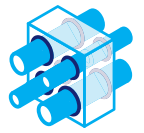# Promat

Structural fire protection

Compartmentation

Fire stopping

Promat Passive Fire Protection Systems for Modular Integrated Construction

Technical manual

etex *inspiring ways of living*

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Introduction

As building costs rise, the construction sector has shifted to new materials and technologies that enhance design capabilities and productivity without compromising quality and performance. Traditional onsite building has made way for lightweight, pre-fabricated and/or prefabricated construction or sometime called Modular Integrated Construction (MiC), where sections of a building are manufactured offsite.

Pre-fabricated lightweight construction brings speed, efficiency and quality – key factors for an industry constantly looking at improving its productivity performance.

In **Hong Kong**, real estate demand and the availability and relative costs of skilled construction labor is making the Modular Integrated Construction (MiC) model attractive to developers. This industry shift has implications for fire safety as the nature of buildings comprised of pre-fabricated lightweight systems is such that the types of fire protection used for standard heavyweight buildings may not be suitable. Careful specification is required to ensure lightweight building systems deliver the required levels of fire protection in real fire conditions.

We take a closer look at fire-resistant elements, such as steel protection, walls, floors, ceilings and fire stopping, in Modular Integrated Construction and discuss the key considerations when specifying and detailing for effective fire protection.

Assessing the Fire Risk in Lightweight Buildings

In modern lightweight construction, the preferred building materials and products include engineered timber or lightweight steel framing, structural insulated panels, pre-fabricated products and even polystyrene building products. Such materials generally have a lower embodied energy rating and may result in lower overall lifecycle energy use when compared to traditional heavier materials such as concrete and masonry. In many cases, using these materials reduces construction costs and offers equivalent or even superior performance under non-fire conditions.

However, the reduced mass of lightweight construction means that the structural integrity of such buildings may weaken faster than conventional structures during a real life fire event.

Studies have confirmed that, under controlled conditions, lightweight wood structures burn and lose integrity faster than their heavyweight counterparts. The faster a building's structural integrity is compromised during a fire event, the less time there is for occupants to escape and the more dangerous it is for fire fighters to put out the fire.

While there is less combustible material in a lightweight steel building, fire can spread quickly and cause structural collapse if the structure has not been properly detailed. During a fire, there is a risk of complete failure of the structural lightweight cold-formed steel studs, joists, and trusses. For such buildings, extra care has to be taken to provide additional forms of fire protection such as sprinkler systems and fire-resistant membranes.

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Specifying for Effective Passive Fire Protection Systems

Given some of potential fire safety issues in Modular Integrated Construction (MiC), a holistic design approach to fire protection is needed. An effective fire protection system includes both passive and active fire safety elements. Passive fire safety measures, such as fire-rated barriers, walls, and structural floors, prevent fire spread and progress. Active measures, such as sprinkler systems, take action to extinguish a fire.

A key aspect of controlling fire within a Modular Integrated Construction (MiC) is breaking the continuity of combustible material in the line of fire range. The fire resistance provided by walls, floor and ceiling systems is critical in stopping a fire from spreading quickly throughout a building.

Unfortunately, the fire detailing of these building elements is often not considered until late in the process. The connections between modules and between different building elements, especially where they are using different types of lightweight systems, are particularly vulnerable. Furthermore, most fire-rated systems are considered in isolation and how they interact with systems from another manufacturer is not adequately considered during the design phase.

Below are some considerations when specifying and detailing wall, floor and ceiling systems for effective passive fire protection.

Design Consideration to Hong Kong Building Regulation

Fire Resistance Rating (FRR)

Fire Resistance Rating (FRR), and continuity of fire resistance, are important design considerations for lightweight wall, floor and ceiling systems. FRR is a rating that assesses the ability of a building element to resist a fully-developed flame in relation to three criteria: structural adequacy, integrity and insulation.

In Hong Kong, fire performance requirements for each building element are found in the **Code of Practice for Fire Safety in Buildings 2011** provides the minimum FRR for internal walls, floors and ceilings for various types of construction.

When specifying wall, floor and/or ceiling systems, designers and specifiers should confirm the product has been fully tested and its FRR meets the **Code of Practice for Fire Safety in Buildings 2011** requirements for the specific building type. The testing regime for determining FRR is found in **BS476: Part 21 to 24** Fire-resistance tests for elements of construction.

Fire stopping

Steel protection

Fire resistant walls

Fire resistant floors and ceilings
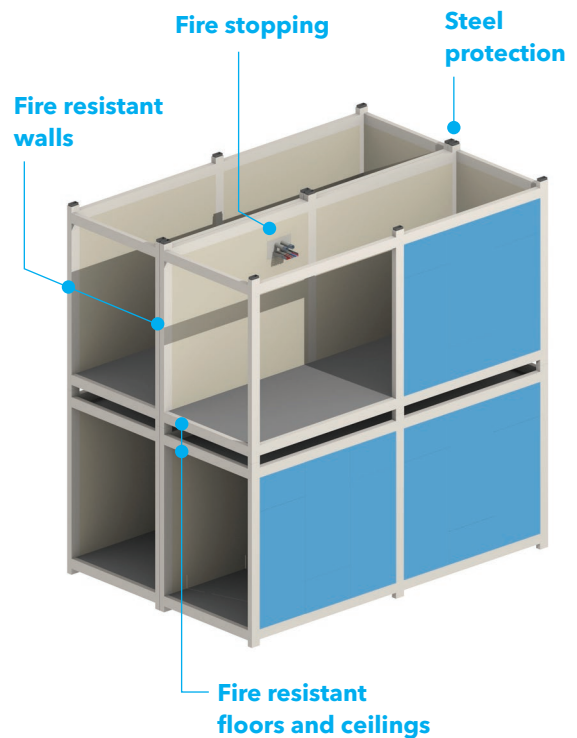
Steel Protection

During a fire event, steel loses its loadbearing capacity at a temperature in excess of 550°C. In light of this, structural steel protection needs to be specified to preserve the stability of the building during a fire. There are several common steel protection methods, including:

→ vermiculite spray;

→ intumescent coatings; and

→ board encasement systems.

Promatized Solution

Promat can provide different fire protection material such as PROMATECT® fire resistant board, PROMAT® CAFCO® fire paint and fire spray for protecting steelwork, depending on systems from 60/0/0 to 240/0/0 to BS 476: Part 21. For details, please contact Promat Technical Department.


Walls

Every FRR-rated wall system has very specific installation procedures that must be followed, including requirements relating to fasteners, fastener spacing and fire-related sealants around perimeters. Compliance and warranty issues may arise when mixing and matching one manufacturer's system to another. While each individual system will have been specifically tested and certified, they will likely not have been fire tested as a whole.

Fire separation generally needs to be continuous across any wall system. Detailing requirements apply where floor, ceiling and roof systems intersect with a separating wall. These intersections can be vulnerable during a fire. For example, voids and cavities between the top of wall and underside of roofing can provide passage for fire. Caulking and service penetrations also have to be carefully considered to ensure there is no open path for fire and smoke. Fire doors and fire-resistant glazing should be specified to provide continuous protection.

Promatized solutions

We can offer PROMATECT® steel stud partition or PROMATECT® solid type partition from 60/60 to 240/240 to BS 476: Part 22. For details, please contact our Promat Technical Department.
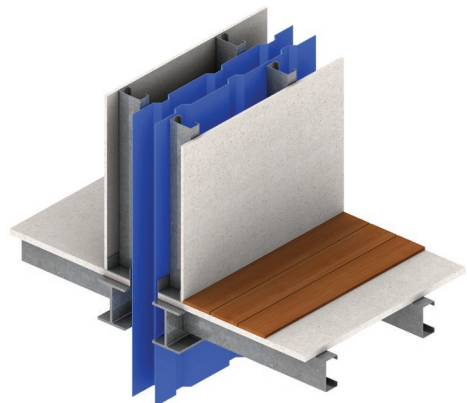
Floors and Ceilings

Lightweight ceiling and floor systems are often asymmetrical and use a non fire-rated product as the floor, such as timber or a similar material. Accordingly, designers and specifiers need to identify systems that have been tested for fire resistance above and below.

As with internal walls, designers and specifiers must be cognisant of the differing fire performance requirements for loadbearing and non-loadbearing ceiling and floor systems and the impact of dimensional changes during extreme temperatures. Caulking, service penetrations, light fittings and access panels have to be carefully designed so as to not provide an open path for fire and smoke.

Promatized Solutions
Promat can offer PROMATECT® ceiling system for 60/60 to 240/240 to BS 476: Part 22. For services enclosure, our Promat system can provide fire protection to services from 60/60 to 240/240 to BS 476: Part 20. For details, please consult with our Technical Department .
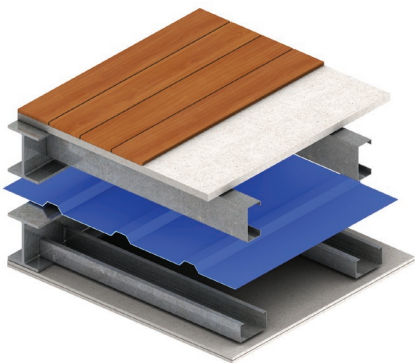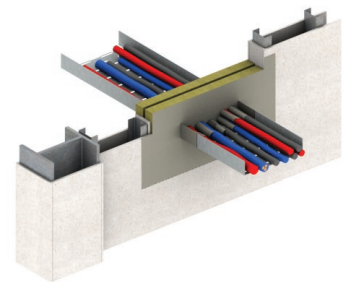

Fire-stopping

Firestops or fire-stopping material refers to a form of passive fire protection that provides a seal around openings and joints in a fire-rated wall, floor or ceiling assembly or to seal gaps around fire-resisting constructions. Firestops prevent unprotected horizontal and vertical penetrations from creating a path for fire and smoke to spread throughout a building.

Designers and specifiers should be aware of the various fire-stopping solutions available on the market, including:

→ intumescents;
→ cementitious mortars;
→ firestop pillows;
→ fire-resistant collars for pipes;
→ high density mineral wool;
→ sealants; and
→ wraps.

Promatized solutions
Promat can offer a numbers of fire stopping solutions to BS 476: Part 20 from 60/0 to 240/0 such as fire sealant, fire collar, fire batt, fire pillow, movement joint strip, electrical junction seal etc. for gaps or holes in fire compartment so as to maintain the integrity of the compartment wall or floor as a whole. For more details, please contact our Technical Department.

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Promat – A Complete Fire Protection Solution

With the industry shifting to Modular Integrated Construction (MiC), more designers are seeking information on code compliant and constructible detailing for key structural elements. With the proliferation of fire-rated wall, ceiling and floor systems in the Hong Kong market, there is a risk that mix-and-matched systems do not deliver the expected level of fire resistance.

It is easier to use a single manufacturer in order to have all the systems working together holistically to meet local demanding fire performance requirements. Promat is that manufacturer.

Promat International (Asia Pacific) Ltd is a subsidiary of the Etex Group of companies, a global organisation with presence in more than 42 countries across all continents. Promat offers fire protection systems for all major elements of a building, including steel protection, fire-rated walls, fire-rated ceilings and floors, penetration seals and external weatherproofing.

Promat systems are lightweight and often have a smaller footprint which has added benefits for the modular and prefabrication industry. The company also offers solutions for service penetrations and cavity barriers.

Promat's expert team can help designers throughout the design process to make sure the fire protection solution complies with all the legal requirements and is ready to protect people, buildings and assets.

All Promat products and systems have been tested at nationally-accredited laboratories around the world to BS476: Part 20 to 24. With the widest range of fire-resistant products and passive fire protection systems in Hong Kong, Promat offers many market-leading solutions, including:

→ PROMATECT® Fire Resistant board for ceiling System;

→ PROMATECT® Fire Resistant Board for lightweight partition system;

→ PROMASEAL® – Fire Collars, Penetration Seals and jointing protection;

→ CAFCO® Spray and Intumescent paint products for steel protection; and

→ PROMATECT® Fire Resistant board for steel protection system.

Promat

Our extensive project references for Modular Integrated Construction (MiC) in worldwide:

As a global player design and supply of fire rated material for MiC, the following are extensive project references in prefabricated unit or the Modular Integrated Construction. One of philosophy of our company to make the environment more fire safe by sharing our knowledges and please feel free to come to us if you are interested in any the following.

Country	Project Name	Product	Fire Rated System
Hong Kong	Innocell, Science Park, Tai Po	PROMATECT®-H board	Steel protection
Hong Kong	Pat Heung Quarantine Centre, New Territories	PROMATECT®-H board	Steel protection
Hong Kong	Penny Bay Quarantine Centres Phase 1 to Phase 4, Lantau Island	PROMATECT®-H board PROMASEAL® Sealant Cafco® SPRAYFILM WB3	Steel protection, ceiling and fire stopping
Hong Kong	Lee Yue Mun Quarantine Centre	PROMATECT®-H board	Steel protection, partition and ceiling
Hong Kong	Lok Sin Tong Housing Scheme at Junction of Sung Wong Toi Road, To Kwa Wan Road	PROMATECT®-H board PROMASEAL® Sealant	Steel protection, ceiling and fire stopping
Hong Kong	United Court Transitional Housing Project, Kau Hui Road, Tung Tau, Yuen Long	PROMATECT®-H board PROMASEAL® Sealant	Steel protection and fire stopping
China	Huawei Data Centre at Langfang, Hebei	PROMATECT®-H board	Partition
China	Huawei Cloud Data Centre (Phase 2) at Ulanqab, Inner Mongolia	PROMATECT®-H board	Partition
China	Huawei Mobile Data Centre at Shaanxi	PROMATECT®-H board	Partition
China	Huawei Project at Yanta District, Shaanxi	PROMATECT®-H board	Partition
Australia	Pallara Secondary School Brisbane – 3 storey modular school building	PROMATECT®-100, Promat SYSTEMPANEL™ 2G, Fire Collars & PROMASEAL®-A Sealant	Walls & steel protection, floor/ceiling system and fire stopping
Australia	Bellbird School in Brisbane	PROMATECT®-100, Promat SYSTEMPANEL™ 2G, Fire Collars & PROMASEAL®-A Sealant	Walls & steel protection, floor/ceiling system and fire stopping
Australia	Mayfields Switchroom – Australia Wide	PROMATECT®-100	Portable fire rated switchgear rooms for Mine Sites, Transport etc (Walls and ceilings)
Australia	Mental Health Expansion – Northern Hospital, Melbourne	Promat SYSTEMPANEL™ 2G, PROMATECT®-100, PROMATECT®-250, PROMASEAL® Fire Stopping Range	Floor/Ceiling, Structural Steel Protection and Fire Stopping
Australia	Mental Health Expansion – Sunshine Hospital, Melbourne	Promat SYSTEMPANEL™ 2G, PROMATECT®-100, PROMATECT®-250, PROMASEAL® Fire Stopping Range	Floor/Ceiling, Structural Steel Protection and Fire Stopping
Dubai	Huawei Data Centre at Dubai	PROMATECT®-H board	Steel protection and partition
Singapore	Wisteria, Yishun Ring Road	PROMATECT®-H board	Steel protection, ceiling and partition
Singapore	Transerve Cabins, 39C Pandan Road	PROMATECT®-H board	Partition and ceiling
Singapore	NTUC Health Nursing Home, Tampines Avenue 2	PROMATECT®-H board PROMASEAL® Fire Stopping	Steel protection, ceiling, partition and fire stopping
Singapore	Tampines North Primary School, Tampines Street 61	PROMATECT®-H board	Ceiling, partition and steel protection
Singapore	AWWA Home and Day Activity Centre, Pasir Ris Street 21	PROMATECT®-H board	Ceiling, partition and steel protection
Singapore	A&A to Compressor Shed, 2 Seraya Rise Jurong Island	PROMATECT®-H board	Ceiling
Singapore	Changi Connect Hall 9 at Expo	PROMATECT®-H board PROMASEAL® IBS	Steel protection, ceiling and fire stopping
Singapore	Kallang Polytechnic, Serangoon Road	PROMATECT®-H board	Ceiling

Penny Bay Quarantine Centres

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→ The technical data provided in this publication is based on mean values prevalent at time of publication and is thus subject to fluctuation. It should not be regarded as a guarantee to system performance.

→ All data contained herein conforms to and frequently surpasses generally accepted fire protection standards recognised by most professional fire science practitioners and regulatory authorities worldwide. The same general principle is equally applicable to all Promat products and systems. Promat has access to a considerable body of test authentication data and this can be provided on a complimentary basis upon request. It should be noted however that this publication replaces all previous editions in its entirety.

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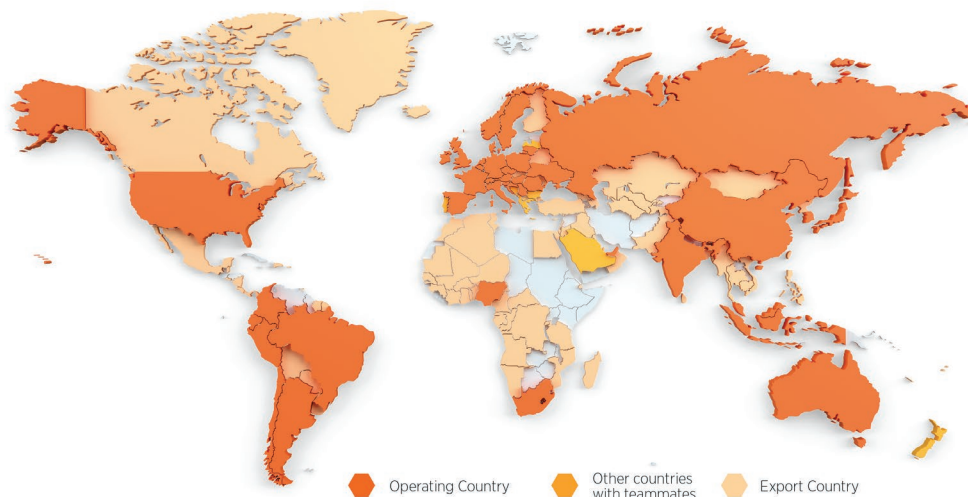
About Etex

Etex is an international building materials specialist; the company wants to inspire people around the world to build living spaces that are ever more safe, sustainable, smart and beautiful. Founded since 1905 and headquartered in Belgium, Etex currently operates more than 140 sites including plants, quarries and offices in 45 countries with over 13,500 employees globally.

Etex fosters a collaborative and caring culture, a pioneering spirit and a passion to always do better for its customers. Building on its experience and global market needs, the company strives to improve its customers quality of living with ever more effective lightweight solutions.

Its three R&D centres support four global sales divisions:

• Building Performance: Leader in plasterboards and fibre cement boards, and the global reference in passive fire protection solutions for the residential and commercial segments.
• Exteriors: Provider of innovative, durable, high performance and beautiful fibre cement exterior materials for architectural, residential and agricultural projects.
• Industry: Front runner of engineering expertise to drive the future of high performance thermal and acoustic insulation as well as passive fire protection in the industrial, aerospace and energy sectors.
• New Ways: New Ways offers high-tech, lightweight, factory-assembled panel and modular solutions based on timber and steel framing.

Etex is Inspiring Ways of Living, for more information, please visit our website: www.etexgroup.com

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