CHINA UNION BUILDING MATERIALS

We believe that passive fire protection is a crucial element of building safety that can save lives and prevent property damage.

We're provide wide range of fireproof board for building.

KINGTEC
HAWK PAN BOARD

1-hour Fire Rated Board Partition System

WE BUILD SAFE SPACES FOR EVERYONE.

Our fireproof board complies with BS and BS EN standards.

+852 5596 7709 www.chinaunion.org/

INTRODUCTION

Depending on its location and function within a building, a wall, ceiling and E&M enclosure may need to meet various requirements during a fire. Fire-resisting walls that partition spaces and enclose compartments must act as a barrier to prevent the spread of fire from either side. Therefore, it is essential for these walls to meet all relevant criteria: integrity, insulation, and, if applicable, load-bearing capacity; all from both sides for the specified fire resistance duration.

Fire Compartmentation

Fire-resistant partitions serve as a means of compartmentalization, effectively separating various fire hazards.

Fire safe exit passage ways

In a fire, exit routes must be fire safe and fully compartmented to prevent fire spread. It's crucial to limit thermal heat transfer in walls to ensure a safe environment for occupants escaping.

Fire resistant party walls and Ceiling

One cannot control the fire risks posed by neighbors who share a common wall delineating different properties. Fire-resistant party walls and ceiling are essential in preventing the spread of fire from one unit to an adjacent one, thereby enhancing safety for all occupants.

INTRODUCTION

www.chinaunion.org/
+852 5596 7709

Hawk Pan calcium silicate fire board systems are fire-resistant, lightweight, clean, and easy to install, making them ideal for a variety of building projects.

These products provide exceptional thermal insulation and fire protection across numerous applications. They are particularly well-suited for internal partitions, ceilings, and electrical and mechanical enclosures, especially within drywall construction.

In addition to protecting lives and assets, Hawk Pan help conserve space and energy, reduce CO2 emissions, and enhance overall efficiency.

Designed to safeguard timber, concrete, or steel structures, these boards can also function as self-supporting elements, such as partition walls and ceilings. With their aesthetically pleasing finish, they serve as an all-in-one architectural feature that facilitates quick construction while optimizing space.

Manufactures Certification

Hawk Pan under a Quality Management System compliant with the International Standard ISO 9001:2008.

TESTING AND THIRO-PARTY CERTIFICATION

Hawk Pan calcium silicate board systems have been rigorously tested and evaluated to comply with the following standards:

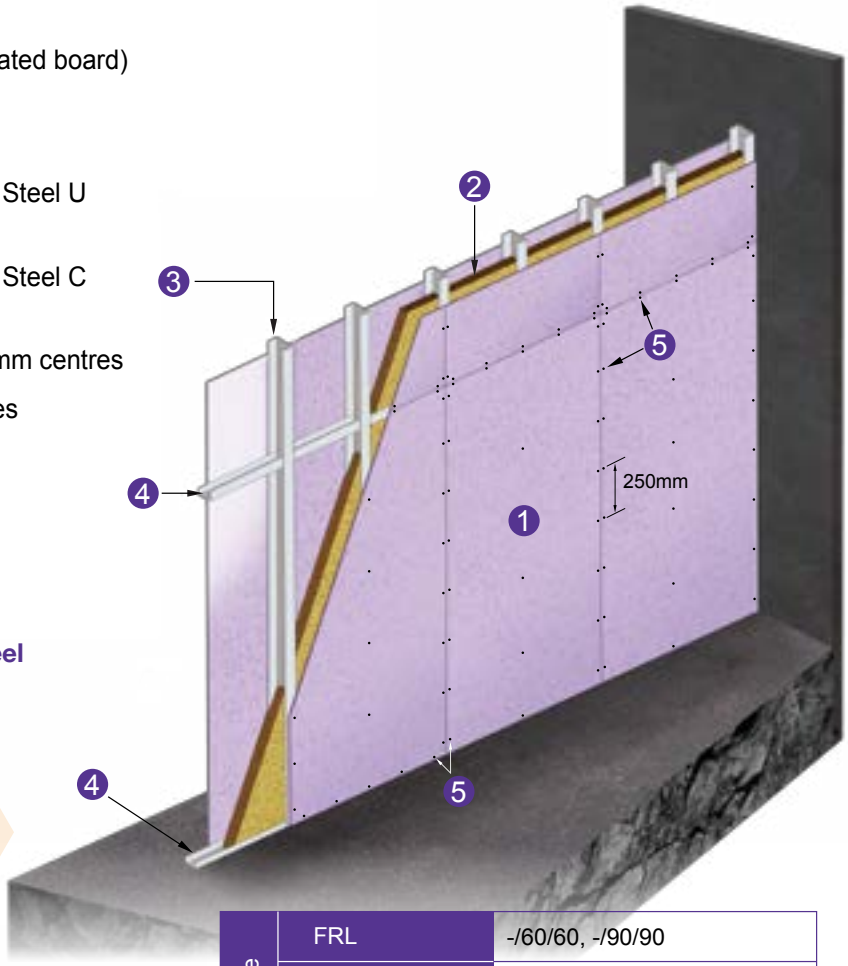
BS 476: Part 4, 6 & 7
BS 476: Part 20: 1987
BS 476: Part 22: 1987

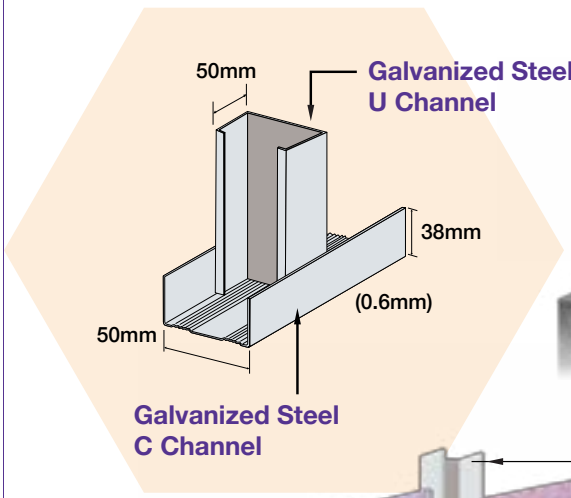
Key Benefits of Hawk Pan:

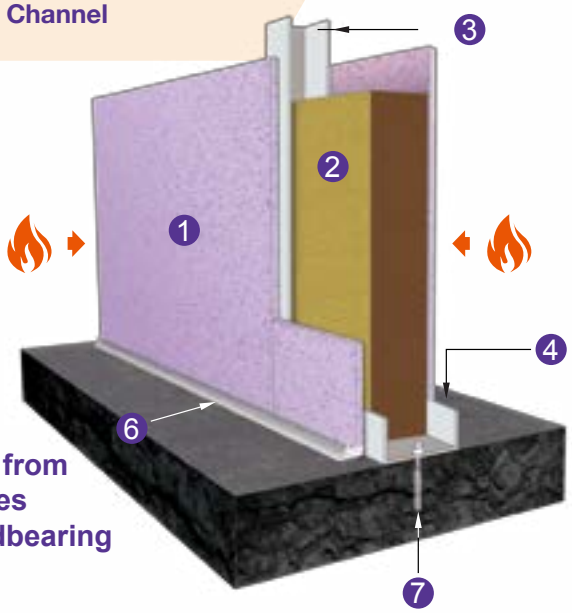
- Fire-resistant
- Extremely low thermal conductivity
- Excellent mechanical integrity
- Minimal shrinkage
- Non-combustible
- Corrosion-resistant
- Impact-resistant
- Moisture-resistant
- Low to no maintenance required
- Environmentally friendly and safe
- Compliant with international fire protection standards
- High thermal resistance and stability up to 1,100 degrees Celsius

60-90 minute fire insulation and integrity with fiew on either side

1. One layer of 9mm thick HAWK PAN (fire rated board)
2. Rock wool 50mm x 80kg/m^3 (60 minute)
   Rock wool 50mm x 100kg/m^3 (90 minute)
3. 50mm x 50mm x 0.6mm thick Galvanized Steel U Channel at nominal 610mm
4. 50mm x 38mm x 0.6mm thick Galvanized Steel C Channel
5. Self-tapping screws M3.5 at nominal 250mm centres
6. M6 Anchor bolts at nominal 500mm centres
7. Firestop Acrylic Sealant







Fire risk from both sides Non loadbearing partition

Fire resistance	FRL	-/60/60, -/90/90
	Standard	BS EN 1364 - 1: 1999 BS 476: Part 20: 1987 BS 476: Part 22: 1987
	Approval	1T14-088, IA 15-029 FORTE
Acousitc	Standard #STC	ASTM E90-09, ASTM E413-10 45
	Standard #RW	ISO140: Part 1&3: 1996 48 DB
	Predicted assessment	(A + A)*L 20th August 2015
Construction	Maximum height	6000mm
	Partition length	Unlimited
	Partition thickness	68mm
	Partition mass	31kg/m^2

Basic knowledge

Sound is the vibration of an object that is felt through the human auditory organ. Acoustics involves many disciplines such as natural science, psychology, and art.

The normal hearing frequency range of the human ear is 20 - 20KHz, 5OOHz and below is low frequency, 500Hz - 2000Hz is medium frequency, and 2000Hz is high frequency. The sound level is used to describe the size of the sound, which is calculated by adding the sound of each frequency. Generally, the A sound level is used. The hearing sound level range of the human ear is 0-120dB. Below 15dB is an extremely quiet environment, 25-30dB is a quiet environment, 30-35dB is a quiet environment, and above 40-50dB is a noisy environment.

Noise damages hearing, affects health, and interferes with work and normal life, so it should be controlled.

The sound insulation of a wall is an indicator of the wall's ability to isolate noise. The larger the value, the better the sound insulation effect.

2.Principle of air sound insulation

Sound is the vibration of an object that is felt through the human auditory organ. Acoustics involves many disciplines such as natural science, psychology, and art.

The normal hearing frequency range of the human ear is 20 - 20KHz, 5OOHz and below is low frequency, 500Hz - 2000Hz is medium frequency, and 2000Hz is high frequency. The sound level is used to describe the size of the sound, which is calculated by adding the sound of each frequency. Generally, the A sound level is used. The hearing sound level range of the human ear is 0-120dB. Below 15dB is an extremely quiet environment, 25-30dB is a quiet environment, 30-35dB is a quiet environment, and above 40-50dB is a noisy environment.

Noise damages hearing, affects health, and interferes with work and normal life, so it should be controlled.

The sound insulation of a wall is an indicator of the wall's ability to isolate noise. The larger the value, the better the sound insulation effect.

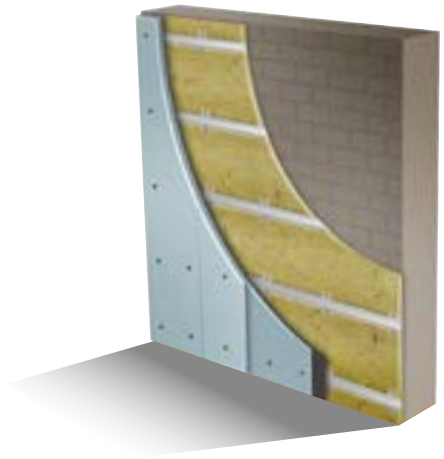
3. Inspection standards

The air sound insulation of KT partition walls complies with the "Building Sound Insulation Evaluation Standard" (GB/T19889.3-2005)

KT partition wall air sound insulation testing complies with the "Sound Insulation Measurement of Acoustic Buildings and Building Components" (GB/T19889.3-2005)

Sound insulation prediction

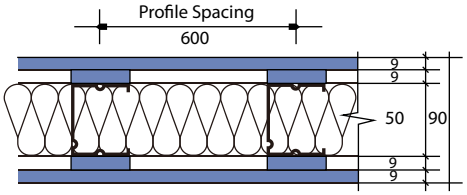
Based on the accumulation of a large number of sound insulation test databases, dry wall sound insulation prediction is carried out as a design guide. The relationship between the actual sound insulation of the wall on site and the laboratory test value is complicated by influencing factors (such as the influence of lateral sound transmission, etc.). In the design, when using laboratory test data, a margin should be left based on the actual situation.



Airborne sound insulation standards

Building Type	Partition area	Calculate sound insulation			
		Special	Level 1	Level 2	Level 3
Residential	Resident/Resident (partition wall)	-	≧50	≧45	≧40
SCHOOL	Classroom/Classroom	-	≧50	≧45	≧40
	Ward/ward	-	≧45	≧40	≧35
	Sick room/noise room	-	≧50	≧50	≧45
hospital	Operating room/ward	-	≧50	≧45	≧40
	Operating room/noise room	-	≧50	≧50	≧45
	Audiometry Room/Other Rooms	-	≧50		
Hotel	Guest Rooms/Guest Rooms	≧50	≧45	≧40	≧40
	Guest Rooms/Corridor (including door)	≧40	≧40	≧35	≧30

STC 45

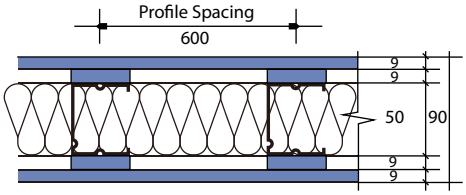


Fire-rated Partition System

The partition system was constructed in the test opening between Receiving Room and Source Room and consisted of:

Face layer : 9mm Klngtec Hawk Pan calcium silicate board (9kg/m²)
Base layer : 9mm x 50mm Klngtec Hawk Pan calcium silicate fillet (9kg/m²)
Metal Stud : 50mm Steel Stud
Acoustic Infill : 50mm Rockwool (5kg/m²)
Base layer : 9mm x 50mm Klngtec Hawk Pan calcium silicate fillet (9kg/m²)
Face layer : 9mm Kingtec Hawk Pan calcium silicate board (9kg/m²)

STC 48



Fire-rated Partition System

The partition system was constructed in the test opening between Receiving Room and Source Room and consisted of:

Face layer : 9mm Klngtec Hawk Pan calcium silicate board (9kg/m²)
Base layer : 9mm x 50mm Klngtec Hawk Pan calcium silicate fillet (9kg/m²)
Metal Stud : 50mm Steel Stud
Acoustic Infill : 50mm Rockwool (5kg/m²)
Base layer : 9mm x 50mm Klngtec Hawk Pan calcium silicate fillet (9kg/m²)
Face layer : 9mm Kingtec Hawk Pan calcium silicate board (9kg/m²)

STC 50A

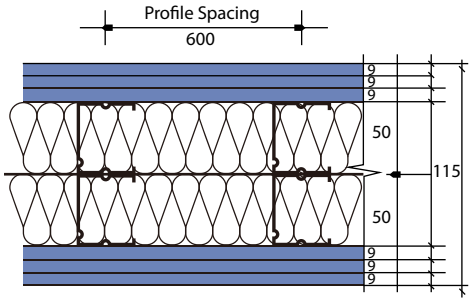


Figure 3.1: The proposed configuration of modified partition system Type A.

Type A:
The 150mm thick partition system compooeo of totally four layers of 12mm thick Kingtec Hawk Pan calcium silicate board with nominal density of 1000kg/m³, 2 x 50mm thick steel stud (at 600mm o.c.) with containing 50mm thick rockwool insulation (density: 100kg/m³).All gaps are fully caulked.

Face layer	: 12mm Klngtec Hawk Pan calcium silicate board (12kg/m²)
Base layer	: 12mm Klngtec Hawk Pan calcium silicate board (12kg/m²)
Metal Stud	: 2 x 50mm Steel Stud
Acoustic Infill	: 2 x 50mm Rockwool (5kg/m²)
Base layer	: 12mm Klngtec Hawk Pan calcium silicate board (12kg/m²)
Face layer	: 12mm Klngtec Hawk Pan calcium silicate board (12kg/m²)

STC 50B

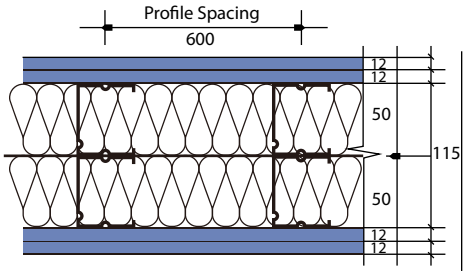
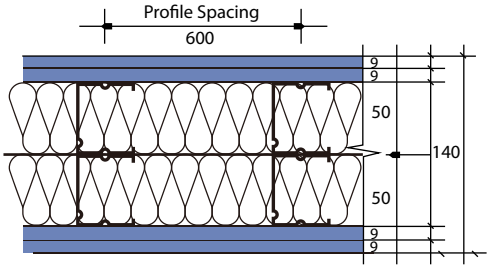


Figure 3.2: The proposed configuration of modified partition system Type B.

Type B:
The 150mm thick partition system compooeo of totally four layers of 12mm thick Kingtec Hawk Pan calcium silicate board with nominal density of 1000kg/m³, 2 x 50mm thick steel stud (at 600mm o.c.) with containing 50mm thick rockwool insulation (density: 100kg/m³).All gaps are fully caulked.

Face layer	: 12mm Klngtec Hawk Pan calcium silicate board (12kg/m²)
Base layer	: 12mm Klngtec Hawk Pan calcium silicate board (12kg/m²)
Metal Stud	: 2 x 50mm Steel Stud
Acoustic Infill	: 2 x 50mm Rockwool (5kg/m²)
Base layer	: 12mm Klngtec Hawk Pan calcium silicate board (12kg/m²)
Face layer	: 12mm Klngtec Hawk Pan calcium silicate board (12kg/m²)

STC 58

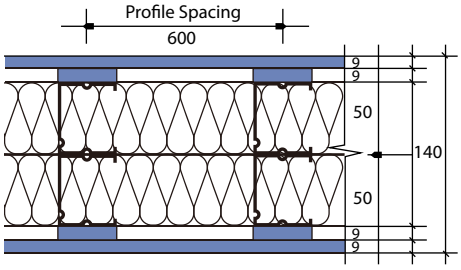


Fire-rated Partition System

The partition system was constructed in the test opening between Receiving Room and Source Room and consisted of:

Face layer	: 9mm Klngtec Hawk Pan calcium silicate board (12kg/m²)
Base layer	: 9mm Klngtec Hawk Pan calcium silicate board (12kg/m²)
Metal Stud	: 50mm Steel Stud x 2
Acoustic Infill	: 50mm Rockwool (5kg/m²) x 2
Base layer	: 9mm Klngtec Hawk Pan calcium silicate board (9kg/m²)
Face layer	: 9mm Klngtec Hawk Pan calcium silicate board (9kg/m²)

STC 59



Fire-rated Partition System

The partition system was constructed in the test opening between Receiving Room and Source Room and consisted of:

Face layer	: 9mm Klngtec Hawk Pan calcium silicate board (12kg/m²)
Base layer	: 9mm Klngtec Hawk Pan calcium silicate board (12kg/m²)
Metal Stud	: 50mm Steel Stud x 2
Acoustic Infill	: 50mm Rockwool (5kg/m²) x 2
Base layer	: 9mm Klngtec Hawk Pan calcium silicate board (9kg/m²)
Face layer	: 9mm Klngtec Hawk Pan calcium silicate board (9kg/m²)

FORTE
TESTING AND CONSULTANTS CO., LTD.

Flat 31, 5/F., My Loft, 9 Hoi Wing Road,
Tuen Mun, Hong Kong.
Tel.: (852) 2152 0638 Fax: (852) 3186 2723

Kingtec Building Materials (HK & Macau) Limited

Unit 1, 3/F., Block B, Shatin Industrial Centre,

5-7 Yuen Shun Circuit, Shatin, New Territories, Hong Kong.

Report Reference: IA15-029

Date: 22 April 2015

ASSESSEMENT ON FIRE RESISTANCE OF DRYWALL PARTITION SYSTEM WITH SINGLE LAYER LINING AND ROCK WOOL INFILL (60 MINUTES INTEGRITY AND INSULATION)

Introduction

We were requested by Kingtec Building Materials (HK & Macau) Limited to provide an assessment of the fire performance of drywall partition system with 9 mm Hawk Pan Board single layer lining with rockwool infill. This assessment report presents an appraisal of fire resistance performance of drywall partition system, which will satisfy the integrity and insulation criteria of BS 476: Part 22: 1987 for not less than 60 minutes.

Contents

1. Assumptions and Limitations

It is assumed that the proposed assembly will be installed to a masonry or reinforced concrete structure or equivalent, which can provide a particular stability, integrity and insulation of fire resistance period. The materials and constituents of the proposed assembly are in similar manners and quality as tested or otherwise appraised by Forte Testing and Consultants Company Limited (FORTE). This assessment may only be reproduced in full by applicant.

2. Background

2.1 Test Report No.IT 14-088

A fire resistance test was conducted by FORTE in accordance with BS EN 1364-1: 1999 on a specimen of non-loadbearing drywall partition system, to determine its fire resistance performance. The test sponsor was Kingtec Building Materials (HK & Macau) Limited. The overall sizes of the specimen were 3,050 mm width by 3,100 mm height by 86 mm thick. It was constructed with one layer of 9 mm thick Hawk Pan Board which fixed to both side of 0.6 mm thick steel stud framework through a 9 mm thick by 50 mm width Hawk Pan Board fillet. The steel studs spaced at maximum 600 mm centres. The cavity was filled with 50 mm by 100kg/m^3 rock wool. The specimen satisfied the integrity criterion of the standard for 90 minutes and 78 minutes insulation criterion. Full construction details of the partition system and the test results were recorded in the test report numbered IT14-088.

---

3. Analysis

3.1 Drywall partition system with 60 integrity and insulation

It is proposed that the non-loadbearing drywall partition system construction 0.6 mm thick steel stud framework with 9 mm Hawk Pan Board fillet and a single layer of 9 mm Hawk Pan Board lining on either side and a specific 50 mm thick rock wool infill the space between the boards layers, will fulfill those requirements and acquire a fire resistance period of not less than 60 minutes integrity and insulation criteria in accordance of BS 476: Part 22: 1987, when a fire attack on either side of the partition system

The details of the main components for proposed partition system are:

1) 9 mm Hawk Pan Board :
   Maximum size per sheet -1220 mm by 2440 mm
2) 9 mm Hawk Pan Board fillet with minimum 50 mm width
3) Galvanised steel U-channel:
   Minimum size – 35 mm (flange) by 50 mm by 0.6 mm thick
   50 mm (flange) by 49 mm by 0.6 mm thick
4) Rock wool
   Nominal 50 mm thick with minimum density of 100 kg/m^3

A layer of 9 mm Hawk Pan Board is screw fixed to each side of the steel stud framework. The spacing between the vertical steel channels is 600 mm. Minimum M4 self-tapping screws at 140 mm – 200 c/c are applied on the perimeter of the Hawk Pan Board and framework members. All screws were located not less than 10 mm from board's edges. The Hawk Pan Board on unexposed and exposed side are installed with stagger arrangement. Joint plaster is applied to screws points and board's joints.

The fire resistance test report numbered IT14-088, demonstrated that the insulated, non-loadbearing 9 mm thick Hawk Pan Board partition system with rockwool infill has obtained more than 60 minutes integrity and insulation performance in accordance with BS 1364-1:1999. After detailed review of the test methods, BS 476: Part 22: 1987 and BS EN 1364-1: 1999, a summary of the primary differences of the test method is presented in Table 1.

Table 1: Gap analysis between BS 476: Part 22: 1987 and BS EN 1364-1: 1999

Parameter	BS 476 : Part 22	BS EN 1364-1: 1999
Standard fire curve	BS 476 : Part 20: 1987 $T = 345 \log_{10}(8t + 1) + 20$	EN 1363-1: 1999 $T = 345 \log_{10}(8t + 1) + 20$
Furnace thermocouple	Type K according to BS 4937.4 with diameter 0.75 mm - 1.5mm, insulated with twin bore porcelain insulators, hot junction project 25 mm from the insulator, or; Mineral insulated metal sheathed type K with overall diameter 1.5 mm, protected with porcelain insulator, hot junction project 25 mm from the insulator.	Plate thermometer, consisted of a mineral insulated steel sheathed type K according to IEC 584-1 with diameter 1 mm, connected to with a steel plate of final size 100 mm square
Furnace pressure	Neutral pressure plane at 1M	Neutral pressure plane at 500 mm
INTEGRITY: **Sustained flaming** **Cotton pad** **Gap gauges**	Failure shall be deemed to have occurred when one of the following occurs: Not less than 10s Applied for 10 – 15 seconds Employed after 5min : 6mm X 150mm (other than at sill level), 25mm dia. For any gap	Failure shall be deemed to have occurred when one of the following occurs: More than 10s Applied for 30 seconds Employed after 5min : 6mm X 150mm (other than at sill level), 25mm dia. For any gap

Parameter	BS 476 : Part 22	BS EN 1364-1: 1999
INSULATION:	Failure shall be deemed to have occurred when one of the following occurs: a) if the mean unexposed face temperature increases by more than 140 °C above its initial value; b) if the temperature recorded at any position on the unexposed face, either by a fixed thermocouple or by the roving thermocouple subject to the following provisions is in excess of 180 °C above the initial mean unexposed face temperature; c) when integrity failures as defined in above.	Failure shall be deemed to have occurred when one of the following occurs: a) if the mean unexposed face temperature increases by more than 140 °C above its initial value; b) if the temperature recorded at any position on the unexposed face, either by a fixed thermocouple or by the roving thermocouple subject to the following provisions is in excess of 180 °C above the initial mean unexposed face temperature; c) when integrity failures as defined in above.
Fixed unexposed surface thermocouple	Position five surface temperature measuring thermocouples with one placed approximately in the centre of the specimen and one at the centre of each quarter section. Attach additional surface temperature measuring thermocouples at positions other than those specified to determine the temperature at other points on the surface where the temperature rise is likely to be higher than elsewhere due to lower levels of insulation, and which may be required for evaluation of the maximum temperature rise.	The unexposed face shall be measured by means of five thermocouples, one located close to the centre of the specimen and one close to the centre of each quarter section. Maximum temperature thermocouples shall be applied to the unexposed faces as follows: a) The head of the specimen at mid-width b) The head of the specimen in line with a stud/mullion c) Junction of the stud and a rail d) Mid height of the fixed edge e) Mid height of the free edge f) Mid width and height adjacent to a horizontal and vertical joint respectively.
Deflection measurement	Monitor lateral deflection.	Deformation measurements to be made at specified locations.
Direct field of application	Not included.	Included.

The test specification and failure criteria for both BS 476 and BS EN 1364-1 are shown in table 1. The time/temperature relationship is the same for both test standards; however, the EN test is controlled using plate thermometers that, due to their slow response, result in the EN test being more severe than the BS test during the early stages of a test. However, unexposed surface temperature measuring points for the partition system under BS EN 1364-1 are more than the requirements stated in the standard of BS 476: Part 22. The Hawk Pan Board with 9 mm thick on the unexposed surface of the partition system remained intact, no notable fractures and without insulation failure observed from the test reports numbered IT14-088. There is no integrity between the joint of the board system during the fire test. Based upon the test evidence, the tested specific partition system with 9 mm thick Hawk Pan Board would be capable of achieving the integrity and insulation of 60 minutes in accordance with BS 476: Part 22: 1987.

---

4. Assessment/Conclusion

It is concluded that the drywall partition system with 9 mm thick Hawk Pan Board single lining with rock wool infill detailed in Section 3 of this report will also achieve the fire resistance of not less than 60 minutes integrity and insulation if tests in accordance with BS 476: Part 22: 1987.

5. Term of validity

This assessment is issued on the basis of test data and information to hand at the time of issue and it is valid only if presented with proper test evidence(s) and all noted supporting data. If contradictory evidence becomes available to FORTE, the assessment will be unconditionally withdrawn and the applicant will be notified in writing. Similarly the assessment is invalidated if the assessed construction is subsequently tested since actual test data is deemed to take precedence over an expressed opinion. This assessment will expire on 22 April 2020, which time it is recommended that it be submitted to FORTE for re-appraisal.

For and on behalf of Forte Testing and Consultants Company Limited:

CHENG San Mei, Sammi
Laboratory Manager

Ir Dr CHAN Yuk Kit, James, RPE (Fire)
Managing Director

6. Declaration by the applicant

- We the undersigned confirm that we have read and complied with the obligations placed on us by this guide on undertaking assessments.
- We confirm that the component or element of structure, which is the subject of this assessment, has not to our knowledge been subjected to a fire test to the standard against which this assessment is being made.
- We agree to withdraw this assessment from circulation should the component or element of structure be the subject of a fire test to the standard against which this 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 FORTE to withdraw the assessment

Name: Sammy Chan Choi Wai

Signed: _____

For and on behalf of : _____

FORTE
TESTING AND CONSULTANTS CO., LTD.

HOKLAS 191
TEST

FIRE RESISTANCE TEST REPORT

DRYWALL PARTITION SYSTEM
with SINGLE LAYER LINING and ROCK WOOL INFILL

in accordance with ***BS EN 1364-1: 1999***

Test Sponsor: **Kingtec Building Materials (HK & Macau) Limited**
Unit 1, 3/F., Block B, Shatin Industrial Centre,
5-7 Yuen Shun Circuit, Shatin, New Territories, Hong Kong.
Tel: 852-2640 8688 Fax: 852-2142 8128

Test Laboratory: **Forte Testing and Consultants Company Limited**
Contact Information:
Room 11, 2 Floor, Po Hong Centre, 2 Wang Tung Street,
Kowloon Bay, Kowloon, Hong Kong.
Tel: 852-2152 0638 Fax: 852-3186 2737

Report Number: **IT 14-088**

Date of Issue: **2014-09-12**

HKAS has accredited Forte Testing and Consultants Company Limited (Reg. No. 191 – TEST) under HOKLAS for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with terms of accreditation. This report may not be reproduced, except in full, without prior written approval from FORTE.

HOKLAS Approved Signatory:

Ir. Dr Chan Yuk Kit

1. Scope of Test

This report is a record of a fire resistance test conducted by Forte Testing and Consultants Co., Ltd, in conformity with requirements in *BS EN 1364-1: 1999 "Fire resistance tests for non-loadbearing elements – Part 1: Walls"* and particular requirements in *BS EN 1363-1: 1999 "Fire resistance tests – Part 1: General requirements"*.

The test subject was a drywall partition system. The drywall partition comprised of "Hawk Pan" fire boards, each with nominal thickness of 9 mm, galvanized steel framework with protected by 9 mm fillet boards and together with rock wool infill; void filled with rock wool. The specimen was supplied for test by Kingtec Building Materials (HK & Macau) Limited.

The specimen achieved the following fire resistance:

INTEGRITY	(E)			INSULATION	(I)		
	Sustained Flaming	90	Minutes		Average Temp. Rise	90	Minutes
	Gap Gauge	90	Minutes		Max. Temp. Rise	78	Minutes
	Cotton Pad	90	Minutes				

2. Test Information

Test Laboratory:	FORTE Testing and Consultants Company Limited		
Test Location:	West Side of Huan Xiang Shan, Xin Yu Road, Shajin, Baoan District, Shenzhen, Guangdong Province, China.		
Test Sponsor:	Kingtec Building Materials (HK & Macau) Limited		
Specimen Manufacturer:	Yichun Kingtec Building Materials Industrial Company Limited		
ID no. of the Specimen:	QT 14-094A		
Date Received:	2014-05-23		
Test Number:	QT 14-094		
Date Tested:	2014-05-26	**Start Time:**	14:37
Approved Test Operator from FORTE:	Ms. Cheng San Mei Sammi		
Witness of the Test:	Mr. Sammy Chan – Official Delegate of the Sponsor		
Report Issue Record:	Version 1 – 2014-09-12		

3. Construction Details of Specimen

3.1 Specimen Description

3.1.1 Board Configuration

The drywall partition system has an overall size 3050 mm (width) x 3100 mm (height). Both exposed and unexposed surfaces of the drywall were consisted of 5 sheets of fire boards including 2 numbers of board with nominal sizes 1220 mm (w) x 2440 mm (h), 1 numbers of board with nominal sizes 1220 mm (w) x 660 mm (h), 1 number of board with nominal sizes 1830 mm (w) x 660 mm (h) and 1 number of board with nominal sizes 610 mm (w) x 2440 mm (h).

Surface fire boards with nominal 9 mm (thick) were fixed to the framework by ø3.5 mm X 25 mm self-tapping screws at 140 – 200 mm centre to centre horizontally and 200 – 300 centre to centre vertically.

Plaster was applied to joints and screw points of specimen.

The space between fixed edges of the specimen and the concrete support frame was caulked with plaster; whereas the space between free edge and the concrete support frame was filled by ceramic fibre.

3.1.2 Structural Framework

The perimeter framework of the drywall partition was made of galvanized steel U-channels sized 35 mm (flange) x 50 mm (depth) x 0.6 mm (t) and they were secured to the test rig by ø6 mm x 60 mm anchor bolts at 550 – 600 mm centre to centre.

Within the perimeter framework, there were four vertical galvanized steel studs each sized 50 mm (flange) x 49 mm (depth) x 0.6 mm (t), which was fixed to the perimeter framework by 2 number of ø4 mm x 10 mm rivets at each joint.

50 mm (w) x 9 mm (t) fire board fillets were fixed on both exposed and unexposed sides of the structural framework. The fillets were fixed to the structural framework by ø3.5 mm X 25 mm self-tapping screws at approximate 150 – 250 mm centre to centre.

The horizontal stiffening steel plates sized 80 mm (w) x 0.6 mm (t) were fixed between the C-channels at 660 mm above the sill level on the exposed side and 660 mm below the top level on the unexposed side.

3.1.3 Infill

Space of the channels and in between exposed and unexposed surface board was fully filled by rock wool with nominal thickness of 50 mm and nominal density 100 kg/m^3.

3.2 Material Schedule

Parts specifications of the specimen were summarized in the following tables.

A star mark "*" indicates those not being verified by FORTE.

Fire Board

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Brand:	Hawk Pan
Material:	Calcium Silicate *
Nominal Density:	950 kg/m^3 *
Nominal Thickness:	9 mm
Location Applied:	Linings of the Specimen and Fillet on the Structural Framework

U-channel

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Material:	Galvanized Steel*
Sizes:	35 mm x 50 mm x 0.6 mm

C-channel

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Material:	Galvanized Steel*
Sizes:	50 mm x 49 mm x 0.6 mm

Horizontal Stiffening Steel Plate

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Material:	Galvanized Steel*
Sizes:	80 mm (w) x 0.6 mm (t)

Infill

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Brand:	ROCKWOOL
Material:	Rockwool*
Nominal Density:	100 kg/m^3 *
Nominal Thickness:	50 mm

Fixing – Screws

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Type:	Self-tapping Screws
Sizes:	Ø3.5 mm X 25 mm

Fixing – Rivets

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Type:	Blind Rivet
Material:	Aluminum
Sizes:	Ø4 mm X 10 mm

Fixing – Anchor Bolts

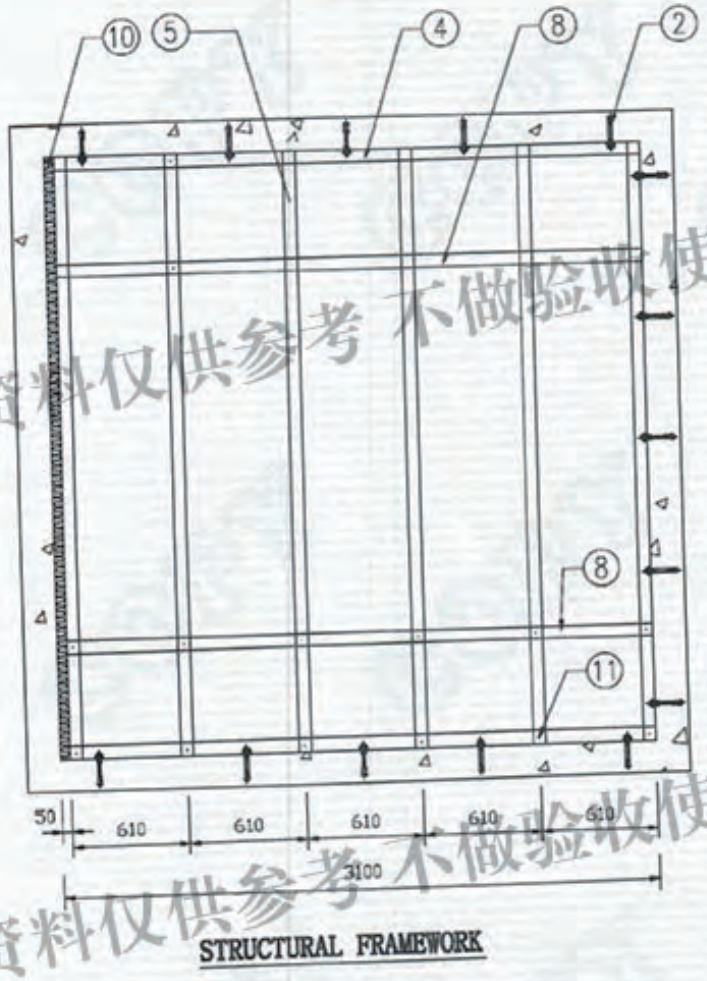
Supplier:	Kingtec Building Materials (HK & Macau) Limited
Type:	Expansion Anchor Bolt
Material:	Steel*
Sizes:	Ø6 mm x 60 mm
Location Applied:	Perimeter Framework to Test Rig

Plaster

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Brand:	Knauf
Material:	Aluminate Cement *
Location Applied:	Joints and Screws Points of Specimen

3.3 Drawings on the specimen provided by the Sponsor (Total 3 pages)

Drawings of Specimen provided by the Sponsor (1)

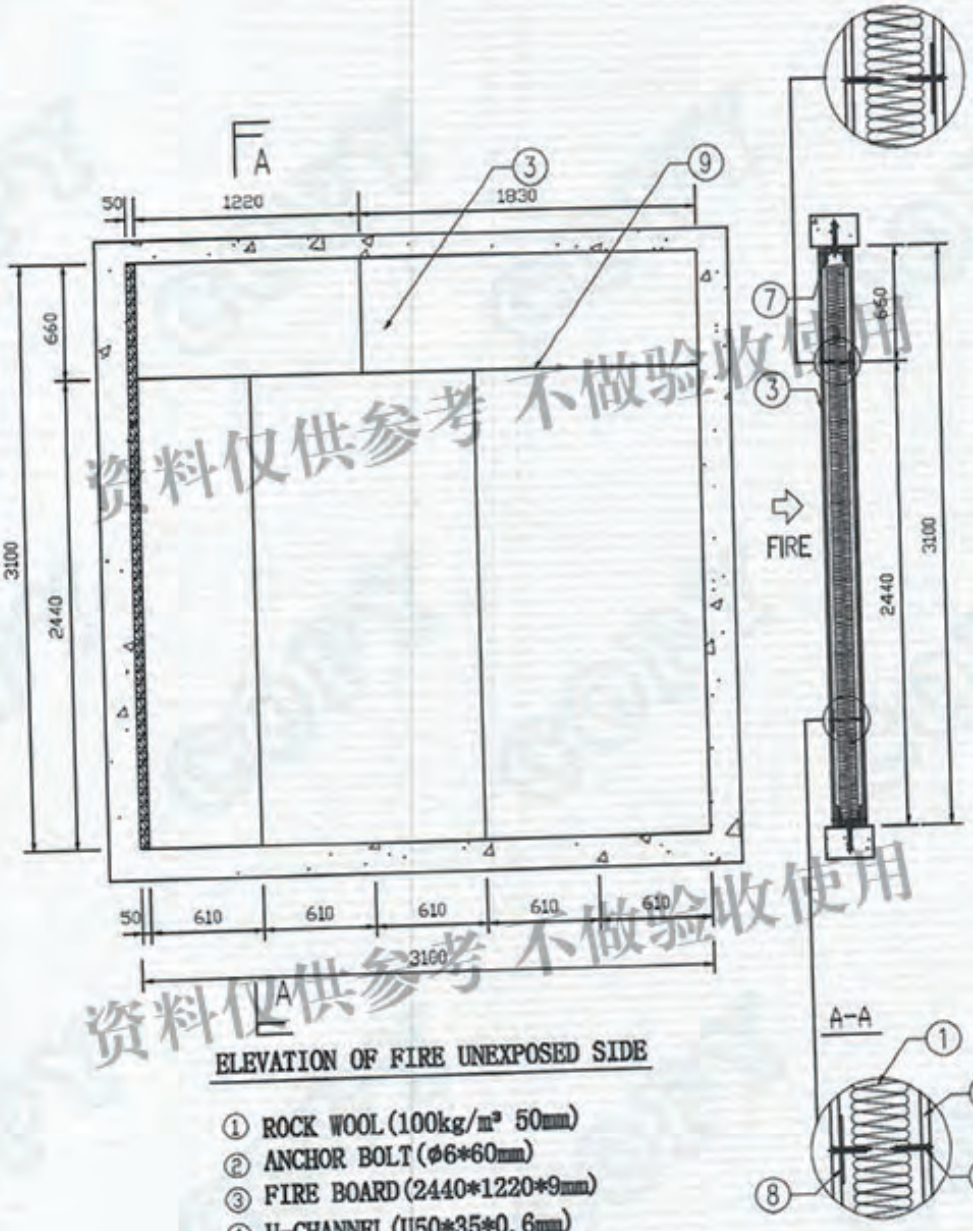


STRUCTURAL FRAMEWORK

① ROCK WOOL(100kg/m³ 50mm)
② ANCHOR BOLT(φ6*60mm)
③ FIRE BOARD(2440*1220*9mm)
④ U-CHANNEL(U50*35*0.6mm)
⑤ GALVANIZED(C50*50*0.6mm)
⑥ SELF-TAPPING SCREW(φ3.5*25mm@250mm)
⑦ FIRE BOARD FILLET(50*9mm)
⑧ STIFFENING STEEL PLATE(80*0.6mm)
⑨ ALUMINATE CEMENT
⑩ CERAMIC FIBRE
⑪ BLIND RIVETS (φ4*10mm)

FIGURE 1

Drawings of Specimen provided by the Sponsor (2)



ELEVATION OF FIRE UNEXPOSED SIDE

① ROCK WOOL(100kg/m³ 50mm)
② ANCHOR BOLT(ø6*60mm)
③ FIRE BOARD(2440*1220*9mm)
④ U-CHANNEL(U50*35*0.6mm)
⑤ GALVANIZED(C50*50*0.6mm)
⑥ SELF-TAPPING SCREW(ø3.5*25mm@250mm)
⑦ FIRE BOARD FILLET(50*9mm)
⑧ STIFFENING STEEL PLATE(80*0.6mm)
⑨ ALUMINATE CEMENT
⑩ CERAMIC FIBRE
⑪ BLIND RIVETS (ø4*10mm)

FIGURE 2

Drawings of Specimen provided by the Sponsor (3)

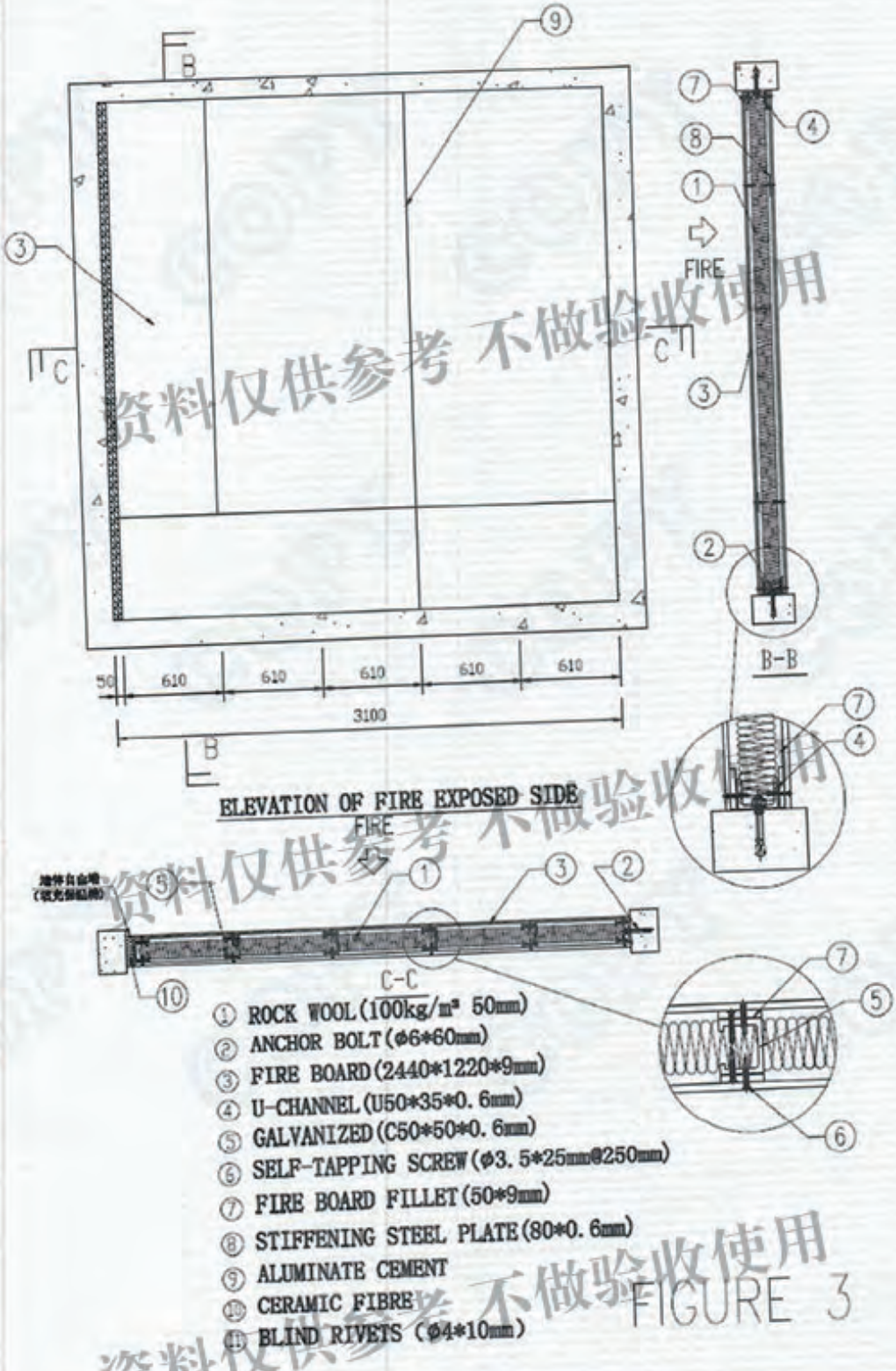


FIGURE 3

4. Specimen Condition

4.1 Selection of the Specimen

The specimen was selected by the Sponsor and submitted to the Test Location. FORTE did not involve in the selection of the specimen.

All the components of the test specimen were supplied by the Sponsor.

4.2 Verification of the Specimen

Additional components of the specimen such as lining and steel studs were transferred to the Test Location on 2014-05-23 by the Sponsor. Samples of the components were taken randomly for verification.

FORTE verified the specimen description given by the Sponsor to the best of its ability. In *section 3.2* of this report, items which had been verified by FORTE was clearly identified and distinguished from those relying on Sponsor's declaration.

4.3 Supporting Construction

The specimen was fixed into a supporting construction made of fully cured reinforced normal density concrete slabs provided by FORTE. The concrete slabs formed a structural opening 3100 mm (w) x 3100 mm (h).

4.4 Installation of the Specimen

The specimen was assembled and installed by workers delegated by the Sponsor from 2014-05-23 to 2014-05-24.

4.5 Specimen Conditioning

The specimen was stored in the Test Location from 2014-05-23, the date which components of the specimen were received, to 2014-05-26, the date which fire resistance test performed.

The average environment parameters in the Test Location within this period were:

Ambient Temperature (°C)	Relative Humidity (%)
33 ± 5	60 ± 10

4.6 Direction of Fire Side and Others

The Sponsor designated and installed that the board configuration on both sides of the drywall partition system was in stagger arrangement. The specimen was asymmetrical along the plane parallel to the furnace opening.

Vertical, horizontal and cross joints were present on the specimen.

The vertical free edge was set adjacent to a smaller board on the exposed face and it was sealed up by ceramic fibre.

5. Test Method

5.1 Ambient Temperature

The ambient temperature was measured by a type K thermocouple. The measuring junction was positioned approximately 1500 mm away the test construction.

5.2 Heating Condition

The average temperature inside the furnace was monitored and controlled throughout the test according to the standard heating curve stated in *BS EN 1363-1:1999* given by the equation:

$$T = 345 \log_{10} (8t+1) + 20$$

Where,

T is the average furnace temperature, in degree Celsius

t is the time, in minutes

The temperature inside the furnace was measured in conformity with *BS EN 1363-1: 1999* by 9 numbers of plate thermometers. These thermometers were evenly distributed over a vertical plane approximately 100 mm from the exposed surface of the test construction.

The positions of furnace thermocouples are shown in *Figure 1*.

5.3 Unexposed Surface Temperature

The unexposed surface temperatures of specimen were measured by 14 numbers of type K thermocouples. These thermocouples were positioned and fixed on unexposed surface of specimen in conformity with *BS EN 1364-1: 1999*.

The positions of unexposed surface temperature measurement points are shown in *Figure 3*. The locations of thermocouples are explained in the following table.

Thermocouple	Area	Description
U1 – U5	Drywall Partition	For average and maximum unexposed surface temperature rise
U6 – U14	Drywall Partition	For maximum unexposed surface temperature rise
U15 – U26	Framework of the Drywall Partition	For additional information only and NOT assessed against insulation criterion; Data is shown in Appendix A
U27 – U29	Underlay of the Unexposed Fire Board	For additional information only and NOT assessed against insulation criterion; Data is shown in Appendix B

5.4 Pressure Condition

The pressure inside the furnace was continuously monitored in compliance with *BS EN 1363-1: 1999* during the whole test. The pressure at a point 500 mm above the notional floor level was to be maintained 0 ± 5 Pa by five minutes from commencement of the test and 0 ± 3 Pa that from ten minutes onwards with respect to the atmosphere.

5.5 Deflection Measurements

Measurements of the deflection of the specimen were taken with a steel rule from cross line laser across the mid-height of the specimen with reference to *BS EN 1364-1:1999*.

The positions of deflection measurement points are shown in *Figure 2*.

Figure 1. Position of thermocouples and pressure measuring probe inside the furnace.

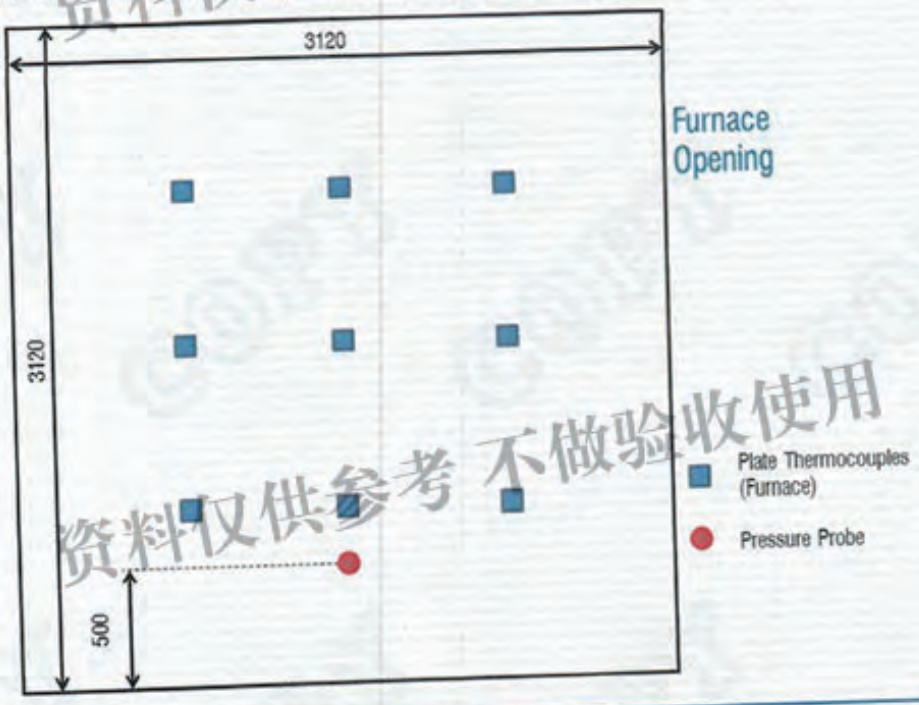
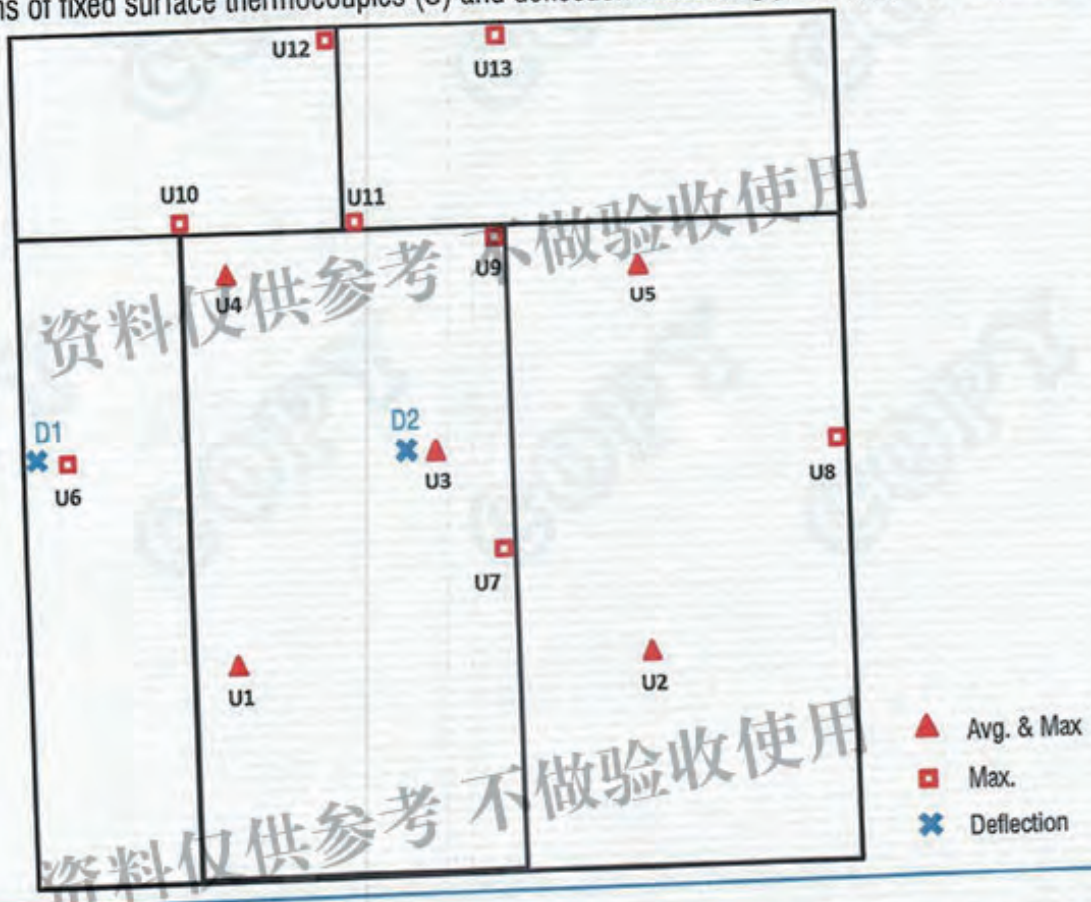


Figure 2. Positions of fixed surface thermocouples (U) and deflection measuring points (D) on the specimen.

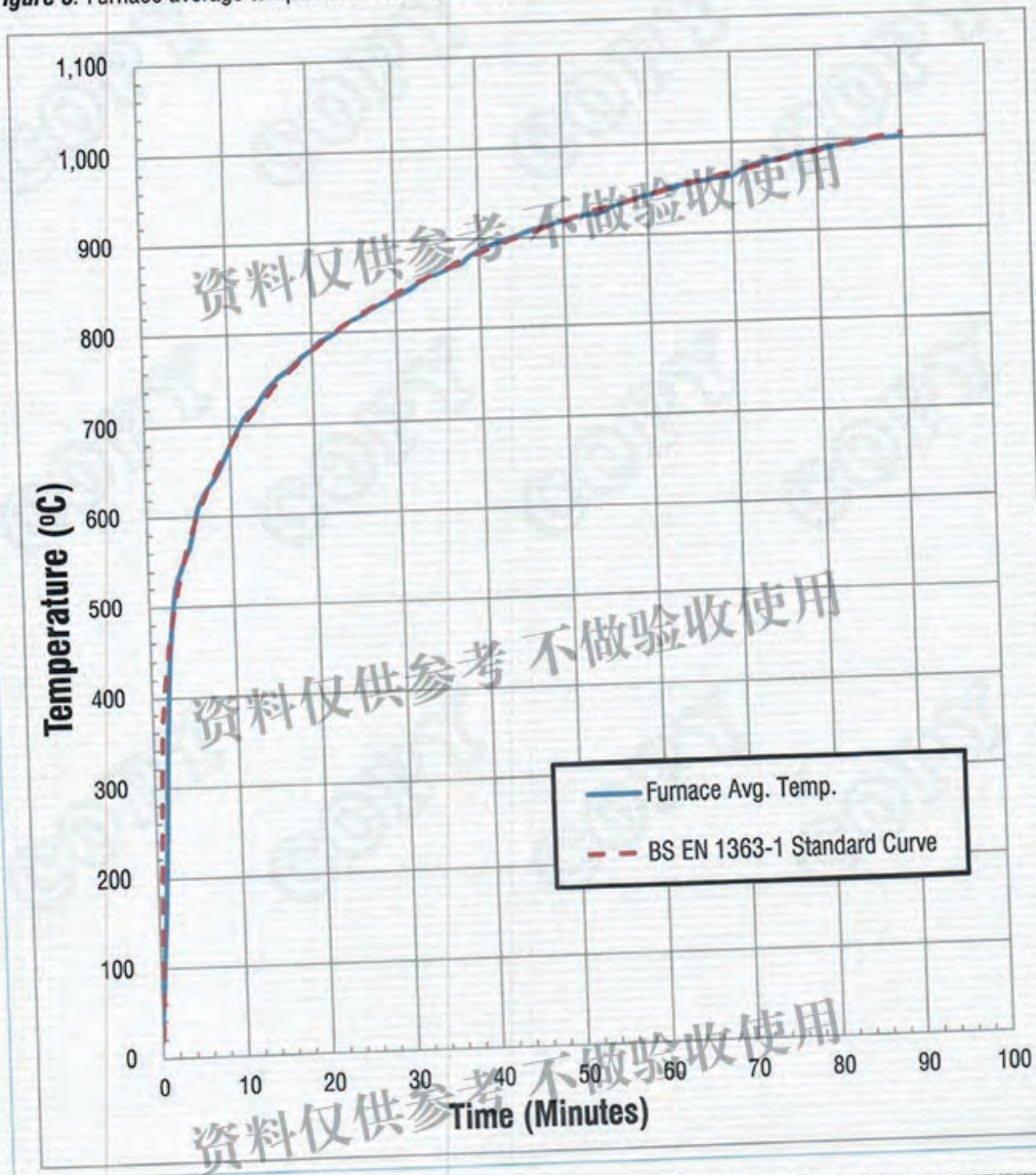


6. Test Data

6.1 Furnace Temperature

The furnace average temperature over the test period is shown in *Figure 3*.

Figure 3. Furnace average temperature over the test period.



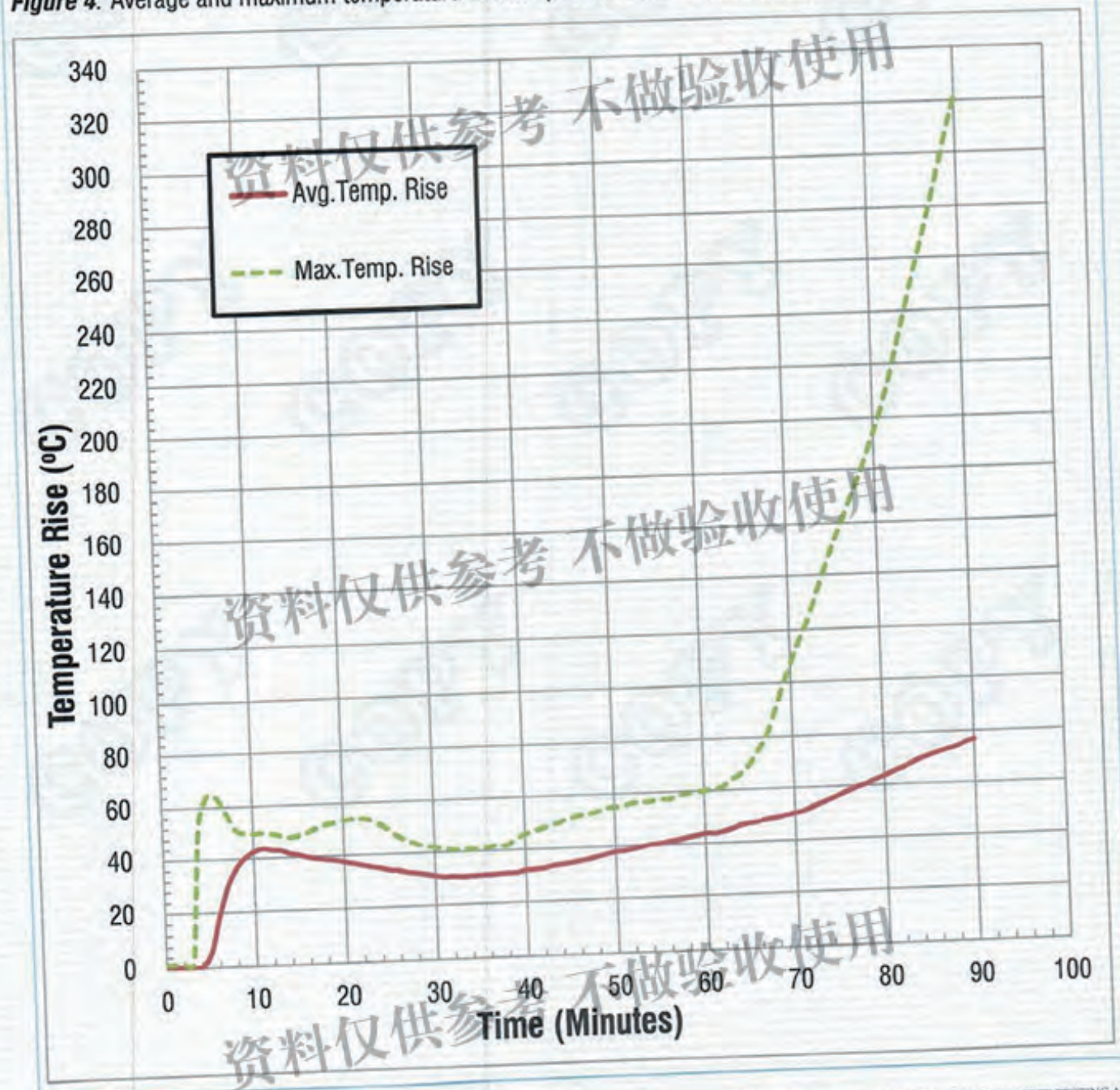
6.2 Unexposed Surface Temperature Rise

6.2.1 Fixed surface thermocouples

The temperature rises of unexposed surface of specimen measured by fixed surface thermocouples over the test period are shown in *Figure 4*.

The maximum temperature rise measured at U10 at 78.6 minute of test was 180.0°C, which was in excess of 180°C limit.

Figure 4. Average and maximum temperature rise of specimen over the test period.



6.2.2 Fixed surface thermocouples – Detailed Temperature Records

The outputs of the unexposed surface thermocouples on specimen are summarized in the following tables.

Measurements were taken in °C.

Temperature outputs from unexposed surface temperature U1 to U10

Time (min)	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10
0	33.3	33.1	33.1	32.9	34.4	32.9	32.5	31.1	34.6	34.1
5	38.5	36.7	36.4	37.8	43.9	35.8	40.9	31.8	47.1	38.2
10	76.0	75.6	73.3	75.4	78.5	76.5	79.1	76.1	75.6	76.0
15	72.9	73.8	72.9	74.8	75.8	76.1	76.9	76.4	78.7	77.5
20	69.2	69.6	69.5	71.3	74.2	71.2	76.7	71.5	78.5	76.0
25	67.0	65.5	64.8	67.4	70.5	67.6	73.8	68.1	74.5	72.5
30	65.7	62.6	61.7	64.4	66.9	65.4	69.5	66.4	73.1	70.4
35	65.4	61.2	61.7	63.8	67.2	64.7	69.4	64.7	73.4	69.8
40	66.0	62.4	63.7	64.2	69.7	66.5	71.1	64.7	74.9	70.7
45	66.5	65.0	66.4	65.5	73.8	67.0	71.6	65.6	76.0	72.2
50	69.9	69.0	69.8	68.4	78.1	68.5	73.2	67.1	77.1	75.3
55	71.5	71.0	72.9	71.5	82.1	69.5	75.4	68.7	79.9	78.4
60	73.8	73.5	76.5	75.2	85.8	70.9	78.6	70.4	87.8	86.7
65	76.6	75.9	80.2	79.2	89.4	72.5	82.6	72.9	96.8	99.7
70	79.2	77.3	83.2	83.0	94.8	74.2	85.5	74.5	119.1	140.3
75	81.5	80.5	86.4	86.4	115.5	75.4	89.6	75.7	151.6	184.0
76	82.3	81.2	87.0	87.3	120.1	76.2	90.4	76.1	157.0	192.6
77	83.0	81.7	87.4	88.0	124.4	76.7	91.2	76.0	162.4	200.7
78	82.8	82.0	87.9	88.3	129.1	76.2	91.6	76.2	168.0	209.1
79	83.5	82.9	88.5	89.6	133.5	77.0	92.4	76.3	172.9	217.6
80	84.3	83.0	89.1	91.0	137.2	77.6	92.9	76.5	177.9	227.5
85	88.1	85.6	91.6	103.7	150.7	80.1	101.0	77.3	200.7	289.2
90	92.7	88.1	93.4	120.0	156.4	82.6	133.5	77.9	218.4	354.8

Temperature outputs from unexposed surface temperature U11 to U14

Time (min)	U11	U12	U13	U14
0	34.4	32.1	31.9	32.7
5	58.6	97.4	33.8	35.7
10	79.3	82.7	63.0	77.8
15	76.1	81.6	75.9	77.3
20	72.3	86.4	73.8	73.6
25	69.7	82.5	72.5	72.3
30	70.3	75.3	72.5	71.4
35	72.6	74.1	71.7	70.1
40	79.0	76.0	70.9	72.4
45	84.5	77.0	71.3	75.0
50	88.1	78.0	72.1	77.5
55	90.6	79.0	73.2	76.0
60	93.3	80.5	74.3	79.5
65	102.3	81.8	76.2	80.0
70	130.2	82.6	77.4	79.1
75	160.5	93.3	79.0	82.8
76	167.3	94.0	78.9	83.4
77	174.6	93.0	79.2	84.5
78	182.1	92.0	79.5	84.9
79	188.3	90.5	80.1	85.9
80	194.5	89.4	80.9	86.4
85	216.8	88.7	85.7	89.1
90	227.8	98.8	88.7	91.6

6.3 Pressure

The furnace pressure over the test period is summarized in the following table.

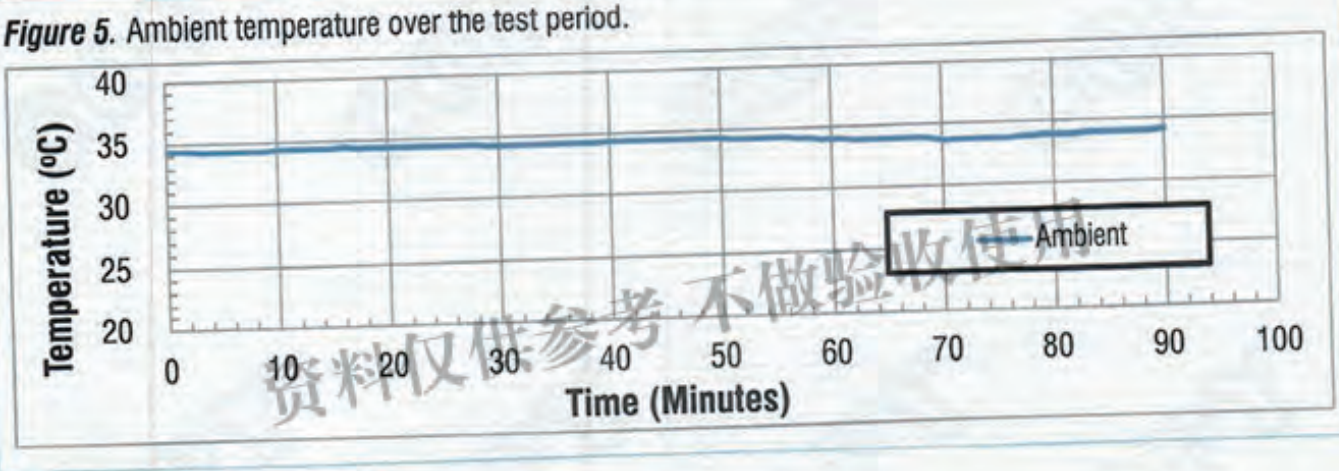
Time (min)	Pressure:	Time (min)	Pressure:
6.0	-1.7	50.0	-0.6
10.0	-0.3	55.0	-0.5
15.0	-2.0	60.0	1.0
20.0	0.4	65.0	-1.0
25.0	-1.1	70.0	1.4
30.0	0.8	75.0	-0.4
35.0	1.7	80.0	-0.2
40.0	0.9	85.0	-0.9
45.0	-0.2	90.0	-0.6

6.4 Ambient Temperature

The ambient temperature over the test period was recorded and is shown in *Figure 5*.

The ambient temperature at the commencement of test was 34.4°C.

Figure 5. Ambient temperature over the test period.



6.5 Lateral Deflections

Measured lateral deflections over the test period are summarized in the following table. A positive measurement indicates a movement towards into the furnace and vice versa.

Measurements were taken in mm.

Positions refer to *Figure 2*.

Maximum deflection measured on specimen was +80 mm at D2 at 75 minute of the test period.

Position \ Time (min)	0	10	20	30	40	50	55	60	70	75	80	85	90
D1	+0	+0	+2	+9	+7	+3	+1	-1	-1	-1	-2	-3	-4
D2	+0	+4	+9	+49	+69	+73	+74	+75	+78	**+80**	+78	+77	+74

6.6 Observations

Significant behaviours on the specimen during the test period are summarized in the following table.
Photos taken during the test period are also attached.

Time (min.sec)	Observation (from unexposed side)
00.00	Test Started.
05.26	No significant changes can be observed.
16.18	Specimen remained stable. Light smoke released from top and bottom edges of drywall partition.
25.17	Small cracks appeared on the plaster at the fixed edges.
30.00	**No integrity failure had occurred.**
31.20	A crack appeared along the bottom edge of the specimen on the joint plaster.
42.42	Middle portion of the specimen bowed toward into the furnace.
43.35	The width of horizontal joints becomes larger.
54.33	(From exposed side) Crack appeared at the horizontal joint, the panel was detached along the joint.
58.04	Light yellow staining mark appeared along the horizontal joint.
60.00	**No integrity failure had occurred.**
66.24	Dark gray staining mark appeared around the screw head at the middle of the specimen.
82.16	Staining mark appeared along the horizontal joint and the top left portion of the right vertical board.
88.26	The area of staining mark mentioned at 82.16 minute was enlarged.
90.36	**Test was terminated at request of the Sponsor.**

6.7 Photos

Photo 1. Exposed surface of the specimen before test.

Photo 2. Unexposed surface of the specimen just after the commencement of test.

Photo 3. Unexposed surface of the specimen at 30 minute of test.

Photo 4. Unexposed surface of the specimen at 60 minute of test.

Photo 5. Unexposed surface of the specimen at the end of test.

Photo 6. Exposed surface of the specimen after the test.

7. Test Results

Test was terminated after a period of 90 minutes at request of the Sponsor.

The test data obtained from the fire resistance test was assessed against performance criteria given in *BS EN 1364-1: 1999*. The test results are summarized in the following table.

Performance Criteria			
Integrity (E)			
Criteria of Failure		**Description**	**Elapsed Time before Failure Occurrence**
Sustained Flaming		Continuous flaming for a period of time greater than 10 seconds on unexposed surface	90 minutes (No Failure)
Gap Gauge	Ø6 mm	Penetration of the gauge into the furnace through the specimens and movable along a 150 mm gap	90 minutes (No Failure)
	Ø25 mm	Penetration of the gauge into the furnace through the specimens	
Cotton Pad		Ignition of the cotton pad	90 minutes (No Failure)

Performance Criteria		
Insulation (I)		
Criteria of Failure	**Description**	**Elapsed Time before Failure Occurrence**
Integrity Failure	The performance criterion "insulation" shall automatically be assumed not to be satisfied when the "integrity" criterion ceases to be satisfied	90 minutes (No Failure)
Average Temperature Rise	An increase of the average temperature of unexposed surface of the specimen above the initial average temperature by more than 140°C	90 minutes (No Failure)
Maximum Temperature Rise	An increase of temperature at any other point of the specimen above the initial average temperature by more than 180 °C	78 minutes

8. Limitations

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in *BS EN 1363-1*, and where appropriate *BS EN 1363-2*. Any significant deviation with respect to size, construction details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report.

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

This report may only be reproduced in full by the Sponsor, without comment, abridgement, alteration or addition, unless otherwise agreed with written approval by FORTE.

9. Field of Direct Applications of Test Results

The field of direct application defines the allowable changes to the test specimen following a successful fire resistance test. These variations can be introduced automatically without the need for the sponsor to seek additional evaluation, calculation or approval.

The series of rules and guidelines are defined in *Clause 13 "Field of direct application of test results"*, *BS EN 1364-1: 1999* and relevant clauses and annexes.

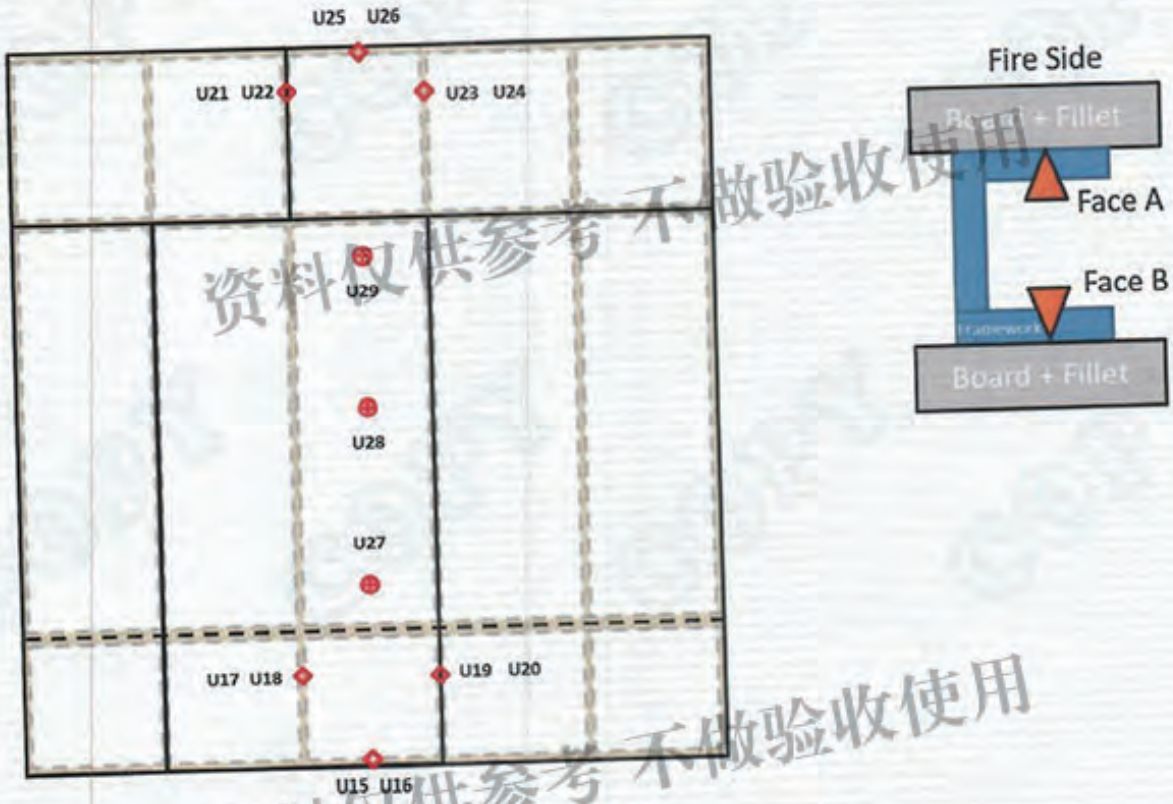
The field of direct applications may only be defined following the identification of classification(s). The field of direct and, where applicable, extended application will be included in classification relevant documents.

Appendix A

A.1 Additional Temperature – Framework

Fixed surface thermocouples were attached to different locations of the framework to obtain additional information. Locations of these thermocouples are shown and summarized in the following figure and table.

Location of Additional Thermocouples



Position	Face A	Face B
100 mm below Top Edge	U21, U3	U22, U24
500 mm above Bottom Edge	U17, U19	U18, U20
Centre of Top Track	U25	U26
Centre of Bottom Track	U15	U16

Position	Number
Unexposed Face of Rock Wool Infill	U27, U28 & U29

A.2 Additional Thermocouples – Detailed Temperature Records

The outputs of the additional thermocouples on framework of the specimen are summarized in the following tables. Measurements were taken in °C.

Temperature outputs from unexposed surface temperature U15 to U22

Time (min)	U15	U16	U17	U18	U19	U20	U21	U22
0	30.0	29.7	31.5	31.9	32.8	30.5	32.1	31.9
5	91.3	56.0	96.2	69.1	83.3	94.7	99.6	97.8
10	98.8	96.6	95.7	94.0	98.6	99.2	98.4	97.1
15	98.1	93.8	96.0	92.7	96.0	97.5	99.0	94.7
20	98.2	91.9	97.9	92.6	93.1	101.6	103.0	96.3
25	98.9	90.5	175.0	94.7	94.0	192.1	129.0	99.8
30	115.0	90.0	276.9	98.9	102.7	304.2	205.7	124.2
35	164.0	90.4	361.7	111.6	127.8	399.0	277.3	159.1
40	217.0	98.0	431.7	141.9	159.4	479.7	341.1	192.2
45	262.5	111.1	492.9	167.8	186.3	553.4	396.9	224.3
50	297.7	131.0	552.8	198.8	213.9	618.3	450.5	256.7
55	314.4	142.0	605.9	235.3	244.4	674.6	500.5	289.2
60	319.6	149.5	648.7	266.4	278.3	719.9	549.9	322.1
65	325.4	155.7	683.3	295.5	314.7	761.0	596.6	355.3
70	333.1	161.3	712.0	321.6	349.3	798.2	636.5	386.4
75	346.0	167.8	738.6	343.2	376.9	824.4	672.7	419.5
80	372.2	176.5	761.1	360.4	400.0	848.3	710.0	449.9
85	402.4	186.8	776.2	373.1	420.8	862.4	744.2	481.3
90	433.7	197.4	789.2	383.9	440.4	871.4	768.6	518.7

Temperature outputs from unexposed surface temperature U23 to U29

Time (min)	U23	U24	U25	U26	U27	U28	U29
0	30.5	29.7	30.9	31.0	32.6	33.0	34.1
5	97.5	95.2	74.2	33.7	80.4	73.4	99.2
10	97.8	96.1	97.5	88.5	94.7	98.0	98.0
15	97.7	93.0	96.6	87.1	85.2	87.5	87.2
20	101.0	93.7	98.1	89.9	78.2	81.9	80.6
25	187.6	94.8	98.5	91.6	72.3	75.4	74.0
30	271.9	104.6	110.2	91.2	67.5	71.3	73.2
35	347.0	133.5	166.9	89.3	68.3	73.9	81.3
40	405.2	159.8	225.9	96.9	73.7	81.3	92.0
45	459.8	183.6	266.4	101.0	83.4	92.9	100.8
50	510.6	207.5	300.3	109.0	96.9	100.9	110.7
55	556.1	232.0	329.5	122.2	105.0	109.6	122.0
60	606.4	267.4	353.5	130.9	112.2	119.0	133.2
65	671.6	317.5	376.0	137.3	123.8	128.7	145.9
70	720.3	365.6	399.6	143.0	139.0	140.1	159.2
75	759.8	400.7	434.4	149.8	153.5	153.3	175.5
80	792.9	427.2	485.6	161.5	164.8	165.6	187.9
85	813.2	453.6	530.6	179.0	169.7	167.1	196.2
90	821.1	478.3	565.3	199.3	173.3	168.9	203.0

END OF REPORT

TEST REPORT

Your Ref Email dated 28 Jun 2006 | Date 04 Jul 2006

Our Ref 54S063476/2A/LGJ | Page 1of 3

DID 68653783 | Fax 68621433

NOTE: This report is issued subject to PSB Corporation's "Terms and Conditions Governing Technical Services". The terms and conditions governing the issue of this report are set out as attached within this report

SUBJECT:

Non-combustibility test on "Hawk" Calcium Silicate Board material submitted by Kingtec (Hong Kong) Building Materials Industiral Co., Ltd. on 30 May 2006.

TESTED FOR:

Jinte Constructional Material Industrial Limited Company
368 Ping An Road, Yichun City
Jiangxi Province
People's Republic of China

Attn: Mr Shi Po De

DATE OF TEST:

27 Jun 2006 and 28 Jun 2006

PURPOSE OF TEST:

To determine whether the material is non-combustible when it is exposed to the conditions of the test specified in British Standard 476: Part 4: 1970 "Fire Test on Building Materials and Structures - Non-combustibility Test for Materials".
The test was conducted at PSB Corporation fire test laboratory located at No. 10 Tuas Avenue 10, Singapore 639134.
fire propagation for products"

PSB

DESCRIPTION OF SAMPLES:

42 pieces of sample, said to be "Hawk" (1244kg/m^3) Calcium Silicate Board material, each of nominal size of 40mm x 40mm x 8mm thickness were received. 6 blocks of specimen, each of nominal test size of 40mm x 40mm x 50mm thickness were prepared.

TEST PROCEDURE:

Specimens were exposed to the specified heating conditions (750 ± 10°C) in a furnace conforming to Clause 6 and illustrated in Figure 1, 2 and 3 of the Standard. The furnace was heated and its temperature stabilized at 750 ± 10°C for more than 10 minutes. One specimen was then inserted in the furnace, the whole operation was performed in less than 5 seconds. The temperature of the specimens and the furnace were measured by two separate Chromel/Alumel thermocouples continuously for 20 minutes on the chart of a recorder. The flaming time of the specimen was determined by a stop watch. The procedure was repeated twice for two other specimens, one at each time.

RESULTS:

Description	Specimen 1	Specimen 2	Specimen 3	Requirements
Time of continuous flaming (sec.)	0	0	0	<10
Temperature rise of furnace (°C)	0	17	15	<50
Temperature rise of sample (°C)	0	0	0	<50
Classification	Non-combustible	Non-combustible	Non-combustible	-

CONCLUSION:

A non-combustibility test for materials in accordance with British Standard 476 Part 4 : 1970 has been performed on the material as described in this report and the classification of the sample is non-combustible.

Mah Poh Huat
Associate Engineer

Chan Lung Toa
Product Manager
(Fire Safety & Security Products)
Mechanical

This Report is issued under the following conditions:

1. Results of the testing/calibration in the form of a report will be issued immediately after the service has been completed or terminated.

2. Unless otherwise requested, a report shall contain only technical results. Analysis and interpretation of the results and professional opinion and recommendations expressed thereupon, if required, shall be clearly indicated and additional fee paid for, by the Client.

3. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that PSB Corporation approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that PSB Corporation in any way "guarantees" the later performance of the product/equipment.

4. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. PSB Corporation therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

5. Additional copies of the report are available to the Client at an additional fee. No third party can obtain a copy of this report through PSB Corporation, unless the Client has authorised PSB Corporation in writing to do so.

6. PSB Corporation may at its sole discretion add to or amend the conditions of the report at the time of issue of the report and such report and such additions or amendments shall be binding on the Client.

7. All copyright in the report shall remain with PSB Corporation and the Client shall, upon payment of PSB Corporation's fees for the carrying out of the tests/calibrations, be granted a license to use or publish the report to the third parties subject to the terms and conditions herein, provided always that PSB Corporation may at its absolute discretion be entitled to impose such conditions on the license as it sees fit.

8. Nothing in this report shall be interpreted to mean that PSB Corporation has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that sample.

9. This report shall not be reproduced wholly or in parts and no reference shall be made by the Client to PSB Corporation or to the report or results furnished by PSB Corporation in any advertisements or sales promotion.

10. Unless otherwise stated, the tests are carried out in PSB Corporation Pte Ltd, No.1 Science Park Drive Singapore 118221.

June 2006

TEST REPORT

Your Ref Email dated 28 Jun 2006 | Date 04 Jul 2006

Our Ref 54S063476/1A/OKH | Page 1 of 6

DID 68653783 | Fax 68621433

NOTE: This report is issued subject to PSB Corporation's "Terms and Conditions Governing Technical Services". The terms and conditions governing the issue of this report are set out as attached within this report.

SUBJECT:

Fire propagation test on "Hawk" Calcium Silicate Board material submitted by Kingtec (Hong Kong) Building Materials Industrial Co., Ltd. on 30 May 2006.

TESTED FOR:

Jinte Constructional Material Industrial Limited Company
368 Ping An Road, Yichun City
Jiangxi Province
People's Republic of China

Attn: Mr Shi Po De

DATE OF TEST:

16 Jun 2006

PURPOSE OF TEST:

To determine the Index of Performance of the material when it is exposed to the conditions of the test specified in British Standard 476 : Part 6 : 1989 "Method of test for fire propagation for products".
The test was conducted at PSB Corporation fire test laboratory located at No. 10 Tuas Avenue 10, Singapore 639134.

PSB TEST® Your Peace of Mind

ISO 9001 JQA QMA 10040

ilac-MRA ACCREDITED LABORATORY SAC-SINGLAS

LA-2001-0212-A
LA-2001-0213-F
LA-2001-0214-E
LA-2001-0215-B
LA-2001-0216-G
LA-2001-0217-G

The results reported herein have been performed in accordance with the laboratory's terms of accreditation under the Singapore Accreditation Council - Singapore Laboratory Accreditation Scheme. Tests marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our laboratory.

DESCRIPTION OF SAMPLES:

6 pieces of sample, said to be "Hawk" (1244kg/m^3) Calcium Silicate Board material, each of nominal size of 225mm x 225mm x 8mm thickness were received.

TEST PROCEDURE:

Three specimens were tested with either face exposed to the specified heating conditions, in an apparatus conforming to paragraph 5 and illustrated in Figures 1 to 3 of the Standard.

The calibration and test procedures were as defined in paragraphs 8 and 9 respectively, of the specification. The apparatus was calibrated prior to test and the actual calibration curve obtained is shown in Figure 1 of this report.

RESULTS OF TEST:

The mean temperature rise above ambient obtained from three specimens is also shown in Figure 1 (i.e. with the actual calibration curve). The mean temperature readings for the material and the calibration curve were obtained at the following intervals from the start of the test: at 1/2 minute intervals up to 3 minutes, at 1 minute intervals from 4 to 10 minutes, and at 2 minutes intervals from 12 to 20 minutes.

RESULTS OF TEST: (Cont'd)

From these readings, the index of performance for the material was determined as follows:

$$s_1 = \sum_{t=0.5}^{t=3} \frac{\Theta_s - \Theta_c}{10t}; \quad s_2 = \sum_{t=4}^{t=10} \frac{\Theta_s - \Theta_c}{10t}$$

and $$s_3 = \sum_{t=12}^{t=20} \frac{\Theta_s - \Theta_c}{10t};$$

$$S = s_1 + s_2 + s_3$$

where S = Index of performance for each of the specimens tested and s_1, s_2 and s_3 are sub-indices

t = Time in minutes from the origin at which readings are taken.

Θ_s = Temperature rise in deg. C for the specimen at time, t

Θ_c = Temperature rise in deg. C for the calibration sheet at time, t

In computations only the positive value of $\frac{\Theta_s - \Theta_c}{10t}$ was used.

RESULTS OF TEST: (Cont'd)

The following test results were obtained for each specimen tested:

Specimen	Sub-Indices			Index of Performance
	s_1	s_2	s_3	S
A	0.0	0.0	0.0	0.0
B	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0

CONCLUSION:

The test results obtained for the sample tested are as follows:

Index of overall performance, I = 0.0
(Fire propagation index)

Sub-index, i_1 = 0.0

Sub-index, i_2 = 0.0

Sub-index, i_3 = 0.0

REMARKS:

1. The test results relate only to the behaviour of the test specimens of the product under the particular conditions of test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.
2. The sample was tested with either exposed to the heat and backed with calcium silicate board.

Mah Poh Huat
Associate Engineer

Chan Lung Toa
Product Manager
(Fire Safety & Security Products)
Mechanical

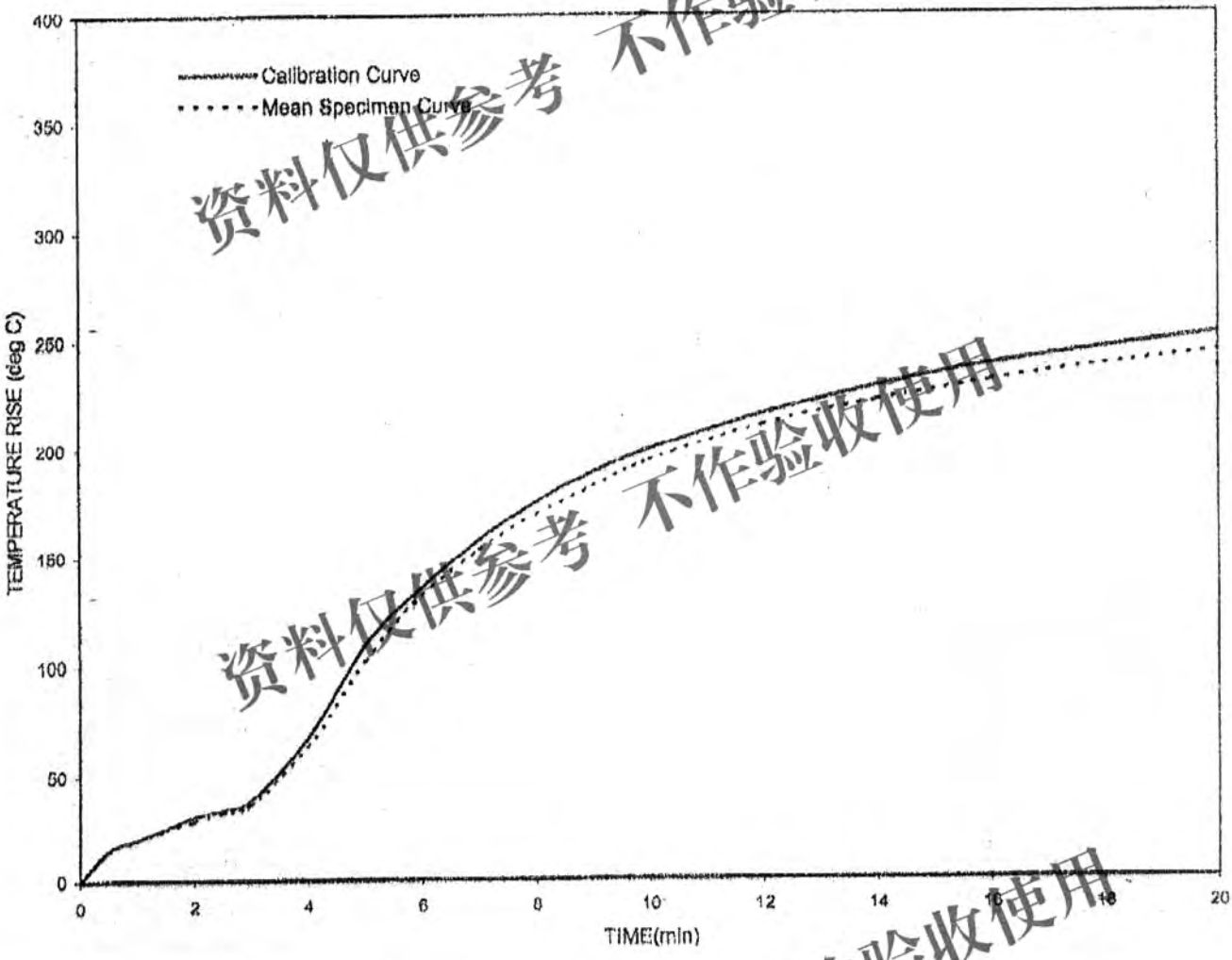


FIGURE 1 : COMPARISON OF MEAN SPECIMEN AND CALIBRATION CURVES

This Report is issued under the following conditions:

1. Results of the testing/calibration in the form of a report will be issued immediately after the service has been completed or terminated.

2. Unless otherwise requested, a report shall contain only technical results. Analysis and interpretation of the results and professional opinion and recommendations expressed thereupon, if required, shall be clearly indicated and additional fee paid for, by the Client.

3. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that PSB Corporation approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that PSB Corporation in any way 'guarantees' the later performance of the product/equipment.

4. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. PSB Corporation therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

5. Additional copies of the report are available to the Client at an additional fee. No third party can obtain a copy of this report through PSB Corporation, unless the Client has authorised PSB Corporation in writing to do so.

6. PSB Corporation may at its sole discretion add to or amend the conditions of the report at the time of issue of the report and such report and such additions or amendments shall be binding on the Client.

7. All copyright in the report shall remain with PSB Corporation and the Client shall, upon payment of PSB Corporation's fees for the carrying out of the tests/calibrations, be granted a license to use or publish the report to the third parties subject to the terms and conditions herein, provided always that PSB Corporation may at its absolute discretion be entitled to impose such conditions on the license as it sees fit.

8. Nothing in this report shall be interpreted to mean that PSB Corporation has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that sample.

9. This report shall not be reproduced wholly or in parts and no reference shall be made by the Client to PSB Corporation or to the report or results furnished by PSB Corporation in any advertisements or sales promotion.

10. Unless otherwise stated, the tests are carried out in PSB Corporation Pte Ltd, No 1 Science Park Drive Singapore 118221.

June 2006

TEST REPORT

Your Ref: Email 26 Oct 05

Date: 28 Oct 2005

Our Ref: 64S055811/OKH

DID: 68653783

Fax: 68621433

PSB Corporation

SUBJECT:

Large scale surface spread of flame test on "Hawk" Calcium Silicate Board material submitted by Kingtec Building Materials Industrial Co., Ltd. on 28 Sep 2005.

TESTED FOR:

Jinte Constructional Material Industrial Limited Company
368 Ping An Road, Yichun City
Jiangxi Province
People's Republic of China

Attn: Mr Shi Zi De

DATE OF TEST:

06 Oct 2005

PURPOSE OF TEST:

To determine the tendency of the surface of a material or a combination of materials to support the spread of flame across its surface and to classify the surface according to the test given in British Standard 476: Part 7: 1997.
The test was conducted at PSB Corporation fire test laboratory located at No. 10 Tuas Avenue 10, Singapore 639134.

PSB TEST

ACCREDITED LABORATORY
SAC-SINGLAS

香 港 認 可 處
Hong Kong Accreditation Service
創新科技署 Innovation and Technology Commission

RQA 1/003/25
Tel No. 2829 4870

12 December 2005

Mr. SZE Po Tak,
Director,
Kingtec (Hong Kong) Building Materials Industrial Co. Ltd,
Shop D, G/F, Lucky House Industrial Building,
64, Tong Mi Road,
Mongkok,
Kowloon

Dear Mr. SZE,

Mutual Recognition Agreement (MRA) Between HKAS and SAC-SINGLAS

I refer to your letter dated 6 December 2005 and the attached SAC-SINGLAS endorsed test reports dated 28 October 2005 and Ref No. 68653783 (Total 5 pages)

HKAS of Hong Kong and SAC-SINGLAS of Singapore are both signatories of the Asia Pacific Laboratory Accreditation Co-operation (APLAC) and the International Laboratory Accreditation Co-operation (ILAC) Multilateral Arrangements (MLA). Under the MLA, signatories accept laboratory accreditation granted by each other as equivalent and undertake to promote the acceptance of test reports endorsed by any signatories to the arrangements. This means that we will regard test report to BS 476:Part 7:1997 standard endorsed by SAC-SINGLAS as equivalent to test reports to the same respective test standards endorsed by HKAS under the Hong Kong Laboratory Accreditation Scheme (HOKLAS).

I hope the above information will be useful to you. If you have any further questions, please do not hesitate to contact the undersigned.

Yours sincerely,

C K Cheung

(C K Cheung)
for Executive Administrator

香港灣仔告士打道七號入境事務大廈三十六樓 36/F, Immigration Tower, 7 Gloucester Road, Wan Chai, Hong Kong
電話 Tel: 2829 4837 傳真 Fax: 2824 1302 電郵 E-mail: hkas@itc.gov.hk 網址 Website: http://www.itc.gov.hk/hkas/

54S055811/OKH

PSBCorporation

DESCRIPTION OF SAMPLES:

9 pieces of sample, said to be "Hawk" Calcium Silicate Board material, each of nominal size of 885mm x 270mm x 8mm thickness were received. The bulk density of the sample was found to be about 1244kg/m^3.

TEST PROCEDURE:

Prior to test, the specimens were prepared and conditioned in accordance with paragraphs 5.3 to 5.6 of the standard and secured to a specimen holder as described in paragraph 6.3.

Six specimens were tested with either face exposed to the specified thermal radiation from the apparatus described in paragraph 6.1 of the standard. The intensity of the radiated heat incident on the specimen varies with distance from the hotter end, so that when the specified calibration panel is mounted in the place to be occupied by the specimen, the irradiance of the radiometer is as given in Table 1. The test was terminated when the flame front reached the 825mm reference line, or after 10 minutes has elapsed, whichever is the shorter.

Table 1 : Irradiance Along Horizontal Reference Line on the Calibration Board

Distance along reference line from inside edge of specimen holder	Irradiance kW/m^2		
mm	specified	min.	max.
75	32.5	32.0	33.0
225	21.0	20.5	21.5
375	14.5	14.0	15.0
525	10.0	9.5	10.5
675	7.0	6.6	7.5
825	5.0	4.5	5.5

RESULTS OF TEST:

Specimen No.	1	2	3	4	5	6
Spread of flame at first 1½ minutes (mm)	0	0	0	0	0	0
Distance (mm)	Time of spread of flame to indicated distance (minutes • seconds)					
Start of flaming	nil	nil	nil	nil	nil	nil
75	-	-	-	-	-	-
165	-	-	-	-	-	-
190						
215						
240						
265						
290						
375						
455						
500						
525						
600						
675						
710						
750						
785						
825						
865						
Time of maximum spread of flame (minutes • seconds)	-	-	-	-	-	-
Distance of maximum spread of flame (mm)	0	0	0	0	0	0
Comments	None					

54S055811/OKH

PSB Corporation

Classification of Surface Spread of Flame

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	266	265 + 25	710	710 + 75
Class 4	Exceeding the limits for class 3			

CONCLUSION:

In accordance with the class definitions specified in the Standard, the test results show that the sample tested has a Class One Surface Spread of Flame.

REMARKS:

1. The test results relate only to the behaviour of the test specimens of the product under the particular conditions of test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.
2. The sample was tested with either face exposed to the heat and backed with calcium silicate board.

Mah Poh Huat
Associate Engineer

Chan Eang Tee
Product Manager
(Fire Safety & Security Products)
Mechanical

This Report is issued under the following conditions:

1. Results of the testing/calibration in the form of a report will be issued immediately after the service has been completed or terminated.

2. Unless otherwise requested, a report shall contain only technical results. Analysis and interpretation of the results and professional opinion and recommendations expressed thereupon, if required, shall be clearly indicated and additional fee paid for, by the Client.

3. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that PSB Corporation approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that PSB Corporation in any way 'guarantees' the later performance of the product/equipment.

4. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. PSB Corporation therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

5. Additional copies of the report are available to the Client at an additional fee. No third party can obtain a copy of this report through PSB Corporation, unless the Client has authorised PSB Corporation in writing to do so.

6. PSB Corporation may at its sole discretion add to or amend the conditions of the report at the time of issue of the report and such report and such additions or amendments shall be binding on the Client.

7. All copyright in the report shall remain with PSB Corporation and the Client shall, upon payment of PSB Corporation's fees for the carrying out of the tests/calibrations, be granted a license to use or publish the report to the third parties subject to the terms and conditions herein, provided always that PSB Corporation may at its absolute discretion be entitled to impose such conditions on the license as it sees fit.

8. Nothing in this report shall be interpreted to mean that PSB Corporation has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that sample.

9. This report shall not be reproduced wholly or in parts and no reference shall be made by the Client to PSB Corporation or to the report or results furnished by PSB Corporation in any advertisements or sales promotion.

10. Unless otherwise stated, the tests are carried out in PSB Corporation Pte Ltd, No.1 Science Park Drive Singapore 118221.

May 2005

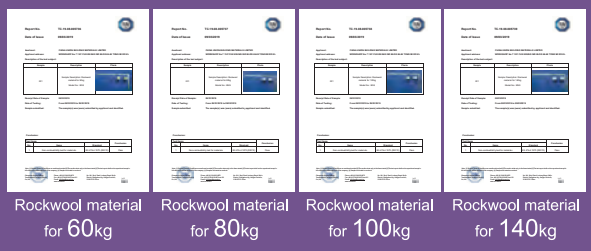
ROCK MINERAL WOOL

BNS mineral rockwool uses selected basalt as the base material and is a heat preservating material made through the processes of being melted at a high temperature, fiber forming through high speed centrifugation and fiber laying through oscillating beltVertically 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 it's different purposes, They are widely applied for exterior walls, roofs, equipments and piping, drywalls help with acoustic corrections & heat preservation as well.

ROCK MINERAL WOOL

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:

CHINA UNION BUILDING MATERIALS

E-mail: Chinaunion2office@gmail.com

Tel: 5596 7709

Due to it's 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

ROCK MINERAL WOOL

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.

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

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.

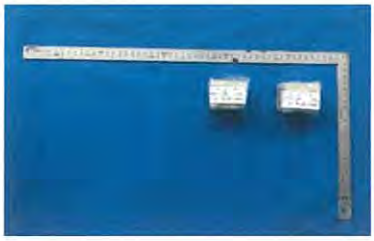
Report No. TC.19.08.005737

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 80kg 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

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

Report No. TC.19.08.005737

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)	749	750	750	750
Duration of sustained flaming inside the furnace (s)	--	--	--	--
Highest temperature of the centre of specimen Tc(max) (°C)	741	743	742	742
Final temperature of the centre of specimen Tc(final °C)	720	721	720	720
Highest temperature of furnace inside TF(max) (°C)	783	784	786	784
Final temperature of furnace inside TF(final °C)	776	777	773	775
The centre of specimen temperature rise △TC(°C)	21	22	22	22
Furnace inside temperature rise △TF(°C)	34	34	36	35

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.

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

Report No. TC.19.08.005737

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-

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

中国认可
国际互认
检测
TESTING
CNAS L6069

Report No. TC.20.07.003401

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 80kg 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

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

Report No. TC.20.07.003401

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	0.97	0	0	0.97
B	1.01	0	0	1.01
C	0.95	0	0	0.95

Sample quantity	i_1	i_2	i_3	Fire propagation index I
3	0.98	0	0	0.98

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

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

$$S = S_1 + S_2 + S_3$$

Fire propagation index:

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

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

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.
Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn
No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

中国认可
国际互认
检测
TESTING
CNAS L6069

Report No. TC.20.07.003401

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

Wayne Wang

Approved by: Shi Shen

Shen hui

-End of Report-

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

中国认可
国际互认
检测
TESTING
CNAS L6069

Report No. TC.20.07.002876

Date of Issue 07/14/2020

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 80kg Model No.: BNS	

Receipt Date of Sample: 07/06/2020

Date of Testing: From 07/06/2020 to 07/14/2020

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

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

中国认可
国际互认
检测
TESTING
CNAS L6069

Report No. TC.20.07.002876

Date of Issue 07/14/2020

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 51.5 mm
Conditioning	Constant mass at a temperature of 23±2°Cand 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.**

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

中国认可
国际互认
检测
TESTING
CNAS L6069

Report No. TC.20.07.002876

Date of Issue 07/14/2020

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 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-

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

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

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

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 Tc(max) (°C)	723	727	729	726
Final temperature of the centre of specimen Tc(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 △TC(°C)	46	43	44	44
Furnace inside temperature rise △TF(°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.

Changzhou Jinbiao Railway Transportation Testmical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

Report No. **TC.19.08.005738**

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-

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

中国认可
国际互认
检测
TESTING
CNAS L6069

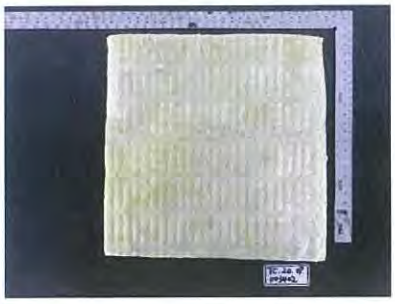
Report No. TC.20.07.003402

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

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

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.

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

$$S = S_1 + S_2 + S_3$$

Fire propagation index:

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

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

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.
Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn
No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

中国认可
国际互认
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

Wayne Wang

Approved by: Hui Shen

Shen hui

-End of Report-

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

中国认可
国际互认
检测
TESTING
CNAS L6069

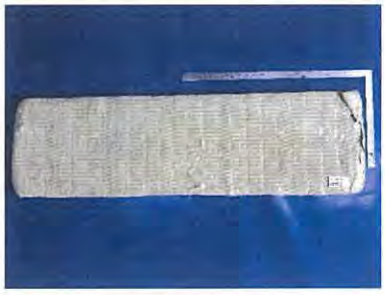
Report No. TC.20.07.002874

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

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

中国认可
国际互认
检测
TESTING
CNAS L6069

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°Cand 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**

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

中国认可
国际互认
检测
TESTING
CNAS L6069

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 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-

Changzhou Jinbiao Railway Transportation Technical Service Co.,Ltd.

Phone: +86/ (0) 519-8123-9872
Fax: +86/ (0) 519-8123-9872 ext.123
E-mail: hui.shen@tuv-sud.cn
www.tuv-sud.cn

No. 164, Wuyi Road ,Lucheng Street, Wujin District, Changzhou city, Jiangsu Province, 213015 P.R. China

REPORT TO: Kingtec Building Materials (HK & Macau) Ltd.

ADDRESS: Unit 1, 3/F, Block B, Shatin Ind. Ctr.
5-7 Yuen Shun Circuit,
Shatin, N.T., Hong Kong

ATTN.: Ms. Lilian Tse / Mr. Sammy Chan

REPORT NO.: APJ15-070-RP002(Rw)

ISSUE DATE: 20 August 2015

HOKLAS Accredited Laboratory Laboratory Sound Reduction Index Measurement Test Report for 90mm Kingtec Hawk Pan Fire-rated Partition System

for Kingtec Building Materials (HK & Macau) Ltd.

(PROJECT NO.: APJ15-070)

Prepared by:

Tang Cheuk Hang
Quality Manager
WN / MT / NS

Endorsed by:

Ng Yan Wa
Laboratory Manager
(Approved Signatory)

HKAS has accredited this Laboratory (Reg. No. 122-TEST) under HOKLAS for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories.

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

1. Method of Measurement

1.1 The measurements were carried out in accordance with ISO 140-3:1995 (E) "Acoustics – Measurement of airborne sound insulation in buildings and of building elements - Part 3 Laboratory measurements of airborne sound insulation of building elements" (equivalent to BS 2750 Part 3: 1995) in the reverberation chamber of Acoustics and Air Testing Laboratory Co. Ltd. And the single-figure quantity for airborne sound insulation rating was evaluated in accordance with BS EN ISO 717-1:1997.

2. Details of Measurement

2.1 Principle of Measurement

The expression "sound transmission loss" (TL) is also equivalent to "sound reduction index" (R).

The sound reduction index 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 receiving room is L_1 and L_2, respectively.

The sound reduction index is given by

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

Where

S is the area of the test specimen, in square metres.

A is the equivalent absorption area in the receiving room, in square metres, which may preferably be evaluated from the reverberation time measured according to ISO 354: 1985 and evaluated using Sabine's formula

$$A = 0.16\,V/T$$

Where

V is the receiving room volume, in cubic metres;

T is the reverberation time, in seconds, which was obtained by reading and averaging the measured value in receiving room.

The Weighted Sound Reduction Index (Rw) in decibels (dB) is calculated by comparing the sixteen values of Sound Transmission Loss from 100 Hz to 3150 Hz with a defined reference curve which is incremented until the requirements of BS EN ISO 717-1: 1997 are met. Spectrum adaptation terms C and C_{tr} are also calculated.

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

2.2 Laboratory Location

Acoustics and Air Testing Laboratory Company Limited
Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street,
Fo Tan, Shatin, N.T., Hong Kong.

2.3 Test Condition

Conditions	Source room	Receiving room
Volume	84m^3	203m^3
Air Temperature	25.8°C	25.1°C
Relative Humidity	66.0%	66.7%

2.4 Test Date

Date of receipt of test item: 17 August 2015

Date test commencement and completion
Commencing date: 18 August 2015
Completion date 18 August 2015

2.5 Instrumentation

2.5.1 For sound production

Type	Serial No.
One Real Time Frequency Analyzer – LAN-XI 3160A	3160-100361
One Equalizer – Marantz EQ20D	56E040097
One Amplifier – B&K 2716 Power Amplifier	2571771
One OmniPower Sound Source – Bruel & Kjaer 4296	2128136
One Loudspeaker – JBL EON 515 Loudspeaker	VTP0890-14112

2.5.2 For sound measurement

One Real Time Frequency Analyzer – LAN-XI 3160A	3160-100361
Two Free-field ½" Microphone – Bruel & Kjaer 4190	2731708 & 2731709
Two ½" Microphone Preamplifier – Bruel & Kjaer 2669	2081972 & 2081971
One Sound Level Calibrator – Bruel & Kjaer 4231	1914426

2.5.3 For reverberation time measurement

One Real Time Frequency Analyzer – LAN-XI 3160A	3160-100361
One Free-field ½" Microphone – Bruel & Kjaer 4190	2731708
One ½" Microphone Preamplifier – Bruel & Kjaer 2669	2081972

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

3. Results Application

3.1 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.

3.2 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.

3.3 The test results obtained relate only to the specimen tested.

4. Description of the Test Construction

4.1 Specimen description: The test specimen composed of totally two layers of 9mm thick Kingtec Hawk Pan calcium silicate board with nominal density of 1000kg/m^3, two calcium silicate fillets (50mm x 9mm), 50mm thick steel stud (at 600mm o.c.) which containing 50mm thick rockwool insulation (density: 100kg/m^3). All gaps were fully caulked.

The 90mm thick partition system was constructed in the test opening between Receiving Room and Source Room and consisted of:

Face layer	: 9mm Kingtec Hawk Pan calcium silicate board (9kg/m^2)
Base layer	: 9mm x 50mm Kingtec Hawk Pan calcium silicate fillet (9kg/m^2)
Metal Stud	: 50mm Steel Stud
Acoustic Infill	: 50mm Rockwool (5kg/m^2)
Base layer	: 9mm x 50mm Kingtec Hawk Pan calcium silicate fillet (9kg/m^2)
Face layer	: 9mm Kingtec Hawk Pan calcium silicate board (9kg/m^2)

4.2 The partition system was essentially as detailed in the client supplied drawing reproduced as in Appendix 1.

4.3 Overall specimen size: 1200 mm (wide) X 2340 mm (high) X 90mm (approx.) thick.

4.4 The tested partition system was supplied and installed by Kingtec Building Materials (HK & Macau) Ltd. on 18 August 2015.

4.5 Photographic records showing the test specimen and measurement setup are given in Appendix 2.

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

5. Measurement Results

5.1 The results of measurement for the tested specimen are given in the following table:

Frequency f, Hz	Sound reduction index R, dB	Sound reduction index R, dB	Uncertainty
100	13.7	17.8	±1.56
125	21.6		±1.63
160	32.0		±1.27
200	38.4	41.4	±1.01
250	43.2		±0.81
315	45.8		±0.66
400	50.1	51.2	±0.66
500	50.8		±0.49
630	53.3		±0.53
800	54.6	55.6	±0.43
1000	56.1		±0.85
1250	56.3		±0.51
1600	55.9	56.0	±0.43
2000	56.2		±0.35
2500	55.8		±0.32
3150	51.6	53.9	±0.36
4000	54.2		±0.31
5000	58.3		±0.37

NOTE: The 95% measurement uncertainty is calculated according to an engineering method in compliance with the "Guide to the Expression of Uncertainty in Measurement", 1995.

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

5.2 The measured sound reduction index of the tested specimen against 1/3-octave band center frequencies is plotted on Figure 1.

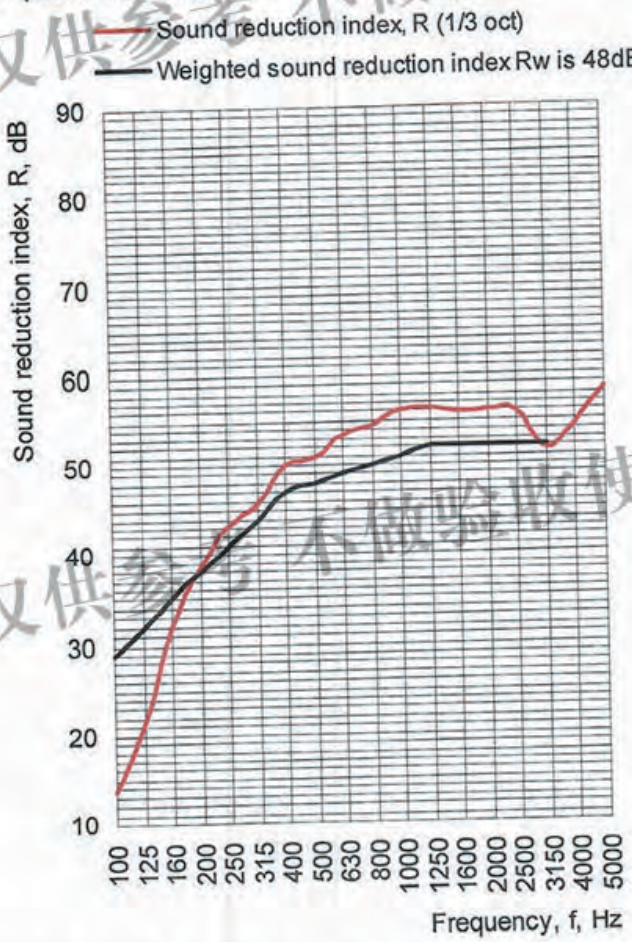


Figure 1. Sound Reduction Index against Frequency

Weighted Sound Reduction Index R'w:

Description	Weighted Sound Reduction Index Rw, dB
90mm Kingtec Hawk Pan Fire-rated Partition System	48

5.3 The rating standard, BS EN ISO 717-1:1997, identifies a number of single figure ratings for this type of test. Evaluation based on laboratory measurement results is obtained by a laboratory method. The calculated values of these rating are:

R'w (C;C_{tr}) = 58 (-7;-15) dB	$C_{100\text{-}5000}$ = -6 dB
	$C_{tr,100\text{-}5000}$ = -15 dB

- END -

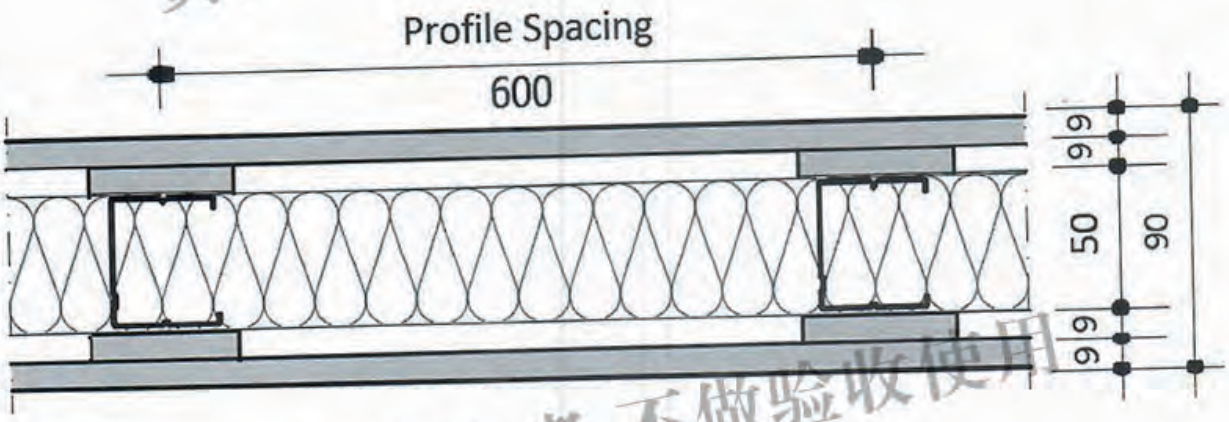
Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

Appendix List

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

Appendix 1

Details of Test Specimen



Fire-rated Partition System:

The partition system was constructed in the test opening between Receiving Room and Source Room and consisted of:

Face layer	: 9mm Kingtec Hawk Pan calcium silicate board (9kg/m^2)
Base layer	: 9mm x 50mm Kingtec Hawk Pan calcium silicate fillet (9kg/m^2)
Metal Stud	: 50mm Steel Stud
Acoustic Infill	: 50mm Rockwool (5kg/m^2)
Base layer	: 9mm x 50mm Kingtec Hawk Pan calcium silicate fillet (9kg/m^2)
Face layer	: 9mm Kingtec Hawk Pan calcium silicate board (9kg/m^2)

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

Appendix 2

Photographic Records

Measurement set-up (Source room)

Measurement set-up (Receiving room)

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

HOKLAS 122 TEST

REPORT TO: Kingtec Building Materials (HK & Macau) Ltd.

ADDRESS: Unit 1, 3/F, Block B, Shatin Ind. Ctr.
5-7 Yuen Shun Circuit,
Shatin, N.T., Hong Kong

ATTN.: Ms. Lilian Tse / Mr. Sammy Chan

REPORT NO.: APJ15-070-RP002(STC)

ISSUE DATE: 20 August 2015

HOKLAS Accredited Laboratory
Laboratory Sound Transmission Loss Measurement
Test Report
for
90mm Kingtec Hawk Pan Fire-rated Partition System

for Kingtec Building Materials (HK & Macau) Ltd.

(PROJECT NO.: APJ15-070)

HKAS has accredited this Laboratory (Reg. No. 122-TEST) under HOKLAS for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories.

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

1. Method of Measurement

1.1 The measurement was carried out in accordance with ASTM E90-09 "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions" in the reverberation room of Acoustics and Air Testing Laboratory Co. Ltd. And the single number rating of airborne sound transmission loss is given as Sound Transmission Class (STC) by evaluated in accordance with ASTM E413-10 "Classification for Rating Sound Insulation".

2. Details of Measurement

2.1 Principle of Measurement

The sound transmission loss 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 and receiving rooms are denoted by 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 meters sabins.

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

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:

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

Where

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

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

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 413-10 are met.

2.2 Laboratory Location

Fo Tan Main Laboratory -
Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street,
Fo Tan, Shatin, N.T., Hong Kong.

2.3 Test Condition

Conditions	Source room	Receiving room
Volume	84m^3	203m^3
Air Temperature	25.8°C	25.1°C
Relative Humidity	66.0%	66.7%

2.4 Test Date

Date of receipt of test item: 17 August 2015

Date test commencement and completion
Commencing date: 18 August 2015
Completion date 18 August 2015

2.5 Instrumentation

2.5.1 For sound production

Type	Serial No.
One Real Time Frequency Analyzer – LAN-XI 3160A	3160-100361
One Equalizer – Marantz EQ20D	56E040097
One Amplifier – B&K 2716 Power Amplifier	2571771
One OmniPower Sound Source – Bruel & Kjaer 4296	2128136
One Loudspeaker – JBL EON 515 Loudspeaker	VTP0890-14112

2.5.2 For sound measurement

One Real Time Frequency Analyzer – LAN-XI 3160A	3160-100361
Two Free-field ½" Microphone – Bruel & Kjaer 4190	2731708 & 2731709
Two ½" Microphone Preamplifier – Bruel & Kjaer 2669	2081972 & 2081971
One Sound Level Calibrator – Bruel & Kjaer 4231	1914426

2.5.3 For reverberation time measurement

One Real Time Frequency Analyzer – LAN-XI 3160A	3160-100361
One Free-field ½" Microphone – Bruel & Kjaer 4190	2731708
One ½" Microphone Preamplifier – Bruel & Kjaer 2669	2081972

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
E-mail: inquiry@aa-lab.com

3. Results Application

3.1 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.

3.2 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.

3.3 The obtained test results relate only to the tested specimen.

4. Description of the Test Construction

4.1 Specimen description: The test specimen composed of totally two layers of 9mm thick Kingtec Hawk Pan calcium silicate board with nominal density of 1000kg/m^3, two calcium silicate fillets (50mm x 9mm), 50mm thick steel stud (at 600mm o.c.) which containing 50mm thick rockwool insulation (density: 100kg/m^3). All gaps were fully caulked.

The 90mm thick partition system was constructed in the test opening between Receiving Room and Source Room and consisted of:

Face layer	: 9mm Kingtec Hawk Pan calcium silicate board (9kg/m^2)
Base layer	: 9mm x 50mm Kingtec Hawk Pan calcium silicate fillet (9kg/m^2)
Metal Stud	: 50mm Steel Stud
Acoustic Infill	: 50mm Rockwool (5kg/m^2)
Base layer	: 9mm x 50mm Kingtec Hawk Pan calcium silicate fillet (9kg/m^2)
Face layer	: 9mm Kingtec Hawk Pan calcium silicate board (9kg/m^2)

4.2 The partition system was essentially as detailed in the client supplied drawing reproduced as in Appendix 1.

4.3 Overall specimen size: 1200 mm (wide) X 2340 mm (high) X 90mm (approx.) thick.

4.4 The tested partition system was supplied and installed by Kingtec Building Materials (HK & Macau) Ltd. on 18 August 2015.

4.5 Photographic records showing the test specimen and measurement setup are given in Appendix 2.

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
http://www.aa-lab.com E-mail: inquiry@aa-lab.com

5. Measurement Results

5.1 The results of measurement for the tested specimen are given in the following table:

Frequency f, Hz	Sound Transmission loss, dB	Sound Transmission loss, dB	Uncertainty, dB
100	14	18	±1.6
125	22		±1.7
160	32		±1.3
200	38	41	±1.0
250	43		±0.8
315	46		±0.7
400	50	51	±0.7
500	51		±0.5
630	53		±0.6
800	54	55	±0.5
1000	56		±0.9
1250	56		±0.5
1600	56	56	±0.5
2000	56		±0.4
2500	56		±0.4
3150	52	54	±0.4
4000	54		±0.4
5000	58		±0.4

5.2 The measured sound transmission loss of the tested specimen against 1/3-octave band center frequencies is plotted on Figure 1.

5.3 The 95% measurement uncertainty is calculated according to the method stated in the Standard ASTM E90-09 A2.

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
E-mail: inquiry@aa-lab.com

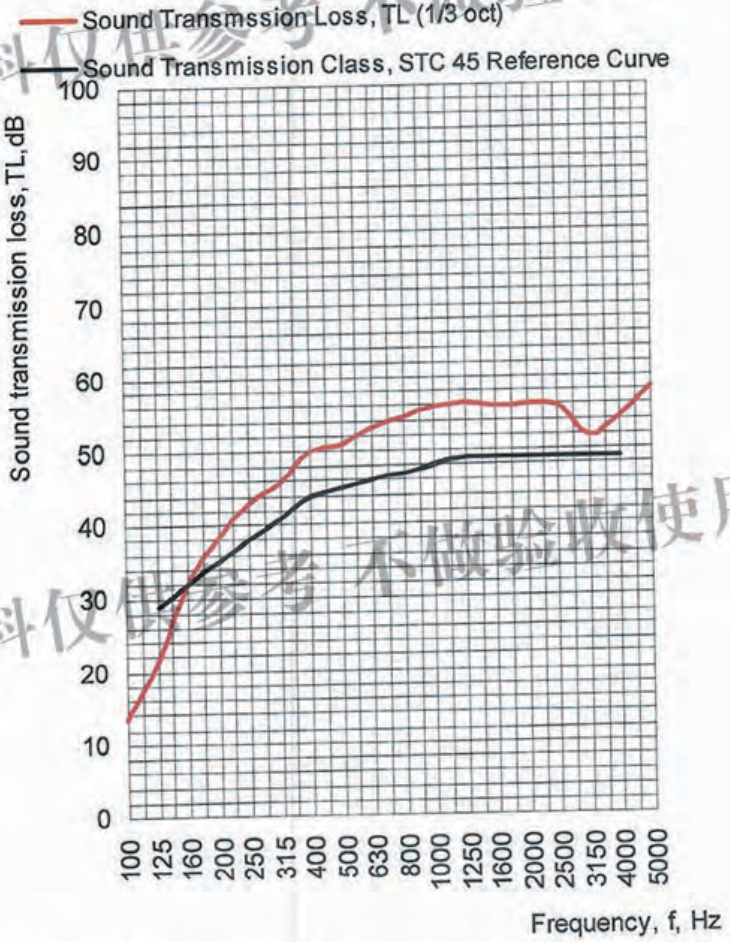


Figure 1. Sound transmission loss against Frequency

5.4 The single number rating of sound transmission class (STC) In accordance with ASTM E413-10 of the tested specimen is given below:

Description	Sound Transmission Class, STC, dB
90mm Kingtec Hawk Pan Fire-rated Partition System	STC 45

Prepared by:

Tang Cheuk Hang
Quality Manager
WN / MT / NS

Endorsed by:

Ng Yan Wa
Laboratory Manager
(Approved Signatory)

- END -

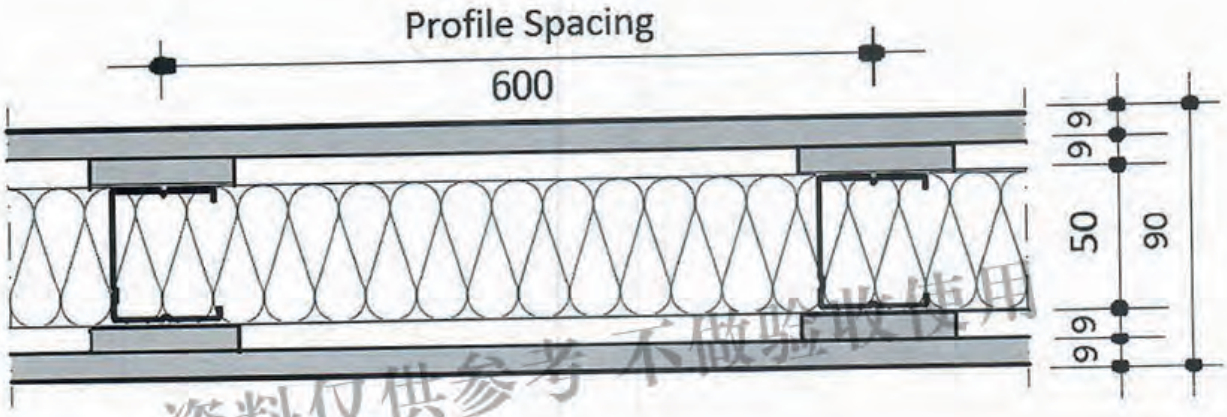
Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
E-mail: inquiry@aa-lab.com

Appendix List

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

Appendix 1

Details of Test Specimen



Fire-rated Partition System:

The partition system was constructed in the test opening between Receiving Room and Source Room and consisted of:

Face layer	: 9mm Kingtec Hawk Pan calcium silicate board (9kg/m^2)
Base layer	: 9mm x 50mm Kingtec Hawk Pan calcium silicate fillet (9kg/m^2)
Metal Stud	: 50mm Steel Stud
Acoustic Infill	: 50mm Rockwool (5kg/m^2)
Base layer	: 9mm x 50mm Kingtec Hawk Pan calcium silicate fillet (9kg/m^2)
Face layer	: 9mm Kingtec Hawk Pan calcium silicate board (9kg/m^2)

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com

Appendix 2

Photographic Records

Measurement set-up (Source room)

Measurement set-up (Receiving room)

Room 422, Leader Industrial Centre, 57-59 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Tel: (852) 2668 3423 Fax: (852) 2668 6946
Homepage: http://www.aa-lab.com E-mail: inquiry@aa-lab.com