Ingeborg®

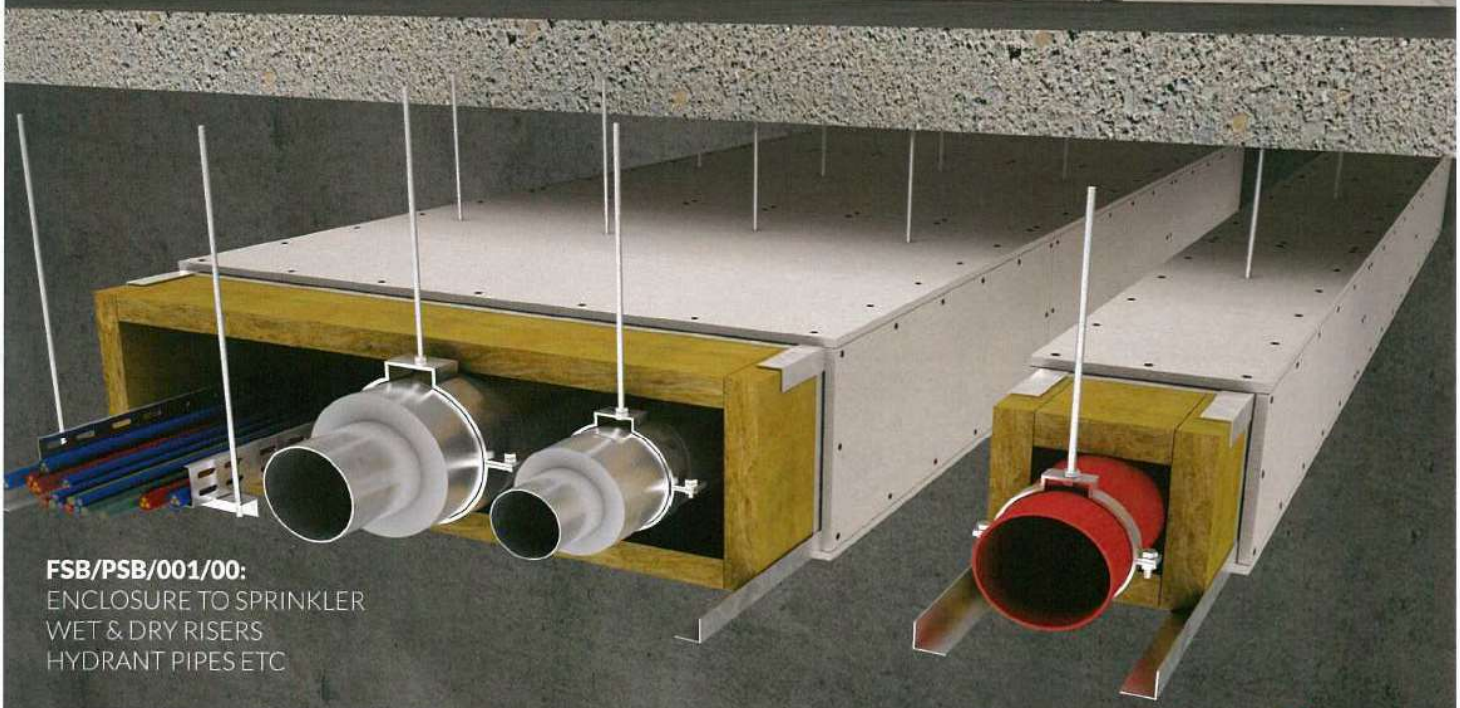
Calcium Silicate Board

100% Asbestos Free

FIRE RATED DUCT SYSTEM

BRITISH STANDARD 476 PART 24:1987

VENTILATION DUCT
SMOKE EXTRACT DUCT
KITCHEN EXHAUST DUCT



FSB/PSB/001/00:
ENCLOSURE TO SPRINKLER
WET & DRY RISERS
HYDRANT PIPES ETC

BRITISH STANDARD 476 PART 20:
ENCLOSURE TO GENERAL BUILDING
SERVICES: CABLES, SANITARY PIPE
CHILLED WATER PIPE AND ETC

Lafire
ASIA


Ng Teng Hong General Hospital

Changi Airport Terminal 4


Downtown Line 3


Singapore Sports Hub

Introduction

Lafire Asia Pte Ltd, understand the importance of fire protection systems in a building. Besides saving lives in the event of fire outbreak, INGEBORG® also reduces the rising cost of insurance policies, protects capital investments and reduces the possible risk to the fire fighters.

The level of fire protection required and the effectiveness of the protective measures are of major concerns in today modern building design. To address this, after years of research and development, we have developed INGEBORG®. It is a high performance fire rated calcium silicate board serves as one of the alternatives to other fire rated board protection system in the building industry; it is a more superior system as compared to the spray system and the intumescents system available in the market.

INGEBORG® is made mainly from pure quartz powder, lime, Portland cement, cellulose and selected mineral additives, formed into wet sheets and cured through advance technology of autoclave process under high temperature and pressure for more than 10 hours to produce the final product.

It is a non combustible, engineered calcium silicate board. There is no asbestos, brucite and meerschaum added in the production of INGEBORG®.

The Best Protection for your Fire Safety and Property

Advantages/Benefits:

- High fire proof temperature of up to 1200°C.
- It is fire proof, antifungal and antiseptic and resistant to mould growth
- Low density, light structure, easy to use.
- Resistant to insect, rodent attack and Chemical corrosion.
- High strength, The lowest strength(parallel) is ≥5.5Mpa, while the highest (across) is ≥7Mpa.
- Good thermal insulation property, decreases the cost of indoor energy consumption and improve building energy efficiency.
- Dry operation, quick and convenient installation.
- Smooth surface finish. Suitable for paint works.
- Non combustible, comply to BS476: Part 4
- Highly stable mechanical & fire resistance properties against moisture.
- Easy to store and transport, packed in palletized form.
- No special maintenance required after installation.

Application

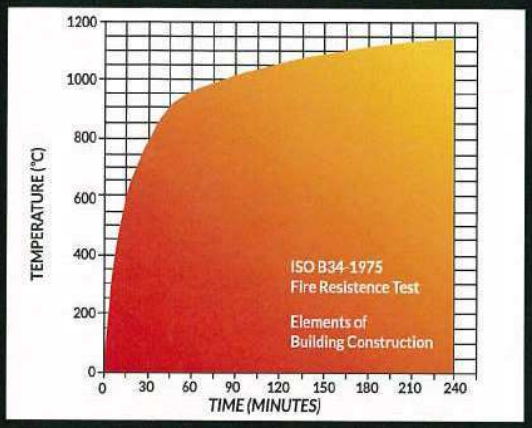
INGEBORG®. Calcium silicate board is recommended for applications where conforming to the high standard fire regulator by the relevant Building and Fire Authority is required. Such applications would include :

- Fire Rated Duct System: eg. Ventilation, Smoke extract and kitchen exhaust ducting system.
- Protection to fire fighting system: Sprinkler, Rising mains, Hydrant etc.
- Protection to Building Services: Cables, Sanitary Pipes, Chilled Water pipes etc.

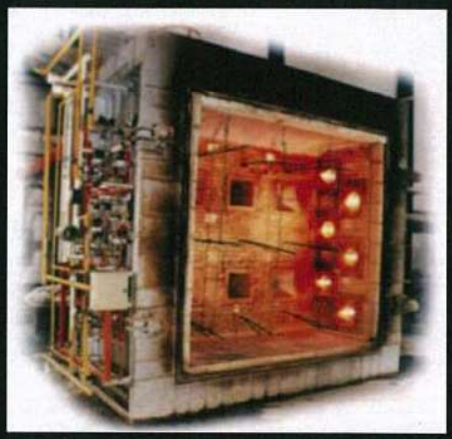
Fire Resistance Test Standard

Fire resistance test standard on ventilation ducts are carried out in accordance with BS 476: Part 24 (ISO 6944). This standard specifies a method of vertical and horizontal ventilation ducts under standardized fire conditions. The general purpose of the test is to measure the ability of a representative duct or duct assembly to resist the spread of fire from one compartment to another. The test is conducted without the involvement of fire dampers. It is applicable to vertical and horizontal ducts, with or without branches, taking into account of joints, air supply and exhaust openings, as well as suspension devices and penetration seals. The performance of the duct assembly is measured in terms of its ability to withstand exposure to high temperatures by setting criteria of which the resistance to collapse thus ensuring the duct is able to fulfill its intended function (STABILITY), the fire containment (INTEGRITY) and the thermal transmittance (INSULATION) functions can be judged. The standard temperature/time fire exposure specified in BS 476: Part 20 is representative of only one possible fire exposure condition at the fully developed fire stage. The method of test does not quantify the behavior of a duct for a precise period of time in a real fire situation but can be used directly to show compliance with fire resistance requirements in regulations or other safety specifications, enables comparisons to be made between constructions.

The specimen which is subjected to the fire test must be designed and constructed to be representative of how it would be constructed on site. Two ducts are tested, one with fire outside only(Duct A) and one with fire inside(Duct B).



BS 476 PART 20 STANDARD TIME / TEMPERATURE



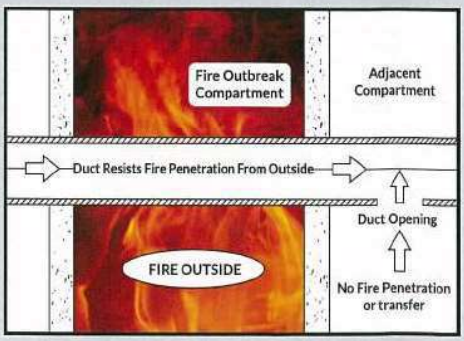
TEST FURNACE

Performance Criteria: BS476 Part 24: 1987 (ISO6944)

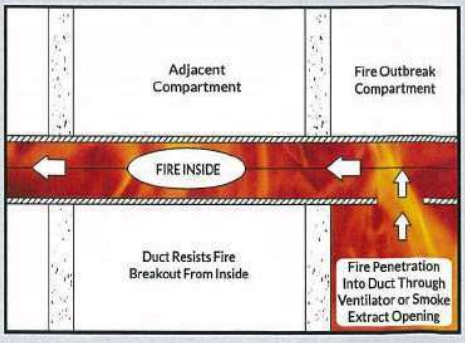
STABILITY:
Stability failure shall be deemed to have occurred in Duct 'A' within the furnace and in Duct 'A' and Duct 'B' outside the furnace when the duct collapses in such a manner that the duct no longer fulfils its intended function. Included in this ability of a smoke extract duct must be retained at least 75% of its cross-sectional area.

INTEGRITY:
The presence and formation in the test specimen of cracks, holes or other openings outside the furnace through which the flames or hot gases can pass shall constitute integrity failure.

INSULATION:
Insulation failure shall be deemed to have occurred when temperature rise above initial ambient temperature in the laboratory on the unexposed surface of the test specimen outside the furnace exceeds either:
a) 140°C as an average value.
b) 180°C as a maximum value read by any surface thermocouple.

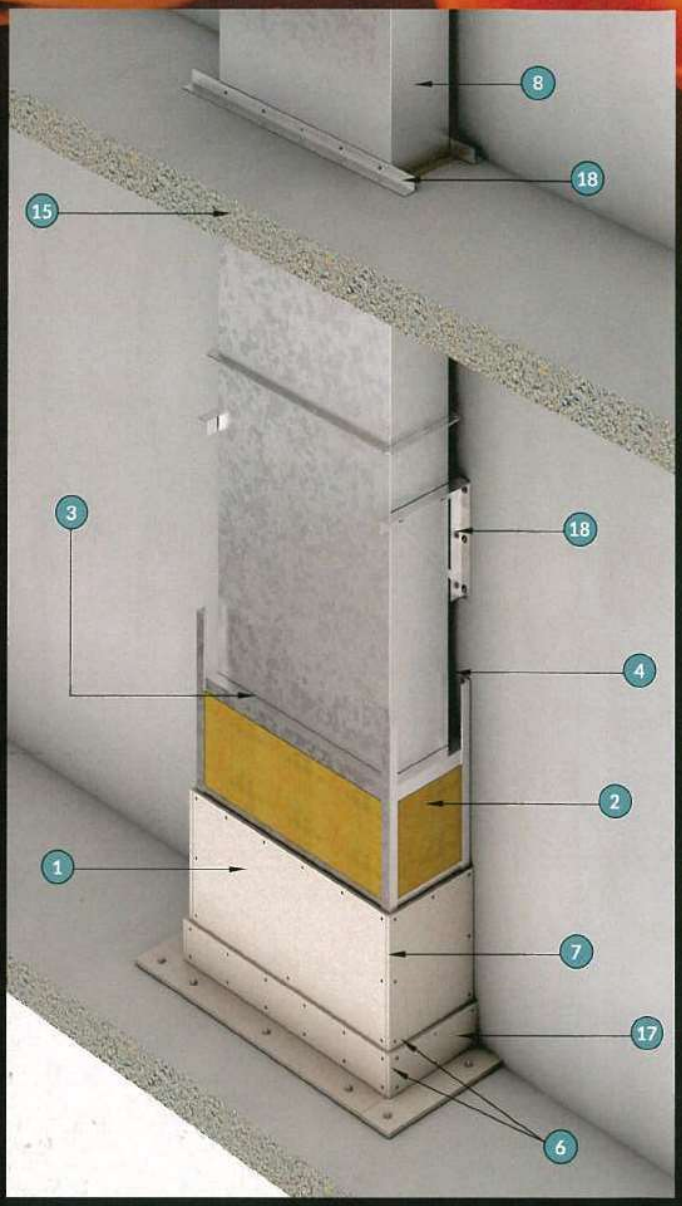


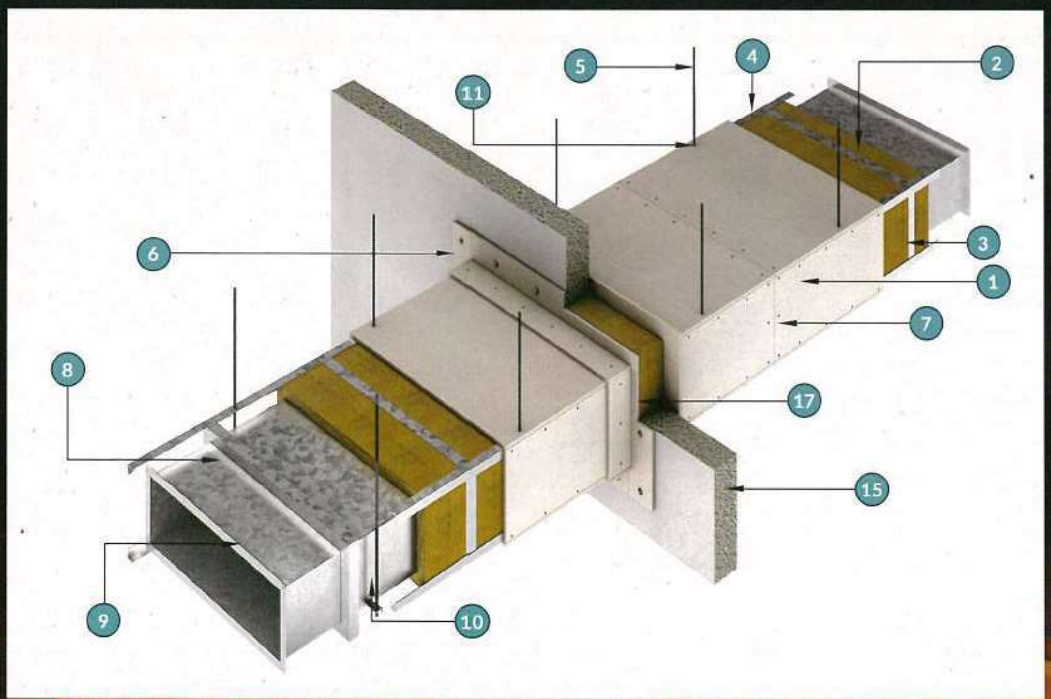
Duct : A

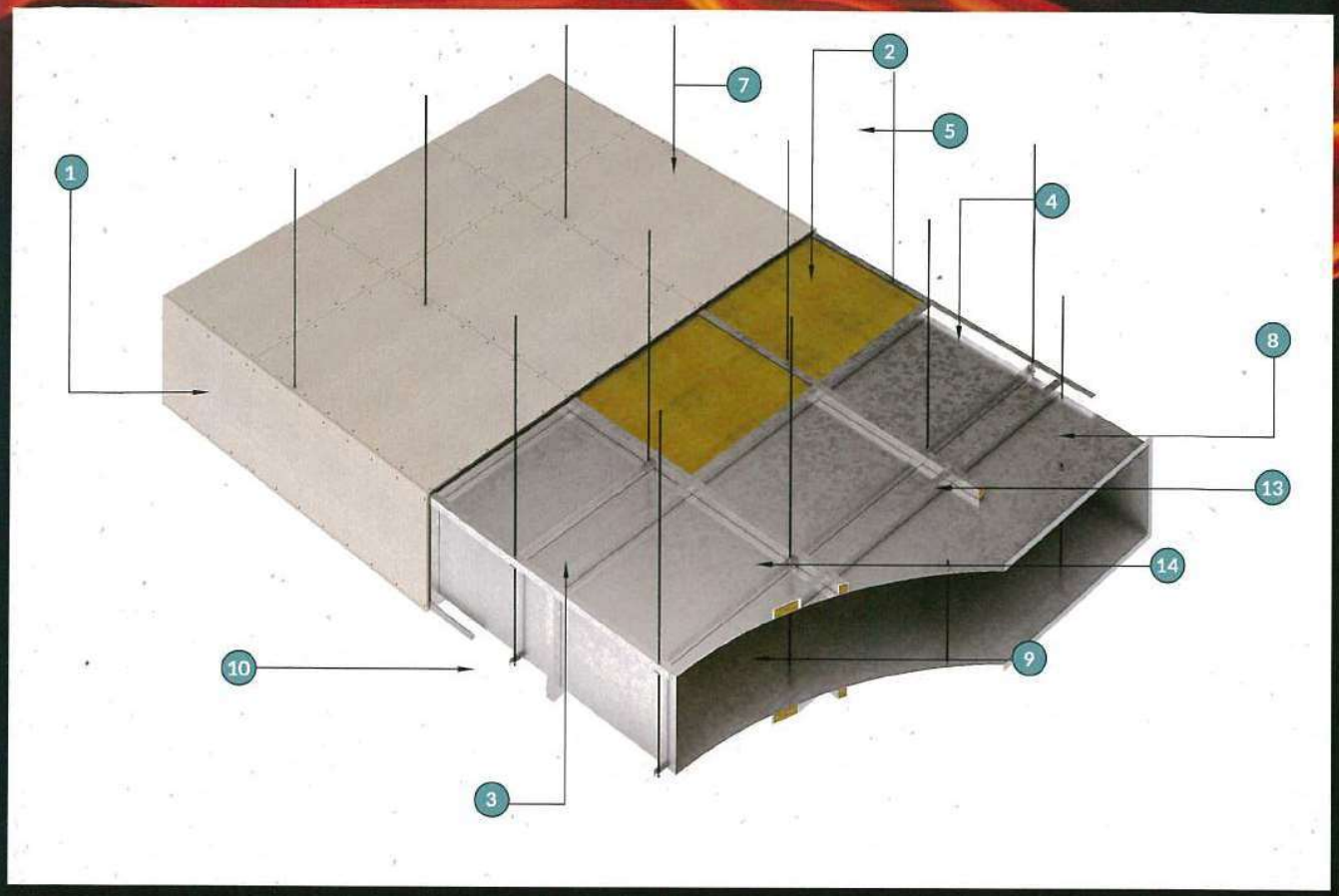


Duct : B

No	DESCRIPTION
1	Calcium Silicate Board 2hrs : 12mm & 15mm thick 4hrs : 24mm thick
2	Mineral Wool 2hrs : 50mm x 100kg/m^2 4hrs : 2 Layers 50mm x 100kg/m^2
3	Steel Channel filled with 100kg/m^2 mineral wool 2hrs : C-50x50x50x0.6mm(thick) 4hrs : C-100x75x100x0.6mm(thick)
4	Continous L-angle 40x40x0.6mm thick
5	Steel threaded rod spaced with according to permissible tensile stress not exceeding : 2hrs : ≤10N/mm^2 4hrs : ≤6N/mm^2
6	Calcium Silicate Board L-Collar at wall penetration minimum 100mm wide: 2hrs : 12mm & 15mm thick 4hrs : 24mm
7	M4 Self Tapping Screw
8	Sheet Metal Duct
9	Tie Rod Stiffener
10	Bracket Support for Duct
11	Filled up with Approved Fire Rated Sealant
12	Divider Calcium Silicate Board 2hrs : 12mm & 15mm thick 4hrs : 24mm thick
13	Longitudinal channel for duct width > 2300mm or unsupport board area greater than 1.5m^2 whichever applicable
14	Thread rod connector
15	Masonry Wall/Floor
16	Expanding Anchor with peneration in the concrete of 50mm depth
17	M6 Anchor
18	Vertical Duct Support



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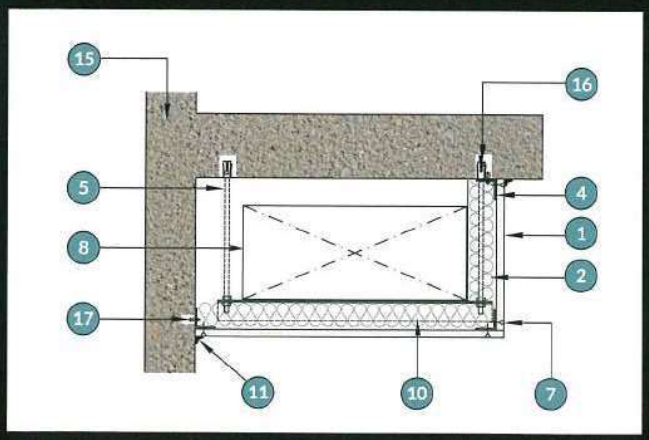
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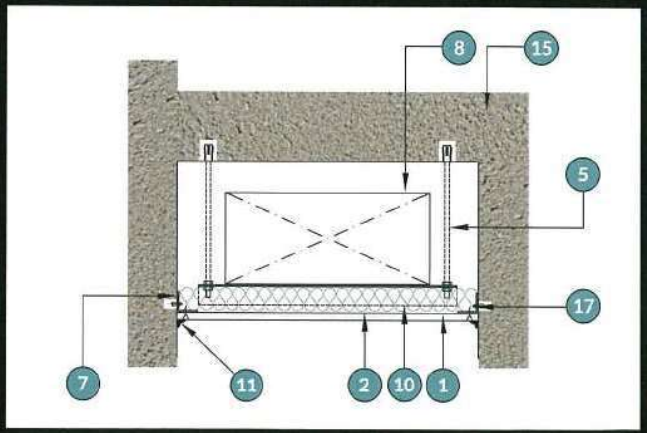
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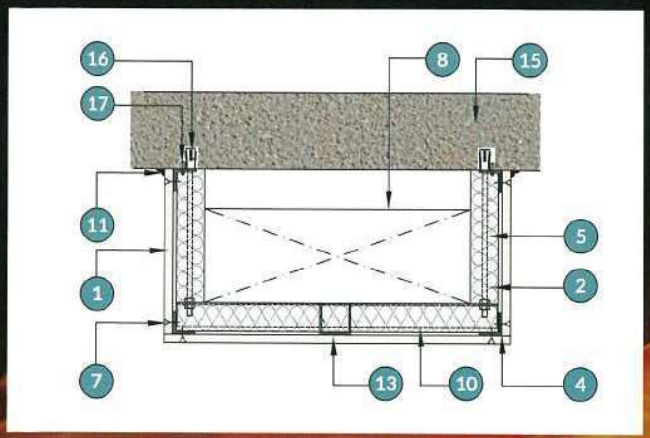
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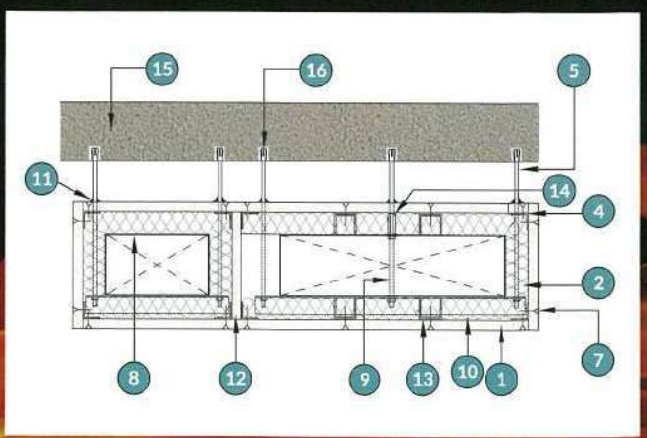
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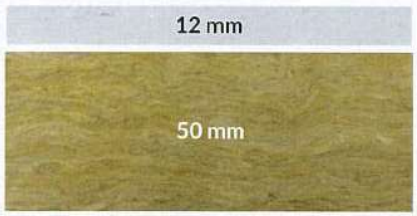
Fire Protection System Tested in Accordance with BS 476: PART 24: 1987 ISO 6944: 1985

Exposed to internal and external fire rating up to 4 hours
Horizontal and vertical duct size up to 10, 000 mm wide x 3,000 mm high
1, 2, 3 and 4 sided construction
Mechanical ventilation system
Smoke extraction system
Kitchen exhaust system
Dual ventilation / smoke extract system

IB -120D 12 mm

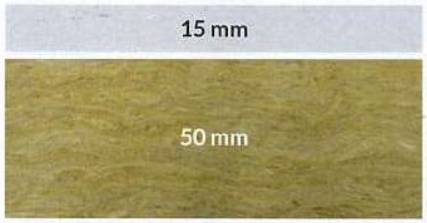
2 HOUR RATING
Stability - 120 minutes
Integrity - 120 minutes
Insulation - 120 minutes

Lighter
Less Interference
Save Space In Logistics
Ease Of Handling And Non – Deformimg
Faster To Install – Improve Productivity



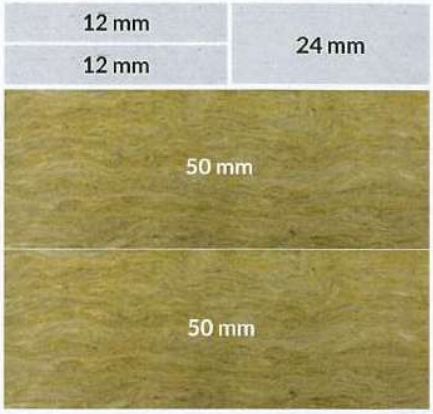
IB - 120 15 mm

2 HOUR RATING
Stability - 120 minutes
Integrity - 120 minutes
Insulation - 120 minutes

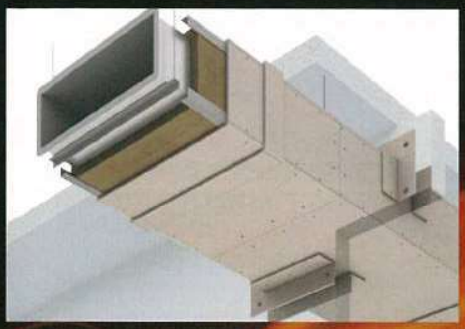


IB - 240 2X12 mm OR IB - 240 24 mm

4 HOUR RATING
Stability - 240 minutes
Integrity - 240 minutes
Insulation - 240 minutes



Installation In Progress



Project Reference


Capitol Building


Duo Residences


Downtown Line 3


Singapore Sports Hub


Suntec City - Major A & A Works


UIC Building

Project Name	M&E Consultant
Downtown Line C973D	LTA
Changi Rail Facility	LTA
Ng Teng Fong General Hospital	Parsons Brinckerhoff Pte Ltd
NUS S5	Parsons Brinckerhoff Pte Ltd
Changi General Hospital (A&A)	Parsons Brinckerhoff Pte Ltd
Suntec City - Major A & A Works	Aecom Singapore Pte Ltd
Bedok Mixed Development	Aecom Singapore Pte Ltd
Tampines Town Hub	Aecom Singapore Pte Ltd
Miltonia Residences	J.Roger Preston (S) Pte Ltd
Westgate Jurong	J.Roger Preston (S) Pte Ltd
Bugis +	J.Roger Preston (S) Pte Ltd
NUS OED	J.Roger Preston (S) Pte Ltd
Shaw Centre (A&A Work)	J.Roger Preston (S) Pte Ltd
Chinese Swimming Club	J.Roger Preston (S) Pte Ltd
ADM Cocoa @ 342 Jalan Boon Lay	J.Roger Preston (S) Pte Ltd
Centrepoint	Squire Mech Pte Ltd
Chinatown Point	Squire Mech Pte Ltd
Ngee Ann Polytechnic	Squire Mech Pte Ltd
Bugis Junction	Squire Mech Pte Ltd
Kallang Sports Hub	Squire Mech Pte Ltd
CHIJMES @ Victoria Street	United Project Consultants Pte Ltd
Harvest @ Woodlands	GIMS Consultant Pte Ltd
Rivervale Plaza @ Sengkang	United Projects Consultants Pte Ltd
Waterfront Key condominium	Belmacs Pte Ltd
Pioneer Road North	William Ng Consultants Pte Ltd
Bedok Walk (East Village)	William Ng Consultants Pte Ltd
Rocku @ Bugis +	Chan Han Chong Consulting Engineers
Alexis Condo	Elead Associates Private
Residential @ Lor 26 & 28 Geylang	Elead Associates Private


National Art Gallery Singapore

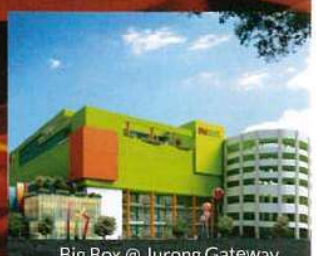

White Sands


Joo Koon NTUC


National Centre for Infection Disease


Integrated Complex Bedok


Tampines Town Hub

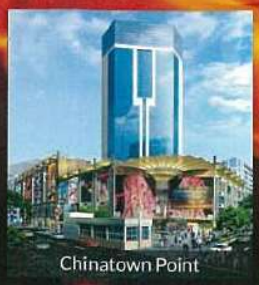

Big Box @ Jurong Gateway

Project Name	M&E Consultant
Wisma	Meinhardt (S) Pte Ltd
Quayside Hotel	Meinhardt (S) Pte Ltd
Assisi Hospice	Meinhardt (S) Pte Ltd
Capitol Development Singapore	Arup Singapore Pte Ltd
National Art Gallery	CPG Consultant Pte Ltd
SGH PATHOLOGY	CPG Consultant Pte Ltd
228 CHANGI ROAD	CPG Consultant Pte Ltd
IBP @ Changi	Beca Carter Pte Ltd
Seletar Mall	Beca Carter Pte Ltd
Connexion @ Farrer Park	Beca Carter Pte Ltd
Bencoolen Hotel	CMP Consultant
Data Centre @ 15 Pioneer Walk	Daco Group Pte Ltd
Hougang Point	Rankie & Hill (S) Pte Ltd
Big Box @ Jurong Gateway	Rankie & Hill (S) Pte Ltd
CCRC @ Vista Exchange	Mott Macdonald (S) Pte Ltd
72 Boat Quay	Unipac Consulting Engineers LLP
IMM @ Jurong East A & A	Alpha Consulting Engineers Pte Ltd
Breadtalk @ Paya Lebar	Alpha Consulting Engineers Pte Ltd
PoMo @ Selegie	Alpha Consulting Engineers Pte Ltd
Alexandra Hotel cum commercial	United Project Consultants Pte Ltd
Tree House	United Project Consultants Pte Ltd
Zhongshan Park Hotel	United Project Consultants Pte Ltd

Ingeborg®

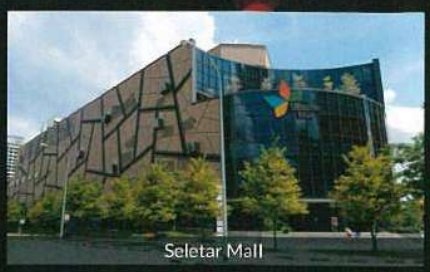
Calcium Silicate Board


Genting Hotel @ Jurong Gateway


Chinatown Point


Ng Teng Fong General Hospital


Westgate Jurong


Seletar Mall

General Technical Properties	
Dimension	2440mm x 1220mm
Thickness	9,12,15,24 (mm)
Density	950kg/m³
Thermal conductivity (k) at mean temperture	0.175 (@20°C) W/m°k
Moisture content	≤10%
Moisture movement	≤0.07%
Bending Strength	
Longitudinal	≥7.0Mpa
Transverse	≥5.5Mpa
Tested and Comply	
British Standard 5234 Part 2 : 1992 ISO TR 1896 : 1991	Comply with clauses 3.8.7(b) and 3.8.9(a) of Singapore Fire Code: 2013 for dry wall construction
Fire Performance	
Material Class (BS476: Part 4 : 1989)	Non Combustible
Fire propagation of product (BS 476: Part 6: 1989)	Index (I)
Surface spread of flame (BS 476: Part 7: 1997)	Class 1
Manufacturing Tolerance	
Thickness tolerance of standard boards	±0.5mm
Length x width of standard boards	±2mm
Edge Straightness	≤2mm/m
Thickness uneven	≤6%
SAFETY CAPACITY	
Asbestos	100% Asbestos Free Safe for application
Radioactive	<1Ra Safe for application <1r Safe for application

Sole Distributor:

The information listed in the brochure are the tested figures under prescriptive conditions. It has no legal buildings, and the information such as the technical indices are subject to the purchase contract. Lafire Asia Pte Ltd will update the index and applications of the products according to the technological progresses, providing our users the latest information. Please contact us for any enquiry.

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Ingeborg Fire Rated Duct System Project Reference

Project Name
I HOTEL @ 320 HAVELOCK ROAD
20 SENOKO DRIVE
KALLANG WAY ON LOT 6203PT MK 24 KALLANG
LOYANG POINT@ PASIR RIS
BIRITISH-AMERTCAN TOBACCO @ 15 SENOKO LOOP
MIRCON @ WOODLAND
51, SELETAR AEROSPACE VIEW
MSC BUILDING @ 71 TAGORE LANE
WEST WOOD EC @ WESTWOOD AVE
MACPHERSAN PRIMARY SCHOOL @ 2 Mattar Rd
MK20 @ 205 JALAN KAYU
KAMPONG UBI INDUSTRIAL ESTATE
THE CAPRICORN AT 1 SCIENCE PARK ROAD
9008 & 9012 TAMPINES STREET 93 TAMPINES INDUSTRIAL PARK A
GENERAL INDUSTRIAL BUILDING
9 SENTUL CRES
304 UBI ROAD
19 TAGORE LANE
FOUR LEAVES @ 37 CHIN BEE CRESCENT
SANMINA BUILDING @ 2 CHAI CHEE DRIVE
ONETEN PAYA LEBAR
KEPPEL BAY TOWER
WISMAH ATRIA LEVEL 4
AMK SEAGATE TECHOLOGY
MAX BRENNER @ VIVOCITY #01-116
131 MOULMEIN ROAD
PIZZA OUTLET AT BLK 801 TAMPINES AVENUE 4 #01-279
TRISTAR COMPLEX AT 970 GEYLANG ROAD
BLK 21 TOH YI DRIVE / TOH YI ROAD
Blk 750b Chai Chee Rd
601 ANG MO KIO AVENUE 4
WOODLANDS N5 C21
SENGKANG N3 C20
HDB BLK 6 @ CHANGI VILLAGE ROAD
PUNGGOL HDB
CHANGI AIRPORT TERMINAL 4 - MSPC
SAFRA PUNGGOL CLUB
SELETAR AEROSPACE CRESCENT
GRABRIE WARD AT 2nd STOREY
HILLVIEW AVENUE (BUKIT BATOK)
BALESTIER ROAD (NOVENA)
77 TANJONG PAGAR ROAD
NATIONAL CENTRE FOR INFECTIOUS DISEASE
ASSISI HOSPICE

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