

BMBM

2 - hour Fire Resistance

Performance of Fully Insulated
Partition Boards Wall Systems

Smart Challenge to
Fire and Noise Attcak



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BNBM

Gypsum board

Fire Resistance Period

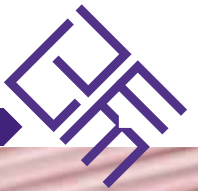
Every element of construction within each compartment and every compartment wall or compartment floor should have an FRP of not less than that specified in Table 2 below.

Fire Resistance Period

Class	Use	Compartment Volume	Fire Resistance Period
1	Domestic	Not exceeding 28 000 m ³	1 hour
2	Hotel bedroom		
3	Office		
4	Shop restaurant and hotel foyer	Not exceeding 7 000 m ³	1 hour
5	Place of public entertainment		
6	Hospital		
7	Place of assembly	Exceeding 7 000 m ³ but not exceeding 28 000 m ³	2 hour
8	Carparking		
9	Bulk storage and warehouse	Not exceeding 7 000 m ³	2 hour
10	Industrial undertaking except bulk storage and warehouse	Not exceeding 28 000 m ³	2 hour

Notes:

- (1) Different use class should be separated in accordance with paragraph 8.
- (2) Special hazards should be separated in accordance with paragraph
- (3) For any use not covered by Table 2, the fire resistance period required will be determined by the Building Authority having regard to the fire load, hazard level, fire service installations and other relevant features of the building.



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STRENGTH AND ROBUSTNESS

PARTITION DUTY -

BNBM Partitioning System provides strength and robustness.

These duty ratings have been calculated in accordance with BS 5234: Part 1 & 2: 1992. The rating is a measure of the ability of the wall to meet the requirements of strength and robustness test. BNBM Partitions are characterized by high acoustic performance, low overall width and high fire resistance.

- Stiffness
- Surface damage by small hard body impact
- Resistance to damage by impact from a large soft body.
- Eccentric downward loading of heavyweight anchorage (wash basin)
- Eccentric downward loading of heavyweight anchorage (high level wall cupboard)

- Crowd pressure
- Perforation by small hard body impact.
- Resistance to structural damage by impact from a large soft body.
- Door slamming
- Pull-out of a lightweight anchorage.
- Pull-down of a lightweight anchorage.

As an aid to specification, the figures below are guidelines for duty-strength/ robustness rating, and minimum sound reduction values for partitions separating various room types.

The wall duty-strength and robustness-rating are grouped as follows:

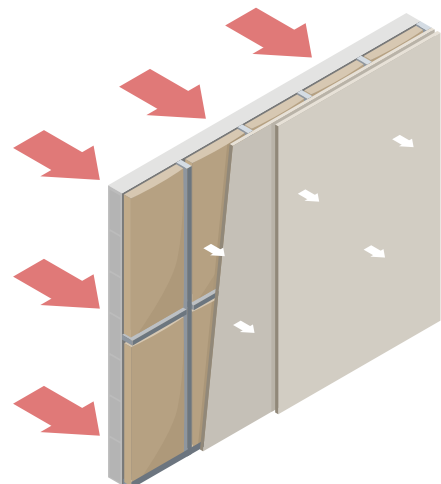
Category	Building Type	Category	Building Type
Light Duty (LD)	Residential	Heavy Duty (HD)	Public or industrial building
Medium Duty (MD)	Office or commercial building	Severe Duty (SD)	Heavy industrial building

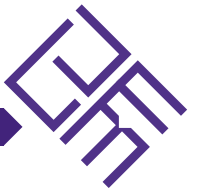
Suggested minimum sound insulation values of partitions:

Suggested minimum sound insulation performance levels for privacy in some occupational conditions are given in table below. The values given are based on laboratory measurements.

Location	Weighted sound reduction index R_w db
Habitable rooms in dwellings	30
Executive offices	50
Quiet rooms in dwellings	44
Hotel rooms	55
Enclosing bathrooms in dwellings	38
Music practice rooms	60
General offices	38
Cinemas	60
Private offices	44

Note: Where there is a great deal of background noise, a lower R_w may be acceptable.





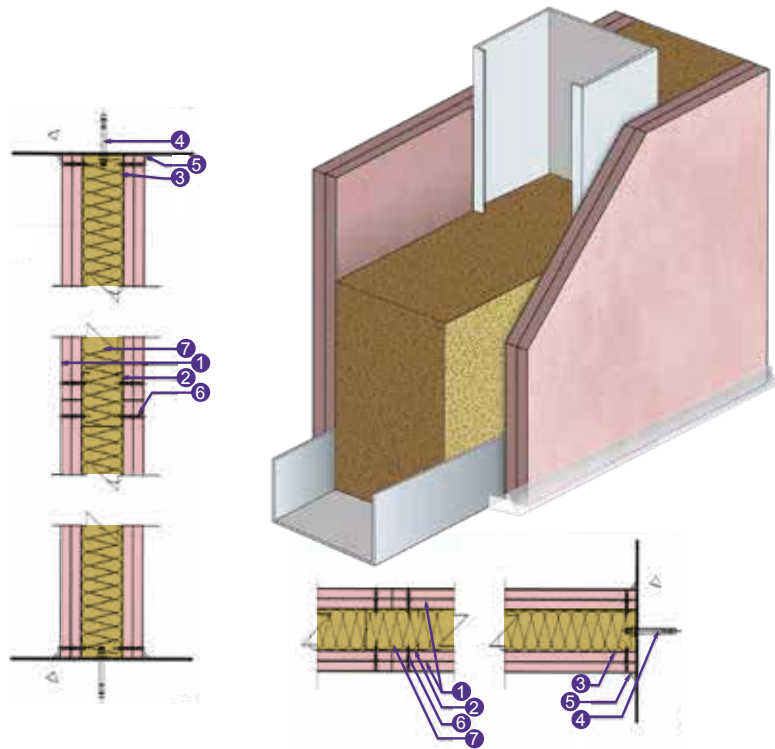
BNBM

Gypsum board

BNBM plasterboard partition systems offer many benefits over conventional masonry wall. Whether it is new construction or refurbishment, BNBM plasterboard partition systems offer greater flexibility in construction and relocation. Unlike conventional masonry wall, they are faster to construct and hence reduce delay to other trades. Because it weighs less than twenty percent of conventional masonry wall, the system reduces the building dead load. The system is also slimmer and the reduced thickness allows for more rentable space, which in turn increases the rental income potential.

Slim fire resistant and acoustic rated partition for all sorts of internal environments

In congested urban developments, high population is confined to small expensive space. This explains why high rise buildings are everywhere. This phenomenon creates problems in terms of fire risk and acoustic isolation between adjacent rooms, and the need to maximize living / working space for each individual is of paramount importance.



Technical Data:

2-Hour fire rating, integrity & insulation

According to BS 476: Part 22, with fire risk from both sides

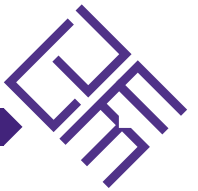
Overall partition thickness = 112 mm

Sound reduction R_w = 53 dB

* For wet area, use 2 x 12mm BNBM moisture resistant plasterboard

LEGEND:

- ① Two layers of 12mm thick BNBM (fire resistant Gypsum plasterboard)
- ② 64mm x 32mm x 0.8mm thick Galvanized Steel C Channel
- ③ 64mm x 32mm x 0.8mm thick Galvanized Steel U Channel at nominal 610mm by 1220mm centres
- ④ Nailable plug at 600mm centers
- ⑤ Fire Sealant
- ⑥ Self-tapping screws at 250mm centres
- ⑦ BNS Rock wool 60mm x 100kg/m³

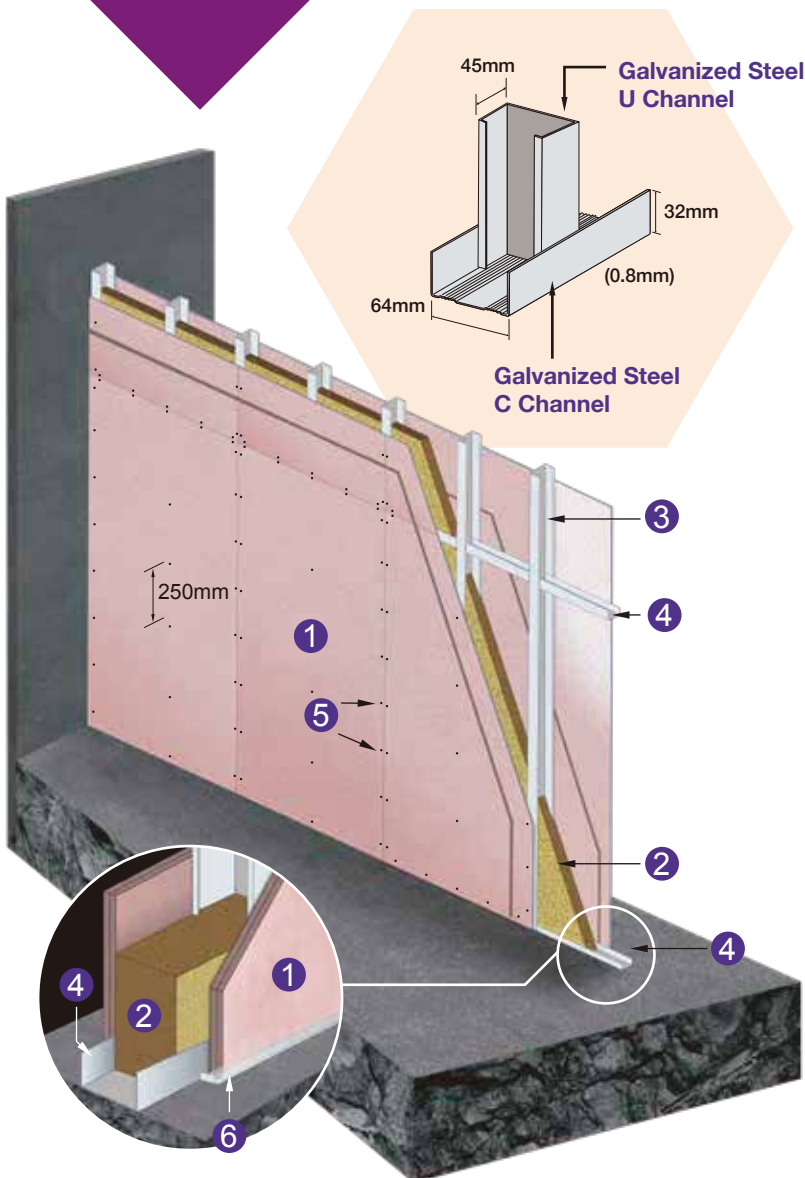


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2-hours fire Rated GypsumBoard Partition (12mm)Systems

Fire resistance	FRL	-/132/114
	Standard	BS 476: Part 20: 1987 BS 476: Part 22: 1987
	Approval	R05K02B RED
Assessment	FRL	-/120/120
	Approval	R17K17 - 1A_Issue 1
	Rock Wool	60mm X 100kg/m ³
	Maximum height	Up To 6m
	Partition thickness	112mm-148mm
	Partition length Standard	Unlimited
Acoustic	#STC	STC - 53
	Standard	ASTM E 90-04 ASTM E 413-87
	Predicted assessment	ATS05-005-RP004 (ATSL) ATS10-013-RP003 (ATSL)
Physical Performance		EN 520 BS 476: Part 4, 6 & 7



- ① Two layers of 12mm thick BNBM (fire resistant Gypsum plasterboard)
- ② BNS Rock wool 60mm x 100kg/m³
- ③ 64mm x 32mm x 0.8mm thick Galvanized Steel U Channel at nominal 610mm by 1220mm centres
- ④ 64mm x 32mm x 0.8mm thick Galvanized Steel C Channel
- ⑤ Self-tapping screws at 250mm centres
- ⑥ Fire Sealant

Sizes of studs for the proposed height of partition boards wall systems

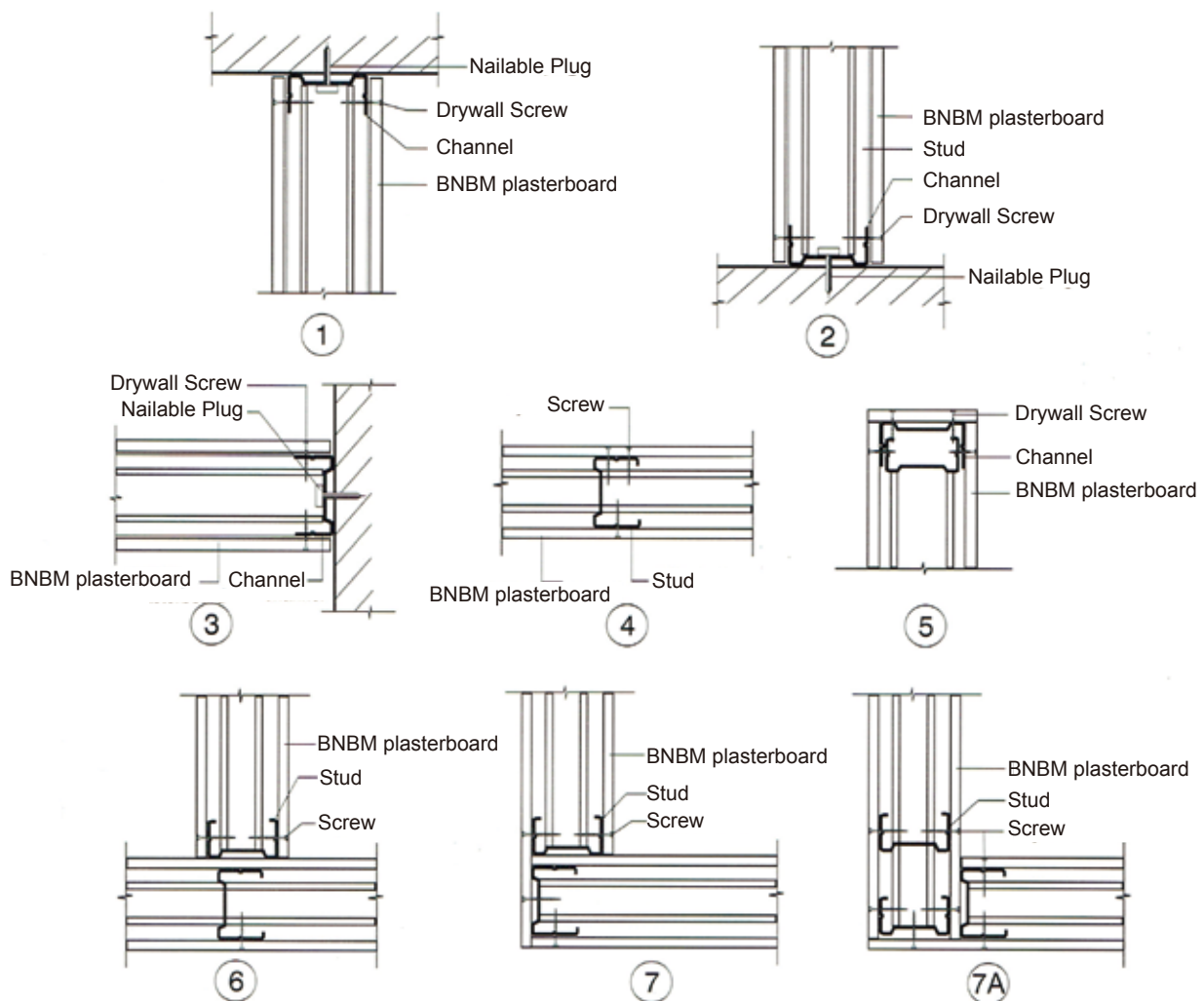
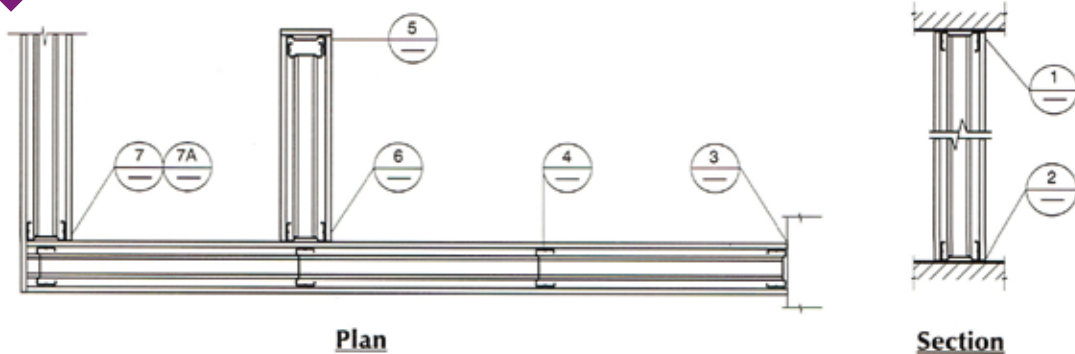
Height up to	Stud sizes (D×F×T)	Studs spacing	Expansion allowance
3.0m < Height ≤ 4.0m	64×45 × 0.8mm	600mm/ c/c	40mm
4.0m < Height ≤ 4.5m	75×50 × 1.2mm	600mm/ c/c	45mm
4.5m < Height ≤ 5.5m	100×40 × 1.2mm	600mm/ c/c	55mm
5.5m < Height ≤ 6.0m	75×50 × 1.5mm	600mm/ c/c	60mm



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Partition Details



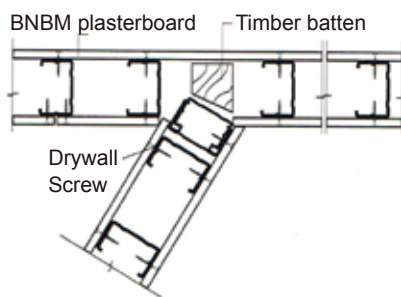


BNBM

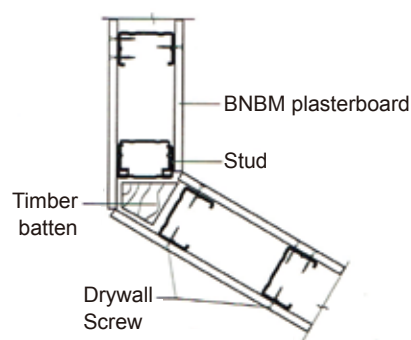
Gypsum board

Partition Details

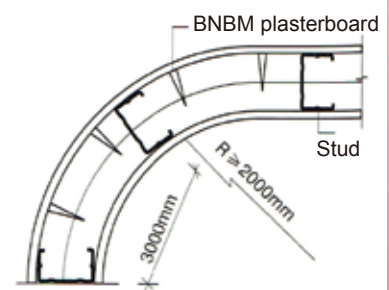
Splayed Corner



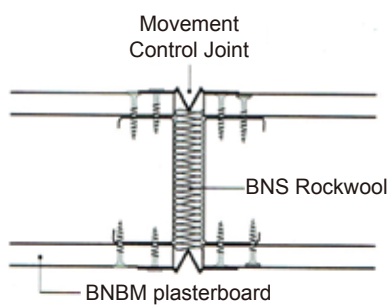
Splayed Corner



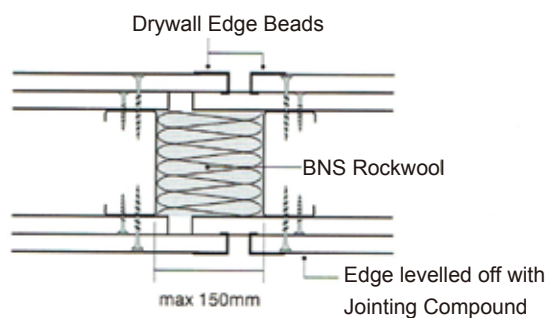
Curved partition



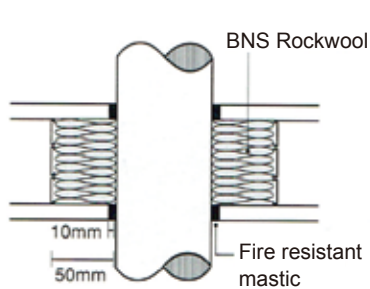
Movement Control Joint



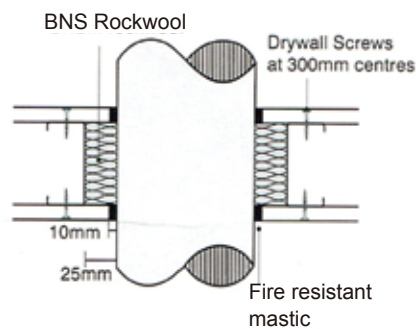
Expansion Joint



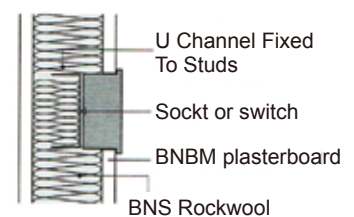
Pipe Penetration



Duct Penetration



Sockets And Switches



PROFESSIONAL AND RELIABLE

Besides the excellent features of standard “Dragon Brand” gypsum board, fire-resistant series has the following function,
High fire-resistant performance: the fire-resistant fiber glass and special additives, with the stability when fire reaches 45 minutes, which is well beyond the requirement of national standard, guarantees the excellent fire-resistant performance.

Complete Contact Details:

Champ Concept

Man Kam To

Contact No.: (852) 5596 7709

Email: chinaunion2office@gmail.com

Company Website: www.chinaunion.org

TEST REPORT

TEST REPORT NO.: R05K02B
DATE OF ISSUE: 22 October 2005

Test Sponsors: 1) **BNS Company Limited** - 北新科技發展有限公司
2) **Gammon Construction Limited**
Address of Test Sponsors: 1) 10/F., CITIC Building, No. 1093, Shennan Mid-Road,
Shenzhen, P.R. China.
Post code: 518031
2) 28/F., Devon House, Taikoo Place, 979 King's Road,
Hong Kong.
Identification of Test Item: **Q5J43B – Insulated Partition System with Double Layer
BNBM Gypsum Boards (Fire Resistant)**
Test Method: Fire resistance test conducted in accordance with BS 476:
Part 22: 1987
Date of Test: 17 October 2005
Ambient temperature at the time of testing: 28 °C

APPROVED SIGNATORY:


(Dr. Andrew SO Kwok Wai)



DATE: 22 OCT 2005

The test results are valid only for the conditions under which the test was conducted.

This laboratory is accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific tests and/or measurements and the results shown in this test report have been determined in accordance with the laboratory's terms of accreditation. It may not be reproduced except with prior written approval from the issuing laboratory.

Fire resistance test conducted in accordance with BS 476: Part 22: 1987, Section 5, on an insulated partition system with double layer BNBM gypsum boards (Fire Resistant)

1. Summary

A specimen of partition system had been subjected to a test in accordance with BS 476: Part 22: 1987, Section 5, to determine its fire resistance performance.

The specimen was comprised of two layers of 12 mm thick "BNBM" fire resistant gypsum boards mounted on each side of "BNBM Dragon" galvanized steel frame. It consisted of vertical studs and head & bottom runners with overall sizes 64 mm x 45 mm x 0.8 mm and 64 mm x 45/32 mm x 0.8 mm respectively.

The two layers of gypsum boards were fixed to the studs by self-tapping screws (3.5 mm x 25 mm / 35 mm long) at 300 mm nominal centres along the edge joints and in the field of gypsum boards. A layer of 50 mm thick rockwool with density of 100 kg/m³ was sandwiched in between the boards. The joints were covered by fiber tape and joint plaster. A free edge of 20 mm wide (approx.) was applied on the left vertical edge and the gap was filled with ceramic rockwool. The specimen was constructed and mounted within a concrete lined specimen holder by the test sponsor, as shown in the client's drawings (see the appendix).

The specimen had overall dimensions of 3,050 mm wide by 3,050 mm high. The specimen satisfied the performance requirements specified in Section 5 of BS 476: Part 22: 1987, for the following periods:

Insulation	114	Minutes
Integrity:	132	Minutes

The test was discontinued after a heating period of 132 minutes per the test sponsor's request.

2. Introduction

The partition system was tested in accordance with Section 5 of BS 476: Part 22: 1987, 'Methods for determination of the fire resistance of non-loadbearing elements of construction'.

This test report should be read in conjunction with the BS 476: Part 20: 1987, 'Methods for determination of the fire resistance of elements of construction (general principles)'.

The specimen was mounted by the test sponsor. The test was led by Dr. S.W. Yuen and was witnessed by Mr. Gary Gong, the representative of the test sponsor.

3. Test Specimen Construction

The specimen was installed into a concrete specimen holder to form the test construction. A description of the test construction is presented in the appendix, together with the mock up drawing for the test.

4. Location of Testing Laboratory

96 York, Lot No. 2440, Section M, Ma Tso Lung, Sheung Shui, New Territories, Hong Kong.

5. Equipment

Equipment includes:

Nine (9) thermocouples to monitor the temperature of the furnace, which were kept at 100 mm from the face of the specimen (see Figure 1).

Five (5) thermocouples to monitor for the temperature of the unexposed face of the specimen (see Figure 2).

A roving thermocouple to measure temperature on hot spots of unexposed surface.

A micro-manometer provided to monitor the furnace pressure.

Steel ruler to monitor the lateral deflection of the specimen.

Cotton pad, 6 mm and 25 mm diameters rod gauges.

6. Test Procedures

The test was conducted in accordance with the procedures specified in Section 5 of BS 476: Part 22: 1987. The ambient temperature of the test area during the test was measured. After the first 10 minutes of the test, the furnace pressure was maintained at 0 ± 2 Pa relative to atmosphere, at 1,000 mm from the notional floor level.

The furnace was monitored by nine (9) thermocouples so that the mean furnace temperature complied with the requirements of Clause 3.1 of BS 476: Part 20: 1987.

The temperature of the unexposed face was monitored by means of five (5) thermocouples fixed to the unexposed surface of the partition system (see Figure 2 for the locations and reference numbers of the thermocouples). Thermocouples S1 to S5 were the key thermocouples for monitoring the mean and maximum temperatures of the unexposed surface of the partition system.

The gap gauges were used, if considered appropriate, to determine compliance with the integrity criterion of the standard. The occurrence of sustained flaming on the unexposed surface was monitored to determine compliance with this criterion.

The lateral deflections of the specimen were measured by steel ruler and were recorded.

7. Test Data and Information

The ambient temperature of the test area during the test was 28 °C.

The furnace was controlled so that the mean furnace temperature complied with the requirements of Clause 3.1 of BS 476: Part 20: 1987. The temperatures recorded are shown graphically in Figure 4.

The mean and maximum temperatures of the unexposed surface of the specimen are shown graphically in Figure 5.

A summary of the observations made on the general behaviour of the specimen is given in the appendix.

The deflections obtained are summarized in Table 1.

The test was discontinued after a heating period of 132 minutes.

8. Results

When tested in accordance with Section 5 of BS 476: Part 22: 1987, the requirements of the standard were satisfied for the following periods:

Insulation	114	Minutes
Integrity:	132	Minutes

Insulation - It is required that the mean temperature rise of the unexposed surface shall not be greater than 140 °C and that maximum temperature rise shall not be greater than 180 °C. Insulation failure also occurs simultaneously with integrity failure.

The 140 °C rise of the mean temperature of the unexposed surface of the specimen reached after a heating period of 121 minutes. The 180 °C rise of the maximum temperature of the unexposed surface of the specimen reached during the test. The maximum temperature rise measured at S4 (see figure 2) was 181 °C after a heating period of 114 minutes.

Integrity - It is required that there is no collapse for the specimen, no sustained flaming on the unexposed surface and no loss of impermeability.

The specimen met the test integrity requirements for a heating period of 132 minutes.

9. Limitations

The results relate only to the behaviour of the specimen of the element of construction under the particular conditions of the test. They are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they reflect the actual behaviour in fires (Refer to Clause 12 of BS 476: Part 20: 1987).

The test results relate only to the specimen tested and shown in this report. The fire resistance performance of the specimen of this design may change if substantially modifications are imposed. Application of the results to the specimen of different dimensions or supported other than by a concrete wall or incorporating different components shall be the subject of a design appraisal.

Appendix

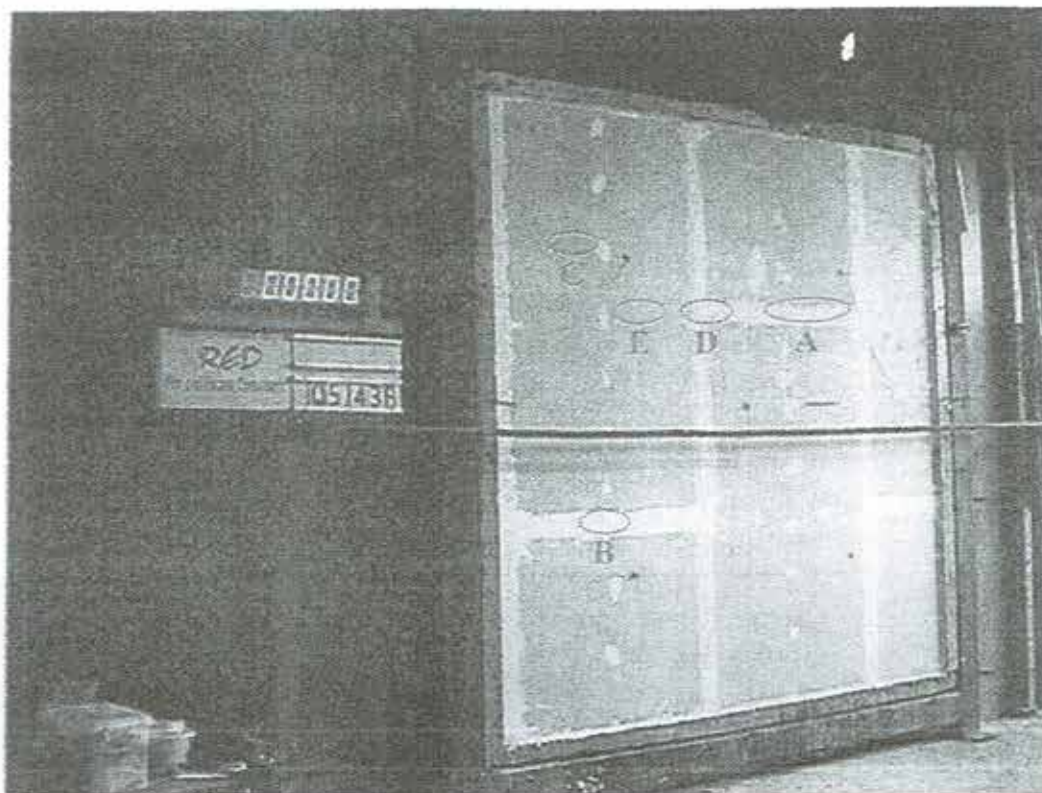


Photo 1 - The unexposed face of the specimen before the test.



FUGRO TECHNICAL SERVICES LIMITED
Fugro Development Centre
5 Lok Yi Street, Tai Lam
Tuen Mun, NT
Hong Kong



Client Ref. : --
Report No. : G24375ST244042(1)

Page 1 of 1

REPORT ON DETERMINATION OF SURFACE HARDNESS OF PLASTERBOARD

Information Supplied by Client

Client : 北新集團建材股份有限公司

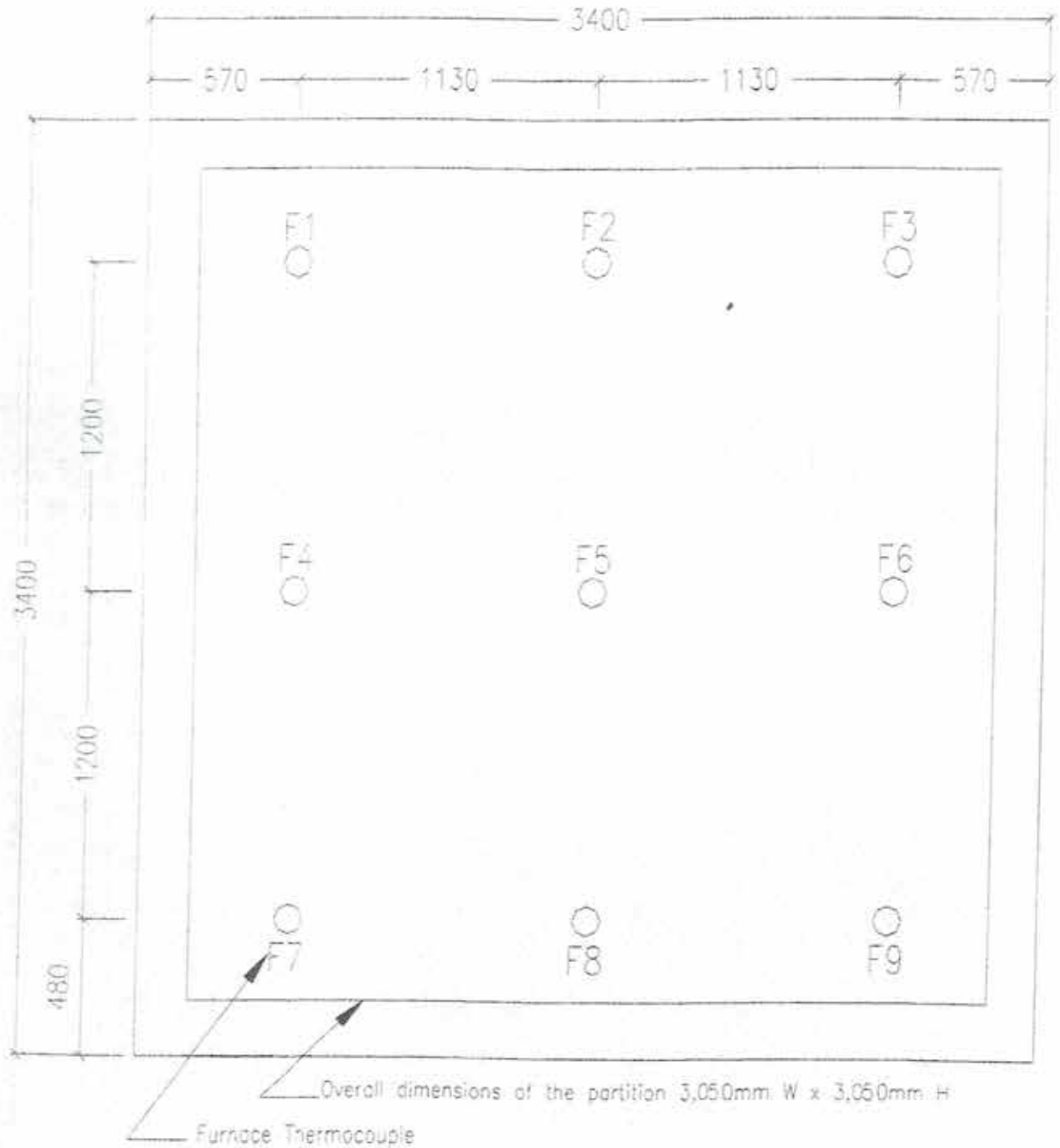


Figure 1 – Locations and reference number of furnace thermocouples.



Figure 2 – Locations and reference number of thermocouples to monitor the temperature of unexposed surface of the specimen.

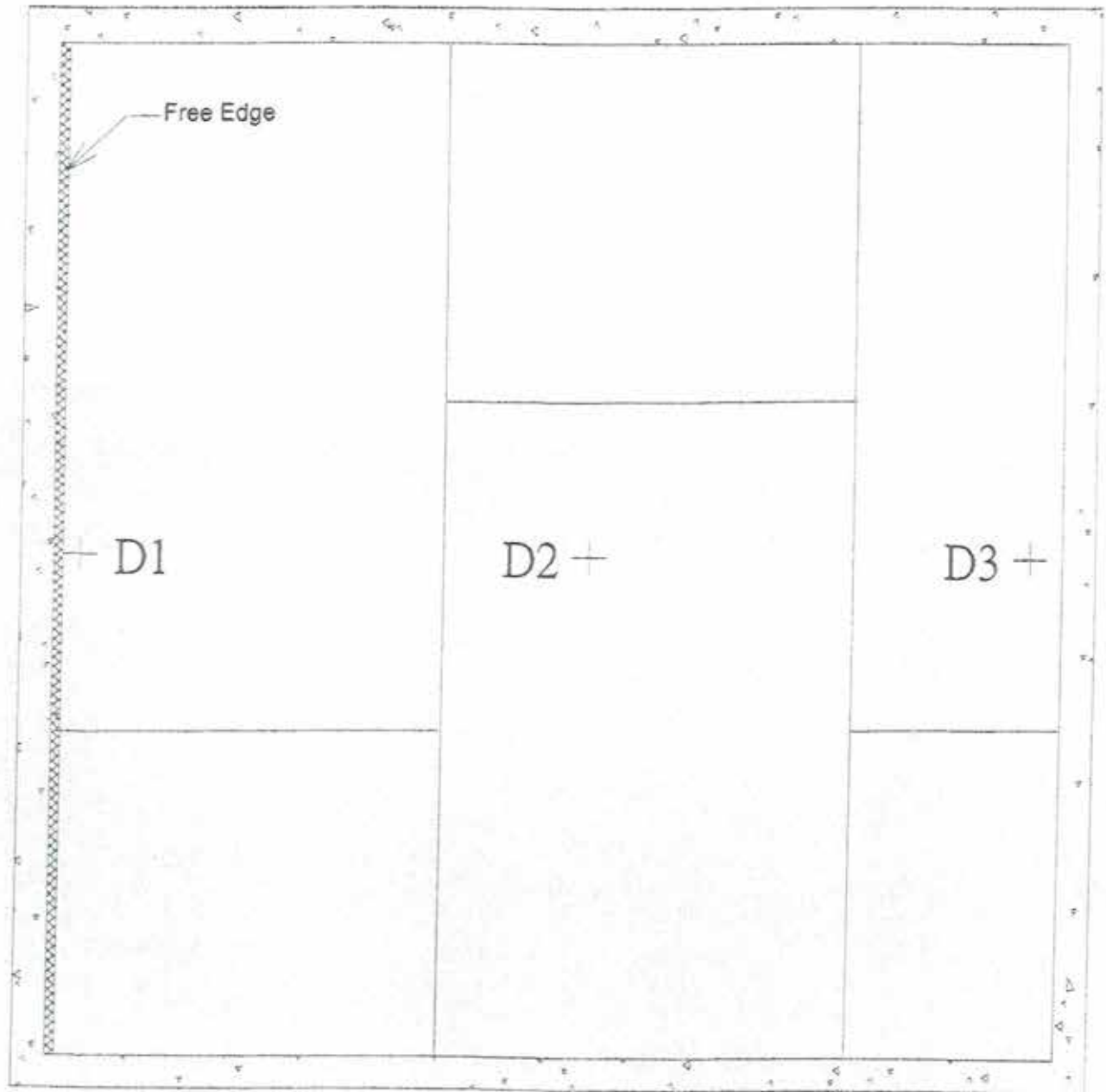


Figure 3 – Locations and reference number of displacement measurement.

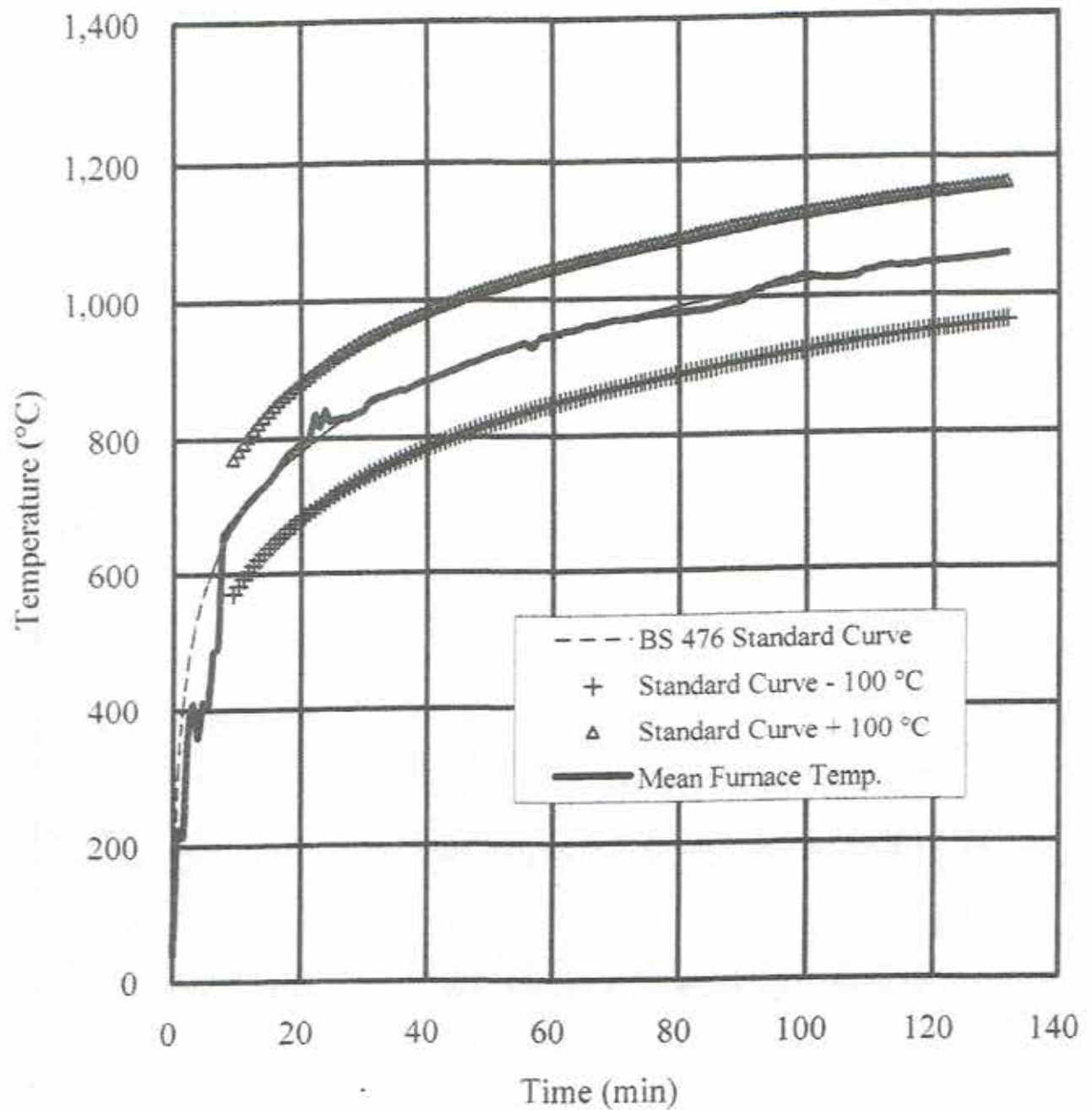


Figure 4 - Mean furnace temperatures.

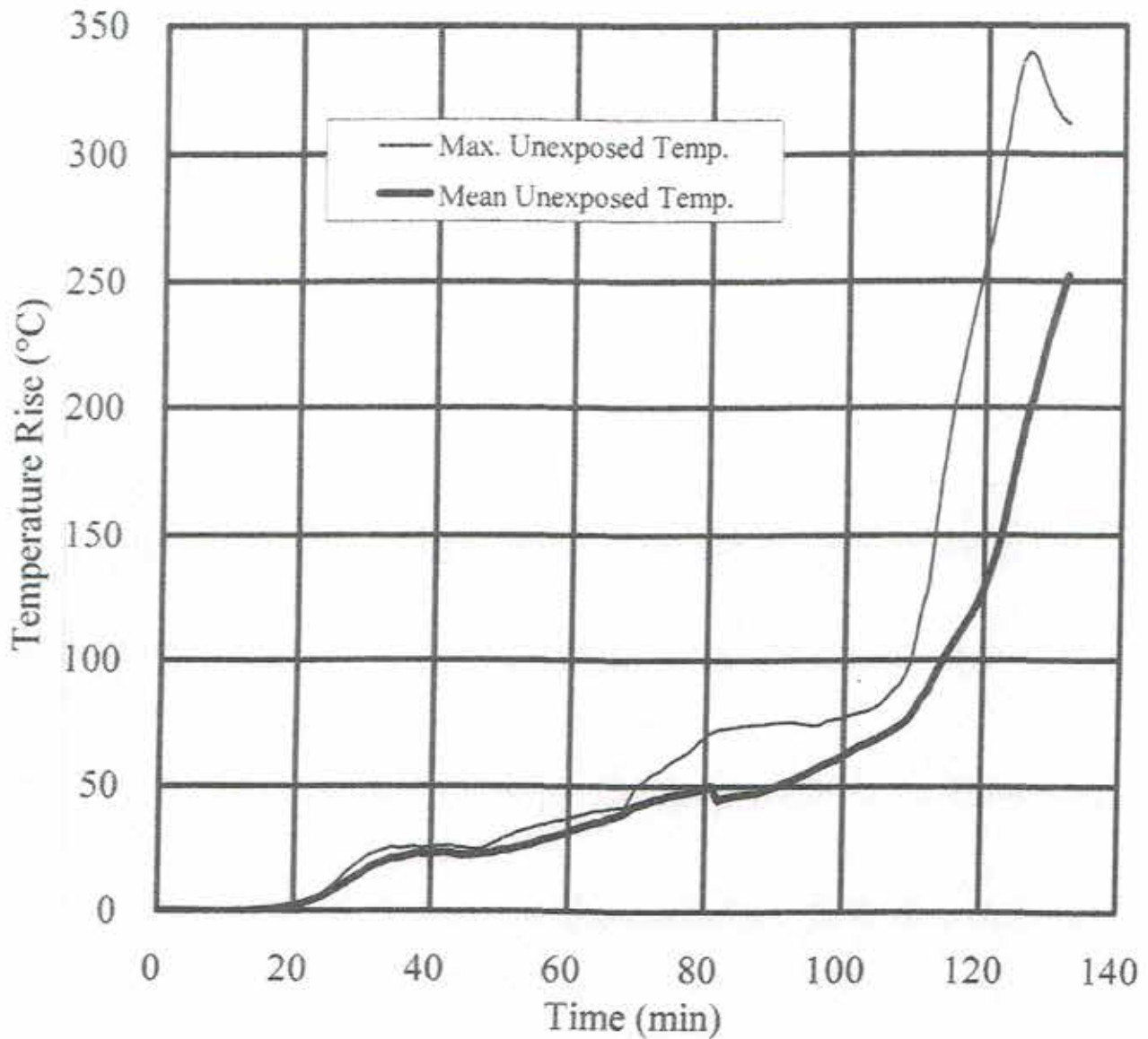


Figure 5 – Temperatures of the unexposed surface.

Observation

Time (min.sec)	Exposed (E) or Unexposed (U)	Observation
00.00	-	Test started.
08.20	E	The linings turned dark.
20.00	E	Linings turned grey.
22.40	E	Portions of linings fell down and flaming was observed.
44.00	U	Visible deformation towards the furnace was observed.
58.00	E	Cracks developed on linings.
58.30	U	Deformation increased.
68.00	U	Smoke started releasing from the perimeter of the specimen.
71.00	U	Smoke release from the joint around point 'A' was observed (see photo 1).
76.00	E	More linings broke and fell down.
81.00	U	Smoke release from the joint around point 'B' was observed (see photo 1).
89.00	U	Area near point 'A' turned dark.
104.00	U	Dark spots developed on linings.
105.00	U	Cotton pad test applied at point 'D' (see photo 1). No failure was observed.
110.00	U	Roving thermocouple applied on point 'C' (see photo 1) and 136 °C was measured.
112.00	U	Roving thermocouple applied on point 'E' (see photo 1) and 152 °C was measured.
114.00	U	Smoke release increased.
132.00	-	Test was terminated per client's request.

Lateral deflections

Table 1

Lateral deflections (in mm) of the specimen during the test as viewed from the unexposed face

Time (mins) Location	0	10	20	30	45	60	75	90	105	120
D1	0	-3	-1	-1	-1	4	7	6	5	12
D2	0	9	6	4	61	74	77	75	76	77
D3	0	2	2	0	4	6	6	6	3	2

Positive deflections indicate movement towards the furnace (see also Figure 3 for the location). The maximum deflection observed at D2 was 77 mm towards the furnace.

Information from client

Item	Description
1	Lining Brand : BNBM 'Dragon'. Manufacturer : Beijing New Building Materials Public Limited Company. Description : Double layer of gypsum board – Fire Resistant. Thickness : 12 mm. Density (nominal) : 9 kg/m ² (Provided by client). Fixing method to steel frame : 3.5 x 25 mm self-tapping steel screws at 300 mm nominal centres for the first ply of boards and 3.5 x 35 mm self-tapping steel screws at 300 mm nominal centres for the second ply of boards.
2	Steel Frame Brand : BNBM 'Dragon'. Material : Galvanized steel channel. Dimensions : Vertical stud - 64 mm x 45 mm x 0.8 mm. Head and bottom runner - 64 mm x 45/32 mm x 0.8 mm. Spacing : 600 mm centres. Fixing method to the test rig : Ø 3.7 mm x 32 mm long drywall screws at 600 mm nominal centres.
3	Insulation Brand : BNBM 'Dragon'. Description : Rockwool. Thickness : 50 mm. Density (nominal) : 100 kg/m ³ .
4	Joint Finishing Brand : BNBM 'Dragon'. Description : 'Easy Finish' ready-mixed joint compound and BNBM 'Dragon' joint tape. Applied location : The joints between linings.
5	Fire Sealant Brand : Hilti. Description : Intumescent joint filler. Model : CP 606. Applied location : At the fixing area of self-tapping screws and three perimeter edges between the specimen and test aperture.

- End of report -

Drawings from client

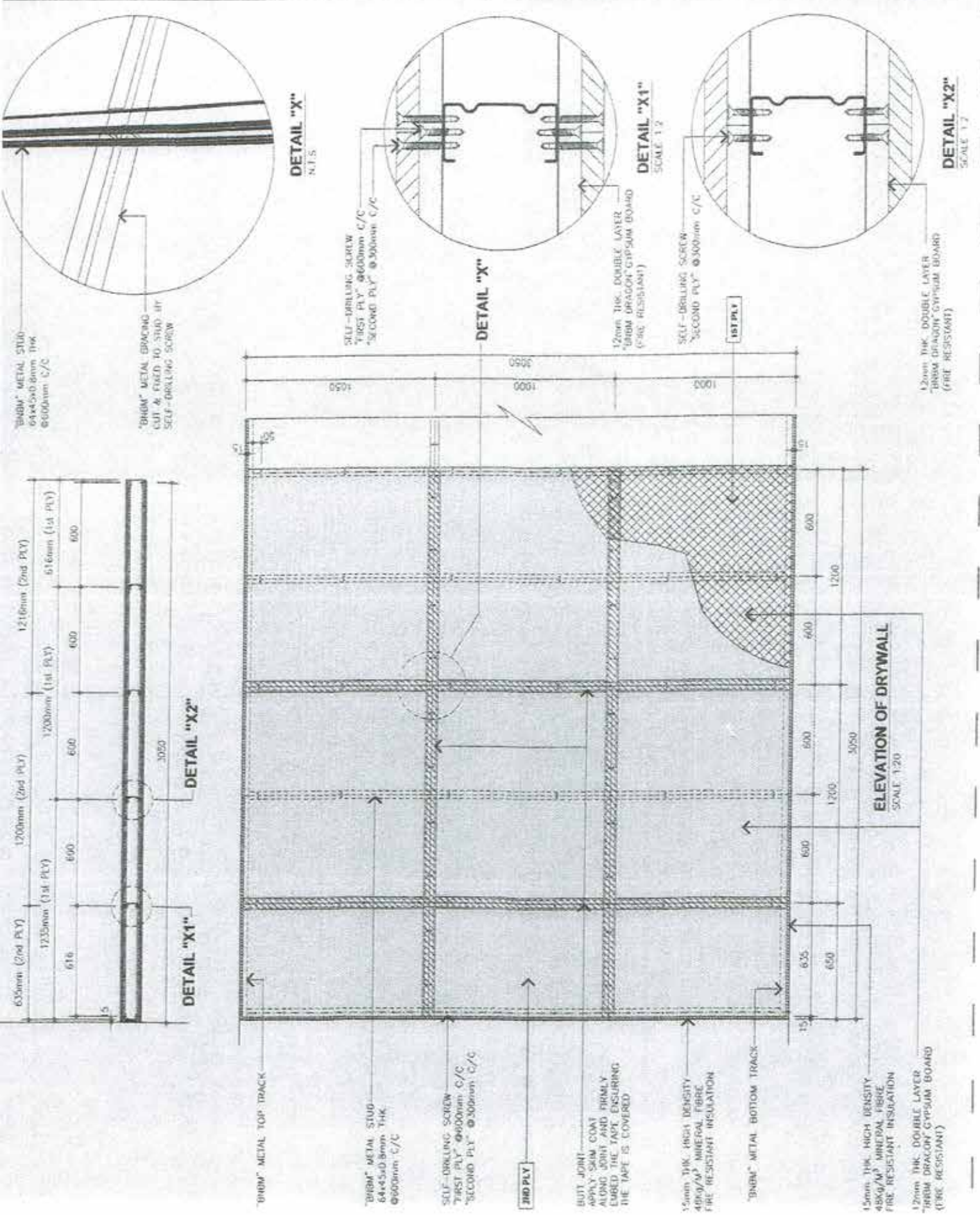
Dated on 5 Oct 2005 & 13 Oct 2005

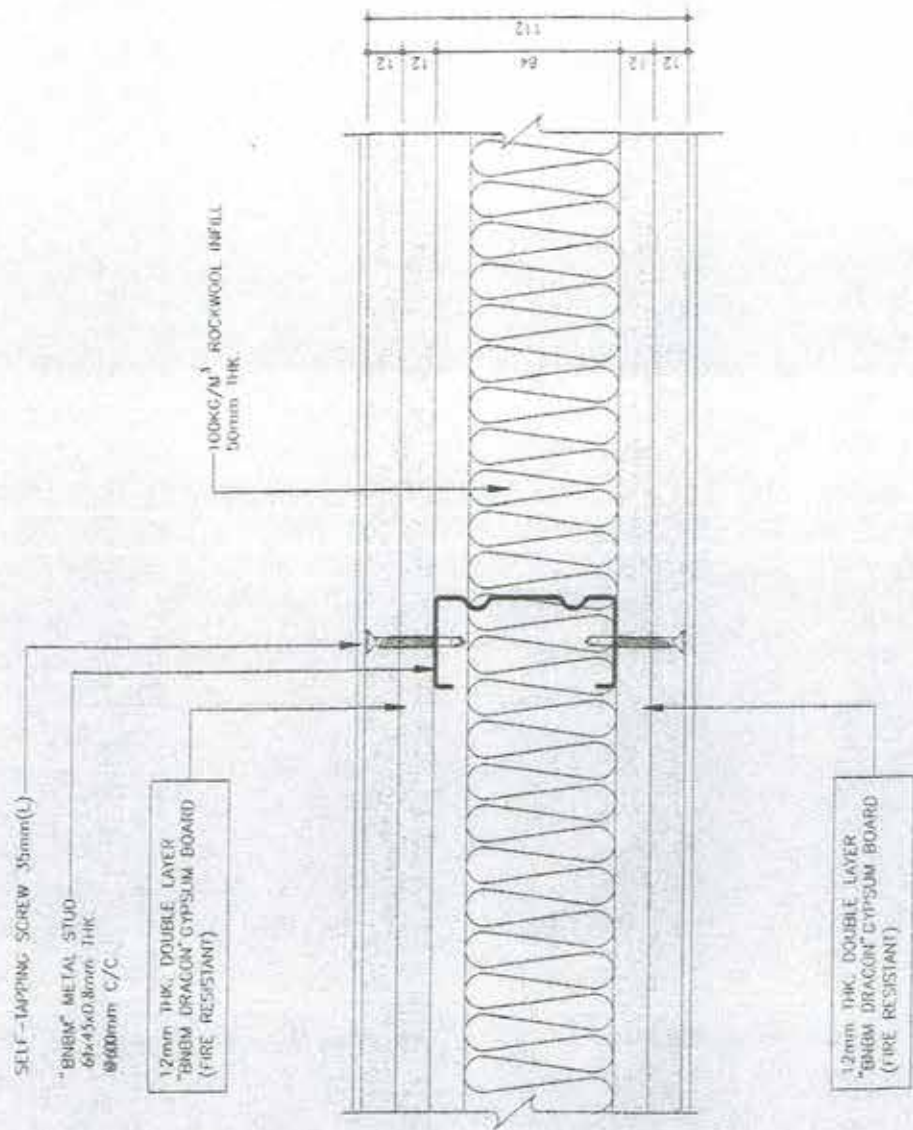
Drawing no. Sk-07

Drawing no. Sk-03

Drawing no. 2120/ENTL/HOT/0411

Drawing no. 2120/ENTL/HOT/0413





SELF-TAPPING SCREW 35mm(L)

"BOMB" METAL STUD
64x45x0.8mm THK.
@600mm C/C

12mm THK. DOUBLE LAYER
"BOMB DRAGON" GYPSUM BOARD
(FIRE RESISTANT)

100KG/M³ ROCKWOOL INFILL
50mm THK.

12mm THK. DOUBLE LAYER
"BOMB DRAGON" GYPSUM BOARD
(FIRE RESISTANT)

No. Annotations

ALL DATA HEREIN IS SUBJECT TO THE DESIGNER'S
DISCRETION. THE USER SHALL BE RESPONSIBLE FOR
THE VERIFICATION OF THE DATA FOR THE CONSTRUCTION.

Rev. No.

Rev. Date

VENETIAN MARCA IN CO
DRYWALL PARTITION

Drawing Title

3

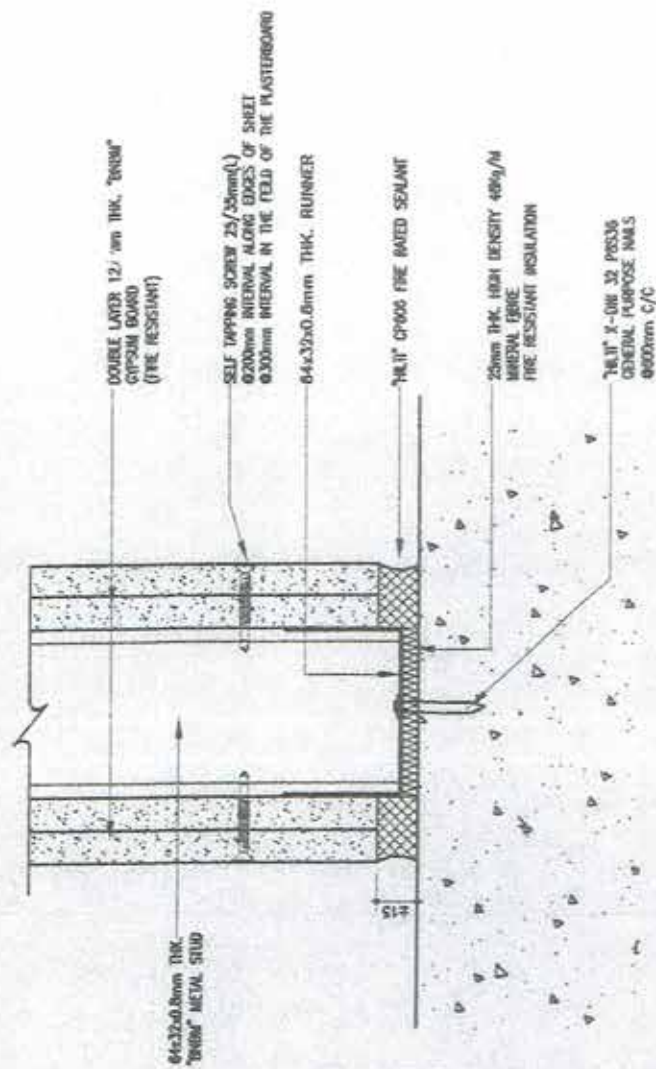
Scale	1	2	(A3)
Date	05	01	2005
Project No.	SK-03		

Drawn By	Checked By
AP	VV



FANTASIS I
A Division of Fantasia
2000, 2001, 2002, 2003
2004, 2005, 2006, 2007
979 King's Road, Hong Kong

FRP REQUIRED : 2 HRS.



DRY WALL BASE DETAIL - 2 HRS. F.R.P.

SCALE 1:2

NO.	REV.	DESCRIPTION	DATE
1	1	ISSUED FOR TENDERS	13/09/08
2	2	REVISED TO SHOW CHANGES	13/09/08
3	3	REVISED TO SHOW CHANGES	13/09/08
4	4	REVISED TO SHOW CHANGES	13/09/08
5	5	REVISED TO SHOW CHANGES	13/09/08
6	6	REVISED TO SHOW CHANGES	13/09/08
7	7	REVISED TO SHOW CHANGES	13/09/08
8	8	REVISED TO SHOW CHANGES	13/09/08
9	9	REVISED TO SHOW CHANGES	13/09/08
10	10	REVISED TO SHOW CHANGES	13/09/08

ALL WORK TO BE DONE IN ACCORDANCE WITH THE SPECIFICATIONS AND STANDARDS OF THE SINGAPORE BUILDING BOARD (SBB) AND THE SINGAPORE FIRE DEPARTMENT (SFD).

VENTILATION

ENTASIS LTD
110, DULAC ROAD, SINGAPORE 110001

NO.	REV.	DESCRIPTION	DATE
1	1	ISSUED FOR TENDERS	13/09/08
2	2	REVISED TO SHOW CHANGES	13/09/08
3	3	REVISED TO SHOW CHANGES	13/09/08
4	4	REVISED TO SHOW CHANGES	13/09/08
5	5	REVISED TO SHOW CHANGES	13/09/08
6	6	REVISED TO SHOW CHANGES	13/09/08
7	7	REVISED TO SHOW CHANGES	13/09/08
8	8	REVISED TO SHOW CHANGES	13/09/08
9	9	REVISED TO SHOW CHANGES	13/09/08
10	10	REVISED TO SHOW CHANGES	13/09/08

ENTASIS LTD
110, DULAC ROAD, SINGAPORE 110001

ASSESSMENT REPORT

120 Minutes Fire Resistance Performance of Fully Insulated Partition Boards Wall Systems

Assessment Report No.: R17K17-1A_Issue 1

Issue Date: 15 July 2022

Date of Review: 14 July 2024

Report Sponsor

China Union Building Materials Limited

G/F, No. 619 Reclamation Street, Mong Kok, Kowloon, Hong Kong

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8	SIGNATORIES	9

REVISION HISTORY

Issue date (DD/MM/YYYY)	Issue number	Remark
08/08/2018	0	Initial version
15/07/2022	1	Revision company address

120 MINUTES FIRE RESISTANCE PERFORMANCE OF

FULLY INSULATED PARTITION BOARDS WALL SYSTEMS

1 INTRODUCTION

This assessment report presents an appraisal of fully insulated partition boards wall systems with construction details referenced to the one tested and described in R05K02B issued by Research Engineering Development Façade Consultants Limited (RED). This assessment report is prepared for China Union Building Materials Limited of G/F, No. 619 Reclamation Street, Mong Kok, Kowloon, Hong Kong.

The proposed fully insulated partition boards wall systems are required to provide a fire resistance performance of 120 minutes integrity and insulation with respect to Section 5 of BS 476: Part 22: 1987.

2 ASSUMPTIONS

The proposed systems are assumed to be installed in a similar manner to that of the previously tested assembly by competent installers. It is assumed that the modified systems will be constructed in a similar manner from materials and components of the same manufacture and equivalent quality as tested with supporting test evidence or otherwise appraised by RED. Further assumptions related to the specific modifications will be stated in the report.

It is also assumed that the supporting structures to which the perimeter of the systems will be fixed are capable of supporting the proposed structure effectively.

Assuming that the issue of the original test report is valid, the current testing standard or testing experience has not been changed and the procedures adopted for the original report have been re-examined and reviewed that there have been no changes to the specification of the construction considered in the original report. If contradictory data or any related evidence becomes available to RED, the assessment will be unconditionally withdrawn and the sponsor will be notified. This report is based on the given information, in which is declared by report sponsor that no contradictory data has become available.

3 SUPPORTING DATA

3.1 Summary of test evidences

Report no.	Section	Description
Primary Test Evidences		
R05K02B	4.1	Supporting test evidence for the general construction of fully insulated partition boards wall systems for 120 minutes FRP

3.2 Primary test evidence

3.2.1 RED TEST REPORT NO. R05K02B*

A fire resistance test in accordance with Section 5 of BS 476: Part 22: 1987 on a fully insulated 'BNBM' gypsum plasterboard partition system was performed at the RED laboratory on 17 October 2005. The test sponsor was BNS Company Limited and Gammon Construction Limited who had permitted the use of this data. As requested by the sponsor, the specimen was mounted within concrete lined specimen holder by the test sponsor. The specimen was symmetrical and only one side of the specimen was tested as per client's request.

The partition system had overall dimensions of 3,030 mm wide by 3,050 mm high. It was comprised of two layers of 12 mm thick "BNBM" fire resistant gypsum boards mounted on each side of "BNBM Dragon" galvanized steel frame. The steel framework was consisted of vertical studs and head & bottom runners with overall sizes 64 mm by 45 mm by 0.8 mm and 64 mm by 45/32 mm by 0.8 mm respectively. The two layers of gypsum boards were fixed to the studs by self-tapping screws (3.5 mm x 25 mm / 35 mm long) at 300 mm nominal centres along the edge joints and in the field of gypsum boards. A layer of 50 mm thick rockwool with density of 100 kg/m³ was sandwiched in between the boards within the steel framework. The joints were covered by fiber tape and joint plaster. A free edge of approximate 20 mm wide was applied on the left vertical edge and the gap was filled with ceramic rockwool.

The specimen satisfied the performance requirements specified in Section 5 of BS 476: Part 22: 1987 for the following periods and the test was discontinued after a period of 132 minutes (see R05K02B for full details).

Insulation:	114	Minutes
Integrity:	132	Minutes

**Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 22: 1987 and found it suitable for this assessment.*

4 PROPOSAL & DISCUSSION

4.1 Fully insulated partition boards wall systems for 120 minutes integrity and insulation with respect to Section 5 of BS 476: Part 22: 1987

Proposal

The proposed fully insulated partition boards wall systems are basically similar to the one tested and described in R05K02B, except that the thickness of the 'BNBM Dragon' rockwool filled within the cavity of steel framework shall be increased from 50 mm to 60 mm.

The proposed fully insulated partition boards wall systems may provide a fire resistance performance of 120 minutes integrity and insulation with respect to Section 5 of BS 476: Part 22: 1987 with the following variations:

- a) the partition boards wall system may be reduced in height;
- b) the partition boards wall system may be extended in width;
- c) alternative brand of grade S275 steel channels may be used;
- d) rockwool with higher density may be used; and
- e) the fully insulated partition boards wall systems may be up to 6 m high and the proposed sizes of studs are shown in Table 1.

Table 1 - Sizes of studs for the proposed height of partition boards wall systems

Height up to	Stud sizes (D x F x T)	Studs spacing	Expansion allowance
3 m < Height $\leq$ 4 m	64 x 45 x 0.8 mm	600 mm c/c	40 mm
4 m < Height $\leq$ 4.5 m	75 x 50 x 1.2 mm	600 mm c/c	45 mm
4.5 m < Height $\leq$ 5.5 m	100 x 40 x 1.2 mm	600 mm c/c	55 mm
5.5 m < Height $\leq$ 6 m	100 x 50 x 1.5 mm	600 mm c/c	60 mm

Discussion

From the test evidence of R05K02B, the fully insulated 'BNBM' gypsum plasterboard partition boards wall system was incorporated with 2 layers of nominal 12 mm thick 'BNBM' fire resistant gypsum boards on each side of the studs and a layer of nominal 50 mm thick 'BNBM Dragon' rockwool with density of 100 kg/m³ was sandwiched in between the boards within the steel framework. The partition boards wall system as tested and described in R05K02B satisfied 132 minutes integrity and 114 minutes insulation criteria of Section 5 of BS 476: Part 22: 1987. The insulation failure occurred when the maximum temperature rise on the surface of the gypsum board exceeded 180 °C after a heating period of 114 minutes, in which the rockwool thickness had influence on the insulation performance of the partition boards wall system.

Based on the assumption that the insulation property of the partition boards wall system will be linearly proportional to the thickness of rockwool filled within the cavity of steel framework, the required thickness

of rockwool to achieve a 120 minutes insulation period may be estimated as follows:

The required thickness of rockwool = (120 minutes / 114 minutes) x 50 mm thick = 52.6 mm thick.

Conservatively, it is reasonable to anticipate that the application of minimum 60 mm thick rockwool with density of 100 kg/m³ filled within the cavity of steel framework will achieve an insulation period of at least 120 minutes. Consequently, the proposed fully insulated partition boards wall systems, incorporated with minimum 60 mm thick 'BNBM Dragon' rockwool with density of 100 kg/m³, are expected to satisfy at least 120 minutes integrity and insulation performance of Section 5 of BS 476: Part 22: 1987. All other construction and fixing details of the partition boards wall systems shall be the same as tested.

- a) The overall dimensions of the partition boards wall system as tested and described in R05K02B were 3,030 mm wide by 3,050 mm high. The proposed partition boards wall system with reduced height is considered to present a similar or reduced level of risk. This is deemed to be more onerous when the fire exposed area is larger as the potential risk of losing integrity performance will be relatively higher. Hence, the proposal of reducing the height of the partition boards wall system is positively appraised.
- b) From the test evidence of R05K02B, the partition boards wall system was tested with a vertical free edge of approximate 20 mm wide. The 20 mm wide free edge allows the partition boards wall system to deform freely under the heating condition, which is used to simulate that the partition boards wall system is a continuous construction. Therefore, the fire resistance performance of the proposed partition boards wall systems with extension in width is expected to be maintained. All other fixing and construction details of the partition boards wall systems shall be the same as the tested prototype.
- c) The framework of the partition boards wall system as tested and described in R05K02B consisted of 'BNBM Dragon' steel studs with sizes of 64 mm by 45 mm by 0.8 mm thick and top & bottom runners with sizes of 64 mm by 45/32 mm by 0.8 mm thick. Alternative brand of steel studs may be used, provided that the studs are grade S275 steel. It is reasonable to expect that material properties of the same type of steel will be the same regardless of the brand. Hence, the deflection of partition boards wall systems using different brand of steel channels is expected to be similar as tested, provided that the sizes of steel channels remain unchanged as tested. Therefore, the above proposal is not expected to have any detrimental effect towards the fire resistance performance achieved by the tested prototype.
- d) From the test evidence of R05K02B, a layer of 50 mm thick 'BNBM Dragon' rockwool with density of 100 kg/m³ was filled in the cavity of the framework of partition boards wall system. As discussed, the proposed fully insulated partition boards wall systems, incorporated with minimum 60 mm thick 'BNBM Dragon' rockwool with density of 100 kg/m³, are expected to satisfy at least 120 minutes integrity and insulation performance of Section 5 of BS 476: Part 22: 1987. It is proposed that 'BNBM Dragon' rockwool with higher density may be used. From our experience, the insulation performance

of the partition boards wall system mainly depends on the thickness of rockwool filled within the cavity of the framework of partition boards wall system. With the thickness of rockwool remains unchanged as tested, the use of rockwool with higher density is not expected to adversely affect the fire resistance performance achieved by the tested prototype. The use of 'BNBM Dragon' rockwool with higher density is positively appraised.

- e) The height of the proposed fully insulated partition boards wall systems may be increased up to 6 m high and the proposed sizes of studs are shown in Table 1. In justifying the increase in height of partition boards wall systems, the potential increase in deflection of the system and the ability of the boards to be remained intact with the framework throughout the test duration are the critical factors to be considered. From the test evidences of R05K02B, the maximum deflection of the partition boards wall system was 77 mm during the heating period of 120 minutes.

For the proposed height of partition boards wall systems up to 4 m, the sizes of studs may remain unchanged as tested. In our opinion, the recorded deflections of the tested partition boards wall systems is not significant and the temperature recorded at the unexposed face is relatively low, it is reasonable to believe from the above test evidences that the proposed partition boards wall systems with height up to 4 m are deemed to be stable. In additions, overrun of 10% for integrity performance achieved by the tested partition boards wall system is used to justify the modifications and the above proposal is considered to be positively appraised.

For the proposed height of partition boards wall systems up to 4.5 m, the calculated deflection based on the use of the same sizes of the studs is the square of the height ratio times the recorded deflection, which is $[(4.5/3)^2 \times 77] = 173$ mm. Therefore, it is suggested that the sizes of the studs shall be increased so as to reduce the expected deflection. In the proposal, the proposed studs are with sizes of 75 mm deep by 50 mm by 1.2 mm thick, the increase in the moment of inertia is about 2.3 times of the original and the increase of overall depth is approximately 1.2 times of the original. The predicted deflection of the proposed 4.5 mm high partition boards wall systems using larger studs is approximate 76 mm, which is less than the one tested and described in R05K02B. The span ratio of the predicted system is $(76 \text{ mm} / 4,500 \text{ mm}) = 0.02$, which is much less than the span ratio of the tested system as in R05K02B, which was $(77 \text{ mm} / 3,050 \text{ mm}) = 0.03$. With the use of stronger studs, it is likely that the proposed partition boards wall systems will remain stable for the required height. The perimeter fixing of the studs shall remain the same as tested. Also, as the height of the studs are increased, there shall be adequate expansion of at least 45 mm allowance to be incorporated so as to allow rooms for studs' expansion under heating. From our experience, the proposal of increasing the height of partition boards wall systems up to 4.5 m is not expected to have detrimental effect towards the fire resistance performance achieved by the tested prototype.

For the proposed height of partition boards wall systems up to 5.5 m, the calculated deflection based on the use of the same sizes of the studs is the square of the height ratio times the recorded deflection, which is $[(5.5/3)^2 \times 77] = 259$ mm. Therefore, it is suggested that the sizes of the studs shall

be increased so as to reduce the expected deflection. In the proposal, the proposed studs are with sizes of 100 mm deep by 40 mm by 1.2 mm thick, the increase in the moment of inertia is about 3.7 times of the original and the increase of overall depth is approximately 1.6 times of the original. The predicted deflection of the proposed 5.5 mm high partition boards wall systems using larger studs is approximate 70 mm, which is less than the one tested and described in R05K02B. The span ratios of the predicted systems are $(90 \text{ mm} / 5,500 \text{ mm}) = 0.01$, which is much less than the span ratio of the tested system as in R05K02B, which was $(77 \text{ mm} / 3,050 \text{ mm}) = 0.03$. With the use of stronger studs, it is likely that the proposed partition boards wall systems will remain stable for the required height. The perimeter fixing of the studs shall remain the same as tested. Also, as the height of the studs are increased, there shall be adequate expansion of at least 55 mm allowance to be incorporated so as to allow rooms for studs' expansion under heating.

For the proposed height of partition boards wall systems up to 6 m, the calculated deflection based on the use of the same sizes of the studs is the square of the height ratio times the recorded deflection, which is $[(6/3)^2 \times 77] = 360 \text{ mm}$. Therefore, it is suggested that the sizes of the studs shall be increased so as to reduce the expected deflection. In the proposal, the proposed studs are with sizes of 100 mm deep by 50 mm by 1.5 mm thick, the increase in the moment of inertia is about 5.4 times of the original and the increase of overall depth is approximately 1.6 times of the original. The predicted deflection of the proposed 6 mm high partition boards wall systems using larger studs is approximate 57 mm, which is less than the one tested and described in R05K02B. The span ratios of the predicted systems are $(57 \text{ mm} / 6,000 \text{ mm}) = 0.01$, which is much less than the span ratio of the tested system as in R05K02B, which was $(77 \text{ mm} / 3,050 \text{ mm}) = 0.03$. With the use of stronger studs, it is likely that the proposed partition boards wall systems will remain stable for the required height. The perimeter fixing of the studs shall remain the same as tested. Also, as the height of the studs are increased, there shall be adequate expansion of at least 60 mm allowance to be incorporated so as to allow rooms for studs' expansion under heating.

Consequently, the height of the proposed fully insulated partition boards wall systems may be increased up to 6 m with the use of studs as shown in Table 1. The insulated partition boards wall systems are expected to satisfy at least 120 minutes integrity and insulation criteria of Section 5 of BS 476: Part 22: 1987, with conservative performance buffer.

5 CONCLUSION

The proposed fully insulated partition boards wall systems are based on the specimen as tested and described in R05K02B and modified as described in section 4.

The proposed fully insulated partition boards wall systems may provide a fire resistance performance of 120 minutes integrity and insulation with respect to Section 5 of BS 476: Part 22: 1987.

6 DECLARATION BY APPLICANT

We, China Union Building Materials Limited, confirm that the materials, components or elements of structure, which is the subject of the test report being reviewed, has not to our knowledge been subjected to another test to the standard against which the assessment is being made.

We agree to withdraw this assessment from circulation should the component or element of structure be the subject of another test to the standard against which the assessment is being made.

We are not aware of any information that could affect the conclusions of this assessment.

If we subsequently become aware of any such information we agree to ask the assessing authority to withdraw the assessment.

7 VALIDITY

This assessment is based on test data, experience and the information supplied. The assessment will be invalidated if the assessed construction is subsequently tested since actual test data is deemed to take precedence over an expressed opinion. Any changes in the specification of product will invalidate this assessment. This assessment relates only to the specimen assessed and does not by itself infer that the product is approved under any other endorsements, approval or certification scheme. Since the appraisal method is under development, the laboratory reserved the right to supersede this assessment in case the appraisal method had been changed.

This report only relates to the specimen(s) tested and may only be reproduced by the sponsor in full, without comment, abridgement and modifications.

8 SIGNATORIES

Assessment by:



Dr. SZE Lip-kit
Authorized Signature

Research Engineering Development
Façade Consultants Limited

Reviewed by:




Ir Dr. YUEN Sai-wing, MHKIE (Fire)
Authorized Signature

Research Engineering Development
Façade Consultants Limited

- End of report -



Client Ref. : --
Report No. : G24375ST244042(1)

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REPORT ON DETERMINATION OF SURFACE HARDNESS OF PLASTERBOARD

Information Supplied by Client

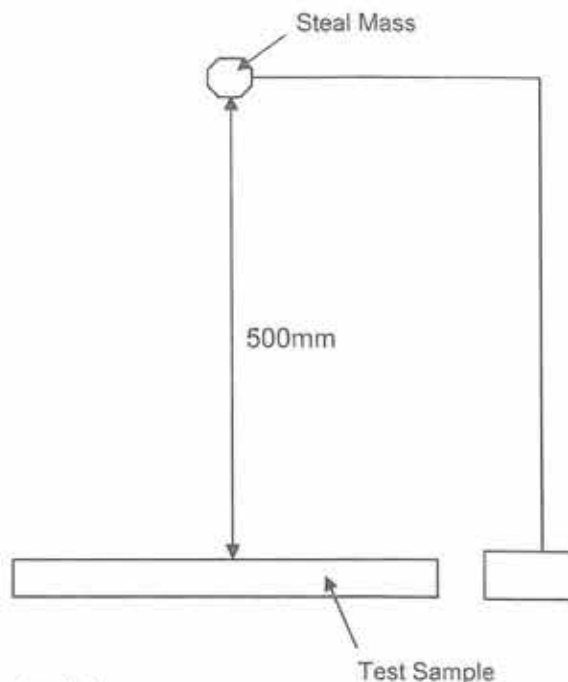
Client : 北新集團建材股份有限公司
Beijing New Building Materials Public Limited Company
Project : TESTING OF PLASTERBOARD
Sample Description : 耐火紙面石膏板
Type : Type F
Fire-Resistant Gypsum Board
Brand Name: 龍牌 BNBM
Nominal Size : 2440 x 1220 x 12 mm

Laboratory Information

Lab. Sample I.D. : ST244042/15A-15C
Date Received : 17 June 2024
Date Test Started : 06 August 2024
Date Test Completed : 06 August 2024
Test Method : BS EN 520, Clause 5.12

Test Results

Lab. Sample I.D.	Diameter of the coloured impact (mm)	Average of the Diameter (mm)
ST244042/15A	18	17.33
ST244042/15B	15	
ST244042/15C	19	



Remarks :
1.) The test results relate only to the samples tested.
2.) The results apply to the sample as received.

Checked by :  Date : 12 AUG 2024 Certified by :  Date : 12 AUG 2024

Ng Shu Shing Chris
Assistant Manager (Product Testing Laboratory)

End of Report



Client Ref. : --
Report No. : G24375ST244042(3)

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REPORT ON DETERMINATION OF WATER ABSORPTION OF PLASTERBOARD

Information Supplied by Client

Client : 北新集團建材股份有限公司
Beijing New Building Materials Public Limited Company
Project : TESTING OF PLASTERBOARD
Sample Description : 耐火紙面石膏板
Type : Type F
Fire-Resistant Gypsum Board
Brand Name: 龍牌 BNBM
Nominal Size : 2440 x 1220 x 12 mm

Laboratory Information

Lab. Sample I.D. : ST244041/5-6
Date Received : 17 June 2024
Date Test Started : 01 August 2024
Date Test Completed : 01 August 2024
Test Method : BS EN 520, Clause 5.9.1 and 5.9.2

Test Results

Lab. Sample I.D.		Length of Sample (mm)	Width of Sample (mm)	Thickness of Sample (mm)	Weight of Sample (g)	Water Absorption (%)
ST244042/5	Before Test	200.23	200.19	12.44	324.77	28.0
	After in water 23°C for 2 hours	200.24	200.21	12.46	451.04	
ST244042/6	Before Test	200.90	200.65	12.40	330.10	27.8
	After in water 23°C for 2 hours	200.81	200.59	12.41	457.43	

Remarks : 1.) The test results relate only to the samples tested.
2.) The results apply to the sample as received.

Checked by :  Date : 12 AUG 2024 Certified by :  Date : 12 AUG 2024

Ng Shu Shing Chris

Assistant Manager (Product Testing Laboratory)

End of Report



Client Ref. : --
Report No. : G24375ST244042(4)

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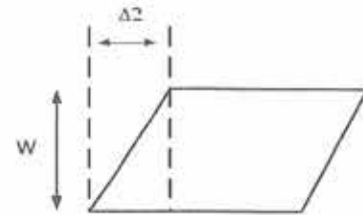
REPORT ON THE DETERMINATION OF SQUARENESS OF GYPSUM BOARD

Information Supplied by Client

Client : 北新集團建材股份有限公司
Beijing New Building Materials Public Limited Company

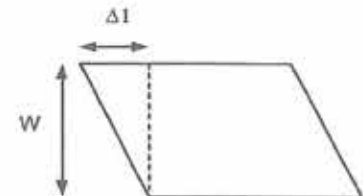
Project : TESTING OF PLASTERBOARD

Sample Description : 耐火紙面石膏板
Type : Type F
Fire-Resistant Gypsum Board
Brand Name: 龍牌 BNBM
Nominal Size : 2440 x 1220 x 12 mm



Laboratory Information

Lab. Sample I.D. : ST244041/7-9
Date Received : 17 June 2024
Date Test Started : 02 August 2024
Date Test Completed : 02 August 2024
Test Method : BS EN 520 : 2004 + A1 : 2009, Clause 5.5



Test Results

Lab. Sample I.D.	Distance (mm)			Squareness (millimetres per metre)		BS EN Requirement / Squareness (mm/m)
	Δ1	Δ2	W	Half Sum	Half Difference	
ST244042/7	1.4	1.7	1219	1.276	0.111	<2.5
ST244042/8	1.5	1.3	1218	1.133	-0.057	
ST244042/9	1.5	1.8	1216	1.332	0.132	

Note : 1.) Half sum = $\Delta 1 + \Delta 2 / 2W$
2.) Half difference = $\Delta 2 - \Delta 1 / 2W$

Remarks : 1.) The test results relate only to the samples tested.
2.) The results apply to the sample as received.

Checked by : Alex Date : 12 AUG 2024 Certified by : Ng Shu Shing Chris Date : 12 AUG 2024

Assistant Manager (Product Testing Laboratory)

****End of Report****



Client Ref. : --
Report No. : G24375ST244042(5)

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REPORT ON THE DETERMINATION OF TAPER PROFILE (TAPER DEPTH) OF GYPSUM BOARD

Information Supplied by Client

Client : 北新集團建材股份有限公司
Beijing New Building Materials Public Limited Company
Project : TESTING OF PLASTERBOARD
Sample Description : 耐火紙面石膏板
Type : Type F
Fire-Resistant Gypsum Board
Brand Name: 龍牌 BNBM
Nominal Size : 2440 x 1220 x 12 mm

2

Laboratory Information

Lab. Sample I.D. : ST244042/7-9
Date Received : 17 June 2024
Date Test Started : 02 August 2024
Date Test Completed : 02 August 2024
Test Method : BS EN 520 : 2004 + A1 : 2009, Clause 5.6.2

1

Test Results

Lab. Sample I.D.	Measurement of Taper Depth (mm)		BS EN Requirement
	1	2	
ST244042/7	1.92	2.67	0.6-2.5 mm
ST244042/8	1.97	2.26	
ST244042/9	2.09	2.00	

Remarks : 1.) The test results relate only to the samples tested.
2.) The results apply to the sample as received.

Checked by :  Date : 12 AUG 2024 Certified by :  Date : 12 AUG 2024

Ng Shu Shing Chris
Assistant Manager (Product Testing Laboratory)

End of Report



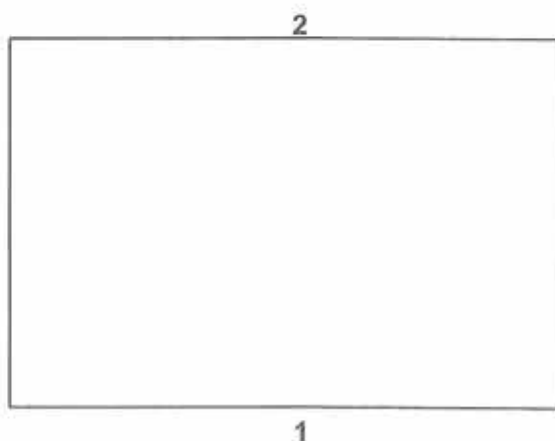
Client Ref. : --
Report No. : G24375ST244042(6)

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REPORT ON THE DETERMINATION OF TAPER PROFILE (TAPER WIDTH) OF GYPSUM BOARD

Information Supplied by Client

Client : 北新集團建材股份有限公司
Beijing New Building Materials
Public Limited Company
Project : TESTING OF PLASTERBOARD
Sample Description : 耐火紙面石膏板
Type : Type F
Fire-Resistant Gypsum Board
Brand Name: 龍牌 BNBM
Nominal Size : 2440 x 1220 x 12 mm



Laboratory Information

Lab. Sample I.D. : ST244042/7-9
Date Received : 17 June 2024
Date Test Started : 02 August 2024
Date Test Completed : 02 August 2024
Test Method : BS EN 520 : 2004 + A1 : 2009, Clause 5.6.1

Test Results

Lab. Sample I.D.	Measurement of Taper Width (mm)		BS EN Requirement
	1	2	
ST244042/7	53	49	40 - 80 mm
ST244042/8	52	51	
ST244042/9	51	53	

Remarks : 1.) The test results relate only to the samples tested.
2.) The results apply to the sample as received.

Checked by : Shen Date : 12 AUG 2024 Certified by : Ng Shu Shing Chris Date : 12 AUG 2024

Ng Shu Shing Chris
Assistant Manager (Product Testing Laboratory)

****End of Report****



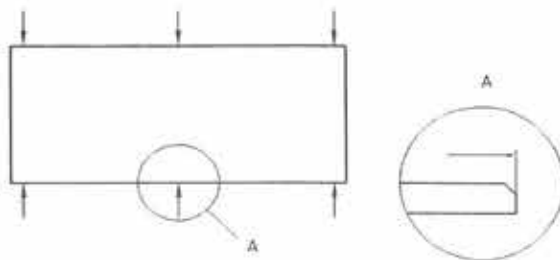
Client Ref. : --
Report No. : G24375ST244042(7)

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REPORT ON THE DETERMINATION OF WIDTH OF GYPSUM BOARD

Information Supplied by Client

Client : 北新集團建材股份有限公司
Beijing New Building Materials Public Limited Company
Project : TESTING OF PLASTERBOARD
Sample Description : 耐火紙面石膏板
Type : Type F
Fire-Resistant Gypsum Board
Brand Name: 龍牌 BNBM
Nominal Size : 2440 x 1220 x 12 mm



Laboratory Information

Lab. Sample I.D. : ST244042/7-9
Date Received : 17 June 2024
Date Test Started : 02 August 2024
Date Test Completed : 02 August 2024
Test Method : BS EN 520 : 2004 + A1 : 2009, Clause 5.2

Test Results

Lab. Sample I.D.	Measurement of width (mm)			Maximum Difference (mm)	Average (mm)	BS EN Requirement / width tolerance (mm)
	1	2	3			
ST244042/7	1219	1219	1219	-1	1219.0	0~-8
ST244042/8	1218	1219	1218	-2	1218.3	
ST244042/9	1215	1219	1219	-5	1217.7	

Remarks : 1.) The test results relate only to the samples tested.
2.) The results apply to the sample as received.

Checked by :  Date : 12 AUG 2024 Certified by :  Date : 12 AUG 2024
Ng Shu Shing Chris
Assistant Manager (Product Testing Laboratory)

End of Report



Client Ref. : --
Report No. : G24375ST244042(8)

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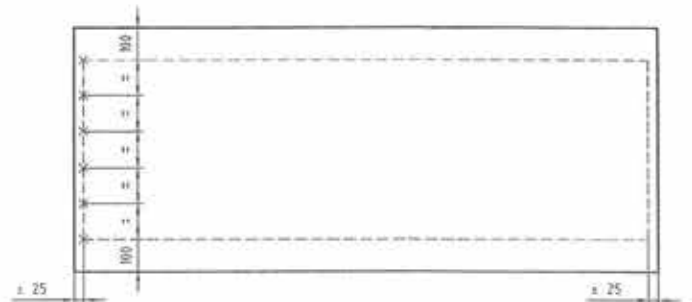
REPORT ON THE DETERMINATION OF THICKNESS OF GYPSUM BOARD

Information Supplied by Client

Client : 北新集團建材股份有限公司
Beijing New Building Materials Public Limited Company
Project : TESTING OF PLASTERBOARD
Sample Description : 耐火紙面石膏板
Type : Type F
Fire-Resistant Gypsum Board
Brand Name: 龍牌 BNBM
Nominal Size : 2440 x 1220 x 12 mm

Laboratory Information

Lab. Sample I.D. : ST244042/7-9
Date Received : 17 June 2024
Date Test Started : 02 August 2024
Date Test Completed : 02 August 2024
Test Method : BS EN 520 : 2004 + A1 :
2009, Clause 5.4



Test Results

Lab. Sample I.D.	Measurement of thickness (mm)						Average (mm)	BS EN Requirement / Average thickness difference (mm)
	1	2	3	4	5	6		
ST244042/7	12.24	12.31	12.7	12.52	12.59	12.74	12.5	±0.5 mm (12-13mm)
ST244042/8	12.48	12.5	12.6	12.54	12.41	12.34	12.5	
ST244042/9	12.4	12.62	12.58	12.34	12.32	12	12.4	

Remarks : 1.) The test results relate only to the samples tested.
2.) The results apply to the sample as received.

Checked by :  Date : 12 AUG 2024 Certified by :  Date : 12 AUG 2024

Ng Shu Shing Chris

Assistant Manager (Product Testing Laboratory)

End of Report



Client Ref. : --
Report No. : G24375ST244042(9)

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REPORT ON THE DETERMINATION OF LENGTH OF GYPSUM BOARD

Information Supplied by Client

Client : 北新集團建材股份有限公司
Beijing New Building Materials Public Limited Company
Project : TESTING OF PLASTERBOARD
Sample Description : 耐火紙面石膏板
Type : Type F
Fire-Resistant Gypsum Board
Brand Name: 龍牌 BNBM
Nominal Size : 2440 x 1220 x 12 mm

Laboratory Information

Lab. Sample I.D. : ST244042/7-9
Date Received : 17 June 2024
Date Test Started : 02 August 2024
Date Test Completed : 02 August 2024
Test Method : BS EN 520 : 2004 + A1 : 2009,
Clause 5.3



Test Results

Lab. Sample I.D.	Measurement of length (mm)			Maximum Difference (mm)	Average (mm)	BS EN Requirement / Length tolerance (mm)
	1	2	3			
ST244042/7	2439	2439	2439	-1	2439.0	0~-6
ST244042/8	2439	2438	2439	-2	2438.7	
ST244042/9	2438	2438	2439	-2	2438.3	

Remarks : 1.) The test results relate only to the samples tested.
2.) The results apply to the sample as received.

Checked by : Shu Date : 12 AUG 2024 Certified by : Ng Shu Shing Chris Date : 12 AUG 2024
Assistant Manager (Product Testing Laboratory)

****End of Report****



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Report No.

TC.19.07.004795

Date of Issue

07/23/2019

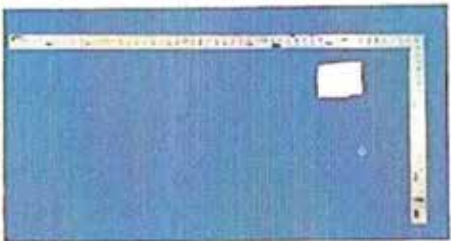
Applicant:

Zhaoqing Beijing New Building Material Public Co.,Ltd.

Applicant address:

Jintao Industrial Park, Jinli, Gaoyao, Guangdong Province

Description of the test subject:

Sample	Description	Photo
001	Sample No.: BNBM Gypsum Board Sample Description: Fire-resistant gypsum board, moisture-resistant gypsum board, standard gpsum board Nominal Thickness(mm): (9.5mm+12mm +12.5mm+15mm)layered and wired to form 50mm) End use: Wall partition; ceiling; etc Buyer: Dealer Manufacturer: Zhaoqing Beijing New Building Material Public Co.,Ltd. Country of origin: China	

Receipt Date of Sample:

07/15/2019

Date of Testing:

From 07/15/2019 to 07/23/2019

Sample submitted:

The sample(s) was (were) submitted by applicant and identified.

Conclusion:

Test Items			Conclusion
No.	Items	Standard	
1	Non-combustibility test for materials	BS 476-4:1970 (R2012)	Pass

Note: (1) General Terms & Conditions as mentioned overleaf.(2)The results relate only to the items tested,(3)The test report shall not be reproduced except in full without the written approval of the company. (4) Samples are tested as received.

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Report No. TC.19.07.004795

Date of Issue 07/23/2019

Test Results

1. BS 476-4:1970 (R2012) Fire tests on building materials and structures. Non-combustibility test for materials

1.1 Sample describe

Specimen size	50mm x 40mm x 40mm
---------------	--------------------

conditioning	temperature	relative humidity	Period
	60±5°C	desiccative	24h

1.2 Test result

Specimen	1	2	3	Average
Furnace temperature (initial) (°C)	750	751	750	750
Duration of sustained flaming inside the furnace (s)	—	—	—	—
Highest temperature of the centre of specimen T _c (max) (°C)	752	752	751	752
Final temperature of the centre of specimen T _c (final °C)	751	751	750	751
Highest temperature of furnace inside TF(max) (°C)	753	754	753	753
Final temperature of furnace inside TF(final °C)	750	751	751	751
Furnace inside temperature rise ΔTF(°C)	3	3	3	3

Requirement:

The material shall be deemed non-combustible if, during the test, none of the three specimens either
1) Causes the temperature reading from either of the two thermocouples to rise by 50 deg C or more above the initial furnace temperature (the stabilized temperature is 750°C), or
2) Is observed to flame continuously for 10 s or more inside the furnace. Otherwise, the material shall be deemed combustible.

Conclusion: According to the test results, the sample complied with the requirement of BS 476-4:1970 (R2012).

Statement: The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to the sole criterion for assessing the potential smoke and toxicity hazard of the product in use.

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company, (4) Samples are tested as received.

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Report No. TC.19.07.004795

Date of Issue 07/23/2019

Changzhou Jinbiao Railway Transportation Technical Service Co., Ltd.

Drafted by:

Lynn liu

Approved by:

Shen hui

-End of Report-

Note: (1) General Terms & Conditions as mentioned overleaf. (2) The results relate only to the items tested. (3) The test report shall not be reproduced except in full without the written approval of the company. (4) Samples are tested as received.

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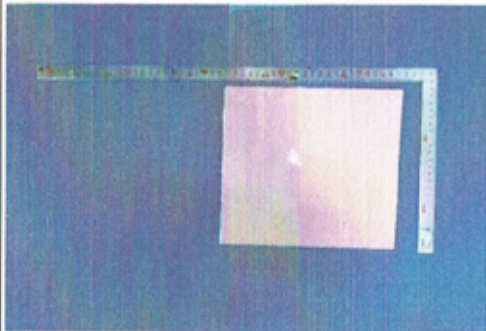
Report No. TC.18.08.004907

Date of Issue 09/10/2018

Applicant: Zhaoqing Beijing New Building Material Public Co.,Ltd.

Applicant address: Tintao Industry Zone, Jinli Town, Gaoyao City, Guangdong Province

Description of the test subject:

Sample	Description	Photo
001	Name: Gypsum plasterboard Style No: Fire-resistant Nominal thickness: 12mm Brand: BNBM End use: wall partition; ceiling; etc... Manufacturer: Zhaoqing Beijing New Building Material Public Co.,Ltd. Country of origin: China	

Receipt Date of Sample: 08/31/2018

Date of Testing: From 08/31/2018 to 09/10/2018

Sample submitted: The sample(s) was (were) submitted by applicant and identified.

Conclusion:

Test Items			Conclusion
No.	Items	Standard	
1	Fire tests on building materials and structures —Part 6: Method of test for fire propagation for products	BS 476-6: 1989+A1:2009	See test result

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company, (4) Samples are tested as received.

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Report No.

TC.18.08.004907

Date of Issue

09/10/2018

Test Results

1. BS476-6:1989+A1:2009 Fire tests on building materials and structures —Part 6: Method of test for fire propagation for products

1.1 Sample details

Size of specimen	225mm×225mm
Thickness	About 12 mm

Precondition	Temperature	Relative humidity	Duration
	23±2°C	50±5%R.H.	48h

1.2 Test result

Specimens	Index of performance of specimens			The index of performance
	S ₁	S ₂	S ₃	S
A	0.5	0.7	0.3	1.5
B	0.4	0.8	0.4	1.6
C	0.4	0.7	0.3	1.4

Sample quantity	i ₁	i ₂	i ₃	Fire propagation index I
3	0.4	0.7	0.3	1.4

Note: S, S₁, S₂ and S₃ are given by the following expressions.

$$S_1 = \sum_{t=0.5}^{t=3} \frac{\theta_s - \theta_c}{10t}; \quad S_2 = \sum_{t=4}^{t=10} \frac{\theta_s - \theta_c}{10t}; \quad S_3 = \sum_{t=12}^{t=20} \frac{\theta_s - \theta_c}{10t}$$

$$S = S_1 + S_2 + S_3$$

Fire propagation index:

$$i_1 = \frac{1}{3}[(S_1)_A + (S_1)_B + (S_1)_C]; \quad i_2 = \frac{1}{3}[(S_2)_A + (S_2)_B + (S_2)_C]$$

$$i_3 = \frac{1}{3}[(S_3)_A + (S_3)_B + (S_3)_C]; \quad I = i_1 + i_2 + i_3$$

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company, (4) Samples are tested as received.



Report No. TC.18.08.004907

Date of Issue 09/10/2018

Remark:

- θS the temperature rise for the flue gases
- θC the actual temperature rise to the nearest °C

Statement: The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential smoke and toxicity hazard of the product in use.

Changzhou Jinbiao Railway Transportation Technical Service Co., Ltd.

Drafted by:

Lynn liu

Approved by:

Shen hui

-End of Report-

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company, (4) Samples are tested as received.

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Report No. TC.18.08.004908

Date of Issue 09/10/2018

Applicant: Zhaoqing Beijing New Building Material Public Co.,Ltd.

Applicant address: Tintao Industry Zone, Jinli Town, Gaoyao City, Guangdong Province

Description of the test subject:

Sample	Description	Photo
001	Name: Gypsum plasterboard Style No: Fire resistant Nominal thickness: 12mm Brand: BNBM End use: wall partition; ceiling; etc... Manufacturer: Zhaoqing Beijing New Building Material Public Co.,Ltd. Country of origin: China	

Receipt Date of Sample: 08/31/2018

Date of Testing: From 08/31/2018 to 09/10/2018

Sample submitted: The sample(s) was (were) submitted by applicant and identified.

Conclusion:

Test Items			Conclusion
No.	Items	Standard	
1	Fire tests on building materials and structures Part 7. Method of test to determine the classification of the surface spread of flame of products	BS 476-7:1997	Class 1

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company, (4) Samples are tested as received.



Report No. TC.18.08.004908

Date of Issue 09/10/2018

Test Results

1. BS 476-7:1997: Fire tests on building materials and structures Part 7. Method of test to determine the classification of the surface spread of flame of products

1.1 Sample details:

Specimen size	885mm×270mm
Thickness	About <u>12</u> mm
Conditioning	Constant mass at a temperature of 23±2°C and a relative humidity of 50±10%

1.2 Test results:

Distance (mm)	Time to travel to indicated distance (second)					
	1	2	3	4	5	6
165	--	--	--	--	--	--
455	--	--	--	--	--	--
710	--	--	--	--	--	--
825	--	--	--	--	--	--
Maximum distance traveled at 1.5 minutes (mm)	0	0	0	0	0	0
Maximum distance traveled during the whole test (mm)	0	0	0	0	0	0
Time to reach maximum distance traveled(second)	--	--	--	--	--	--
Observations	--					

Remark: six specimens are usually tested. If the test on any specimen is deemed to be invalid, as defined in the standard, it is permissible for up to a maximum of nine specimens to be tested in order to obtain the six valid test results.

Classification:

In accordance with the tested results and the classifications defined in BS 476: Part 7:1997, the submitted sample is classified as **Class 1**

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Date of Issue 09/10/2018

Classification requirements:

Classification	Spread of flame at 1.5 min		Final spread of flame	
	Limit (mm)	Limit for one specimen in sample(mm)	Limit (mm)	Limit for one specimen in sample(mm)
Class 1	165	165+25	165	165+25
Class 2	215	215+25	455	455+25
Class 3	265	265+25	710	710+25
Class 4	Exceeding the limits for class 3			

Statement: The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential smoke and toxicity hazard of the product in use.

Changzhou Jinbiao Railway Transportation Technical Service Co., Ltd.

Drafted by:

Lynn liu

Approved by:

Shen hui

-End of Report-

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company. (4) Samples are tested as received.

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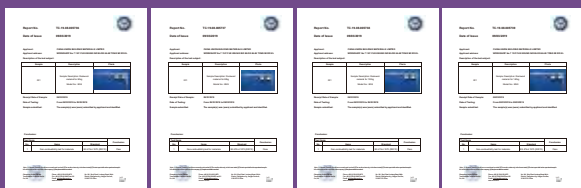
ROCK MINERAL WOOL

BNS mineral rockwool uses selected basalt as the base material and is a heat preserving material made through the processes of being melted at a high temperature, fiber forming through high speed centrifugation and fiber laying through oscillating belt. Vertically pressed and molded. BNS mineral rockwool is ideal for thermal insulation and sound absorption. It has a stable chemical Properties as well as fireproof and corrosion resistant. It can be made into different forms of boards, felt and pipe shell according to its different purposes. They are widely applied for exterior walls, roofs, equipments and piping, drywalls help with acoustic corrections & heat preservation as well.



Fire Performance Certificate:

BS 476-4:1970, BS 476-6:1970, BS 476-7:1970



Rockwool material
for 60kg

Rockwool material
for 80kg

Rockwool material
for 100kg

Rockwool material
for 140kg



Rockwool material
for 60kg

Rockwool material
for 80kg

Rockwool material
for 100kg

Rockwool material
for 140kg



Rockwool material
for 60kg

Rockwool material
for 80kg

Rockwool material
for 100kg

Rockwool material
for 140kg



Fire
prevention



Thermal
insulation



moisture
proof



Green
material



Withstand
voltage



Sound
absorption

Description

BNS rockwool boards are supplied in 1200 x 600mm format with a density of 60- 140 kg/cu.m. The standard product is bare, but could be manufactured with a factory applied foil or tissue facing if required.

Distributed by:



E-mail: Chinaunion2office@gmail.com
Tel: 5596 7709

ROCK MINERAL WOOL

Due to its superior acoustic performances and the speed of installation of drywalls, lightweight steel-framed partitions are becoming more popularly used in commercial use buildings such as hospitals, cinemas studios and offices.

Below are some suggested specifications of BNS drywalls

1 Standard metal stud partitions

In all, inside BNS (steel stud) partitions, install acoustic insulation of BNS Rockwool (Unfaced), (50-200mm thick).

Secure BNS Rockwool (Unfaced) at roof of partition using timber batten or light steel angle.

Insulation to fit snugly between studs and at bottom of the structure to ensure that there are no gaps. Seal partition at sides and all service penetration with acoustic sealant

Fire Performance

BNS rockwool is classified as non-combustible to BS476: Part 4.

Thermal performance

The thermal conductivity of BNS rockwool varies from 0.035 to 0.043 w/mk.

Durability

BNS rockwool is odorless, non-hygroscopic, rot proof, not sustain vermin and does not promote mildew, fungi, or bacteria.

2 Staggered stud partitions

In all, BNS (steel stud) partitions, install acoustic insulation of BNS Rockwool (Unfaced). (50-200mm thick)

Once the BNS studs have been positioned and boarded on one side, wound the insulation through the studs horizontally. Ensure there are no gaps at abutments or between adjacent lengths of the insulation.

Seal partition at sides and all service penetrations with acoustic sealant.

3 High performance twin frame

In all BNS (twin frame) partitions, install acoustic insulation of BNS Rockwool, (50-200mm thick).

Once the BNS studs have been positioned and boarded on one side, the insulation layer should be inserted between the studs horizontally.

Ensure there are no gaps at abutments or between adjacent lengths of the insulation.

Seal partition at side and all service penetrations with acoustic sealant.



ROCK MINERAL WOOL



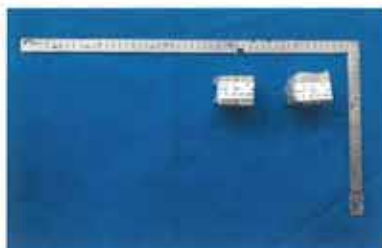
Report No. TC.19.08.005738

Date of Issue 09/03/2019

Applicant: CHINA UNION BUILDING MATERIALS LIMITED

Applicant address: WORKSHOP No.7 13/F FUK KEUNG IND BLDG 66-68 TONG MI RD KL

Description of the test subject:

Sample	Description	Photo
001	Sample Description: Rockwool material for 100kg Model No.: BNS	

Receipt Date of Sample: 08/23/2019

Date of Testing: From 08/23/2019 to 09/03/2019

Sample submitted: The sample(s) was (were) submitted by applicant and identified.

Conclusion:

Test Items			Conclusion
No.	Items	Standard	
1	Non-combustibility test for materials	BS 476-4:1970 (R2012)	Pass

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company, (4) Samples are tested as received.

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Report No.

TC.19.08.005738

Date of Issue

09/03/2019

Test Results

1. BS 476-4:1970 (R2012) Fire tests on building materials and structures. Non-combustibility test for materials

1.1 Sample describe

Specimen size	40mm x 40mm
Height	50mm

conditioning	temperature	relative humidity	Period
	60±5°C	desiccative	24h

1.2 Test result

Specimen	1	2	3	Average
Furnace temperature (initial) (°C)	746	749	748	748
Duration of sustained flaming inside the furnace (s)	--	--	--	--
Highest temperature of the centre of specimen T _c (max) (°C)	723	727	729	726
Final temperature of the centre of specimen T _c (final °C)	677	684	685	682
Highest temperature of furnace inside TF(max) (°C)	767	769	770	769
Final temperature of furnace inside TF(final °C)	756	756	754	755
The centre of specimen temperature rise ΔT _C (°C)	46	43	44	44
Furnace inside temperature rise ΔTF(°C)	21	20	22	21

Requirement:

The material shall be deemed non-combustible if, during the test, none of the three specimens either

- 1) Causes the temperature reading from either of the two thermocouples to rise by 50 deg C or more above the initial furnace temperature (the stabilized temperature is 750°C), or
- 2) Is observed to flame continuously for 10 s or more inside the furnace. Otherwise, the material shall be deemed combustible.

Conclusion: According to the test results, the sample **complies** with the requirement of BS 476-4:1970 (R2012).

Statement: The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to the sole criterion for assessing the potential smoke and toxicity hazard of the product in use.

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company. (4) Samples are tested as received.

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Date of Issue 09/03/2019

Changzhou Jinbiao Railway Transportation Technical Service Co., Ltd.

Drafted by:

Lynn liu

Approved by:

Shen hui

-End of Report-

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company. (4) Samples are tested as received.

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Report No. TC.20.07.003402

Date of Issue 08/04/2020

Applicant: CHINA UNION BUILDING MATERIALS LIMITED

Applicant address: WORKSHOP No.7 13/F FUK KEUNG IND BLDG 66-68 TONG MI RD KL

Description of the test subject:

Sample	Description	Photo
001	Sample Description: Rockwool material for 100kg Style No.: BNS	

Receipt Date of Sample: 07/27/2020

Date of Testing: From 07/27/2020 to 08/04/2020

Sample submitted: The sample(s) was (were) submitted by applicant and identified.

Conclusion:

Test Items			Conclusion
No.	Items	Standard	
1	Fire tests on building materials and structures —Part 6: Method of test for fire propagation for products	BS 476-6:1989+A1:2009	See test results

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company, (4) Samples are tested as received.

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Report No. TC.20.07.003402

Date of Issue 08/04/2020

Test Results

1. BS476-6:1989+A1:2009 Fire tests on building materials and structures —Part 6: Method of test for fire propagation for products

1.1 Sample details

Size of specimen	225mm×225mm
Thickness	About 50.0 mm

Precondition	Temperature	Relative humidity	Duration
	23±2°C	50±5%R.H.	48h

1.2 Test result

Specimens	Index of performance of specimens			The index of performance
	S ₁	S ₂	S ₃	S
A	0.93	0	0	0.93
B	0.96	0	0	0.96
C	0.92	0	0	0.92

Sample quantity	i ₁	i ₂	i ₃	Fire propagation index I
3	0.94	0	0	0.94

Note: S, S₁, S₂ and S₃ are given by the following expressions.

$$S_1 = \sum_{t=0.5}^{t=3} \frac{\theta_s - \theta_c}{10t}; \quad S_2 = \sum_{t=4}^{t=10} \frac{\theta_s - \theta_c}{10t}; \quad S_3 = \sum_{t=12}^{t=20} \frac{\theta_s - \theta_c}{10t}$$

$$S = S_1 + S_2 + S_3$$

Fire propagation index:

$$i_1 = \frac{1}{3}[(S_1)_A + (S_1)_B + (S_1)_C]; \quad i_2 = \frac{1}{3}[(S_2)_A + (S_2)_B + (S_2)_C]$$

$$i_3 = \frac{1}{3}[(S_3)_A + (S_3)_B + (S_3)_C]; \quad I = i_1 + i_2 + i_3$$

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company. (4) Samples are tested as received.

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2 of 3





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检测
TESTING
CNAS L6069



Report No. TC.20.07.003402

Date of Issue 08/04/2020

Remark:

- θ_s the temperature rise for the flue gases, °C
 θ_c the actual temperature rise to the nearest, °C

Statement: The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to the sole criterion for assessing the potential smoke and toxicity hazard of the product in use. Test results are just for internal reference.

Changzhou Jinbiao Railway Transportation Technical Service Co., Ltd.

Drafted by:

Wayne Wang



Approved by:

Shen hui

-End of Report-

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company. (4) Samples are tested as received.

Changzhou Jinbiao Railway
Transportation Technical Service
Co., Ltd.



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Report No. TC.20.07.002874

Date of Issue 07/13/2020

Applicant: CHINA UNION BUILDING MATERIALS LIMITED

Applicant address: WORKSHOP No.7 13/F FUK KEUNG IND BLDG 66-68 TONG MI RD KL

Description of the test subject:

Sample	Description	Photo
001	Sample Description: Rockwool material for 100kg Style No.: BNS	

Receipt Date of Sample: 07/03/2020

Date of Testing: From 07/03/2020 to 07/13/2020

Sample submitted: The sample(s) was (were) submitted by applicant and identified.

Conclusion:

Test Items			Conclusion
No.	Items	Standard	
1	Fire tests on building materials and structures Part 7. Method of test to determine the classification of the surface spread of flame of products	BS 476-7:1997(R2016)	Class 1

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Report No. TC.20.07.002874

Date of Issue 07/13/2020

Test Results

1. BS 476-7:1997(R2016) Fire tests on building materials and structures Part 7. Method of test to determine the classification of the surface spread of flame of products

1.1 Sample details:

Specimen size	885mm×270mm
Thickness	About 50 mm
Conditioning	Constant mass at a temperature of 23±2°C and a relative humidity of 50±10%

1.2 Test results:

Distance (mm)	Time to travel to indicated distance (second)					
	1	2	3	4	5	6
165	NR	NR	NR	NR	NR	NR
455	NR	NR	NR	NR	NR	NR
710	NR	NR	NR	NR	NR	NR
825	NR	NR	NR	NR	NR	NR
Maximum distance traveled at 1.5 minutes (mm)	--	--	--	--	--	--
Maximum distance traveled during the whole test (mm)	--	--	--	--	--	--
Time to reach maximum distance traveled(second)	--	--	--	--	--	--
Observations	--					

Remark:

1. Six specimens are usually tested. If the test on any specimen is deemed to be invalid, as defined in the standard, it is permissible for up to a maximum of nine specimens to be tested in order to obtain the six valid test results.

2. NR=Not reached

Classification:

In accordance with the tested results and the classifications defined in BS 476-7:1997(R2016), the submitted sample is classified as **Class 1**

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Report No. TC.20.07.002874

Date of Issue 07/13/2020

Classification requirements:

Classification	Spread of flame at 1.5 min		Final spread of flame	
	Limit (mm)	Limit for one specimen in sample(mm)	Limit (mm)	Limit for one specimen in sample(mm)
Class 1	165	165+25	165	165+25
Class 2	215	215+25	455	455+45
Class 3	265	265+25	710	710+75
Class 4	Exceeding the limits for class 3			

Statement: The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential smoke and toxicity hazard of the product in use. Test results are just for internal reference.

Changzhou Jinbiao Railway Transportation Technical Service Co., Ltd.

Drafted by:

Lynn liu



Approved by:

Shen hui

-End of Report-

Note: (1) General Terms & Conditions as mentioned overleaf, (2) The results relate only to the items tested, (3) The test report shall not be reproduced except in full without the written approval of the company. (4) Samples are tested as received.

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Acoustic Testing Services Limited

聲學測試服務有限公司

**Sound Transmission Loss
Test Report for
Drywall System (Two Layers of BNBM Fire Board)**

(Report No.: ATS05-005-RP004)

REPORT TO: ENTASIS LIMITED

ADDRESS: 28/F., Devon House,
Tai Koo Place, 979 King's Road,
Hong Kong

ATTN.: Mr. Fred Chan / Dr. Ernest Cheng

Issued by:

Ir. Dr. F. Chong
CEng, RPE, MHKIE, MIMechE,
MCIBSE, MIOA, MHKIOA

Date of Issued: 09 August 2005

Page 1 of 13



1. Method of Measurement

The measurement for sound transmission loss of the drywall system provided by Entasis Limited was carried out according to ASTM E 90 "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions" in the reverberation rooms of Acoustic Testing Services Limited. And the single number rating of airborne sound transmission loss is given as Sound Transmission Class (STC) by evaluated in accordance with ASTM E413 – 87 "Classification for Rating Sound Insulation".

2. Details of Measurement

2.1 Principle of Measurement

The sound transmission loss of a partition is usually measured in a laboratory by placing the element in an opening between two adjacent reverberant rooms designed for such tests. Noise is introduced into one of the rooms, referred to as the source room, and part of the sound energy is transmitted through the test element into the second room, referred to as the receiving room. The resulting mean space-average sound pressure levels in the source room and the receiving room is L_1 and L_2 , respectively.

The sound transmission loss is given by

$$TL = L_1 - L_2 + 10 \log(S/A) \quad \dots (1)$$

Where

- L_1 is the average sound pressure level in the source room, in dB;
- L_2 is the average sound pressure level in the receiving room, in dB;
- S is the area of the test specimen, in m^2 ;
- A is the equivalent absorption area in the receiving room, in metres sabins.

$$A = (0.9210Vd/c) \quad \dots (2)$$

and where

- V is the receiving room volume, in m^3 ;
- d is the rate of decay of sound pressure level in receiving room, dB/s;
- c is the speed of sound in the medium, m/s.

The speed of sound changes with temperature and is shall be calculated for the conditions existing at the time of test from the equation:

$$c = 20.047\sqrt{273.15 + t} \quad \dots (3)$$

where, t is the receiving room temperature, measured to nearest degree.



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The Sound Transmission Class (STC) of test specimen is calculated by comparing the sixteen values of Sound Transmission Loss from 125 Hz to 4000 Hz with a defined reference curve which is incremented until the requirements of ASTM E 413 – 87 are met.

2.2 Location

Unit H, 2/F., Century Industrial Centre,
33-35 Au Pui Wan Street,
Fo Tan, Shatin, N. T., Hong Kong

2.3 Test Condition

Conditions	Source room	Receiving room
Volume	198m ³	91m ³
Air Temperature	25°C	26°C
Relative Humidity	68%	69%

2.4 Test Date

Date of receipt of test material:
Date of measurement performed:

04th August 2005
08th August 2005

2.5 Instrumentation

2.5.1 For sound production

Type	Serial No.
One Real Time Frequency Analyzer –Briel & Kjaer 3560-B	2487568
One Equalizer – Ultragraph Pro	N0517513166
One Amplifier – STK V-6	C04OM013
One OmniPower Sound Source – Bruel & Kjaer 4296	2485313

2.5.2 For sound measurement

Type	Serial No.
One Real Time Frequency Analyzer –Briel & Kjaer 3560-B	2487568
Two Random Incident ½" Microphone – Bruel & Kjaer 4942	2365510 for source
	2365511 for receiving
Two ½" Microphone Preamplifier – Bruel & Kjaer 2671	2494533 for source
	2494534 for receiving
One Sound Level Calibrator – Bruel & Kjaer 4231	2478237



2.5.3 For reverberation time measurement

Type	Serial No.
One Real Time Frequency Analyzer –Briel & Kjaer 3560-B	2487568
One Random Incident ½" Microphone – Bruel & Kjaer 4942	2365511
One ½" Microphone Preamplifier – Bruel & Kjaer 2671	2494534
One Loudspeaker – ART Series 315A	DGX6565

3. Description of the Test Construction

- 3.1 Two layer 12.5mm BNBM fire rated gypsum board (size 1.2m x 3m x 12.5mm) inserted between floor and ceiling 64mm x 32mm x 0.8mm "Studco" runners with tab-flange section of 64mmx45mmx0.8mm "Studco" steel C studs between panels. The span of "Studco" Steel C studs is 600mm centre to centre. 50mm thickness with 100kg/m³ "BNBM" rockwool insulation friction fit in stud space. The underneath of top and bottom channel were laid on 15mm thick fibreglass insulation (48kg/m³) with Bostik fire resistant sealant on both sides. It allows building deflection. All the gypsum board panel joint have taped and plastering.
- 3.2 Effective area of the tested drywall system (Two Layers of BNBM Fire Board) is 10.5m² as 3500mm wide by 3000mm high.
- 3.3 The tested drywall system (Two Layers of BNBM Fire Board) was installed by Entasis Limited on 08 August 2005.



4. Measurement Results

- 4.1 The sound transmission loss of the tested drywall system (Two Layers of BNBM Fire Board) at measured frequency bands (1/3 and 1/1 octave band central frequencies) are shown by the following table:

Frequency f, Hz	1/3 Octave Band Sound Transmission Loss, dB	1/1 Octave Band Sound Transmission Loss, dB
100	20.9	25.4
125	33.3	
160	41.1	
200	40.9	43.5
250	45.2	
315	46.6	
400	48.9	50.4
500	50.9	
630	51.8	
800	53.5	55.2
1000	55.8	
1250	57.1	
1600	58.1	59.2
2000	60.1	
2500	59.8	
3150	54.2	54.8
4000	54.8	
5000	55.4	

The above data are presented in Figure 1.

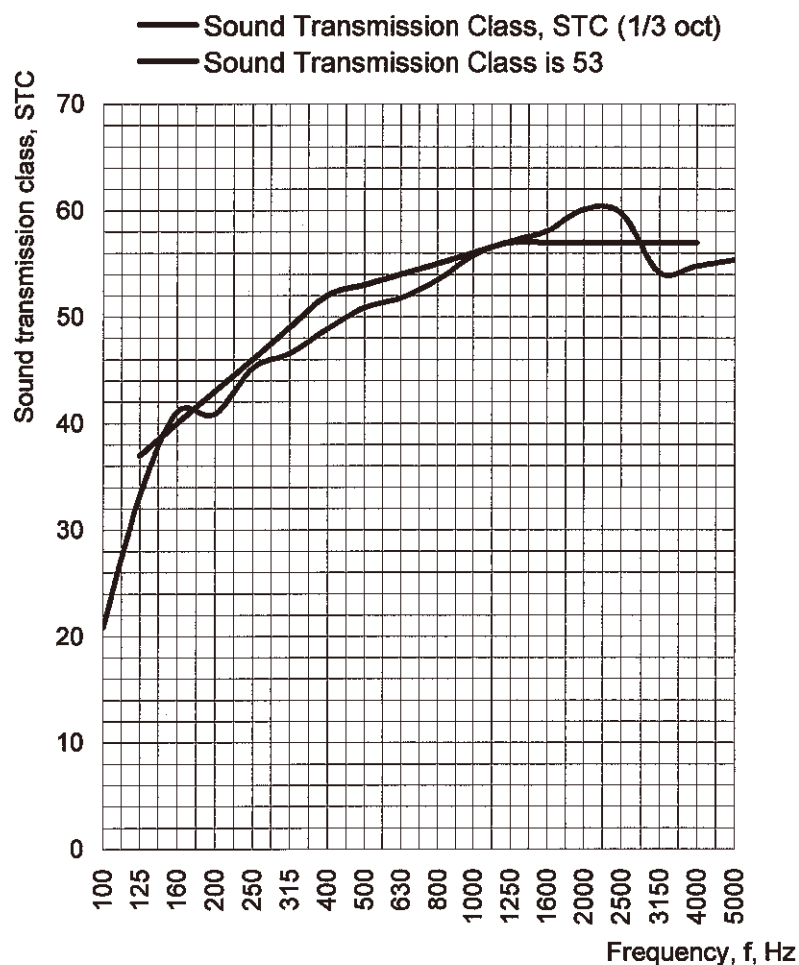


Figure 1. Sound Transmission Loss against Frequency

- 4.2 The result of sound transmission class (STC) of the tested drywall system (Two Layers of BNBM Fire Board) is shown in the following table.

Description	Sound Transmission Class, STC
Drywall System (Two Layers of BNBM Fire Board)	53



5. Results Application

- 5.1 The obtained results can be used to design building elements with appropriate acoustic properties, to compare the sound insulation properties of building elements and to classify such elements according to their sound insulation capabilities.
- 5.2 The measurements are performed in laboratory test facilities in which transmission of sound on flanking paths is suppressed. Results of measurements shall not be applied directly in the field without accounting for other factors affecting sound insulation, especially flanking transmission and loss factor.
- 5.3 The test results obtained relate only to the specimen under tested.
- 5.4 Material information is provided by the Client and/or the material supplier(s), the laboratory has no liability to check.

Reported by:

Ir. Dr. F. Chong
CEng, RPE, MHKIE, MIMechE,
MCIBSE, MIOA, MHKIOA

Date: 09 August 2005



Acoustic Testing Services Limited

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Appendix List

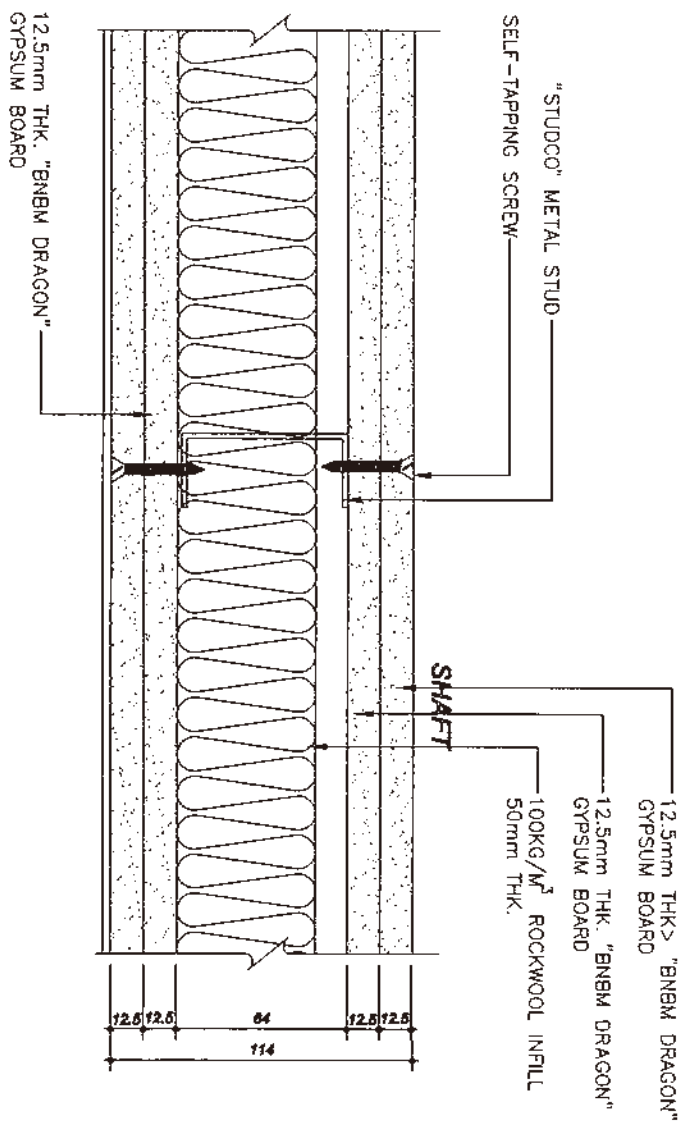
Appendix 1	Detailed Configuration of Drywall System
Appendix 2	Photographic Records



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Appendix 1 Detailed Configuration of Drywall System



2 DRY WALL DETAIL - TYPE B
SCALE 1:2

FILE NO.	REV.
No.	Amendments
Date	

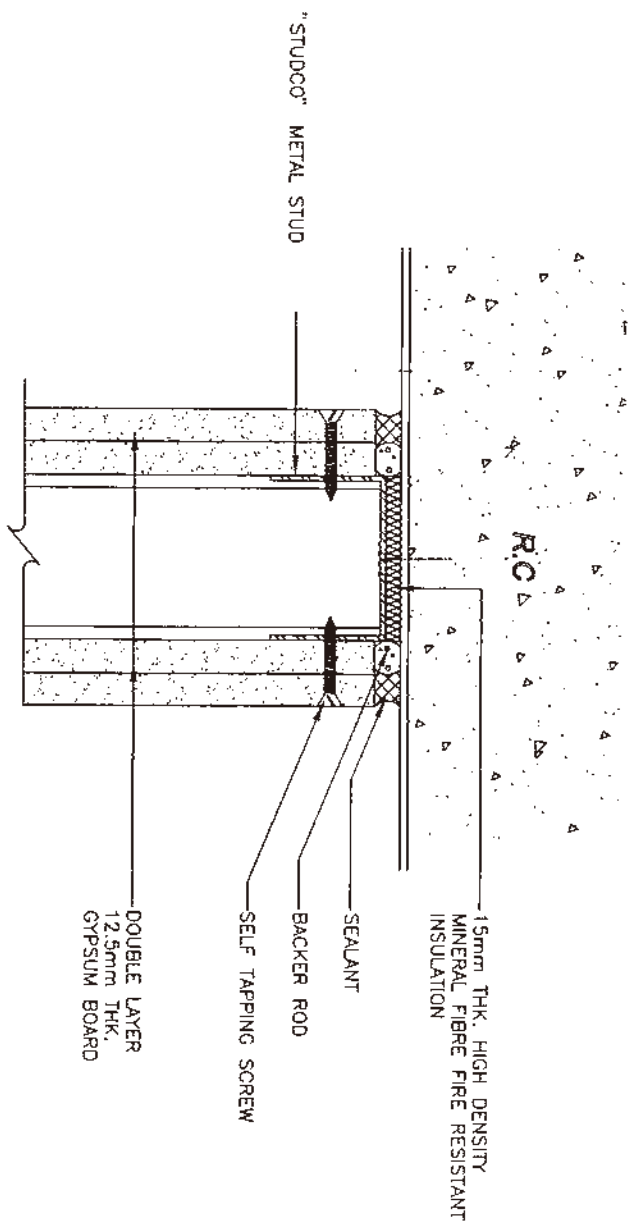
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Drawing Title
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10 DRY WALL HEAD DETAIL - 2 HRS. F.R.P.
SCALE 1:2

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573 King's Road, Hong Kong
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JOB TITLE
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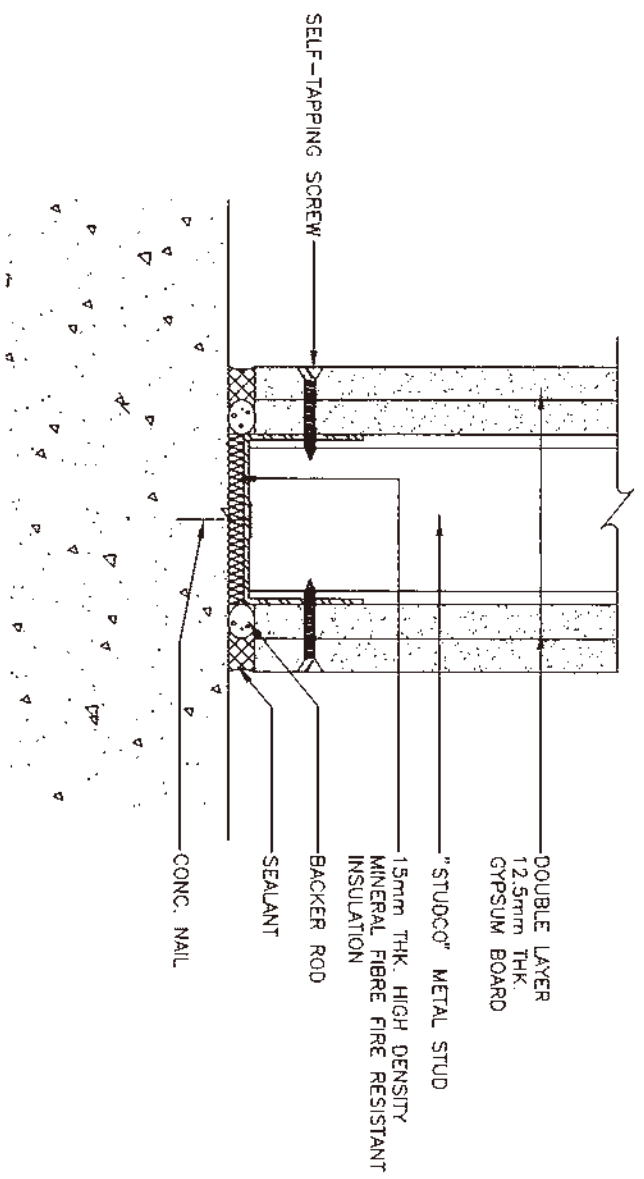
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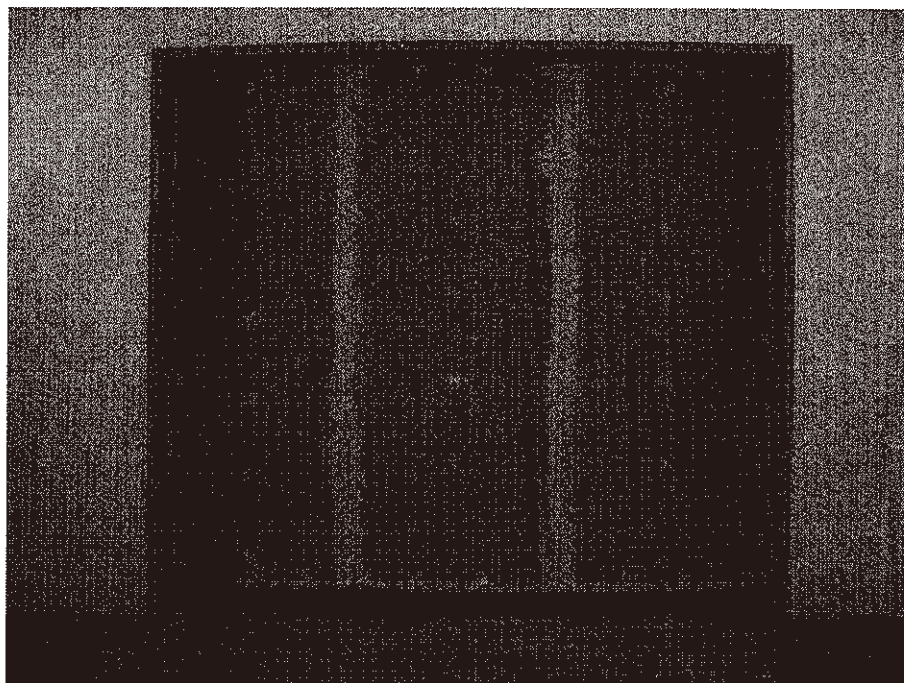
12 DRY WALL BASE DETAIL - 2 HRS. F.R.P.
SCALE 1:2



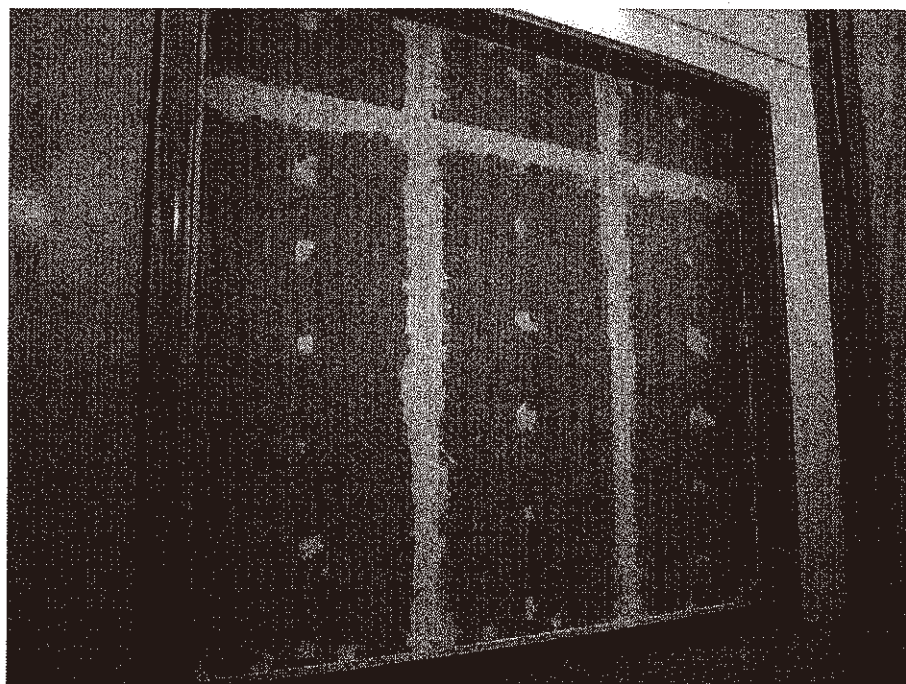
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Appendix 2 Photographic Records



Installation of Tested Drywall System (in Source room)



Installation of Tested Drywall System (in Receiving room)

Laboratory Sound Transmission Loss Test Report

TEST REPORT REFERENCE NUMBER: ATS10-013-RP003

DATE OF REPORT: 22 June 2010

TESTED FOR: BNS Company Limited

34/F, International Trade Centre,
No. 3002, RenminSouth Road,
Luohu District, Shenzhen, 518014
P.R. China

ATTENTION: Mr. Lynn Siu

UNIT UNDER TEST: BNBM 'C' stud Acoustic Plasterboard
Partition (STC53)

TEST STANDARD: ASTM E90 - 04

TESTED AT: Unit E, 2/F., Century Industrial Centre,
33-35 Au Pui Wan Street,
Fo Tan, Shatin,
New Territories, Hong Kong.

Approved by:



Ir Dr. CHONG Fan / Managing Director
CENG, RPE, HHKIE, MIMechE, MCIBSE,
MASHRAE, MIOA, MHKIOA



Hong Kong Accreditation Service (HKAS) has accredited this laboratory under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report (or certificate, where appropriate) were determined by this laboratory in accordance with its terms of accreditation.

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1. METHOD OF TEST

The test was conducted in accordance with ASTM E90 – 04 "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions" in the reverberation rooms of Acoustic Testing Services Limited. And the single number rating of airborne Sound Transmission Loss is given as Sound Transmission Class (STC) by evaluated in accordance with ASTM E413 – 04 "Classification for Rating Sound Insulation".

2. INSTRUMENTATION

Description:	Serial Number:
Bruel & Kjaer Type 3560-B Real Time Frequency Analyzer	2454296
Ultragraph Pro Equalizer	N0517513166
STK V-6 Amplifier	C04OM013
Bruel & Kjaer Type 4292 OmniPower Sound Source	021005
Bruel & Kjaer Type 4942 Random Incident ½" Microphone (Source Room)	2497997
Bruel & Kjaer Type 4942 Random Incident ½" Microphone (Receiving Room)	2497998
Bruel & Kjaer Type 4231 Sound Level Calibrator	2478237

The measuring equipment has been calibrated by an external HOKLAS laboratory, and is in current calibration.

3. TEST CONDITIONS

Air temperature	Source room : 26 °C
	Receiving room : 26 °C
Relative humidity	Source room : 68 %
	Receiving room : 67 %
Room volume	Source room : 220.75 m ³
	Receiving room : 79.70 m ³
Date of receipt of unit under test	: 05 June 2010
Date of test	: 10 June 2010

4. PRINCIPLE OF TEST

The Sound Transmission Loss of a partition is usually measured in a laboratory by placing the element in an opening between two adjacent reverberant rooms designed for such tests. Noise is introduced into one of the rooms, referred to as the source room, and part of the sound energy is transmitted through the test element into the second room, referred to as the receiving room. The resulting mean space-average sound pressure levels in the source room and the receiving room is L_1 and L_2 , respectively.

The Sound Transmission Loss is given by

$$TL = L_1 - L_2 + 10 \log(S/A)$$

where

L_1 is the average sound pressure level in the source room, in dB;

L_2 is the average sound pressure level in the receiving room, in dB;

S is the area of the test specimen, in m^2 ;

A is the equivalent absorption area in the receiving room, in metres sabins.

$$A = (0.9210Vd/c)$$

and where

V is the receiving room volume, in m^3 ;

d is the rate of decay of sound pressure level in receiving room, dB/s;

c is the speed of sound in the medium, m/s.

The speed of sound changes with temperature and shall be calculated for the conditions existing at the time of test from the equation:

$$c = 20.047 \sqrt{273.15 + t}$$

where

t is the receiving room temperature, measured to nearest degree.

The Sound Transmission Class (STC) of test specimen is calculated by comparing the sixteen values of Sound Transmission Loss from 125 Hz to 4000 Hz with a defined reference curve which is incremented until the requirements of ASTM E413 – 04 are met.

5. RESULTS APPLICATION

The results obtained can be used to design building elements with appropriate acoustic properties, to compare the sound insulation properties of building elements and to classify such elements according to their sound insulation capabilities.

The test was performed in laboratory facilities in which transmission of sound on flanking paths is suppressed. Results of measurements shall not be applied directly in the field without accounting for other factors affecting sound insulation, especially flanking transmission and loss factor.

The test results obtained relate only to the tested unit.

6. DESCRIPTION OF UNIT UNDER TEST

Unit Under Test:	BNBM 'C' stud Acoustic Plasterboard Partition (STC53)		
Sample I. D.:	ATS10-013-TS003		
Dimensions use for calculation:	3500	mm (width) X 3000	mm (height)
Manufacturer:	BNBM/BNS Company Limited		
Installed by:	BNS Company Limited		
Additional Description:	2 layers of 12mm thick BNBM fire resistance gypsum plasterboard installed on two sides fixed on 50x32x0.55mm BNBM/BNS steel stud at 610mm C/C and 50x25x0.55mm BNBM/BNS steel track with double layers of 25mm thick 16kg/m ³ BNS glasswool infill.		

The details of the tested unit are referring to the drawings given in Appendix 1.

7. TEST RESULTS

The measured Sound Transmission Loss of the tested unit was tabulated as follow:-

Frequency f, Hz	1/3 Transmission Loss, TL	1/1 Transmission Loss, TL
100	26	30
125	34	
160	40	
200	42	44
250	43	
315	47	
400	48	49
500	50	
630	51	
800	53	54
1000	54	
1250	54	
1600	55	56
2000	56	
2500	57	
3150	59	61
4000	61	
5000	64	

Measurement marked with a "**", if any, is affected by flanking transmission.

The Sound Transmission Class (STC) calculated in accordance with ASTM E413 – 04 was tabulated as follow:-

STC	=	53
-----	---	----

The measured Sound Transmission Loss against Frequency was plotted on Figure 1.

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ATS10-013-RP003



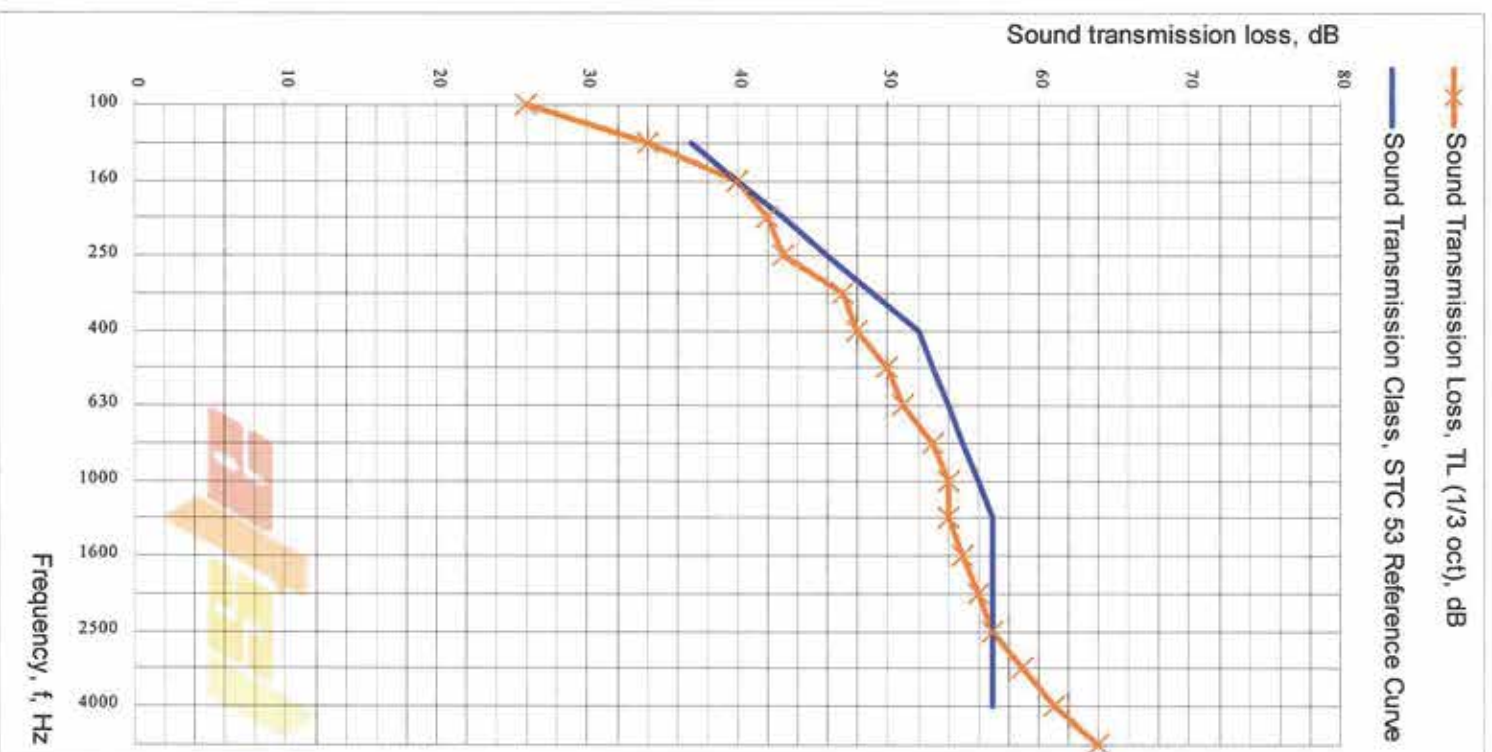


Figure 1. Sound Transmission Loss against Frequency

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ATS10-013-RP003

APPENDIX LIST

APPENDIX 1	Details of Tested Unit
APPENDIX 2	Photographic Records

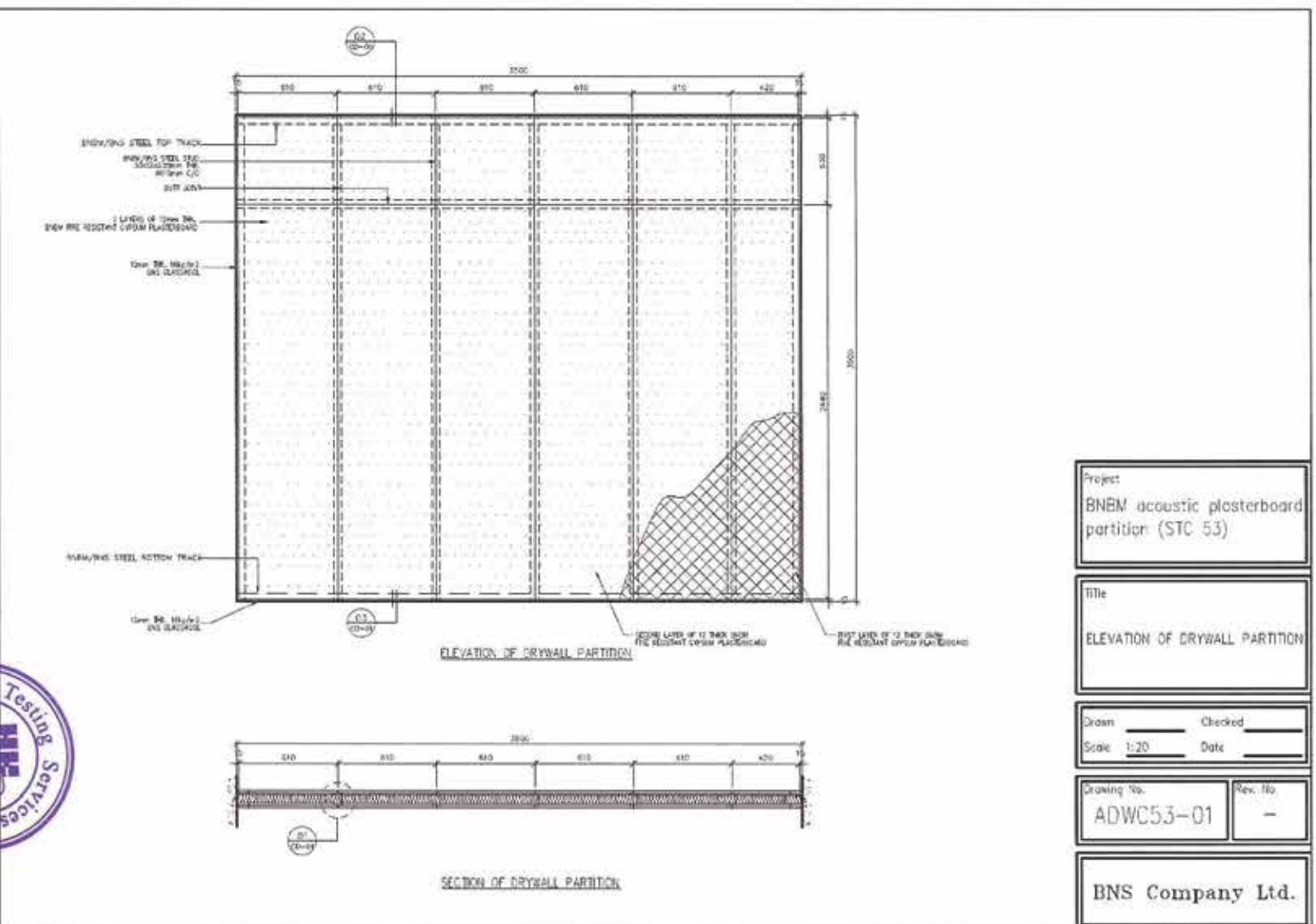
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ATS10-013-RP003



APPENDIX 1

Details of Tested Unit

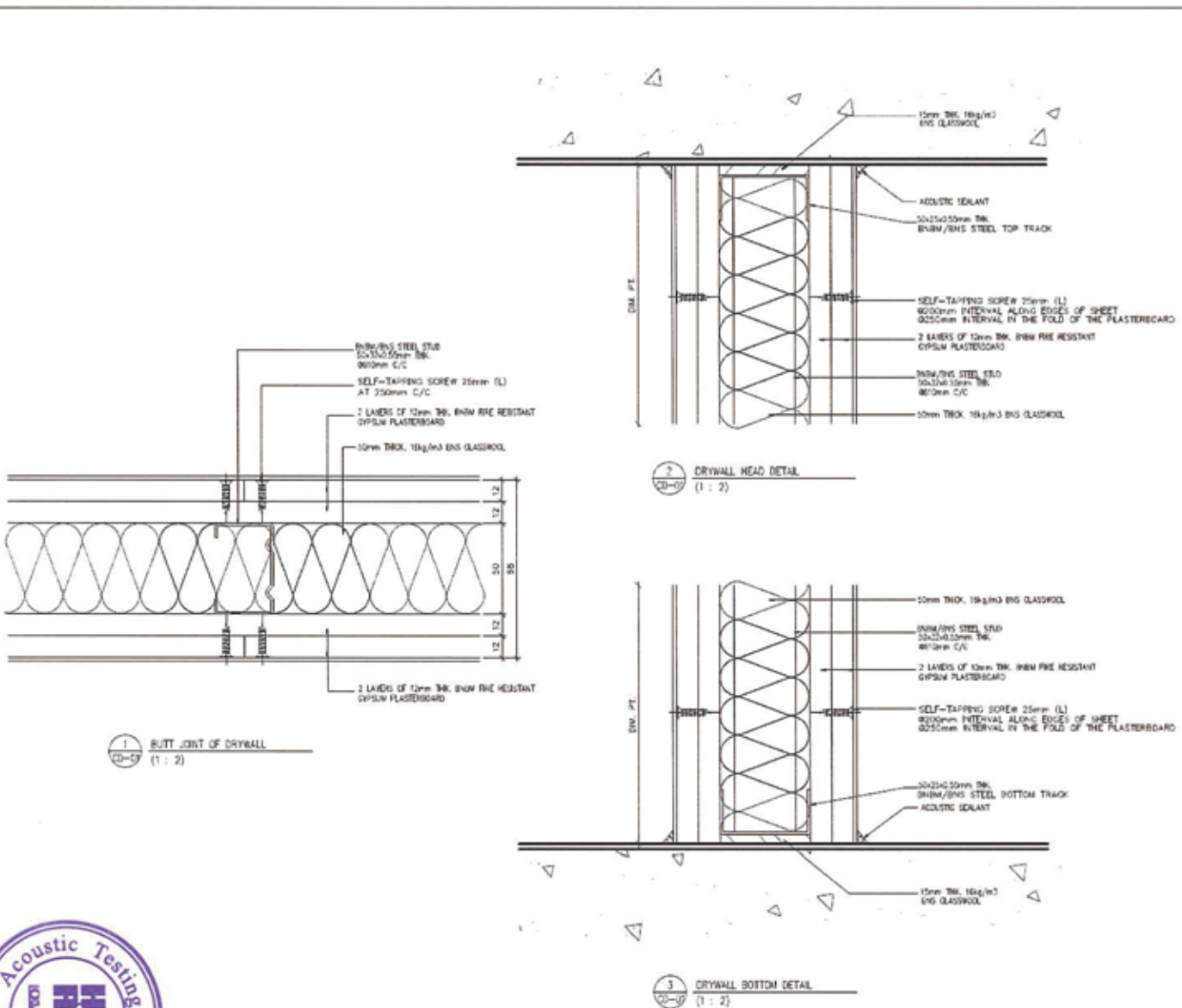


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Project	
BNBM acoustic plasterboard partition (STC 53)	
Title	
DETAIL OF DRYWALL PARTITION	
Drawn _____	Checked _____
Scale _____	Date _____
Drawing No.	Rev. No.
ADWC53-02	—
BNS Company Ltd.	



APPENDIX 2

Photographic Records



Set-up of Test Unit (Source room)



Set-up of Test Unit (Receiving room)

End of Report

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