

# Promat Technology Trends

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All the top Promat solutions,  
read them first here in PTT...



• from Marina Bay Sands® page 6



• from Hong Kong Academy  
for Performing Arts page 5



• from a fighting ship of  
the Royal Malaysian Navy page 3



Upgrading refinery facilities to meet future demands for lighter fuel production, more than 100,000m<sup>2</sup> of 35mm thick Cafco FENDOLITE® MII integrated fire protection coating systems are employed at the Hyundai Oilbank HOU#2 project near Daesan, South Korea.

## Cafco FENDOLITE® MII Wins Prestigious Hyundai Oilbank Project

**H**yundai Oilbank Co Ltd is South Korea's fourth largest oil refining and marketing company. The company is extensively engaged in petroleum refining and production of petrochemicals high in demand by business, industry and individual consumers.

The company's products include gasoline, diesel, kerosene, liquefied petroleum gas, bunker, benzene, paraxylene, low sulphur waxy residue and high octane aviation fuel.

Hyundai Oilbank routinely invests a great deal of time and money in the development and use of sustained marketing strategies for their products and services in a crowded, highly competitive market place.

Aware of modern fuel trends, Hyundai Oilbank began work some years ago to upgrade their refining facilities at its plant near Daesan. The general aim of the exercise is to reposition the refinery to produce a portfolio of lighter fuels.

The total cost of the upgrade is expected to cost in the vicinity of KRW2.1 trillion or about €1.25/US\$1.60 billion. After completion of the upgrade, the refinery's daily capacity will rise to 120,000 barrels from 68,000 barrels, its current production yield.

The major focus of this upgrading project — in convenient, progressive workflow stages — spotlights gas processing plants, gas field and ancillary developments.

This Hyundai Oilbank HOU#2 project includes beams and columns, fire hazardous equipment and pipe rack support at the main refinery.

As a matter of interest, the engineering consultant for the upgrade project — Shaw Energy and Chemical Group, USA — was predisposed to Cafco FENDOLITE® MII.

It was perceived as a good technical and business fit for the entire refinery, thanks largely to more than three decades of worldwide experience in international petrochemical industries.

The spray applied vermiculite and Portland cement based Cafco FENDOLITE® MII product — producing a monolithic coating able to withstand thermal shock typical of high intensity hydrocarbon fires — makes it a frequent first choice by industry professionals.

Cafco FENDOLITE® MII is highly durable and will not crack or spall under mechanical impact. Its low density also reduces dead load significantly for petrochemical application.



Column protected with smooth sprayed Cafco FENDOLITE® MII

Continued on next page

# Available from Promat offices now !



An information packed brochure that demonstrates the versatility of lightweight PROMATECT® 40, utilising innovative PromaX® technology. See how this cost effective product is equally at home in roof sheathing, floor and staircase decking, acoustic underlays, partitions (including open plan office partitions), backing board and lost formwork, bases for kitchen, laboratory and industrial work surfaces, ceilings, shelving and in portable and prefabricated buildings.

This brochure summarises everything from specific technical performance data to workability, installation, decoration and finishing, and environmental, health and safety concerns!



This colourful technical guide outlines the requirements for optimal fire resistance performance of partitions and ceilings while also providing the superior performance characteristics of PROMATECT® 50, Promat's new technology Cement Bound Matrix architectural board.

The clear and easy-to-understand sectional drawings show the functional usability of PROMATECT® 50 while clearly demonstrating the ease of installation of this versatile, robust building component. The technical data is essential reading for everyone responsible for the construction and installation of fire resistant partitions and ceilings in modern buildings.

The outcry over recent oil spills once again focuses international attention on the petrochemical industry and the impact of environmental issues on the dynamics of the global economy.

The environment has understandably and quite rightly become a political hot potato with far-reaching effects. To make matters even more sensitive, despite continuing research into viable alternatives, we rely increasingly on non-renewable fuel sources for most of our energy needs. The international petroleum industry is clearly as strategically important as it is vulnerable, and in constant need of optimum levels of quality protection.

Fortunately, Promat has forged strong relationships — largely through its Cafco brand of sprayed fire protection — with leading petrochemical companies, particularly in recent years. In this milestone fifth issue of Promat Technology Trends, we are proud to feature a couple of relevant and very interesting spray protection stories.

The first looks at Cafco FENDOLITE® MII applications at Hyundai Oil Bank refinery in South Korea while the second reviews a recent refurbishment project at the Hong Kong Academy for Performing Arts.

This edition of PTT also reports as usual on other dimensions of Green, starting with our brilliant PROMATECT® 40 in home construction and also looking at different fire resistant solutions employed at Norwegian owned Renewable Energy Corporation's new solar panel factory, both in Singapore.

## Signs of the times?

Making headlines in PTT and with high rollers around the globe is the Little Red Dot's eagerly anticipated and recently opened Marina Bay Sands® integrated resort, apparently already attracting 25,000 visitors per day! Unknown to all but a few is the resort's high level of Promat fire protection, assuring international standards of safety and security should never be just a roll of the dice...and you can read all about in the following pages!

We also get an insight into the application Promat marine products PROMAGUARD® and PROMAGLAF® systems on board one of the modern vessels of the Royal Malaysian Navy. From Australia there's a well-illustrated review of PROMALIGHT® in a cement plant and in our Know How department we provide a brief comparative overview of protective sprays solutions and fire protection board systems.

Last but by no means least, I am delighted to note here that this PTT (along with subsequent editions and other company publications) is printed on Forest Stewardship Council (FSC) graded recycled paper. This is just one of many socially responsible steps Promat takes in its continuing dedication to sustainable business.

This fine issue of PTT continues the tradition of providing timely, educational and technically superior information to all our multicultural, multilingual business friends. It also demonstrates once again that our professional ethos of sustained quality, innovation, hard work and diversification continues to energise Promat market leadership...and these are always good signs of the times for all of us to follow!

**Erik D. van Diffelen**  
Managing Director  
Promat Asia Pacific companies  
Second half 2010

## THE HYUNDAI OILBANK HOU#2 PROJECT IN SOUTH KOREA

Continued from front page

Structures protected with Cafco FENDOLITE® MII in this upgrade project have been fully tested and assessed for 240 minute fire resistance in accordance with BS 476: Part 20: 1987 Appendix D (Hydrocarbon Curve) in the UK and UL 1709 in the USA.

The mainly steel superstructure and much of the hardware equipment involved were fabricated by Daelim Industries Co and various Hyundai E&C contractors from South Korea. These companies erected the mega structures and heavy refinery processing equipment positioned throughout the complex, as well as the maze of pipelines which are a dominant visual and essential component of every modern refinery.

Engineering and structural challenges included ensuring adequate load strength, providing sufficient structural support and precise placement and protection of the actual steel support sections.

Clearly these needed adequate fire protection and the project owner/client, in collaboration with the engineering consultant, insisted on and approved the application of Cafco FENDOLITE® MII.

The excellent track record of Cafco FENDOLITE® MII in the petrochemical industry and the availability of jet fire and blast test certification gave the brand a high profile presence.

<b>Project owner</b> Hyundai Oilbank Co Ltd, South Korea	<b>Installers</b> Metro E&C, Woo Sung
<b>Engineer</b> Shaw Energy & Chemical Group, USA	<b>Distributor</b> Shin Sung Trading Co Ltd
<b>Contractors</b> Daelim Industries Co, Hyundai E&C	<b>Main product</b> Cafco FENDOLITE® MII

The location of the factory of Promat associate Shin Sung was strategically important for production and prompt delivery. The strict QA/QC controls and the fact that the Shin Sung factory is UL approved lent considerable weight to many of the decision making processes.

The numerous meetings and a high level of assurances to the owners and contractors convincingly demonstrated Promat responsibility on the integrated issues of safety.

Cafco FENDOLITE® MII applied in this very challenging and demanding petrochem project amounted to more than 100,000m<sup>2</sup> of 35mm thickness, installed as a completely integrated fire protective system using CAFCO® PSK 101 as a keycoat sealer, onto a mesh and towelled finished.

The application period runs from March 2010 to March 2011 and the specification requirements are for 120 minutes of fire resistance level according to UL 1709.

The refinery's overall upgrade project is expected to be fully operational by mid 2011. □

Photos at far left, top to bottom: Cafco FENDOLITE® MII applied throughout refinery equipment and structures of the Hyundai Oilbank HOU#2 project for 120 minute fire resistance.

Photo at left: Bagging of Cafco FENDOLITE® MII under strict QA/QC facilities at UL approved Shin Sung factory.



# Royal Malaysian Navy Ship Now Protected by PROMAGUARD® & PROMAGLAF® WB

Builder / Owner  
Royal Malaysian Navy

Project  
KD Mahawangsa ship

Distributor  
Omahams Corporation Sdn Bhd

Installer  
Kaymarine Sdn Bhd

Products  
PROMAGUARD®,  
PROMAGLAF® WB

passageways and escape routes, also the issues with smoke inhalation, which all too often results in fatalities.

The regulations of the fire protection, fire detection and fire extinction for all ships has been included in SOLAS, International Convention for the Safety of Life at Sea. It has been developed in detail within the world governing body the International Maritime Organization (IMO), It includes detailed fire safety provisions for all ships and specific measures for passenger ships, cargo ships and tankers.

At the Boustead Naval Shipyard in Lumut, Perak, the Promat A60 system for both bulkhead and deckhead protection — utilising PROMAGUARD® and PROMAGLAF® WB systems — is currently being fitted on board a Royal Malaysian Navy vessel.

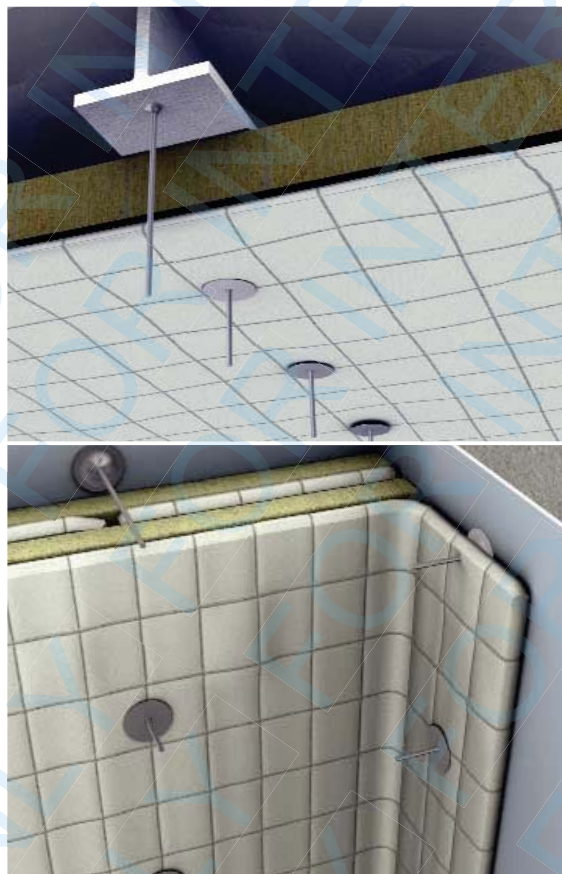
The steel bulkhead protection consists of layers of 10 mm thick PROMAGUARD® and 20mm thick PROMAGLAF® WB. On the steel deckhead, 10mm thick PROMAGUARD® is installed. The PROMAGUARD® layer will be coated with a suitable coating to provide additional resistance to water and oil splashes.

Both systems provide a fire performance to meet the A60 criteria.

Promat has arranged further training sessions to ensure that installation of Promat products on board follows precise and exact naval and international specifications.

Promat continues to provide technical support through frequent site visits to ensure installation follows prescribed international and site specific methodology.

In fact, site visits have been arranged to assist the installer overcome difficulties with existing structural complexities, cables and services unique to complex naval vessels. □



Left: Examples of PROMAGUARD® flexible microporous insulation blankets for the fire protection of the structural steel bulkhead and deckhead with PROMAGLAF® WB fibre thermal acoustic insulation layer installed behind the blankets for the bulkhead structure.

Below: The Royal Malaysian Navy's 4,300 ton multi-role support ship based at Lumut Naval Base in Perak, Malaysia. It was named in honor of Merong Mahawangsa, the founder of Kedah state in peninsular Malaysia. "KD" means "Kapal Diraja" or "His Majesty's Ship" in the Malay language.

Even in an age of sophisticated ship building technology and innovative navigation equipment, calamitous accidents involving enormous environmental, human and financial implications remain an area of major concern for all maritime industries.

For example, fire accidents have the potential not only for unimaginable human and economic impact but also significant damage to ecosystems through long term marine pollution. Indeed, fire is perhaps the most dreaded of all and uncontrolled fire raging on board a seagoing vessel is certainly every sailor's worst nightmare. Numerous active and passive systems, as well as many human resources, are directed at preventing fire from happening.

Many fire incidents on ships have been reported to the whole world. In most of the cases, fire will cause a lot of damage to the structure of ship, whilst the smoke will cause severe problems to the people on board; problems such as obscuring

## Best Defence For The Protection of Structural Steel: Cementitious Spray Protection Or Fire Resistant Boards?

The various design and build processes involved in the construction of most modern structures integrate numerous professional disciplines. These in turn are usually aimed at creating functional, multipurpose value chains and optimum return on investment of usable space in the built environment.

Not surprisingly, a number of difficult questions punctuate this complex "foundation-to-occupation" scenario, many of which are directly related to vitally important safety and security issues.

Fortunately, the provision of many safety solutions is predicated and led by abundant scientific, empirical evidence balanced against prevalent regulatory authority requirements and building code legislation. Increasingly, these important decisions are also directly influenced by recognised and acceptable international building benchmarks and fire code standards.

Taken together, the situation creates clear cut and relatively straight forward decisions in most areas of concern, effectively balancing cost and functionality with acceptable, deliverable performance in a win-win situation for developers, designers and end users.

There are, however, many instances where the line between the efficacy and usability of, let's say, spray fire protection over fire resistant boards for structural steel, for example, is not so clearly defined.

Indeed, it can be extremely difficult to assess on an analytical and pragmatic basis simply because the design, location and size of the structure lies at the borderline of a particular cost/function/ performance differential and various scales of economies.

Companies like Promat, a worldwide leader in the business of innovative fire science technologies — thanks to its 50 years of experience and a continuous and ongoing research and development programme — have developed a set of tools aimed at making the decision making process considerably less problematic.

These scientific models — from well established fire curves right through to abundant fire test data — are well known to most professionals with an interest in the fire performance of various structural components and competitively priced fire safety solutions.

Promat has now taken these principles a step further and developed specific tools to assist professionals make the correct decision in recommending correct fire protection spray, board or paint solutions in difficult, non standard situations.

These new tools look at and extrapolate the critical factors related to general, regulatory, scientific and proven principles of effective fire protection.

These include the fundamentals of compartmentation, fire curve requirements, design parameters, risk management considerations...right through to the application and installation of applicable Promat's board and sprayed fire resistant solutions.

The flowcharts are available now as downloadable files from the [http://www.promat-ap.com/ptt/ptt\\_jul-dec2010.htm](http://www.promat-ap.com/ptt/ptt_jul-dec2010.htm) webpage. □

## Predicting The Future, Green Label Award Winner PROMATECT® 40 Now Used in Construction of Singapore's "Green Home"

Leading the way via the implementation of tried and tested architectural principles in tandem with sustainable building systems, the fourth PROMATECT® 40 "green home" nears completion in Jalan Peradun, Singapore.

Located in the suburban northeast of the crowded island republic, this two level + one attic, 350m<sup>2</sup> semi-detached duplex house utilises a light gauge but robust high tensile steel frame as a basic design and structural engineering component.

In many ways, this comfortable but not extravagantly designed family home exemplifies how a "green home" can be constructed to provide maximum benefits. For example, no expensive, noisy and potentially polluting piling is required because the lightweight structure sits on a floating foundation.

The lightweight high tensile steel frame used throughout the building – up to and including the roof structure – provides convenient and plentiful cavities for easy concealment of services, pipes and electrical conduits.

PROMATECT® 40 Cement Bound Matrix board has been employed for maximum effect in this residential property's dry construction for floors, walls and ceilings throughout. The system can also be used to run services (see photos at right).

This negated the need for slow and bothersome wet trades such as wet concreting and masonry work. As a result, no waste water is discharged into local waterways, many of which now lead from a relatively efficient drainage system into central catchment reservoirs, a precious resource in water scarce Singapore. Dust and particulate matter pollution generated throughout the construction process is thus minimised.

All in all, these supreme advantages – enhanced by speedy and easy installation, minimum noise and air pollution, and minimum negative impact on the environment – bring distinct benefits to every builder and any neighbourhood in the densely populated island nation, and elsewhere.

As a matter of interest, PROMATECT® 40 is also employed in other Singapore residential construction sites. These include Guok Ave, Colchester Road and Taman Bedok. □



**Location**  
Jalan Peradun, Singapore

**Builder**  
Awell Pte Ltd

**Architect**  
Archideas Pte Ltd

**Installer**  
Qwik Built Pte Ltd

## Promat's Leading Fire Science Systems Help Protect Important New Investments in Singapore's Renewable Energy Industry

As global trading and financial systems struggle to come to terms with hesitant economic recovery, long-term concerns about climate change and business sustainability increase their ability to create headline news worldwide. Fortunately it is not all doom and gloom. Indeed, some industries attract record levels of financial participation.

Renewable energy is one such industry. It innovates new products and services while consistently attracting healthy new investments. For example, in financial 2009 alone it reportedly attracted equity participation in excess of US\$100 billion (more than €79 billion) worldwide.

As a company with its own sophisticated EHS strategies and an international reputation for international fire science technology leadership to protect and expand, Promat clearly understands many of the issues involved.

The Renewable Energy Corporation (REC) is recognised as a world leader in the renewable energy business. It employs more than 3,000 personnel and has state-of-the-art factories in its home base of Norway and in the United States of America.

In 2009 REC generated revenues equivalent to €1.2 (approximately US\$1.5) billion. This is a business Promat understands well and can communicate with at a similar level of technical sophistication.

One of REC's most recent initiatives, a big new plant valued at S\$6.3 (€3.62 or US\$4.57) billion, is nearing completion on a greenfield project site in the western part of Singapore.

Considered amongst the largest of its type in the world, Phase 1 of the new REC Singapore plant will produce wafers, cells and modules used in the generation of solar power. It is expected to commence operations in late 2010.

Naturally, REC has extremely high standards and they turned to Promat to meet the rigorous fire requirements of the Singapore plant, including:

- PROMATECT®-H 240 minute fire resistant partitions
- PROMATECT®-H cladding steel ducts up to a total of 2,750m<sup>2</sup> for 120-240 minutes of fire resistance
- PROMASTOP® UniCollar® □



Vertical steel duct clad with PROMATECT®-H for 120 minute fire resistance

**Owner**  
Renewable Energy Corporation ASA, Singapore

**Location / Project**  
Phase 1, new REC plant

**Consultant**  
United Project Consultants Pte Ltd

**Package builder/contractor**  
M+W Zander Pte Ltd

**Sub contractor / Installer**  
Pyrotech Pte Ltd

**Main product**  
PROMATECT®-H

# Tough, Durable Cafco SPRAYFILM® WB3 Supports Hong Kong's Performing Arts

The Hong Kong Academy for Performing Arts (HKAPA) is a popular focal point of the local arts scene. Located in the Wanchai district and a mere stone's throw away from Victoria Harbour, it is well known on the international circuit, frequently visited by locals and tourists alike. Opened in 1984, the HKAPA building is sandwiched between the constantly busy Harcourt/Harbour Road and another of the island's high density arterial traffic routes, Gloucester Road. Like all structures in Hong Kong, the building is exposed to the erosive forces and high intensity pressures of relentless, unmitigated urbanity.

These include dense populations of man and his machines, inclement Mother Nature (e.g. exceptional humidity and a prolonged late summer typhoon season) and increasingly unhealthy urban airborne pollution, much of which is swept into this boisterous, crowded city by prevailing winds from unrestrained industry in the nearby Pearl River delta.

No easy task by any means, the HKAPA has to deal with this pot pourri of ambient forces while adequately fulfilling its mission as a modern centre of creative arts. In recent times, the open air amphitheatre on the west side of the main HKAPA building has been transformed into an enclosed multi-purpose auditorium. Basically a routine refurbishment project, it substantially upgrades the comfort and usability of a popular venue seriously challenged by nearby traffic noise, air pollution and bad weather.

For these and other reasons — including ease of application and speed of installation — Cafco SPRAYFILM® WB3 has been chosen to protect the steel beam and truss system of the new auditorium. This brings the structural system up to a 120 minute fire resistance level in line with the local building code regulations required of such a site.

More than eight hundred 25kg plastic pails of Cafco SPRAYFILM® WB3 were used. □

**Location**  
West side of HKAPA

**Architect**  
Oval Partnership Ltd

**Structural consultant**  
BMMK, Ratcliffe,  
Hoare & Co Ltd

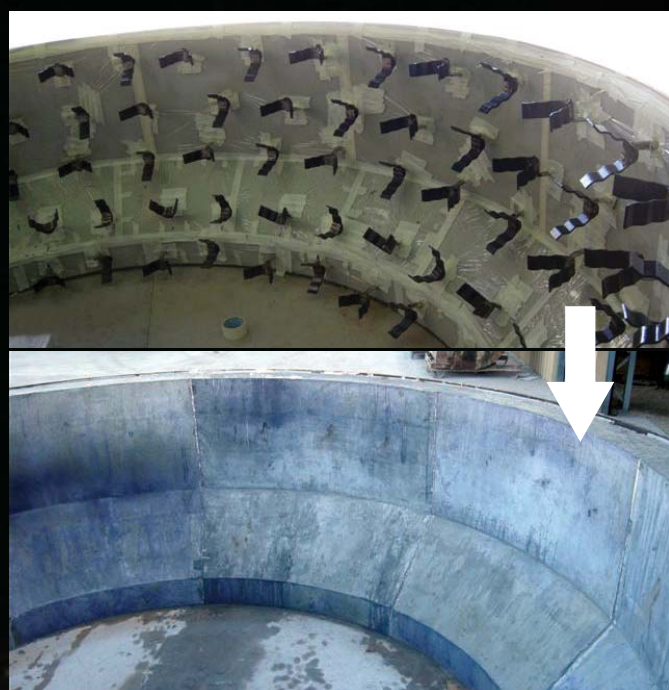
**Contractor**  
Goldfield N&W  
Construction Co Ltd

**Applicator**  
Gregory Engineering  
Co Ltd

**Product**  
Cafco  
SPRAYFILM® WB3



# PROMALIGHT® Creates Benefits for Australian Cement Plant



Cement making requires temperatures to 1450°C. Exhaust gases must be scrubbed clean. For example, the primary function of the tertiary air duct (TAD) connected to the kiln hood is to recover exhaust hot air gases from the cement clinker cooler.

These gases contain some abrasive clinker particulate, propelled through the TAD at velocities up to 30m per second, eroding the refractory lining in the duct.

Particularly susceptible are bends, dampers and expansion joints. Scheduled shutdowns for routine maintenance are essential.

In one recent refractory and insulation programme of Blue Circle Southern Cement (BCSC), three TAD expansion joints required replacement at its Berrima plant but the new design left precious little space for standard insulation board or insulating castable behind the selected hot face refractory castable.

Hot face low cement castables have high abrasion, alkali and cement clinker resistance but due to final precast density and silicon carbide content, they also represent high thermal heat conductivity through to the steel casing.

BCSC's refractory contractor Andreco Hurl Refractory Services, working with the HTI division of Promat Australia, recommended PROMALIGHT® 320 board and 10mm thick PROMALIGHT® 240FX nanoporous panel for their extremely low thermal conductivity, high thermal resistance and simplicity of installation.

After the 253MA anchors were welded to the steel casings of TAD expansion joints, the PROMALIGHT® boards and panels were glued to the casing using alumina silicate glue. The joints were then taped and covered with plastic to stop migration of water from within the precast refractory materials.

Each refractory concrete panel section was cast using steel formwork, allowing up to 24 hour curing time prior to formwork removal.

The TAD expansion joint steel casings were then installed and a controlled preheat schedule was incorporated using gas burners for the recommended refractory dry out procedure.

When the Berrima plant returned to operational status, the TAD expansion joints were checked with thermal heat measuring equipment to calculate steel casing temperatures.

The cold face temperatures of around 60°C exceeded expectations in thermal efficiencies and also created measurable energy savings. □

**Owner**  
Blue Circle Southern Cement,  
Australia

**Location**  
Berrima, NSW

**Contractor**  
Andreco Hurl Refractory  
Services Pty Ltd

**Products**  
PROMALIGHT® 320,  
PROMALIGHT® 240FX

# Singapore's Iconic Marina Bay Sands® Integrated Resort Well Protected by Promat Fire Science Systems

The Marina Bay Sands® integrated resort officially opened on 23 June 2010. It features a world class casino, a luxury 2,500 room hotel, a museum, numerous fine dining experiences and 90,000m<sup>2</sup> of shop-till-you-drop retail therapy.

The resort already attracts around 25,000 visitors daily and is expected to eventually generate S\$1 billion in profits annually. It is slated to be fully operational by end 2010.

For Singapore's economy, Marina Bay Sands® resort will likely contribute an additional S\$2.7 billion to GDP coffers — about 0.8% of the total — by 2015. It will employ 10,000 people while creating 20,000 jobs in other industries.

The resort was built at an estimated S\$8 (US\$5.8/€4.5) billion, including the cost of 40 acres of prime real estate. The unique three hotel-tower structure is interconnected by a one hectare rooftop sky terrace — the Sands® Sky Park — starring the world's longest elevated swimming pool. This has a 144.75m infinity edge and is 297.18m above ground level. Some 181,818kg of stainless steel was used in its construction.

## FIRE RESISTANT CONSTRUCTION & FIRE STOPPING APPLICATION

In addition to many fire resistant board systems in different areas of the resort (see table below), Promat also scored well with fire stopping products. To satisfy the fire performance of fire resistant dry wall systems, for example, more than 28,000 pieces of PROMASEAL® Switchbox Intumescent were installed in hotel rooms. □



From left to right: Recess switchboxes protected with PROMASEAL® Switchbox Intumescent; PROMATECT®-H general services for up to 240 minutes of fire resistance; VICUCLAD® enclosure for 120 minutes of riser pipe protection.

Application	Project	Product	Area	Installer
Structural steel	Meetings, Incentives, Conferencing & Exhibitions (MICE)	PROMATECT®-H	942m <sup>2</sup>	Dong Jian (S) Pte Ltd
	Theatre			C & L Interbuild Pte Ltd
Partitions	District Cooling Centre (DCS)	PROMATECT®-H	7,580m <sup>2</sup>	Plasterceil Industries Pte Ltd
	Hotel Tower 3			Shanghai Chong Kee Furniture & Construction Pte Ltd
	Hotel 55M Towers			Beijing Jangho Curtain Wall Co., Ltd Singapore Branch
	Casino			Yau Lee Construction (S) Pte Ltd YDL Construction Pte Ltd KM Interior Works Pte Ltd
	Escalator pit, Casino B2M			Great Harvest Construction (S) Pte Ltd
	Linkbridge, Tower 2			Sunray Woodcraft Construction Pte Ltd
Ceilings	Switch room, DCS	PROMATECT®-H	1,211m <sup>2</sup>	Plasterceil Industries Pte Ltd
	Linkbridge, Tower 2			Sunray Woodcraft Construction Pte Ltd
	Hotel towers			KM Interior Works Pte Ltd
	North podium, Casino			Corus Building System Pte Ltd
	South podium, MICE			C & L Interbuild Pte Ltd
Ducts	DCS	PROMATECT®-H	67,357m <sup>2</sup>	CSL Building Services Engineering Pte Ltd
	Podium, transformer room			Shinyo Corporation
	Hotel towers			Kin Xin Engineering Pte Ltd
	North podium			Shinyo Corporation
General building services	DCS	PROMATECT®-H	11,838m <sup>2</sup>	Kandenko Co. Ltd Choon Insulation Services
	Link chamber			Kandenko Co. Ltd
	Tower 1			
	Tower 3			
	Hotel towers			
	Casino			
Pipe protection	MICE	VICUCLAD®	3,715m <sup>2</sup>	Deluge Fire Protection (SEA) Pte Ltd Bestofire & Thermal Pte Ltd
	Theatre			
	Link chamber			
	Hotel towers			
Pipe protection	South podium, MICE	VICUCLAD®	3,715m <sup>2</sup>	Deluge Fire Protection (SEA) Pte Ltd Bestofire & Thermal Pte Ltd
	Podium external work			
	North podium			
	Hotel towers			

Location / Project	Architect
Marina Bay Sands® Singapore	Aedas Pte Ltd
Designer	Engineers
Moshe Safdie, USA	ARUP, Parsons Brinkerhoff (MEP), USA

### DISCLAIMER

The Promat International Asia Pacific Network spans the region with innovative proactive fire protection products, systems and solutions: Australia, China, Hong Kong, India, Malaysia and Singapore, with distributors in Brunei, Indonesia, Japan, New Zealand, Philippines, South Korea, Taiwan, Thailand and Vietnam.

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