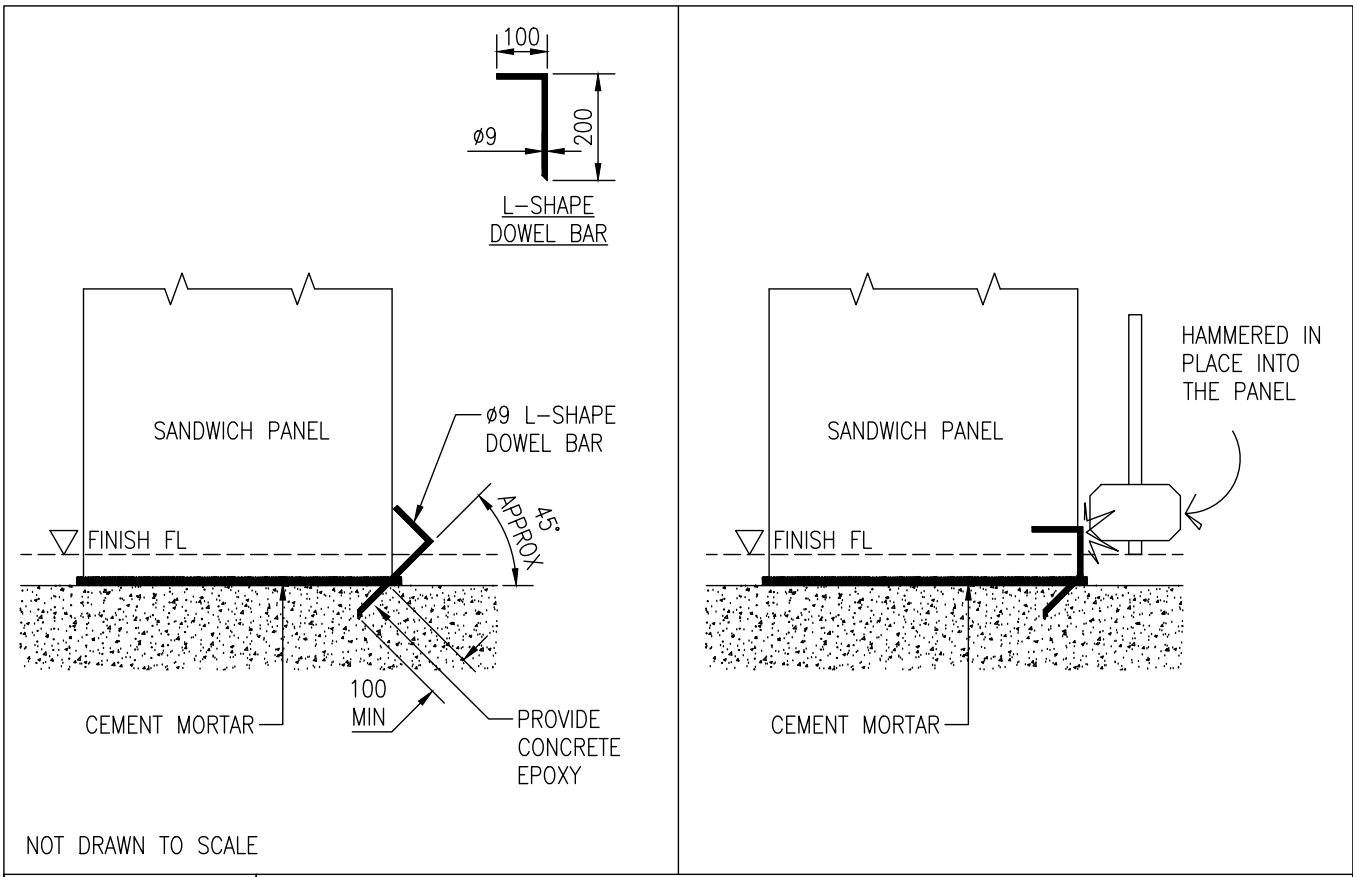
NOT DRAWN TO SCALE

S008	SANDWICH PANEL AT "T" INTERSECTION OR JOINT

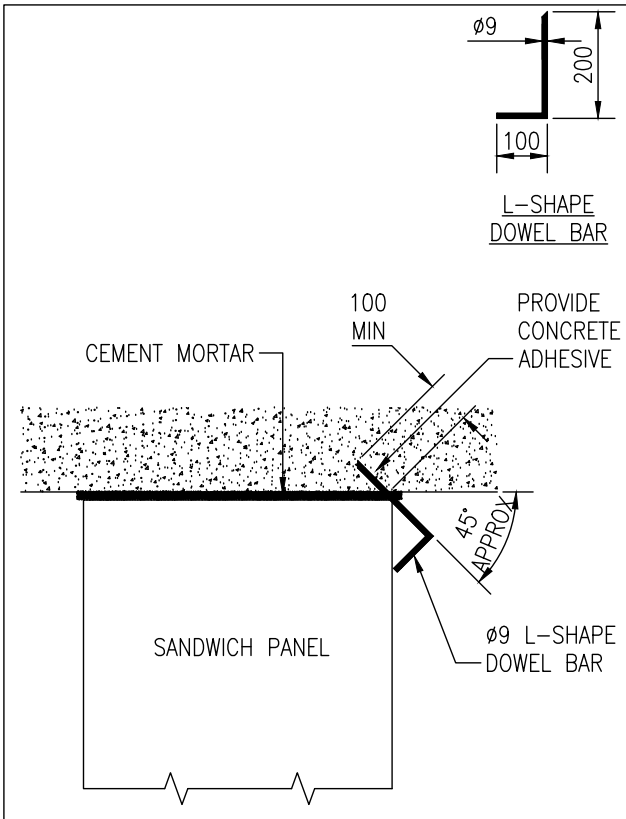


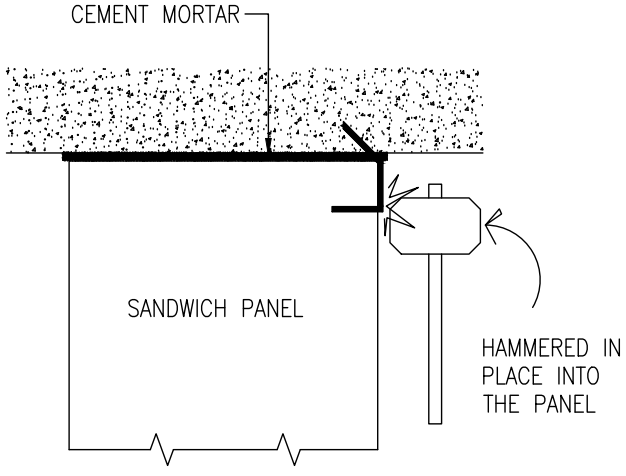
NOT DRAWN TO SCALE

S009	SANDWICH PANEL TO SANDWICH PANEL CONNECTION



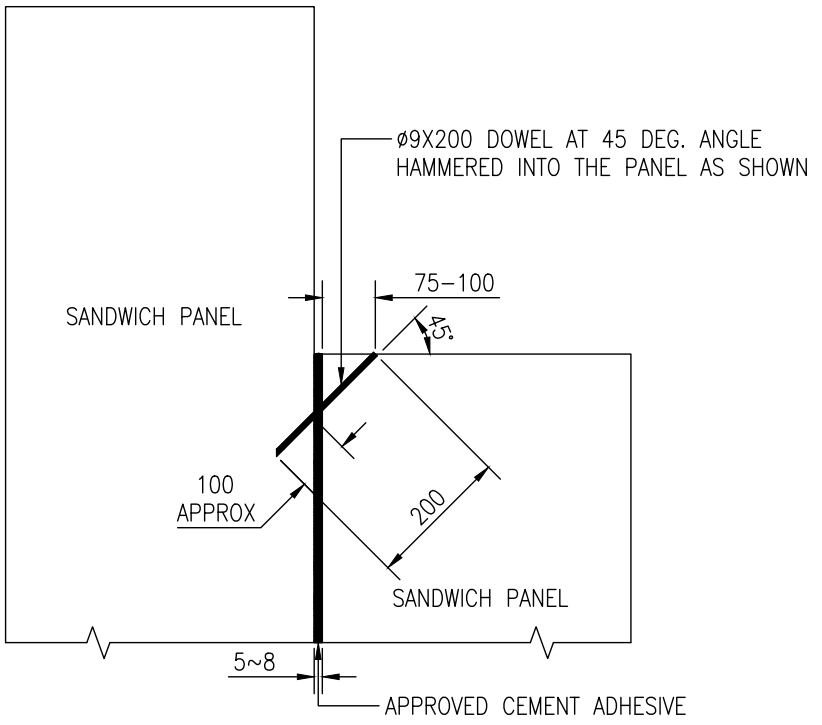
S0010	SANDWICH PANEL TO FLOORING CONNECTION





NOT DRAWN TO SCALE

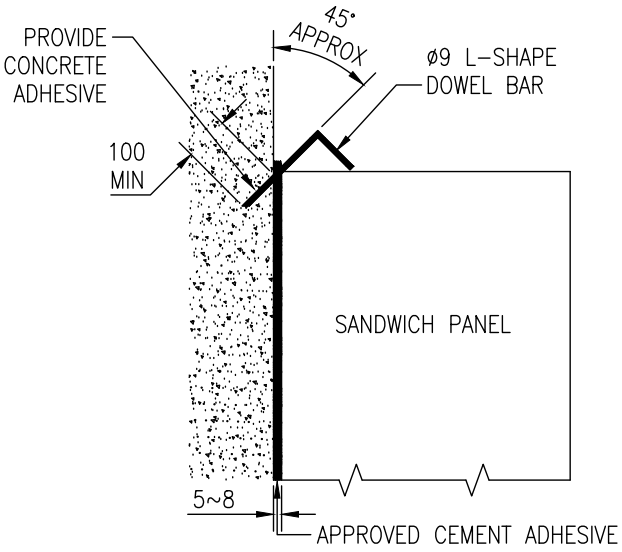
S0011	SANDWICH PANEL TO BOTTOM OF BEAM/SLAB

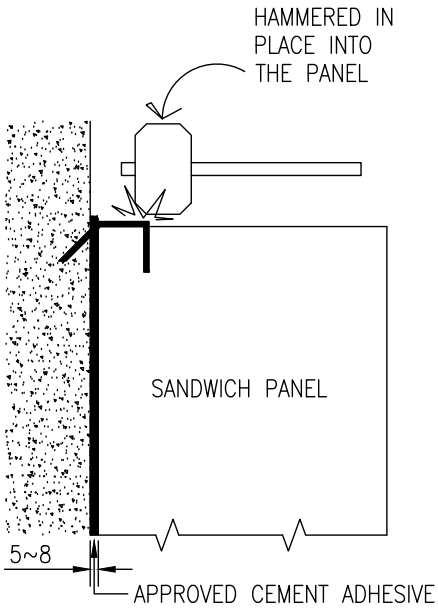


NOT DRAWN TO SCALE

S0012	SANDWICH PANEL FIXING DETAIL

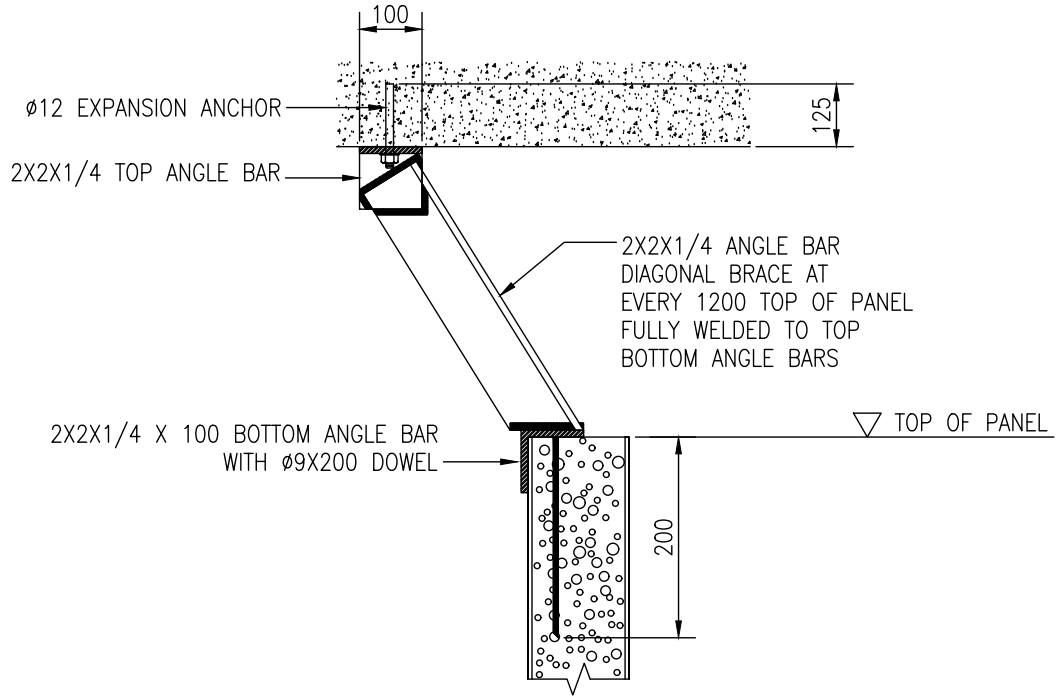
L–SHAPE
DOWEL BAR





NOT DRAWN TO SCALE

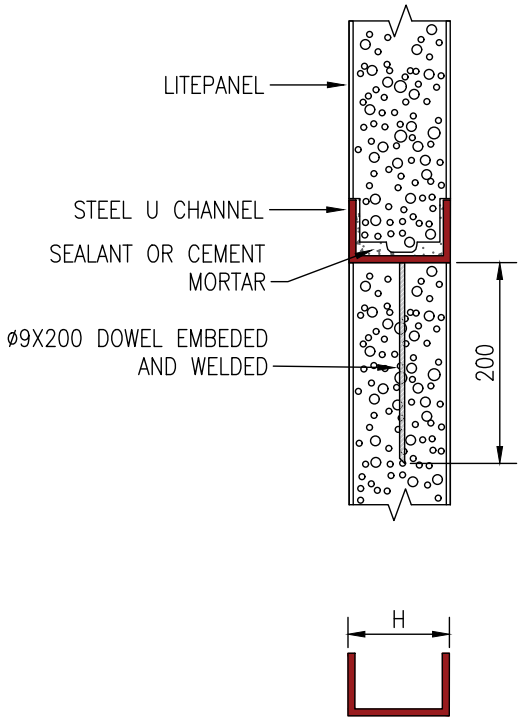
S0013	SANDWICH PANEL TO COLUMN/WALL CONNECTION

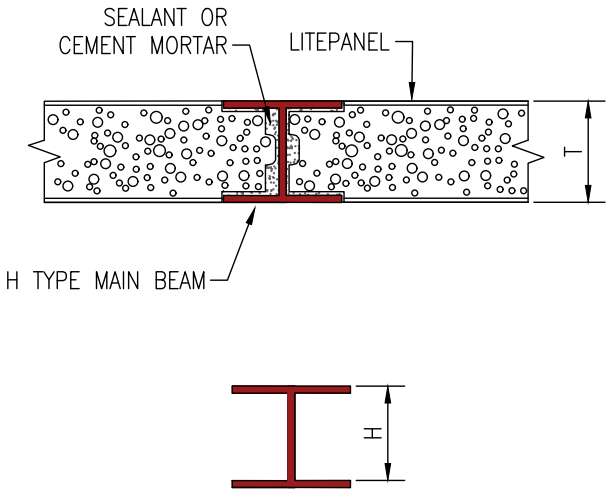


NOT DRAWN TO SCALE

NOTE:
CONNECTION DETAIL ONLY APPLICABLE FOR INTERIOR WALLS.

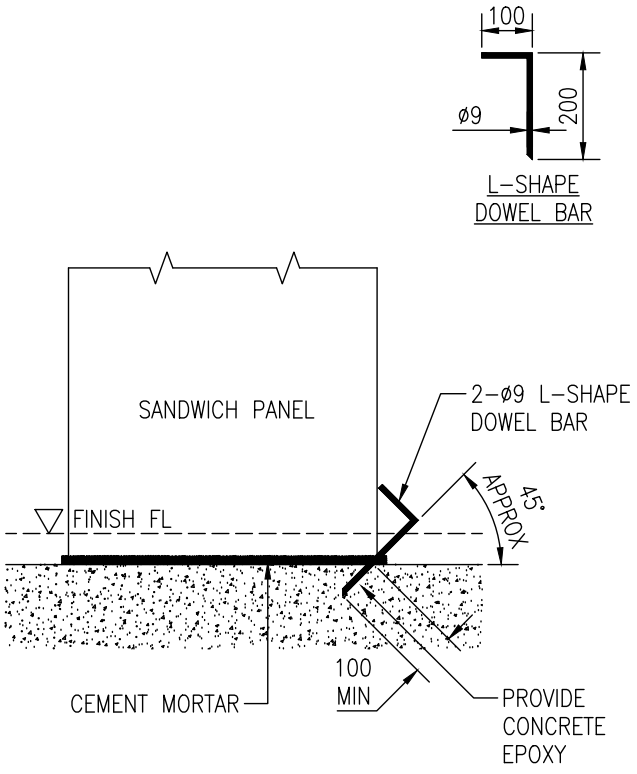
S0014	SANDWICH PANEL TO ANGLE BRACE CONNECTION

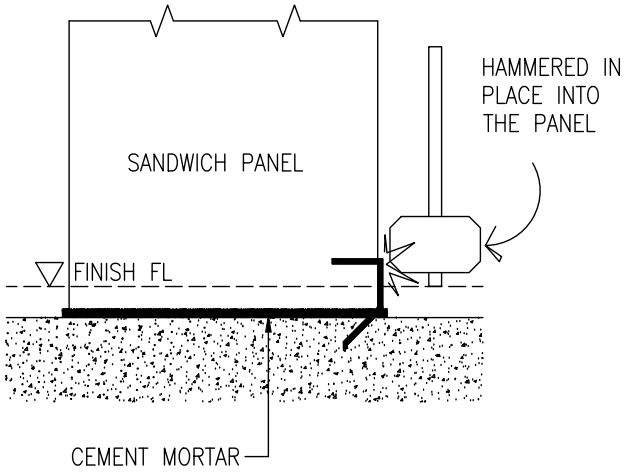




NOT DRAWN TO SCALE

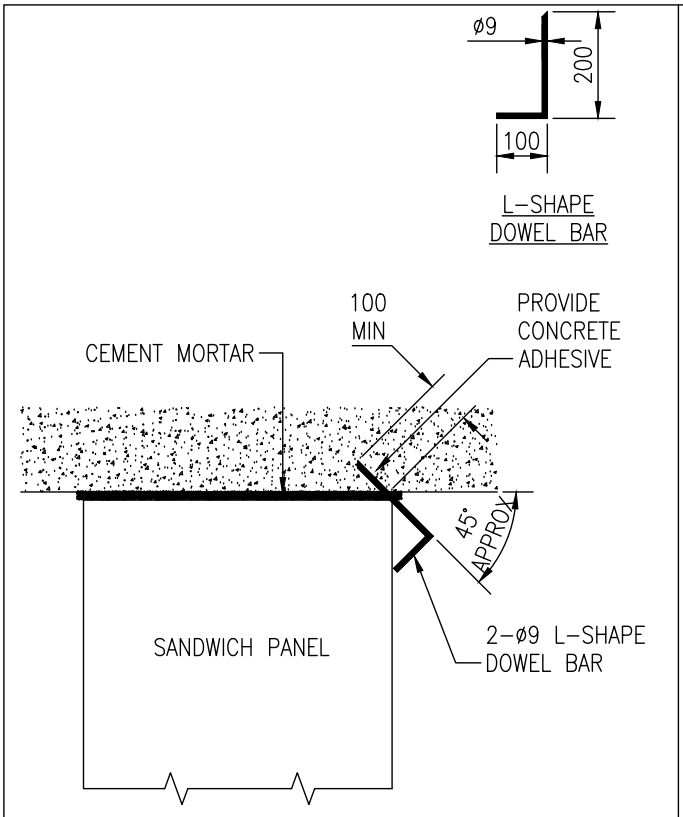
S0015	SANDWICH PANEL TO STEEL CONNECTION

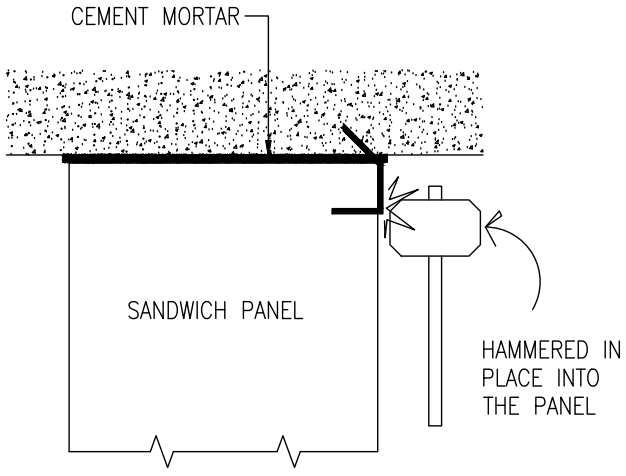




NOT DRAWN TO SCALE

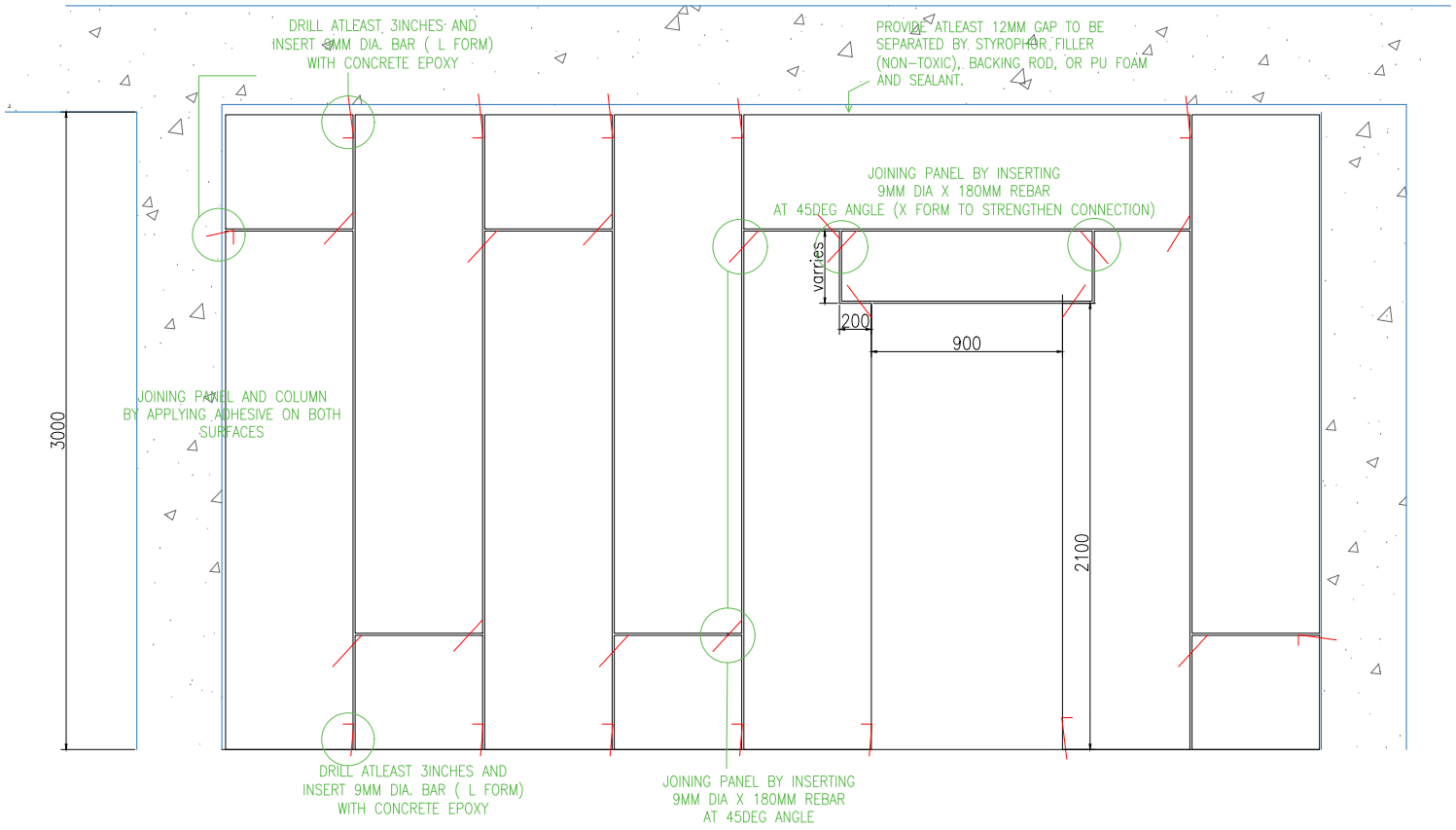
S0016	6" SANDWICH PANEL TO FLOORING CONNECTION





NOT DRAWN TO SCALE

S0017	6" SANDWICH PANEL TO BOTTOM OF BEAM/SLAB


DRILL ATLEAST 3INCHES AND
INSERT 9MM DIA. BAR (L FORM)
WITH CONCRETE EPOXY
PROVIDE ATLEAST 12MM GAP TO BE
SEPARATED BY STYROFOAM FILLER
(NON-TOXIC), BACKING ROD, OR PU FOAM
AND SEALANT.
JOINING PANEL BY INSERTING
9MM DIA X 180MM REBAR
AT 45DEG ANGLE (X FORM TO STRENGTHEN CONNECTION)
varies
200
900
2100
3000
JOINING PANEL AND COLUMN
BY APPLYING ADHESIVE ON BOTH
SURFACES
DRILL ATLEAST 3INCHES AND
INSERT 9MM DIA. BAR (L FORM)
WITH CONCRETE EPOXY
JOINING PANEL BY INSERTING
9MM DIA X 180MM REBAR
AT 45DEG ANGLE

LITEPANEL

BY LITECRETE PHILIPPINES

TEST RESULTS

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LITEPANEL

TEST RESULTS

COMPRESSIVE STRENGHT TEST

FIRE RATING TEST

WATER ABSORPTION TEST

PULLOUT TEST

ACOUSTICAL TEST

EXTERIOR (WIND LOAD) TEST

PERFORMANCE TEST

LITEPANEL
BY LITECRETE PHILIPPINES

ASTEC

Materials Testing Corporation

A Geotechnical and Materials Testing Laboratory

BRS/DPWH Accredited: Member ASTM International

- Compressive / Flexural Strength of Concrete
- Three Edge Bearing Test for Concrete Pipes
- Concrete Coring
- Rebound Hammer Test
- Curability Test of Soils & Aggregates
- Field Density Test / CBR Test
- Tensile Test of Steel Materials
- Core Cut Test in Portland Cement
- Verification / Calibration of Testing Equipment
- Ultrasonic Thickness Gauge Determination of Steel Materials
- Structural Load Test

TEST REPORT ON COMPRESSIVE STRENGTH OF PAVING BLOCKS
ASTM C 67 - 97

Client: LITECRETE CORP.
Attention: THRU: LITECRETE CORP.
Project: FOR IHFO
Location:
Sampled Delivered: 3PCS LITE PAVEL
Delivered By: MR. MELBERT OLDOY
Sampled By:
Concrete Supplier: LITECRETE
Compression Machine Serial No: 170404
Caliper & Balance Serial No.: 111127

Test Ref. No.:
Test Request Form No.: 11514
Date Received:
Date of Test: 01-11-2013
Date of Report:
Tested By: RPEBOLLA
Encoded By: PPCASTRO JR
Checked By:
Page: 1/1
Sample and preparation: WP

Sample Nr	Type of Pavers	Actual Dimension			Received Weight	Oven Dry Weight	Saturated Weight	Immersed Weight	Gross Area	Absorption	Maximum Load	Compressive Strength		Specified Compressive Strength	
		Length mm	Width mm	Height mm	kg	kg	kg	kg	mm²	%	Newton	Mpa	psi	Mpa	psi
1	LITE PAVEL	151	101	151	1.59	–	–	–	15251	–	44680	2.93	420	2.76	400
2		149	101	151	1.58	–	–	–							
3		150	100	151	1.59	–	–	–	15049	–	43850	2.91	420	2.76	400
4									15000	–	50600	3.37	490	2.76	400
5		NOTHING FOLLOWS													
6															
7															
8															
9															
10															

Test Witnessed by:
Melbert Oldoy
Name / Signature

Name / Signature

Name / Signature

Name / Signature

Remarks:
1. Test in compliance with ASTM C 67-97
2. This report give the result carried out on sample submitted to the laboratory
3. This report shall not be reproduced, except in full without the written approval of the laboratory
4. N/A - Not requested / Not specified

Authorized Signatory:

ASTEC
ADVANCE COPY ONLY
SUBJECT TO VERIFICATION AND ARRANGEMENT
AUTHORIZED SIGNATORY

(Not valid without ASTEC dry seal)

Quezon City Laboratory : No. 70 Zuzuarregui St., nr. Cor. Commonwealth Ave., Diliman, Q.C. Tel. No. (02)931-7152, Telefax No. (02) 931-7153
Calamba Laboratory: Km. 54 Nr. Nakiling, Calamba, Laguna Telefax (049) 545-3208
Cavite Laboratory: No. 102 Sampaloc 1, Brgy., Talaposan, Gen. Aguinaldo Highway, Dasmariñas, Cavite Telefax No. (046) 573-3621
Pampanga Laboratory : Unit A Genesis Building, Mc Arthur Highway, Brgy. San Isidro, City of San Fernando, Pampanga Telefax (045) 616-3437
Sta. Rosa Laboratory: Yasco Compound, Purok 3 Pulong Sta. Cruz, Sta. Rosa, Laguna Telefax No. (049) 534-3162
Makati Laboratory: No. 3131 Pasa St., Brgy. Pinagkaisahan, Makati City, Telefax No. (02) 455-0935
E-mail Address : astecresults@yahoo.com

BRS/DPWH Accredited

November 22, 2022

MR. JOHN MICHAEL RAMAS
LITECRETE CORPORATION
U.N. Avenue, Umapad, Mandaue City
Cebu 6014
CP: 0917 700 2750

Dear Mr. Ramas:

This refers to the one (1) unit of LITEPANEL measuring 100mm x 61mm x 1000mm made of Calcium Silicate Board, Cement, Aggregate, Water, Polypropylene Fiber and Special Admixture that was tested for fire resistance following the Standard Specification stipulated under ASTM E119, Fire Tests of Building Construction and Materials. The test was conducted inside the compound of LITECRETE Corporation, U.N. Avenue, Umapad, Mandaue City, Cebu on November 22, 2022. The LITEPANEL was exposed to horizontal position to the flame that lasted for one hundred forty two (142) minutes and the maximum temperature is monitored every five minutes using a thermocouple attached to a pyrometer. The result of the test is shown in the Table below.

Litepanel (100mmx61mmx1000mm)	Temp (°C)	Observations
5	995	No change
10	996	No change
15	998	No change
20	1007	No change
25	1013	No change
30	1018	No change
35	1021	No change
40	1031	No change
45	1036	No change
50	1034	No change
55	1027	No change
60	1034	No change
65	1034	No change
70	1036	No change
75	1036	With few checks/cracks on the surface exposed under the flame
80	1040	Same as above
85	1038	Same as above
90	1040	Same as above
95	1050	Size of crack increasing/progressing
100	1053	Same as above

105	1052	Same as above
110	1053	Same as above
115	1057	Size of crack increasing
120	1056	Same as above
125	1056	Same as above
130	1054	Same as above
135	1054	Same as above
142	1054	Litepanel broken, end of test.

Note: The LITEPANEL (100mm x 61mm x 1000mm) made of Calcium Silicate Board, Cement, Aggregate, Water, Polypropylene Fiber and Special Admixture did not show sign of defects like cracks or checks during the early stage of exposure under the flame. The defect was observed only after75 minutes of exposure. Cracks and hairline checks were observed on the litepanel surface that was exposed under the flame. Eventually, the litepanel was broken after 142 minutes of exposure under the flame with an average heat temperature of 1,034.67ºC.

Conclusion:

The identification and other technical description of the LITEPANEL were provided by Mr. John Michael Ramas, LITECRETE Corporation, Umapad, Mandaue City, Cebu. The LITEPANEL (100mm x 61mm x 1000mm) made of Calcium Silicate Board, Cement, Aggregate, Water, Polypropylene Fiber and Special Admixture, tested in accordance with ASTM E119, Fire Tests of Building Construction and Materials achieved a FIRE RESISYANCE RATING OF 142 MINUTES WHEN TESTED WITH FIRE AGAINST INTERIOR SURFACE ONLY.

CATALINO L. PABUAYON
Wood Preservation/Fire Retardation Specialist

Witnessed by:

Ma. Aiza Calumba
Litecrete Corp.

John Michael Ramas
Litecrete Corp.

SFO1 Danny D. Zamoras
BFP- Mandaue City

FO1 Junbill B. Robledo
BFP-Mandaue City

November 22, 2022

CERTIFICATION

This is to certify that the LITEPANEL, measuring 100mm x 60mm x 1000mm made of Calcium Silicate Board, Cement, Aggregate, Water, Polypropylene Fiber and Special Admixture was tested for fire resistance following the standard specification stipulated under ASTM E119, Fire Tests of Building Construction and Materials.

The LITEPANEL TESTED IN ACCORDANCE WITH ASTM E119, ACHIEVED A FIRE RESISTANCE RATING OF 142 MINUTES WITH AN AVERAGE HEAT TEMPERATURE OF 1034.67°C WHEN TESTED WITH FIRE AGAINST INTERIOR SURFACE ONLY.

This certification is issued for whatever legal purpose it may serve.

CATALINO L. PABUAYON
Wood Preservation/Fire Retardation Specialist

Attested by:

Ma. Aiza Calumba
Litecrete Corp.

John Michael Ramas
Litecrete Corp.

SFO1 Danny D. Zamoras
BFP- Mandaue City

FO1 Junbril D. Robledo
BFP-Mandaue City

MEGATESTING CENTER INC.
CIVIL ENGINEERING LABORATORY
No. 219 D. JAKOSALEM ST., BRGY. ZAPATERA, CEBU CITY
DPWH-BRS Accredited Laboratory
Tel. No.: (032) 254-1395 / Email : megatesting_cebu@yahoo.com
Main Office: No. 28 Congressional Ave., Brgy. Bahay Toro, Quezon City
Tel. No.: (02) 8269 - 8305
Valid Until : 2024-05-11

Date: March 14, 2023

Lab. Report No.: CEB-230123-0027

TEST REPORT ON HYDRAULIC CEMENT CONRETE

Project : **LITECRETE CORP.**
Location : UN. AVE., UMAPAD, MANDAUE CITY, CEBU
Contractor : **INFORMATIONAL**
Type of Unit : N/S
Quantity represented : 3 pcs.
Sampled at : N/S
Original source : N/S
Proposed use : N/S
Spec's Item No. : **ASTM C1585-13**
Sampled by : - (*Name & designation*) - (*Office*) - (*Date Sampled*)
Submitted by : *Aiza Calumba* (*Name & designation*) - (*Office*) 1/23/23 (*Date Submitted*)
Tested by : *Airo R. Placer - Lab Tech* (*Name & designation*) **MTCI-Cebu** (*Office*) 1/23/23 (*Date Tested*)

TESTS	TESTS TIME (S)	Results		
		Sample 1	Sample 2	Sample 3
Measurement of Rate of Absorption of Water	*0*	0	0	0
	60	1.259	1.162	1.066
	300	1.356	1.356	1.259
	600	1.453	1.356	1.356
	1200	1.647	1.453	1.453
	1800	1.744	1.550	1.647
	3600	1.841	1.841	1.841
	7200	1.937	1.937	2.034
	10800	2.228	2.131	2.228
	14400	2.325	2.228	2.422
	18000	2.519	2.422	2.519
	21600	2.712	2.809	2.809
	92220	3.972	3.197	4.166
	193200	4.456	4.069	4.650
	268500	4.941	4.553	5.231
	432000	5.231	4.844	5.522
	527580	5.522	5.134	6.006
	822200	5.812	5.425	6.297
	691200	6.006	5.619	6.491

Remarks : *This report gives the results carried out on samples submitted and tested to Megatesting Center, Inc. - Cebu Branch*
This Laboratory is Responsible for test only.

Prepared by:
Airo R. Placer
Sr. Laboratory Technician

Checked by:
Richenza B. Cajudo
Laboratory Manager

Witnessed by :
Aiza Calumba

Attested:
ENGR. CHRISTOPHER V. CASINILLO
MATERIALS ENGINEER I
PRC LICENSE # 0132530
DPWH-BRS ACCREDITATION # 4775

ALLIED MATERIAL TESTING LABORATORIES
CIVIL ENGINEERING LABORATORY
DOOR 3 & 8 NEOTRINITY BUILDING,
HIGHWAY, KAUSWAGAN, CDO CITY
CELLPHONE NO. : 09178214796

DPWH – BRS
ACCREDITED LABORATORY
VALID UNTIL : 12 – 05 – 2023

Page : 1 of 1
Date : FEBRUARY 10, 2023
Laboratory No. : AMTL – 2302 – 1001

TEST RESULT ON PULL OUT TEST

Project Name : LITEPANEL

Location : UN AVENUE, BRGY. UMAPAD, MANDAUE CITY, CEBU
Contractor : LITECRETE CORP.
Material Description : 8mm Expansion Bolt, Litepanel
Specification : ASTM D – 4436
Tested By : R. Mencede/H.B. Asumbrado–MLT/MLA (Name & Designation) Allied Mat. Testing Lab. (Office) February 10, 2023 (Date)

EXPANSION BOLT

EXPANSION BOLT #	LITEPANEL THICKNESS (INCHES)	EXPANSION LENGTH (INCHES)	ANCHOR BOLT DIAMETER (MM)	DATE INSTALLED	DATE PULL TESTED	GAUGE READING (KN)	REMARKS
1	4	2.5	8	Feb. 10, 2023	Feb. 10, 2023	1.69	PASSED
2	4	2.5	8	Feb. 10, 2023	Feb. 10, 2023	1.73	PASSED
3	4	2.5	8	Feb. 10, 2023	Feb. 10, 2023	1.75	PASSED
4	4	2.5	8	Feb. 10, 2023	Feb. 10, 2023	1.80	PASSED
5	4	2.5	8	Feb. 10, 2023	Feb. 10, 2023	1.86	PASSED
					Average Maximum Load Applied, KN:	1.77	PASSED
					Maximum Load Applied, Kg.:	180.49	
					Maximum Load Applied, lbs.:	397.91	

Test Witnessed by:

MA. KRISTINA VILLACARLOS
Technical Manager & QC Manager
Litecrete Corp.

Prepared By :

NORAINE D. LINGCONG
Assistant Manager Consultancy Division
Allied Material Testing Laboratories

Checked & Attested By :

CRISTY B. CERBAS
Operations Manager/ Material Engineer II
Allied Material Testing Laboratories

ALLIED MATERIAL TESTING LABORATORIES
CIVIL ENGINEERING LABORATORY
DOOR 3 & 8 NEOTRINITY BUILDING,
HIGHWAY, KAUSWAGAN, CDO CITY
CELLPHONE NO. : 09178214796

DPWH – BRS
ACCREDITED LABORATORY
VALID UNTIL : 12 – 05 – 2023

Page : 1 of 1
Date : FEBRUARY 10, 2023
Laboratory No. : AMTL – 2302 – 1002

TEST RESULT ON PULL OUT TEST

Project Name : LITEPANEL

Location : UN AVENUE, BRGY. UMAPAD, MANDAUE CITY, CEBU
Contractor : LITECRETE CORP.
Material Description : 10mm Expansion Bolt, Litepanel
Specification : ASTM D – 4436
Tested By : R. Mencede/H.B. Asumbrado– MLT/MLA (Name & Designation) Allied Mat. Testing Lab. (Office) February 10, 2023 (Date)

EXPANSION BOLT

EXPANSION BOLT #	LITEPANEL THICKNESS (INCHES)	EXPANSION LENGTH (INCHES)	ANCHOR BOLT DIAMETER (MM)	DATE INSTALLED	DATE PULL TESTED	GAUGE READING (KN)	REMARKS
1	4	2.5	10	Feb. 10, 2023	Feb. 10, 2023	2.17	PASSED
2	4	2.5	10	Feb. 10, 2023	Feb. 10, 2023	2.05	PASSED
3	4	2.5	10	Feb. 10, 2023	Feb. 10, 2023	1.86	PASSED
4	4	2.5	10	Feb. 10, 2023	Feb. 10, 2023	2.02	PASSED
5	4	2.5	10	Feb. 10, 2023	Feb. 10, 2023	1.97	PASSED
Average Maximum Load Applied, KN:						2.01	PASSED
Maximum Load Applied, Kg.:						204.96	
Maximum Load Applied, lbs.:						451.86	

Test Witnessed by:

MA. KRISTINA VILLACARLOS
Technical Manager & QC Manager
Litecrete Corp.

Prepared By :

NORAINE D. LINGCONG
Assistant Manager Consultancy Division
Allied Material Testing Laboratories

Checked & Attested By :

CRISTY B. CERBAS
Operations Manager/ Material Engineer II
Allied Material Testing Laboratories

ACOUSTIC ANALYSIS
SCIENTIFICALLY SOUND DECISIONS

1850 E. Rodriguez Sr. Blvd.
Cubao, Quezon City
Philippines 1109
TEL: (63-2) 415-1424
TEL/FAX: (63-2) 721-7383
URL: http://www.acoustics.com.ph

ACOUSTIC/NOISE CONTROL TEST REPORT

CLIENT:	Litecrete Corp. UN Avenue, Umapad, Mandaue City, Cebu	**ATTN:**	John Michael Ramas
SUBMISSION DATE:	16 March 2023		
TEST DATE:	13 March 2023		
TEST TIME:	10:30 pm		
TEST TYPE:	Field Sound Transmission Test for a Precast Partition Wall		

I. Abstract

This test involves the determination of the sound isolation properties of the Litecrete Corp, LITEPANEL partition wall at the Sound Transmission Test room at Litecrete Corp. Acoustic Analysis, Inc. was commissioned by Litecrete Corp. to ascertain the as built sound transmission performance of the Litepanel 150mm thick precast partition.

Acoustic Analysis conducted sound transmission tests by placing a measurement microphone in the designated receiver room and then generating pink noise in an adjacent room designated as the source room. The difference in sound pressure levels between the source room and the receiver rooms were then computed to determine the amount of sound transmission loss achieved by the glass partition wall separating the two rooms. A summary of the results and conclusions follows:

- *The results of these tests **do not** represent the performance of the partition wall alone but the entire noise isolation performance between rooms including, wall to mullion joints, slab to mullion joints, the quality of installation/construction of the wall as well as any other flanking paths such as wall penetrations.*
- *The average sound attenuation through the unit partition wall was measured to be **33.1 dB**. A Field Sound Transmission Class rating of **FSTC 51** was computed from the transmission loss results and is found to be within tolerance of the required STC 50-55 for a plastered 150mm CHB wall as Field Test ratings are accepted to perform from three to six STC points lower than lab rated results for installed partitions.*

A more detailed account of the abovementioned testing can be found in the following sections of the report.

1850 E. Rodriguez Sr. Blvd.
Cubao, Quezon City
Philippines 1109
TEL: (63-2) 415-1424
TEL/FAX: (63-2) 721-7383
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II. Objectives

1. To determine the sound transmission performance of the concrete precast wall partition
2. To ascertain potential problems and recommend solutions for improvement if needed

III. Test Details

Test Specimen Description:
Wall - 4560mm by 2700mm, 150mm thick concrete precast wall (see Appendix A)

Test Room:
Dimensions: 23.17 sqm X 2.7m (See Appendix B)
Finishes:
Floor: Concrete
Ceiling: Fiber cement board
Rear Wall: Concrete
Side Walls: Concrete

Equipment: NTi Audio XL2 Acoustic Analyzer
NTi Minirator MR-Pro Signal Generator
Powered Speaker + Stand

IV. Procedure

1) An NTi XL2 Acoustic Analyzer was placed in a bare unfinished room, that was designated as the Receiver Room (see room details in Appendix A)
2) A playback sound system consisting of 1 powered loudspeaker and a signal generator was placed at the Source Room separated by the Test Partition
3) The background noise spectrum for the receiver room was measured and recorded
4) The speaker in the Source Room was positioned to produce a diffuse sound field
5) Broadband pink noise was generated from a signal generator and played through the speaker system at a sound pressure level of approximately 100 dB
6) The spectrum level output of the speaker, at a 1-meter distance from the test wall and 1.2 meter height, was measured and recorded using an NTi XL2 Acoustic Analyzer to obtain a reference source output level.
7) The NTi XL2 Acoustic Analyzer was then transferred to the Receiver Room facing the shared wall at a 1-meter distance and the transmitted sound pressure level (SPL), and its spectral data, was measured and recorded
8) Steps 3 to 7 were repeated for 3 points along the test wall spaced approximately 1 meter away from walls and 1 meter apart horizontally

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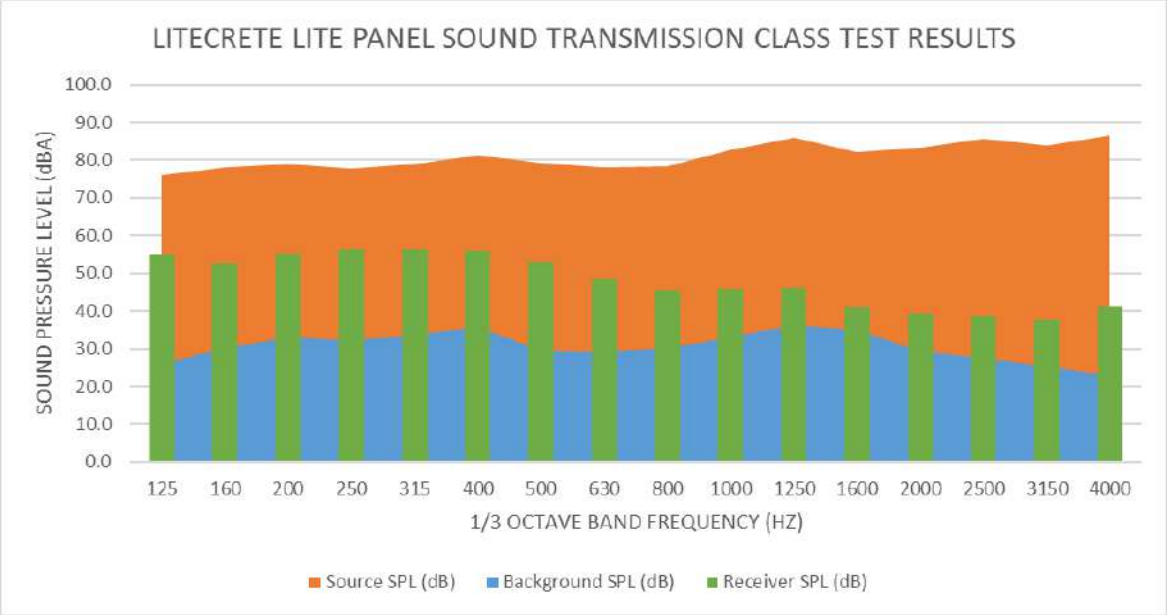
9) The Reverberation Time at the Receiver Room was measured and recorded

V. Results

LITECRETE LITE PANEL SOUND TRANSMISSION TEST RESULTS				
1/3 Octave	**Background SPL (dB)**	**Source SPL (dB)**	**Receiver SPL (dB)**	**Transmission Loss**
125	26.2	76.2	54.8	21.3
160	30.1	78.2	52.5	25.7
200	33.0	79.1	55.1	24.0
250	32.3	77.7	56.3	21.4
315	33.5	78.8	56.2	22.7
400	35.6	81.3	56.1	25.2
500	29.5	79.3	52.8	26.6
630	29.2	78.2	48.4	29.7
800	30.0	78.5	45.6	32.9
1000	33.1	82.6	45.9	36.7
1250	36.2	85.9	46.1	39.8
1600	35.2	82.3	40.8	41.5
2000	29.4	83.2	39.4	43.8
2500	27.6	85.6	38.6	47.0
3150	25.2	83.9	37.6	46.3
4000	23.0	86.6	41.3	45.3
Average	**30.6**	**81.1**	**48.0**	**33.1**



ACOUSTIC ANALYSIS
SCIENTIFICALLY SOUND DECISIONS

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Field STC computations for the test partition tested are provided below. These do not represent the actual performance of the partition alone but also other sound flanking paths.

FIELD SOUND TRANSMISSION CLASS RATING

Test Data

Surface area of test wall (sqm):	Aw =	12.312
Total absorption of receiver room	Ar =	0.23

COMPUTE TL

TL=Lp source - Lp receiver +10LOG(Aw/ Ar)

Frequency (Hz)	Lps (dB)	Lpr (dB)	TL (dB)
125	76.2	54.8	38.6
160	78.2	52.5	43.0
200	79.1	55.1	41.3
250	77.7	56.3	38.7
315	78.8	56.2	40.0
400	81.3	56.1	42.5
500	79.3	52.8	43.9
630	78.2	48.4	47.0
800	78.5	45.6	50.2
1000	82.6	45.9	54.0
1250	85.9	46.1	57.1
1600	82.3	40.8	58.8
2000	83.2	39.4	61.1
2500	85.6	38.6	64.3
3150	83.9	37.6	63.6
4000	86.6	41.3	62.6

FSTC ITERATION

Field Sound Transmission Class	**FSTC:**	**51**	*<iterate FSTC Here*

Frequency (Hz)	Contour Level (dB)	TL (dB)	CL-TL (dB)	1=pass 0=fail	
125	35	38.6	0.0	1	
160	38	43.0	0.0	1	
200	41	41.3	0.0	1	
250	44	38.7	5.3	1	
315	47	40.0	7.0	1	
400	50	42.5	7.5	1	
500	51	43.9	7.1	1	
630	52	47.0	5.0	1	
800	54	50.2	3.8	1	
1000	55	54.0	1.0	1	
1250	55	57.1	0.0	1	
1600	55	58.8	0.0	1	
2000	55	61.1	0.0	1	
2500	55	64.3	0.0	1	
3150	55	63.6	0.0	1	
4000	55	62.6	0.0	1	
		Sum of defficiencies:	17.93	**1**	**=pass/fail**

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VI. Discussions

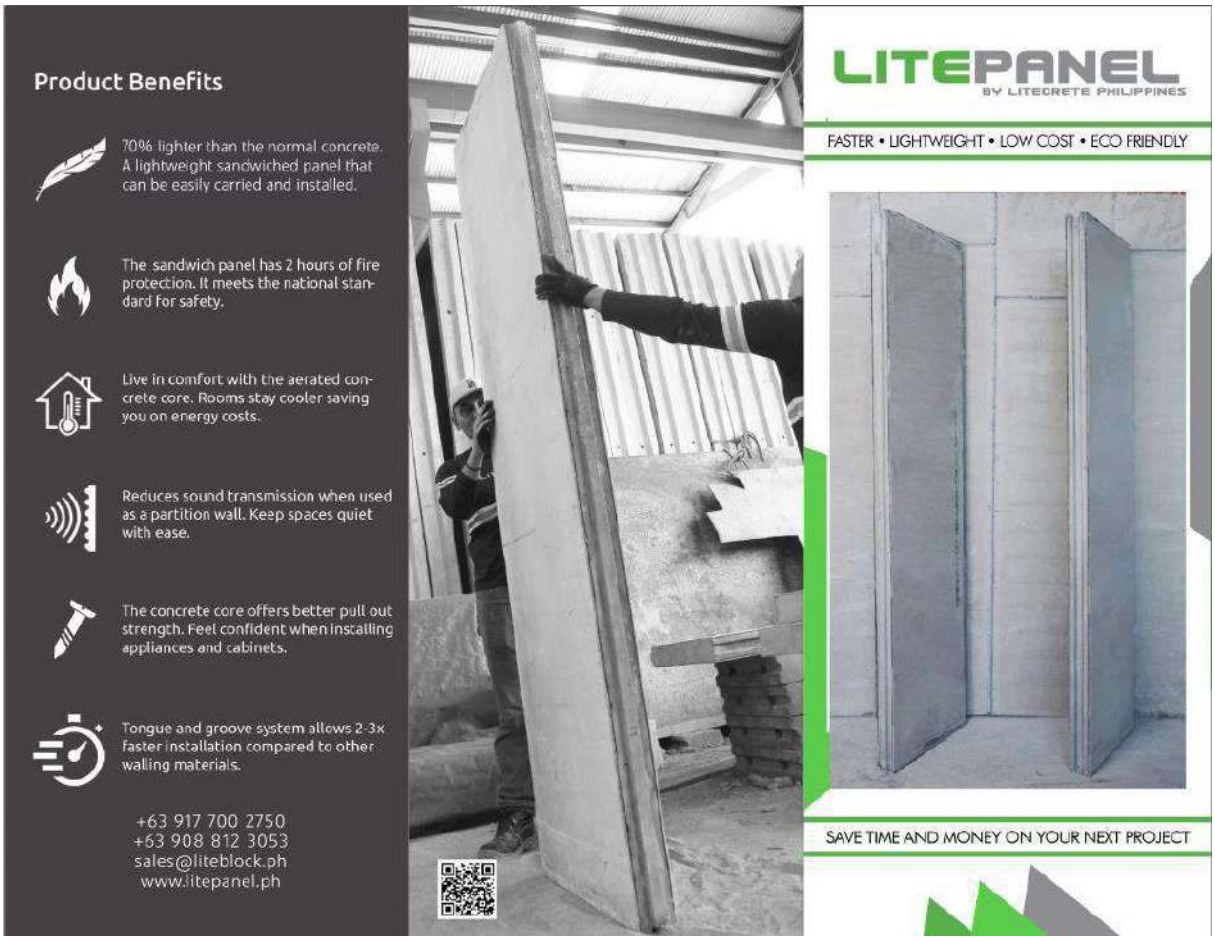
An actual field test of this type cannot be used to rate the performance of a wall panel alone. There are too many variables which could influence the results of the test. A test of this type gives an indication of the real-world overall noise isolation between rooms including all boundary surfaces and all possible sound transmission paths such as air gaps, wall penetrations, construction joints, and solid borne transmissions. It is accepted that field transmission ratings can be lower by up to 6 - 9 STC points than lab tested ratings (See Appendix E).

The Field Sound Transmission Class of the Lite Panel Precast wall at the was determined to be **FSTC 51.** Based on standard computations, the Lite Panel 150mm precast wall panel has the potential to perform at an **STC 57**. This surpasses the accepted ratings for 150mm CHB partitions with 25mm plastering on both sides. A 150mm thick CHB Hollow wall with 25mm plastering on both sides totaling 200mm thick performs at STC 49 whereas a 150mm CHB partition with all cells filled with 25mm plastering on both sides totaling 200mm thick performs at an STC 54 (See appendix C & D). A minimal amount of sound transmission due to flanking paths from a drainpipe was perceived which would lower the tested performance of the partitions.

Jose F. Hermano
President
Acoustic Analysis, Inc.

1850 E. Rodriguez Sr. Blvd.
Cubao, Quezon City
Philippines 1109
TEL: (63-2) 415-1424
TEL/FAX: (63-2) 721-7383
URL: http://www.acoustics.com.ph

APPENDIX A: WALL DETAILS



1850 E. Rodriguez Sr. Blvd.
Cubao, Quezon City
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TEL: (63-2) 415-1424
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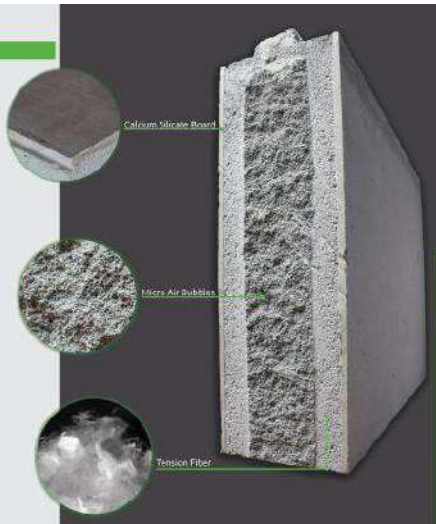
The product

Litepanel is an innovative lightweight walling product that is designed to increase efficiency and reduce installation time.

It is made out of lightweight concrete sandwiched between two calcium silicate boards. This gives its distinctive durability while maintaining a level and smooth surface.



installation

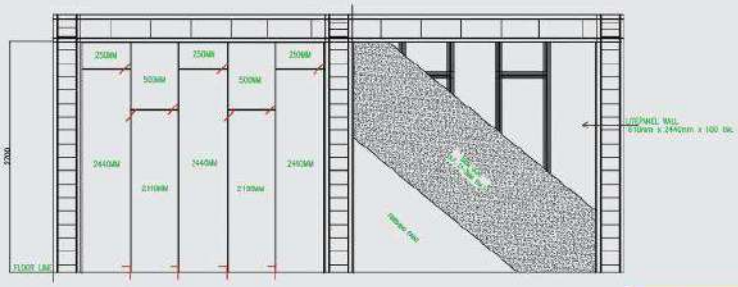


FIGURE 3 : 2700mm WALL HEIGHT

Litepanel size	
4"	0.61m x 2.44m x 0.1m
6"	0.61m x 2.44m x 0.15m
Weight per panel	
4"	115 kgs
6"	170 kgs
Raw materials	Sand, Cement, Tension Fiber, & Calcium Silicate Board
Dry density	750 kg/m³
Compressive Strength	400-500 psi
Sound Insulation	STC :45dB to 50dB
Installation time	2-3x faster
Fire resistance	Over 2 hours fire rating
Water Absorption	Low water absorption

"Build 2-3x times faster than your typical walling material"

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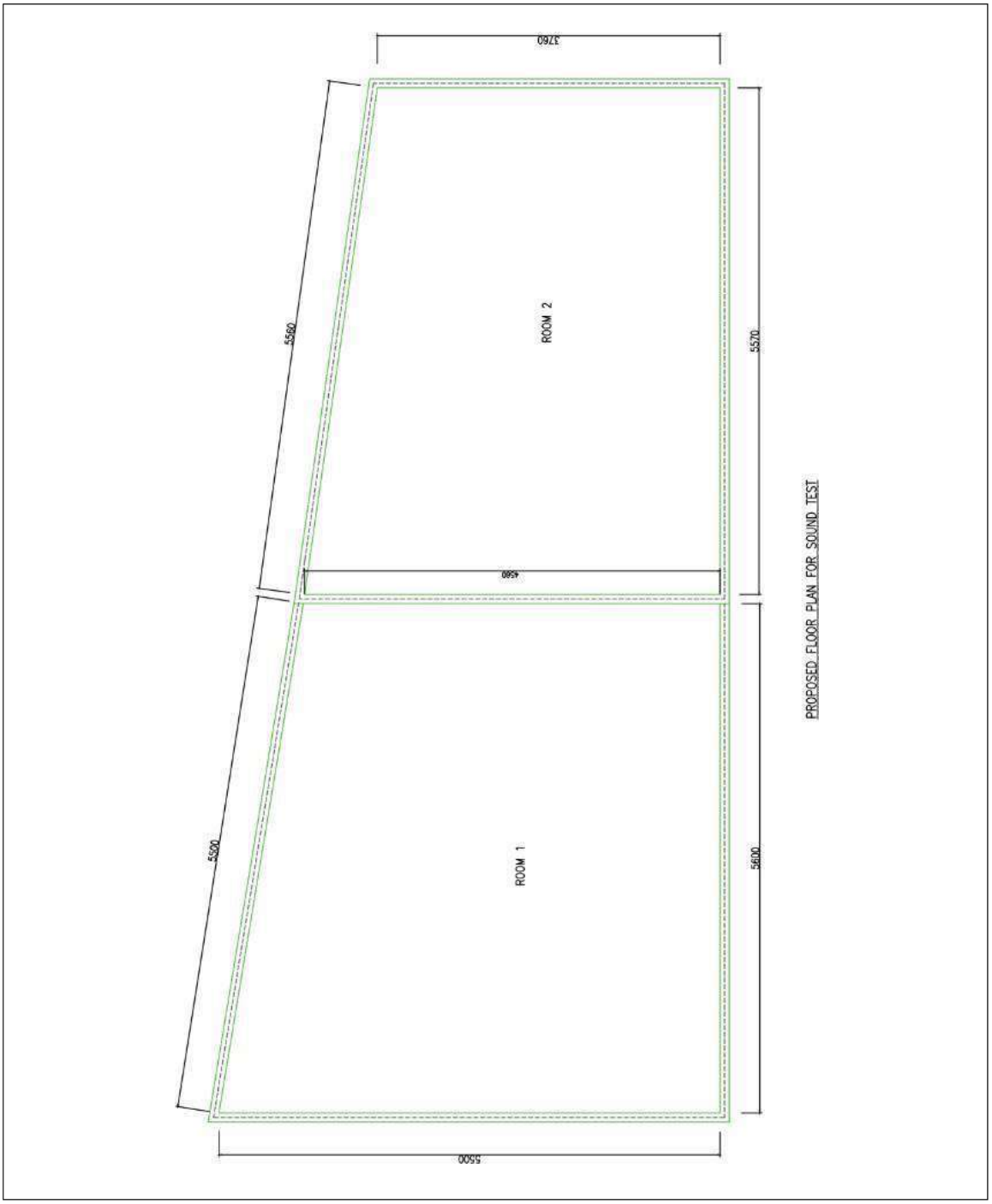
APPENDIX B: ROOM DETAILS



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Philippines 1109
TEL: (63-2) 415-1424
TEL/FAX: (63-2) 721-7383
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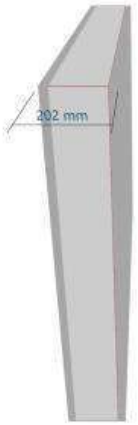
APPENDIX C: 150mm CHB Wall hollow with 25mm plastering on both sides

Sound Insulation Prediction (v9.0.20)

Margin of error is generally within STC ±3 dB
Acoustic Analysis, Inc. - Key No. 5639
Job Name:
Job No.: Initials:FH
Date:16/03/2023
File Name:

ACOUSTIC ANALYSIS
SCIENTIFICALLY SOUND DECISIONS

Notes:150mm thick Hollow CHB wall with 25mm plaster on both sides



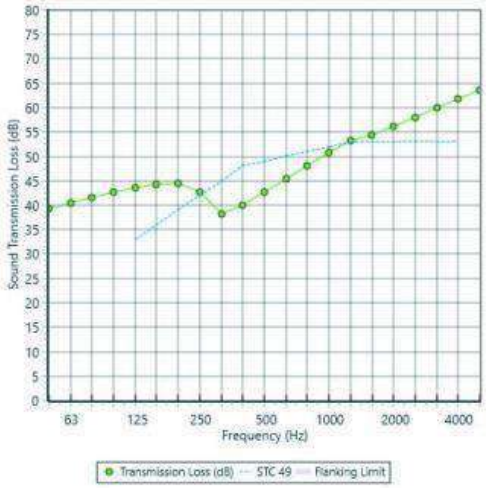
STC 49
OITC 45

Panel Size = 2.7 m x 4.0 m
Partition surface mass = 284 kg/m²

System description

Panel 1: 1 x 25 mm Concrete
+ 1 x 152 mm CMU Hollow (136 lb/ft²)
+ 1 x 25 mm Concrete

freq.(Hz)	TL(dB)	TL(dB)
50	39	
63	40	40
80	42	
100	43	
125	44	43
160	44	
200	44	
250	43	41
315	38	
400	40	
500	43	42
630	45	
800	48	
1000	51	50
1250	53	
1600	54	
2000	56	56
2500	58	
3150	60	
4000	62	62
5000	64	



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Cubao, Quezon City
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URL: http://www.acoustics.com.ph

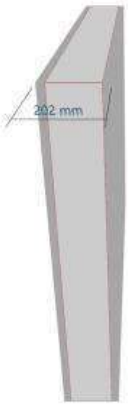
APPENDIX D: 150mm CHB Wall filled with 25mm plastering on both sides

Sound Insulation Prediction (v9.0.20)

Program copyright Marshall Day Acoustics 2017
Margin of error is generally within STC ±3 dB
Acoustic Analysis, Inc. - Key No. 5639
Job Name:
Job No.:
Initials:FH
Date:16/03/2023
File Name:

ACOUSTIC ANALYSIS
SCIENTIFICALLY SOUND DECISIONS

Notes:150mm thick CHB Filled wall with 25mm plaster on both sides



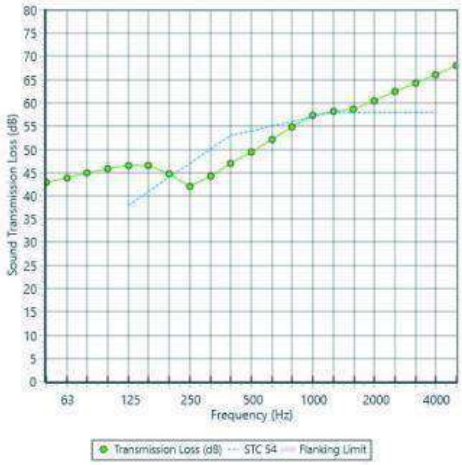
STC 54
OITC 49

Panel Size = 2.7 m x 4.0 m
Partition surface mass = 426 kg/m²

System description

Panel 1 1 x 25 mm Concrete
+ 1 x 25 mm Concrete
+ 1 x 152 mm CMU Grout Filled (136 lb/ft²)

freq.(Hz)	TL(dB)	TL(dB)
50	43	
63	44	44
80	45	
100	46	
125	46	46
160	46	
200	45	
250	42	44
315	44	
400	47	
500	50	49
630	52	
800	55	
1000	57	57
1250	58	
1600	59	
2000	61	60
2500	62	
3150	64	
4000	66	66
5000	68	



1850 E. Rodriguez Sr. Blvd.
Cubao, Quezon City
Philippines 1109
TEL: (63-2) 415-1424
TEL/FAX: (63-2) 721-7383
URL: http://www.acoustics.com.ph

APPENDIX E: STC versus F

LPES, Inc.
Engineering and Planning

Field Sound Transmission Class (FSTC)

Field Sound Transmission Class (FSTC) evaluates the sound-insulating properties of in-place building elements. It quantifies sound isolation between two rooms and the performance of a partition installed in the interior of a building. Testing is conducted to be as independent of the field conditions as possible and to yield a number for the partition only.

In practice, the Sound Transmission Class (STC) of laboratory samples represents optimum conditions, and is rarely achieved in actual construction. The difference between the FSTC and STC results from sound leaks and "flanking" paths. Flanking is sound that travels between two rooms along paths other than through the demising partition. FSTC is a function of background noise levels, room volumes, surface areas, sound absorption values, and spectral content of the sound source. Partitions composed of multiple elements such as doors, windows and walls will tend to have an overall FSTC close to the lowest FSTC value of any component.

The behavior of two partitions with similar FSTC rating can be considerably different. For example, one of the most annoying sounds transmitted between dwelling units tends to be the bass in music, a part of the sound spectrum far removed from the voice range. An eight inch concrete block wall rated at FSTC 50, that can block 20 dB more sound in some bass frequencies would be a better choice than an FSTC 50 drywall partition for an application where music or mechanical noise will be a problem.

Table 1: Subjective Interpretation of Effects of FSTC as Measured

STC (Lab)	FSTC (Field)	Subjective description of effectiveness
26-30	20-22	Most sentences clearly understood
30-35	25-27	Many phrases and some sentences understood without straining to hear
35-40	30-32	Individual words and occasional phrases clearly heard and understood
42-45	35-37	Medium loud speech clearly audible, occasional words understood
47-50	40-42	Loud speech audible, music easily heard
52-55	45-47	Loud speech audible by straining to hear; music normally can be heard and may be disturbing
57-60	50-52	Loud speech essentially inaudible; music can be heard faintly but bass notes disturbing
62-65	55-60	Music heard faintly, bass notes "thump"; power woodworking equipment clearly audible
70-	60	Music still heard very faintly if played loud.
75+	65+	Effectively blocks most air-borne noise sources

The International Building Code (IBC) requires partitions separating dwelling units have a STC 50 (FSTC 45). IBC provides sample ratings for several types of wall construction.

tlavallee@lpesinc.com
www.lpesinc.com
(P) 757.357.0730
(F) 757.357.0780
14053 Lawnes Creek Road
Smithfield, VA 23403

1850 E. Rodriguez Sr. Blvd.
Cubao, Quezon City
Philippines 1109
TEL: (63-2) 415-1424
TEL/FAX: (63-2) 721-7383
URL: http://www.acoustics.com.ph

LPES, Inc.
Engineering and Planning

Field Sound Transmission Class (FSTC)

Unfortunately, in field situations, test ratings of the same wall section vary from test to test and walls do not perform as well as under laboratory conditions. This drop in performance can leave the builder liable for additional construction to bring up the performance of the wall if the tenants obtain field test results from the dwelling units that confirm a reduced STC. The builder's best options for getting a satisfactory STC result are to specify partitions with a laboratory rating of STC 54 or better. At an early stage in the construction, testing can be done to rate the construction and upgrades recommended before costly finishing is in place.

How is FSTC Measured and Calculated?

Transmission loss data is measured in the field by means of a standardized procedure defined in ASTM E336 for field tests in actual buildings, while the calculation procedures for FSTC are defined in ASTM E413. The FSTC is heavily weighted in favor of the speech frequency range above 125 Hz and correlating with human hearing acuity. For the determination of the final FSTC number, the values between 400 Hz and 1250Hz are somewhat discounted, the values below 400Hz are increasingly discounted. The FSTC number is determined from Transmission Loss values using an algebraic formula for maximum or sum of deficiencies. The standard test method also requires minimum room volumes for the test to be correct at low frequencies.

To calculate FSTC

- Background measurements are taken in the source and receiving room.
- A speaker is set up in a corner of the source room away from the wall to be tested.
- Sound levels measurements are taken at several positions in the source and receiving room.
- Reverberation time is measured in the receiving room.
- The FSTC is calculated per ASTM E-413.

Recommended Readings

Measurement of Airborne Sound Insulation in Buildings ASTM E366-97, American Institute of Physics and Acoustical Society of America, 1997

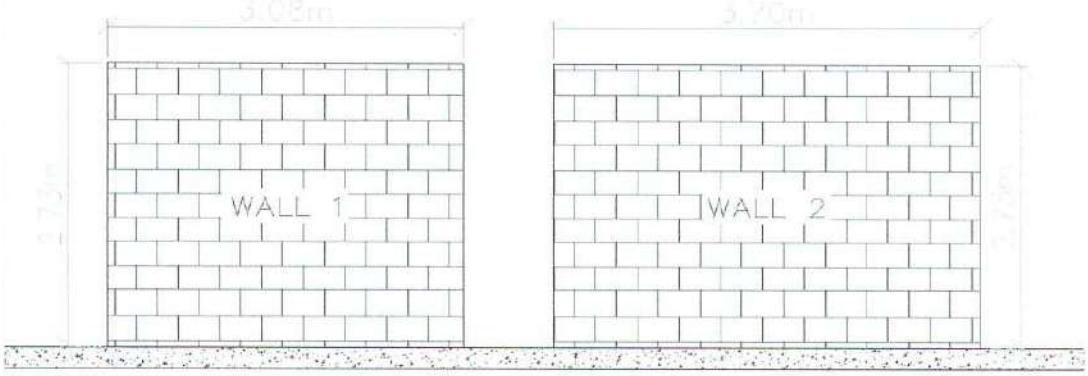
Classification for Rating Sound Insulation, ASTM E413-87, American Institute of Physics and Acoustical Society of America, 1987

Architectural Acoustics, Egan, M. David, McGraw-Hill, 1988

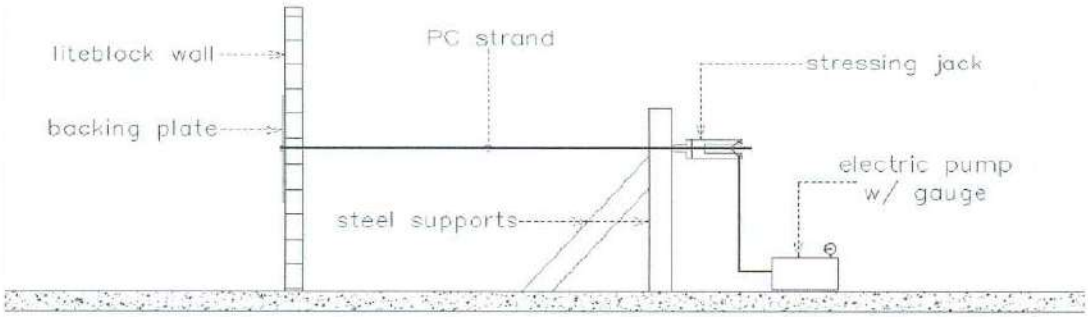
tlavallee@lpesinc.com
www.lpesinc.com
(P) 757.357.0730
(F) 757.357.0780
14053 Lawnes Creek Road
Smithfield, VA 23403

Project: Testing of Liteblock Panel
Owner: Litecrete Corp.
Location: UN. Ave., Mandaue City 6014 Cebu

Test Procedure:



FRONT VIEW



SIDE VIEW

Equipment:

-Electric Pump w/ gauge up to 10,000psi
-Powerteam SPX Stressing Jack
Jack Model: SJ2010P
CAT No.: PE554-50-220
Capacity: 10,000psi
Piston Area: 2885mm^2
-12.7mmϕ 7-Wire PC Strand
Diameter: 12.7mmϕ
Length: 3.0m
-Steel Backing Plate
1m x 1m x 20mm

Test Results:

-Wall No. 1-

L = 3.08 m

H = 2.73 m

t = 150 mm

Gauge Pressure, GP = 1500 psi 10.34214 MPa

Jacking Force, F = GP x Piston Area

F = 10.34214 Mpa x 2885mm^2

F = 29837.07 N

*Solve for qh1 @ 75m height

Sec 207A.9, G = 0.85

Fig 207D.4-1 Cf = 1.8

F = qh.G.Cf.As

qh1 = 2319.271 Pa

*Solve for Wind Velocity, V1 @ 75m height

Sec 207A.6, Kd = 0.85

Sec 207D.3-1, Kz = 1.278

Sec 207A.8.2 Kzt = 1

Basic Wind Speed (Cebu), V = 280 kph

qh = 0.613Kd.Kz.Kt.V^2

V1 = 59.01611 m/s

V1 = 212.458 kph < 280 kph

-Wall No. 2-

L = 3.7 m

H = 2.73 m

t = 100 mm

Gauge Pressure, GP = 1000 psi 6.89476 MPa

Jacking Force, F = GP x Piston Area

F = 6.89476 Mpa x 2885mm^2

F = 19891.38 N

*Solve for qh1 @ 75m height

Sec 207A.9, G = 0.85

Fig 207D.4-1 Cf = 1.8

F = qh.G.Cf.As

qh2 = 1287.091 Pa

*Solve for Wind Velocity, V1 @ 75m height

Sec 207A.6, Kd = 0.85

Sec 207D.3-1, Kz = 1.278

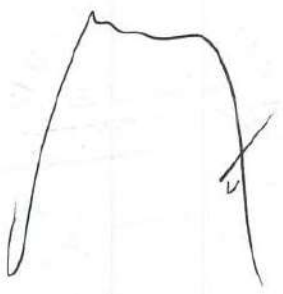
Sec 207A.8.2 Kzt = 1

Basic Wind Speed (Cebu), V = 280 kph

qh = 0.613Kd.Kz.Kt.V^2

V2 = 43.96423 m/s

V2 = 158.2712 kph < 280 kph



Discussion and Recommendation:

The liteblock panels were tested for exterior use. Based on the results, the liteblock panels can withstand wind pressures occuring at a maximum of 65m building height (18-20 storeys). Further reinforcements and tests have to be performed on the panels for exterior use at heights exceeding 75m. For interior use, the liteblock panels can be used regardless of the building height.

Engr. Wallace D. Lestano, F. ASEP
Structural Engineer
Reg No. : 65786
PTR No. : 1500225
Date : 01-06-2023
TIN : 135-439-219

PERFORMANCE TEST

OF

PARTITION WALL SYSTEM

USING

LITEPANEL™ 100MM THK

TESTED WITH REFERENCE TO

BS 5234 Part 2 : 1992

SUMMARY

Tested For Litepanel™ 100mm thk

Test Date June 5 - 6, 2023

Test Method Reference to BS 5234 Part 2 : 1992

Test Description The purpose of the test is to determine the resistance to damage of partition system for use as internal walls of building.

Test Results

Table 1. Summary of grade requirements and principal test performance levels	
Requirement	Grade performance achieved
	Severe Duty (SD)
Partition Stiffness	Passed
Small hard body impact	
Surface damage	Tested
Perforation	Passed
Large soft body impact	
Damage	Passed
Structural damage	Passed
Door Slam	Passed

Table 2. Summary of tests for crowd pressure, lightweight and heavyweight anchorages	
Requirement	Performance achieved
Crowd pressure	Refer to **3.7**
Lightweight anchorage – pull out	Refer to separate pull out test report
Lightweight anchorage – pull down	250 N
Heavyweight anchorage – wash basin	1000 N
Heavyweight anchorage – wall cupboard	4000 N

Certified by:

ENGR. IAN B. BERTULFO
CIVIL-STRUCTURAL ENGINEER
LICENSE NO. 109990

1. TEST SETUP

Litepanel™ 100mm thk was installed as the wall specimen with 5100mm width x 2440mm height and a partition junction assembly of a right-angle corner with a return of 1200mm for the performance test.

A doorset 1000mm width x 2100mm height and a 600mm run of partition flanking at one side of the doorset was included in the wall specimen.

The setup was installed from May 29 – June 1, 2023.

Fig 1. Litepanel™ wall specimen for performance test

2. DESCRIPTION OF TESTS

The following tests were conducted with reference to British Standard 5234 Part 2:1992:
It is noteworthy that this test purportedly applied *Note in Section 2.1* in BS 5234 Part 2: 1992 which states that "dead weights, at a conversion of 1 kg to 10 N, may be used to apply forces specified".

2.1. DETERMINATION OF PARTITION STIFFNESS (modified)

The test is to establish the ability of the partition to withstand people or ladder leaning against the partition wall without causing unacceptable cracking or movement.

A static horizontal load total of 500 N was applied using a pre-weighed steel frame inclined on the partition through 150mm dia steel plate with a contact rubber pad of 6mm thk. The load was applied at a height of 1500mm from the bottom of the setup. Deflection was taken on the load side at 125mm above the center point of load application. A pretest load 100 N was maintained for 2 minutes then deflection was recorded. The load was then applied in 100 N increments until 500 N before unloading and was sustained for 2 minutes in each loading. Deflection was recorded at the end of the 2-minute intervals while the residual deflection was recorded after 1 hour or when the partition has fully stabilized.

2.2. DETERMINATION OF SURFACE DAMAGE BY SMALL HARD BODY IMPACT

The test is to determine the resistance of the partition to damage from impacts by small, hard objects. A 3 kg / 50mm dia steel sphere impactor was used to simulate hard body object. It was attached to a 600mm length swinging arm.

Total of 11 positions were selected on the partition for the test. Each position was subjected to 10 N•m impact energy by raising the impactor at 63.6° then released. Bouncing or secondary impact of the impactor was prevented.

The depth of indentation was recorded on each position. The 11th position was tested at the partition junction.

2.3. DETERMINATION OF RESISTANCE TO DAMAGE BY LARGE SOFT BODY IMPACT

The test is to simulate impact caused by people falling against or any large, soft object such as a ball hitting the partition wall. A spheroconical bag 600mm x 400mm filled with hardened glass beads with a total weight of 50 kg was used as the impactor to simulate large soft body object.

Total of 3 positions were selected on solid point (no joint) of the partition for the test. Each position was subjected to 100 N•m impact energy by raising the impactor to give a drop height of 204mm. The line was released and prevented from bouncing.

Permanent deformation was recorded after the partition was allowed to stabilize for 5 minutes. The 3rd position was tested at the partition junction.

2.4. DETERMINATION OF RESISTANCE TO PERFORATION BY SMALL HARD BODY IMPACT

The test is to determine the resistance of the partition to perforation from impacts by small, hard objects. A 3 kg / 50mm dia steel sphere impactor was used to simulate hard body object. It was attached to a 600mm length swinging arm.

Total of 11 positions were selected on the partition for the test. Each position was subjected to 30 N•m impact energy by raising the impactor at 131.8° then released. Bouncing or secondary impact of the impactor was prevented.

The partition was inspected for any damage or perforation on each position. The 11th position was tested at the partition junction.

2.5. DETERMINATION OF RESISTANCE TO STRUCTURAL DAMAGE BY LARGE SOFT BODY IMPACT

The test is to simulate impact caused by people falling against or any large, soft object such as a ball hitting the partition wall. A spheroconical bag 600mm x 400mm filled with hardened glass beads with a total weight of 50 kg was used as the impactor to simulate large soft body object.

Total of 3 positions were selected on solid point (no joint) of the partition for the test. Each position was subjected to 3 impacts with impact energy of 120 N•m by raising the impactor to give a drop height of 245mm. The line was released and prevented from bouncing.

The partition was inspected for any surface or structural damage.

2.6. DETERMINATION OF THE EFFECTS OF DOOR SLAMMING

The test simulates a door being forcefully slammed by a person, wind, or tensioned door closer.

A 60 kg door leaf was slammed through an opening angle of 60° using a 15 kg test weight for 100 times. A pre-slam test (3 times) was done, and residual displacement was recorded. The partition and door frame were allowed to stabilize for 5 minutes before measuring residual displacement. Any damage during and after the test was also recorded.

2.7. DETERMINATION OF RESISTANCE TO CROWD PRESSURE (modified)

The test simulates a uniform band load such as a crowd leaning against the wall.

A separate wall specimen 3m x 2.4m was horizontally placed with concrete beam as the base and the side with dowel resting on top of metal channel as soffit, imitating seismic joint. Instead of timber beam, a 10” x 6” I-beam was placed 1.2m from the base and was used to apply concentrated load on the specimen. An increment of 125 kg up to 2250 kg was loaded through the I-beam.

Deflection was measured above the beam. Any changes during the test was recorded.

2.8. LIGHTWEIGHT ANCHORAGE PULL DOWN TEST

The test bracket was mounted on the partition where one side has the anchorage, and the other side is where the load test is. Pull-up shim plate was placed before tightening the anchorage. A pull down load of 250 N parallel to the wall was applied on the bracket. The load was sustained for 1 minute before unloading. Displacement was measured just above the bracket. It was also recorded whether the pull-up shim plate was released or not.

2.9. HEAVYWEIGHT ANCHORAGE (WASH BASIN) ECCENTRIC DOWNWARD LOADING TEST

A steel bracket identical to a standard wash basin was mounted on the partition and the shims were inserted before tightening the anchorage. A preload of 200 N was gradually applied and maintained for 1 minute before unloading. Cyclic load of the following sequence was then applied at approximately 1 minute intervals:
500, 750, 500, 500, 750, 500, 750, 500, 1000, 500, 1000, 500, 1250, 500, 1250, 500, 1500, 500, 1500 & 500 N.

Maximum deflection was recorded at each measuring point. Residual deflections were taken after 5 minutes from unloading on both faces midpoint between the brackets. Any damage during and after the test was also recorded.

2.10. HEAVYWEIGHT ANCHORAGE (HIGH LEVEL WALL CUPBOARD) ECCENTRIC DOWNWARD LOADING TEST

A steel bracket identical to a standard wall cupboard was mounted on the partition and the shims were inserted before tightening the anchorage. A preload of 200 N was gradually applied and maintained for 1 minute before unloading. Incremental load of the following sequence was then applied at approximately 1 minute intervals:
500, 1000, 1500, 2000, 2500, 3000, 3500, 4000 N.

Maximum deflection was recorded at each measuring point. Residual deflections were taken after 5 minutes from unloading on both faces midpoint between the brackets.

3. INDIVIDUAL TEST REPORTS

3.1. STIFFNESS (modified)

Grade tested: Severe Duty
Load applied: 500 N

Load (N)	Duration (min)	Deflection (mm)	Residual Deflection (mm)	Condition of specimen	BS 5234 Part 2: 1992 Requirements
Pretest load of 100 N	1	0	-	No damage occurred	1. There shall be no damage or detachment, loosening or dislodgement of partition wall's parts or fixing. 2. The maximum deflection and residual deformation shall not exceed 10 and 1 mm respectively.
100	2	0	-		
200	2	0	-		
300	2	0	-		
400	2	0	-		
500	2	0	0.0		

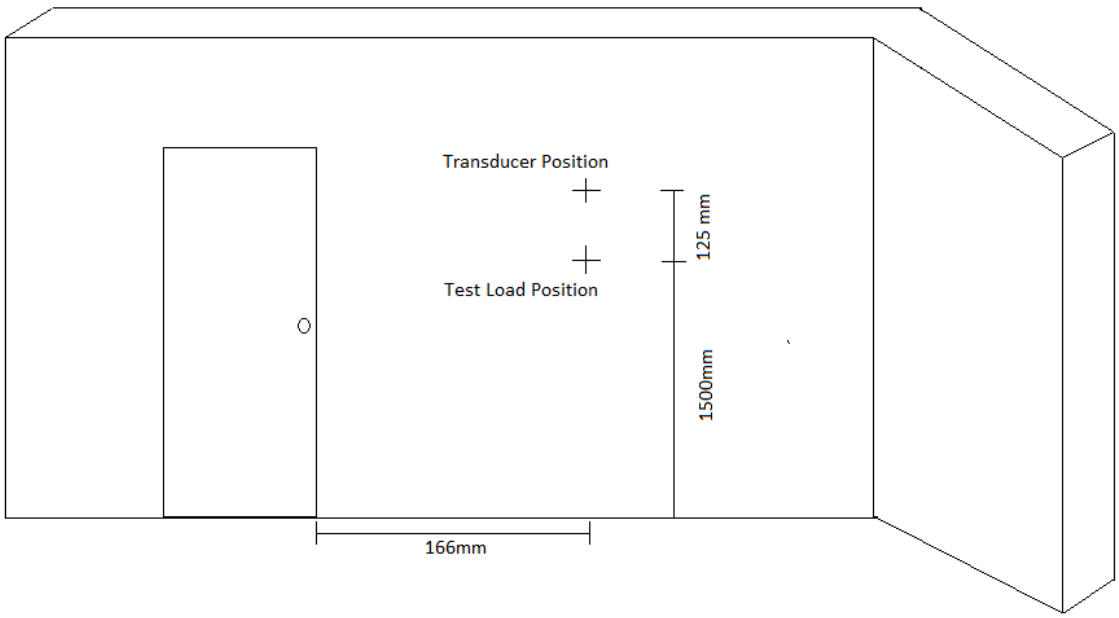


Fig 2. Location of applied load for determination of partition stiffness

3.2. SURFACE DAMAGE BY SMALL HARD BODY IMPACT

Grade tested: Severe Duty

Impact energy level: 10 N•m

Impact Position	X (mm)	Y (mm)	Depth of indentation (mm)	Condition of specimen	BS 5234 Part 2: 1992 Requirements
1	2058	608	1.2	Tested	1. No specific criterion for acceptance 2. Attached photographs of surface damages for the authority judgement to be made whether can be easilyrepaired for acceptance
2	2220	608	1.5		
3	2415	608	1.2		
4	2585	608	1.4		
5	2925	608	1.4		
6	3258	608	1.4		
7	3585	608	1.4		
8	3995	608	1.4		
9	4237	608	1.5		
10	4498	608	1.2		
11	170*	608	1.4		

* Standard X position for corner junction is 75mm from the corner. Due to frame limitation, 11th position was tested at 170mm from the corner.

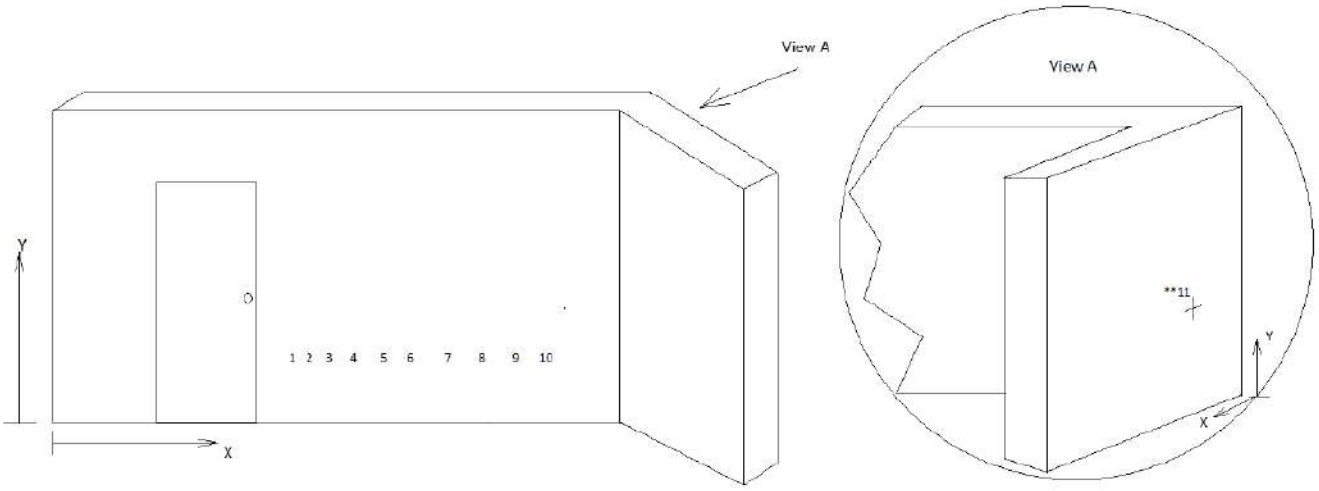


Fig 3. Locations of small hard body impact for surface damages (above)

Fig 4. Close up view of indentations (left) – surface damage by small hard body

3.3. DAMAGE BY LARGE SOFT BODY IMPACT

Grade tested: Severe Duty

Impact energy level: 100 N•m

Impact Position	X (mm)	Y (mm)	Residual deflection (mm)	Condition of specimen	BS 5234 Part 2: 1992 Requirements
1	2885	1200	1.0	No damage occurred	The partition wall and right angle junction shall be capable of withstanding the impact energy without sustaining either permanent deformationin excess of 2 mm or any damage.
2	4100	1200	1.0		
3	865*	1220	1.0		

* Standard X position for corner junction is 200mm from the corner. Due to frame limitation, 3rd position was tested at 865mm from the corner.

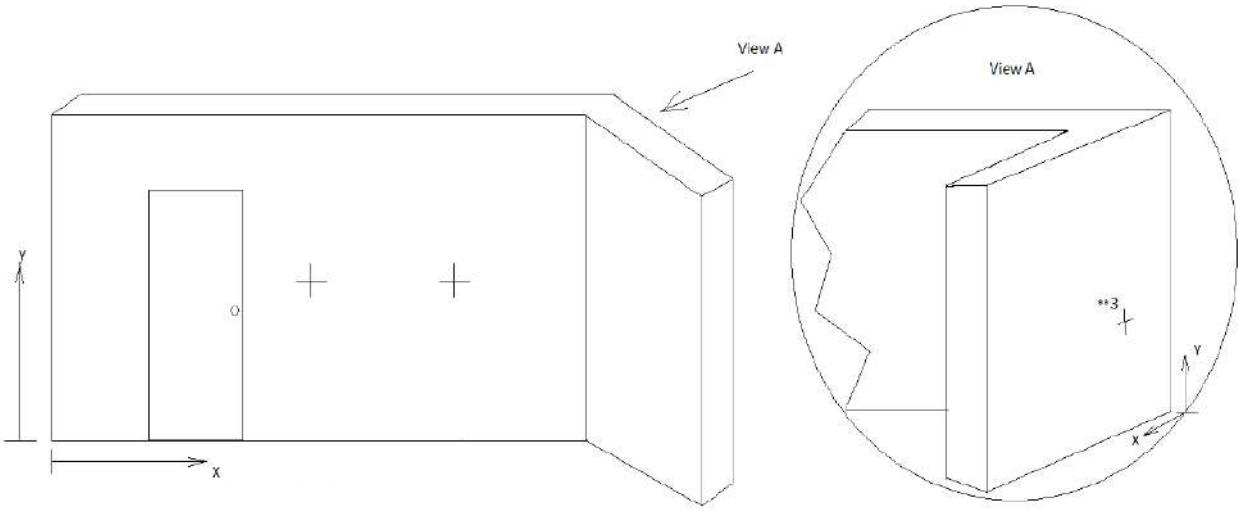


Fig 5. Locations of large soft body impact for resistance to damage

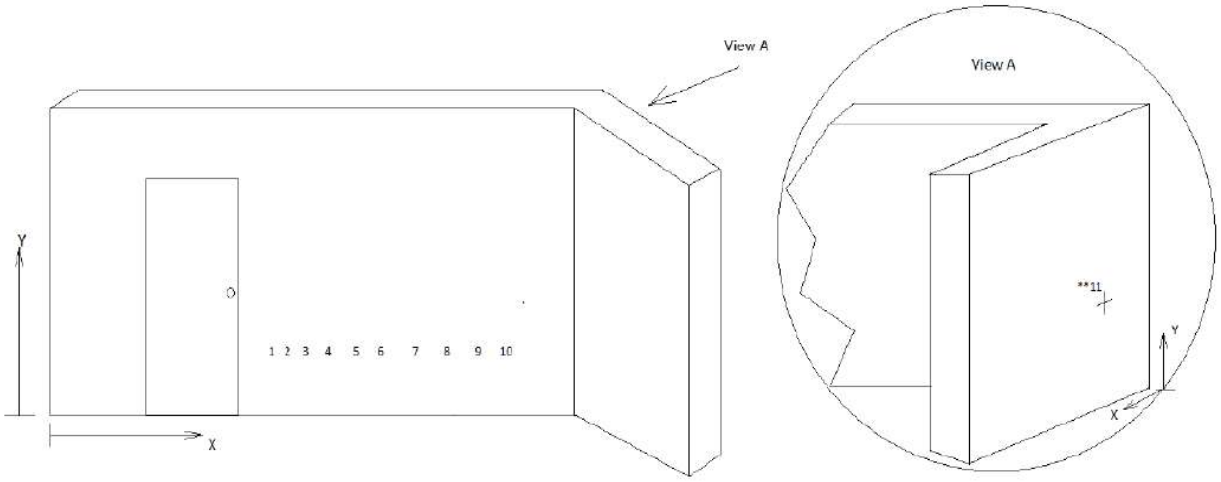
3.4. PERFORATION BY SMALL HARD BODY IMPACT

Grade tested: Severe Duty

Impact energy level: 30 N•m

Impact Position	X (mm)	Y (mm)	Depth (mm)	Condition of specimen	BS 5234 Part 2: 1992 Requirements
1	2425	500	4.1	No perforation	There shall be no perforation of the partition wall on corner junction, or panel after being subjected to the impact energy.
2	2651	500	4.2		
3	2815	500	3.8		
4	2945	500	3.8		
5	3127	500	3.7		
6	3286	500	3.6		
7	3463	500	4.0		
8	3917	500	3.7		
9	4108	500	3.8		
10	4279	500	3.7		
11	180*	500	3.8		

* Standard X position for corner junction is 75mm from the corner. Due to frame limitation, 11th position was tested at 180mm from the corner.



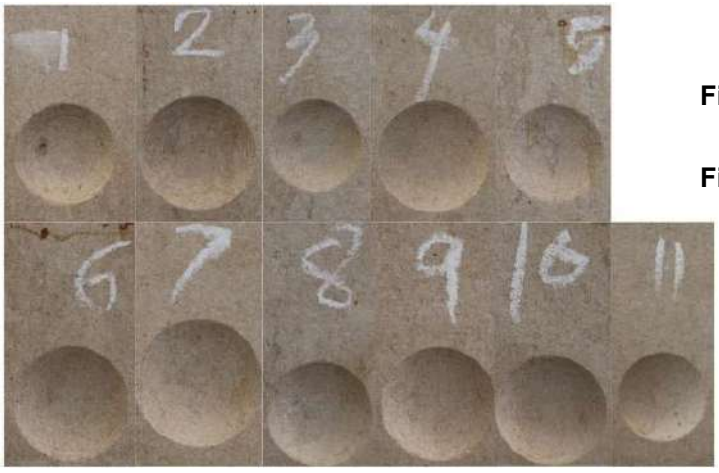


Fig 6. Locations of small hard body impact for perforation (above)

Fig 7. Close up view of indentations (left) - perforation by small hard body

3.5. STRUCTURAL DAMAGE BY LARGE SOFT BODY IMPACTS

Grade tested: Severe Duty

Impact energy level: 120 N•m

Impact Position	X (mm)	Y (mm)	Condition of specimen	BS 5234 Part 2: 1992 Requirements
1	2885	1400	No damage occurred	The partition wall shall be capable of withstanding the impact energy, without collapsing or dislocating the partition wall or its fixings.
2	4100	1400		

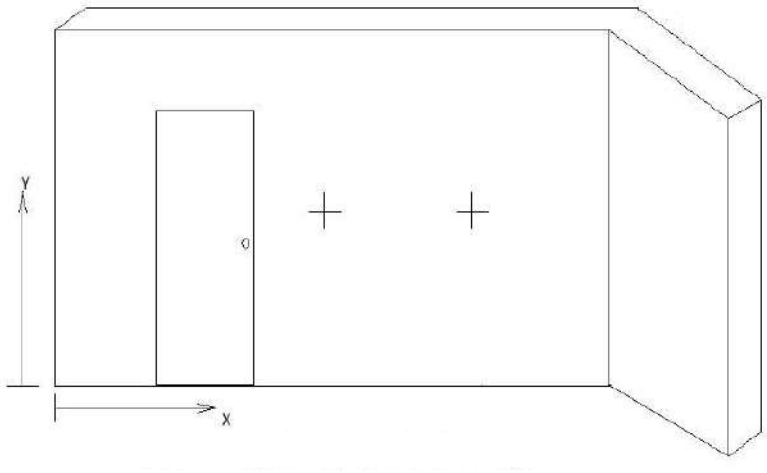


Fig 8. Locations of large soft body impact for resistance to structural damage

3.6. DOOR SLAM

Grade tested: Severe Duty

Door weight: 60 kg

Number of slams	Residual deflection (mm)	Observations	Condition of specimen	BS 5234 Part 2: 1992 Requirements
Pretest of 3	-		Partition not damaged. No frame fittings were detached or became loose.	1. The partition shall not be damaged, nor shall door frame fittings and architraves become detached or loose after the door leaf has been slammed. 2. The closing jamb of the door frame shall not be permanently displaced by more than 3mm as a result of the pre-slam test and by more than 1 mm as a result of the main slam test, from its position at the start of the test, measured at 1.0m above the bottom of the door leaf.
30	-	Hairline crack on lintel started to show		
70	-	Hairline crack on stiffener on the lock side started to show		
100	1.0	Neither of the cracks propagated or widened		

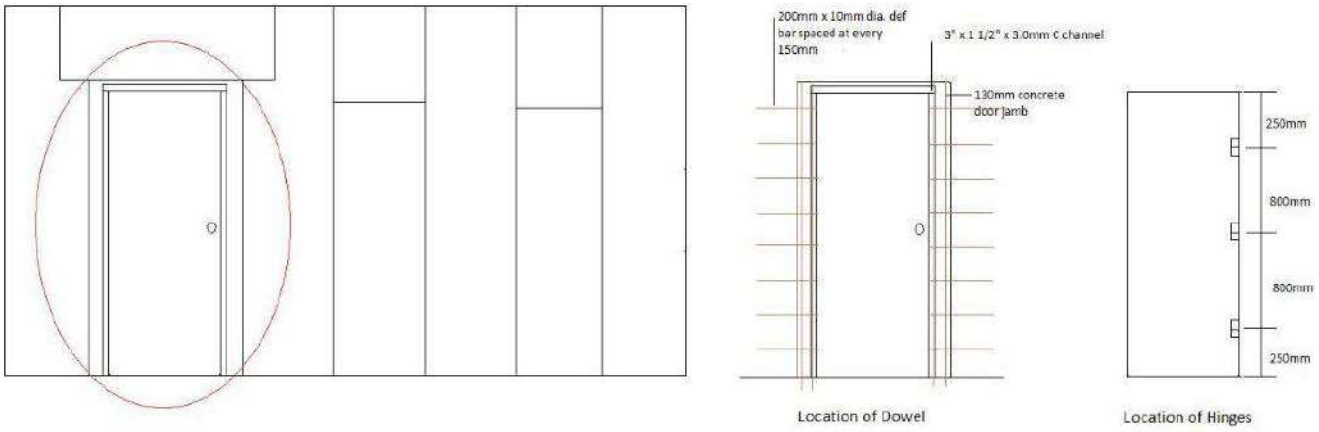


Fig 9. Locations of small hard body impact for perforation

3.7. CROWD PRESSURE (modified)

Load applied: 2250 kg

Load (kg)	Duration (min)	Deflection (mm)	Residual deflection (mm)	Observations	Condition of specimen
Pretest of 200	1	0.0	0.0		Sample did not collapse or shatter
125	2	0.0	-		
250	2	0.0	-		
375	2	1.0	-		
500	2	1.0	-		
625	2	1.0	-		
750	2	1.0	-		
875	2	1.0	-		
1000	2	1.0	-		
1125	2	2.0	-		
1250	2	3.0	-	Visible crack at beam and panel joint	
1375	2	3.0	-	Joints near dowel side start to tear	
1500	2	3.0	-		
1625	2	3.0	-		
1750	2	3.0	-		
1875	2	5.0	-	Crack widened to 1mm at beam and panel joint	
2000	2	5.0	-		
2125	2	5.0	-		
2250	2	6.0	8.7		

BS 5234 Part 2: 1992	There shall be no collapse or damage that would render the partition wall dangerous, due to any of its parts becoming dislodged or shattered, in a manner that could cause injury.

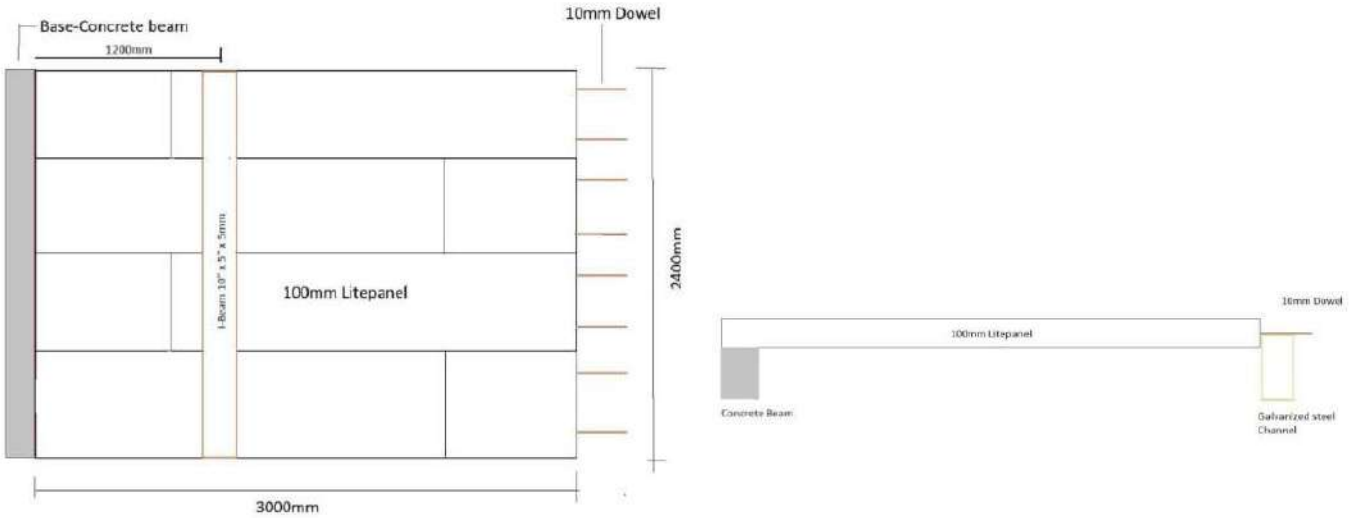


Fig 10. Setup of the modified crowd pressure test

3.8. LIGHTWEIGHT ANCHORAGE PULL DOWN

Load applied: 250 N

Type of anchorage used: 6mm dia screw, 10” wall plug

Load (N)	Duration (min)	Deflection (mm)	Condition of specimen	BS 5234 Part 2: 1992 Requirements
250	1	0.5	No damage occurred	1. The partition wall shall withstand the traverse load without releasing the pull-up shim plate or damaging the partition other than superficial cracking . 2. The maximum movement of the pull-down bracket shall not exceed 2mm.

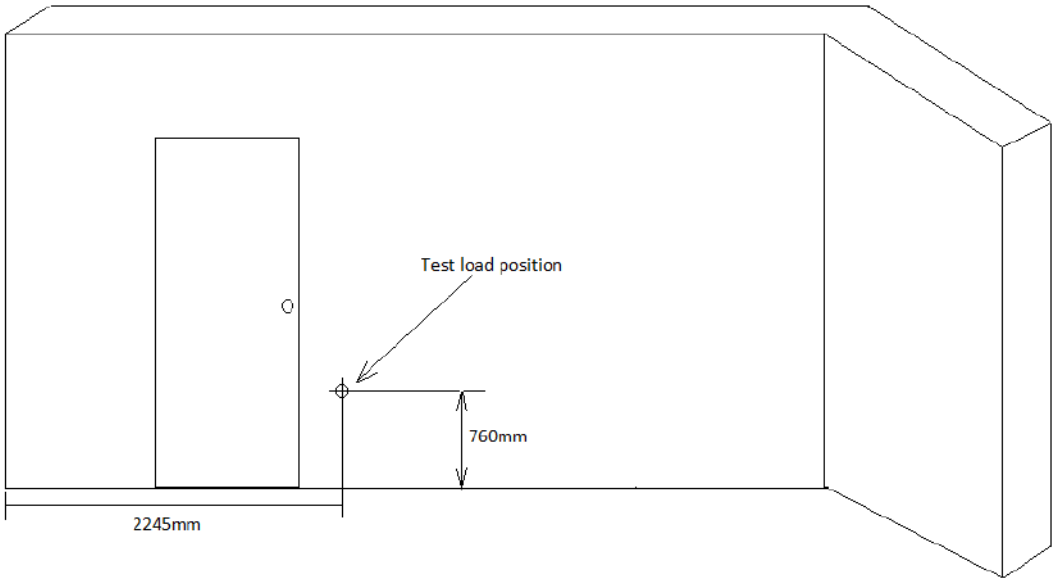


Fig 11. Location of applied load for lightweight anchorage pull down test

Fig 12. Anchorage used for pull down test

3.9. HEAVYWEIGHT ANCHORAGE WASH BASIN

Load applied: 1000 N

Type of anchorage used: G.I. expansion shield with lag screw 5/8" x 2 ½"

Load (N)	Time (min)	Deflection (mm)				Residual deflection (mm)				Condition of specimen
		1	2	3	4	1	2	3	4	
Pretest load of 200	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Pull up shim plate not released Refer to Fig 23 in Annex
500	1	0.0	0.0	0.0	0.0	-	-	-	-	
750	1	0.3	0.2	1.0	1.0	-	-	-	-	
500	1	0.3	0.3	0.4	0.5	-	-	-	-	
750	1	0.3	0.5	0.5	0.2	-	-	-	-	
500	1	0.4	0.5	0.4	0.1	-	-	-	-	
1000	1	0.5	0.8	0.2	0.2	-	-	-	-	
500	1	0.3	0.2	0.4	0.4	-	-	-	-	
1000	1	0.1	0.1	0.2	0.2	-	-	-	-	
500	1	0.4	0.1	0.4	0.2	-	-	-	-	
1250	1	0.1	0.5	0.8	0.7	-	-	-	-	
500	1	0.0	0.0	0.7	0.8	0.5	0.4	0.4	0.0	

BS 5234 Part 2: 1992	The anchorages shall be capable of withstanding the load selected applied to the 2 linked brackets without releasing either pull-up shim plate, exceeding 20 mm deflection or 1 mm residual deformation limits and without loosening, detaching, or damaging the partition wall.

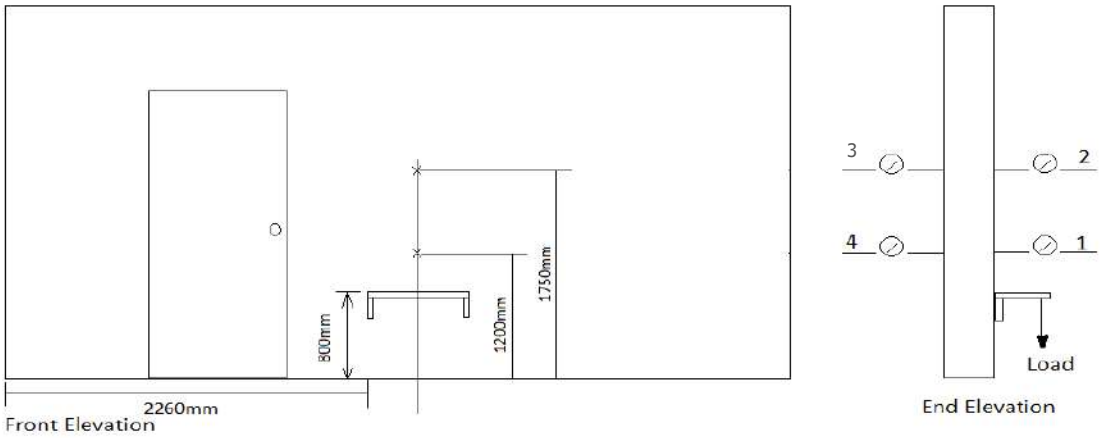


Fig 13. Location of applied load for heavyweight anchorage wash basin eccentric downward loading test

Fig 14. Anchorage used for wash basin test

3.10. HEAVYWEIGHT ANCHORAGE WALL CUPBOARD

Load applied: 4000 N

Type of anchorage used: G.I. expansion shield with lag screw 5/8" x 2 ½"

Load (N)	Time (min)	Deflection (mm)				Residual deflection (mm)				Condition of specimen
		1	2	3	4	1	2	3	4	
Pretest load of 200	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Pull up shim plate not released Refer to Fig 24 in Annex
500	1	0.0	0.0	0.0	0.0	-	-	-	-	
1000	1	0.0	0.0	0.0	0.0	-	-	-	-	
1500	1	0.0	0.0	0.0	0.3	-	-	-	-	
2000	1	0.2	0.2	0.1	0.5	-	-	-	-	
2500	1	0.1	0.2	0.2	0.3	-	-	-	-	
3000	1	0.1	0.2	0.3	0.3	-	-	-	-	
3500	1	0.4	0.4	0.4	0.3	-	-	-	-	
4000	1	0.4	0.5	0.4	0.3	0.0	0.1	0.3	0.3	

BS 5234 Part 2: 1992	The anchorages shall be capable of withstanding the load selected applied to the 2 linked brackets without releasing either pull-up shim plate, exceeding 5 mm deflection or 1 mm residual deformation limits and without loosening, detaching, or damaging the partition wall.

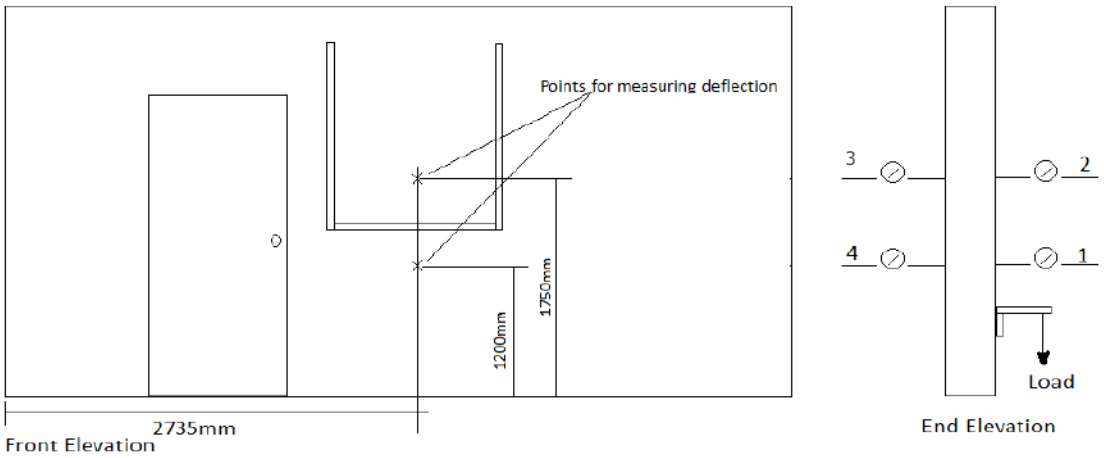


Fig 15. Location of applied load for heavyweight anchorage wash basin eccentric downward loading test

Fig 16. Anchorage used for wash basin test

ANNEX: TEST SETUP

Fig 17. Stiffness test

Fig 18. Small hard body impact test

Fig 19. Large soft body impact test

Fig 20. Door slam test

Fig 21. Crowd pressure test

Fig 22. Pull down test

Fig 23. Wash basin test

Fig 24. Wall cupboard test

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