OTHER**HIGHLIGHTS**

Delhi Metro Rail's headquarters employs Promat fire resistant smoke extraction duct system **THE NEXT PAGE**

Environmental effects of construction industry linked to planning and management policies **THE CENTREFOLD**

Review of "proactive" fire protection solutions for China's booming electronics factories **PAGE 6**

YOUR **COMPLIMENTARY** COPY

# PROACTIVE FIRE TRENDS

• AUSTRALIA • CHINA • HONG KONG • INDIA • MALAYSIA • SINGAPORE • VIETNAM

KDN PP 10803/5/2007 (UNTUK AHLI SAHAJA) MICA (P) 122/07/2006

PROACTIVE FIRE TECHNOLOGIES HALF-YEARLY

ISSUE NO.19 FOR **JANUARY – JUNE 2007** Vol.10 No.1

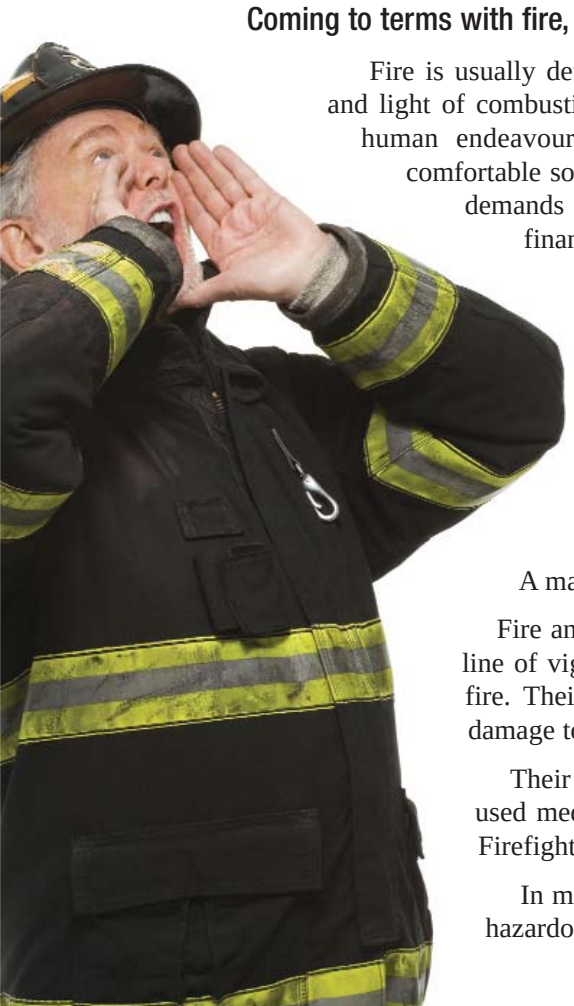
Emphasis must always be on prevention and suppression –

# Environmental pollution should be factored into firefighting strategies

Fire science professionals dedicate their lives to fire technologies and, directly or indirectly, help to save lives and property. Individually and collectively, a great deal of time and huge amounts of human and financial resources are invested in better understanding fire and learning how to control it as scientifically as possible. At the end of the day, however, defeating fire is a matter of man battling against the forces of nature.

Despite the best of intentions, success is not always guaranteed. The world is a complex place and nature still has to be factored into most equations where much is balanced somewhat precariously on the principles of cause and effect. Even the heroic act of fighting a fire has some rather unexpected downstream effects.

## Coming to terms with fire, an endless struggle



Fire is usually defined as the active principle of burning, characterised by the heat and light of combustion. For thousands of years it has been a much studied aspect of human endeavour. Ever since man discovered that fire provides not just the comfortable solace of a hardworking servant but the unreasonable, uncontrollable demands of a rapacious master, fire has been the subject of considerable financial and scientific investment.

It has taken mankind a very long time indeed to come to terms with fire. These days we are more sophisticated in the way we approach it. We employ much science and technology but there are still times when the control of the heat and flames of fire is an unrewarding struggle with some rather unusual downstream effects.

## Mix fire with water, add a dash of heroics

A man with a bucket of water at the right time can work wonders.

Fire and rescue personnel are usually well-trained professionals, the front line of vigilance and defence in the unrelenting fight against uncontrollable fire. Their main role is to extinguish fire, save human life and minimise damage to property.

Their weapons are many but water is undoubtedly the most commonly used medium for firefighting. It is cheap, plentiful and generally effective. Firefighters know how to employ it to best effect.

In most circumstances, two parts hydrogen and one part oxygen is non-hazardous. But downstream from a fire scene can be an entirely different matter. Here it can change its character, particularly if mixed with other firefighting chemicals and materials found at the fire scenes of many building sites.

Water run-off is often the result of voluminous usage over long hours of active firefighting *(above)*. Even worse, it can lead to major pollution issues when the used water enters downstream water systems *(below)*.

Unfortunately, the fire may be effectively extinguished but several major pollution incidents can occur when water used for fighting fires enters downstream water systems.

## Pollution can be a by-product fire fighting activities

The reaction of fire with combustible materials will often produce poisonous monoxides. As new materials are invented and used in firefighting, the chemical admixture can be toxic.

To make matter worse, many industries routinely store and use large quantities of potentially polluting substances within their sites. In case of a spillage, particularly in the event of fire, these substances could rapidly be transmitted to the nearest water course where severe pollution may be cause for alarm.

Two well-reported examples on the page 3 definitely illustrate the general concern.

Security a concern for headquarters in crowded, prime central business district location –

# Fire safety measures dominate in new building of Delhi Metro Rail Corporation

The Delhi Metro Rail system is designed to alleviate many pernicious problems. When it is completed it will surely do much to reduce the increasing traffic congestion that threatens to strangle India's bustling capitol city. The new ultra modern rail system certainly reflects the continuing desire for success of Planet Earth's second most populous nation.

Built to highest possible standards and completed within planned schedules, Delhi Metro Rail is eventually expected to be a panacea to many of the transportation woes that bedevil one of the nation's most strategically important metropolitan areas.

Phase I (65.1 km) of "the Metro", as the new rail system is commonly known, is in place. It reaches out to a significant catchment area of potential passengers – from Dwarka in the west to Rithala in the north, Shadra in the east and across the Yamuna River to the downtown central business district around Connaught Circus.

In fact, work on the second phase of the Metro is well underway. Expected completion is slated before the Commonwealth Games in 2010.

With the Metro's physical network growing rapidly – indeed, some of the stations are already operational – there has been a need for large office space to adequately accommodate Delhi Metro Rail Corporation's growing family of personnel and inter-related services.

The corporation wisely took the decision to construct its own offices in the central business district. Situated in the prime New Delhi location of Connaught Circus, the new headquarters building of Delhi Metro Rail Corporation has been designed by city's leading architect, Mr. Raj Rewal, to an open plan concept.

The building is seven stories high with double basements.

Security and safety measures designed into the building were of the utmost importance, as was adherence to local building bylaws and the revised National Building Code of India. Over the past few years, Promat has played a significant role in the evolution of the latter.

To make the building fire safe, the designer incorporated the latest state of art technology. For example, both the client and the consultant, understanding the need for adequate smoke management, agreed to use a cladded smoke extraction duct system. Not surprisingly, the local Promat team has demonstrated a keen interest in every step of the project.

In order to optimise marketing and after sales service, installation work is closely monitored. It is hoped that this would also achieve a high level of customer satisfaction and provide a good example for all involved in the decision-making process of future projects.

The smoke extraction duct system in the new headquarters of Delhi Metro Rail Corporation is comprised of galvanised mild steel clad with fire rated 15mm PROMATECT®-H boards.

The project is being completed to a tight schedule, mindful of the very high level of aesthetic finish that is expected. PFT

2 hours fire rated integrity and insulated post cladding smoke extraction ducts using 15mm PROMATECT®-H boards at the Delhi Metro Rail Corporation project.

POINT of VIEW

## Be Green & Protect The Built Environment?

I am a True Blue city boy, born and happily raised to the beat of modern metropolitan life. I have spent most of my professional life working in cities, so it would be fair to say that, like many in Promat, I'm "Hardcore Urban", comfortably at home when surrounded by the steel, concrete and glass of crowded urbanity. However, my sailing days in Holland – wide open spaces of sky, sea and endless freedom – left an indelible and very convincing impression. As a mere mortal trying to balance the elemental forces of wind and water, I realised then, very emphatically indeed, that Mother Nature will always hold the key to how we humans live. Coming from cities and personal, climate-controlled spaces, we frequently tend to overlook this simple, undeniable fact of life…a fact reconfirmed time and again, by the way, in my more recent scuba diving experiences.

It has become increasingly obvious, to me at least, that we have no choice but to do much, much more for our environment, both directly and indirectly. Recycling plastic bags and using less fossil fuels, for example, is good but no longer enough. I am inclined to agree with those who believe that the best chance for society and a sustainable future is to follow the master plan – plain for all to see in nature – and actually plan and design a very high level of true recyclability into everything we do, especially in the structures and built environment we live and work in. Clearly, a fundamental and broad-based change of mindset is first essential. In the meantime we have to start somewhere.

It is noteworthy that Etex Group policies are based on a sound value system of corporate social responsibility. The Group's very own Environment, Healthy and Safety department is dedicated solely to environmental, health and safety issues of our factories and offices, our people and the communities in which we work. In Asia Pacific, environmental awareness varies, reflecting the different stages of development and maturity present in our region. Environmental issues are definitively on the agenda and clearly destined to generate more significance in the near future.

Down Under By The Great Pacific Sea, to use a well-known turn of vernacular phrase, our Australian colleagues lead the way by their membership of the Green Building Council of Australia. This not-for-profit initiative aims to promote the transition of building design, construction and operation to optimum green principles. In Singapore, too, plans are well underway to ensure that all future buildings will address and resolve numerous environmental concerns. It's good for the building and the occupants of the building. It's good for the local community and it's good the environment. A true win-win situation that can only get better and hopefully improve the quality of life for our children and grandchildren.

This issue of PFT, our 19th by the way, is devoted to a number of different matters, most of them green. Our lead story, starting on the cover and continuing on page 3, takes a look at the importance of factoring environmental pollution into fire fighting strategies. Pages 4 and 5 overview the environmental effects of the construction industry as a whole and highlight several areas that need our close, collective attention. Page 6 features a focus on the need for sensible fire protection measures in China's proliferating factories manufacturing for worldwide electronic demand.

On the economic front, business continues to look good in all of our markets in the Asia Pacific region. We must remain alert and mindful of the fact that the future will demand much more of us, especially on environmental issues. There will certainly be some daunting challenges ahead and we will need to continue adapting, as we have done in the past. Our new Grafitex production line in Adelaide is very reassuring… there's very little waste and we save a lot of energy. We can be environmentally responsible AND make good business, particularly if we use wisely the accumulated experience and considerable resources available to us.

I look forward to hearing your thoughts on these and all other issues that affect our lives and our business.

Erik D. van Diffelen
*Managing Director*
Promat Asia Pacific Organisation
Second quarter 2007

CONTINUED FROM THE COVER

ironmental pollution should be factored into firefighting strategies Environmental pollution should be factored into firefighting strategies Environmental

On 14 August in 1998, at least 10 fire companies used about 300,000 gallons of water to fight a hay barn fire in Franklin, Chester County, near Pennsylvania in the USA.

The water run-off accumulated in a nearby manure lagoon and eventually overflowed into a tributary of the White Clay Creek. An extensive fish kill resulted across a broad area of Pennsylvania and Delaware states. The run-off also affected water supply intakes in Delaware.

Apparently, the local Department of Environmental Protection (DEP) only learned about the fire the next day when the fish kill was reported.

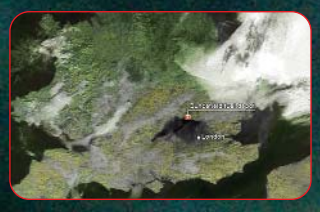
The Franklin hay fires serve as an important reminder that there can be many different environmental consequences to even the most routine of chosen fire fighting strategies.

If time allows, building owners and fire and rescue departments should work hand in glove with local environmental protection agencies, even if the advice of the latter may go against the grain of ordinary firefighting instinct.

At the other side of the world, the Buncefield fuel depot fire in December 2005 was the UK's biggest peacetime blaze. Disaster struck as unleaded motor fuel was being pumped into a storage tank in the north west corner of the depot.

None of the staff on duty realised the tank's capacity had been reached. Safeguards on the tank failed and the ominous black smoke plume towering above the resultant fire could be seen clearly from great distances. The fire raged on. It took the combined resources of several fire brigades many days to finally extinguish.

The environmental impact of the fire was expected to be severe. Local people still talk about the health risks and the affects on the local environment.




The local fire chief described the fire incident near Hemel Hempstead, after 0900 GMT on the day itself, as possibly the largest in peacetime Europe.

However, the Buncefield fuel depot fire was investigated by the UK's Environment Agency and the Health Protection Agency who found long term environmental impact to be negligible. The strategies and infrastructure that contained most of the firefighting water and foam to close proximity of the actual fire clearly worked.

Apparently, management of the fuel depot worked closely with the local fire service to minimise impact on local rivers and ground water quality.

A total of 20 petrol tanks were reportedly involved in the fire, each said to hold three million gallons of fuel.

The Buncefield depot is a major distribution terminal operated by Total and part-owned by Texaco. It stores oil and petrol as well as kerosene, supplying airports across the region, including Heathrow and Luton. It is the fifth largest fuel distribution depot in the UK and it is also used by BP, Shell and British Pipeline.

In the fire, many houses were damaged while others felt the effects of the explosion as far away as Oxfordshire. It was heard in a number of distant counties and even in France and the Netherlands across the Channel.

## Preventing pollution from firefighting activities

The heroic effort of firefighters is always appreciated. After all, they routinely put their lives on the line in the cause of the greater good. However, many countries now have legislation in place governing the use of water courses and their pollution. Clearly, in a fire situation, even if water containment strategies are in place and followed, prioritising decisions should be made at the outset.

The first step to mitigate the downstream effect of firefighting water is to assess the likely route of any run-off from the fire site. The possible volumes of water which might result from any incident then need to be calculated.

Most well-informed environmental agencies are usually in a position to provide relevant advice on the likely routes to surface and groundwater. In conjunction with local public utility companies, they should also be able to advise on sewerage routes. Using firefighting best practice as their benchmark, the firefighting service can then suggest volume estimation and advice on the quantities and the volume of containment required.

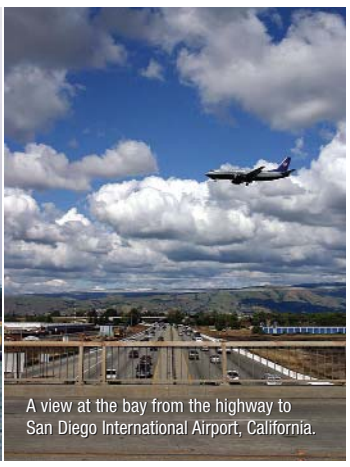
## Containment systems, firefighting strategies and run-off management

Firefighting water containment should be considered over and above the requirements for ordinary storage and tank systems. A secondary containment system should be considered and if necessary implemented.

Containment systems must be designed to protect both surface and foul water drainage systems. The methods used may be permanent or temporary. All emergency plans must include firefighting strategies and possible ways to reduce the amount of fire water run-off generated.

It is important to aim for the firefighters gold environmental standard – Only Rain Down The Drain – and not such toxins and pollutants as motor oil, antifreeze, paints, fertilisers, pet waste and pesticides, amongst other undesirable substances.

It is also advisable to develop programmes that provide and maintain structure sources to reduce pollutants from non-emergency firefighting flows, simply because different locations need different approaches to fighting fires.



A view at the bay from the highway to San Diego International Airport, California.

For example, as shown in the picture above, in San Diego bay, California, USA, patrol boats with trained officers and firefighting capabilities are used to fight fire On-The-Water. These boats draw water from the bay to fight fires and do not connect to any land-based water lines. They ensure that the water does not come into contact with the land or any pollutants. Urban run-off pollution is therefore not a problem.

San Diego's international airport employs its own fire fighting crews and maintains its own equipment. The firefighters at the Airport Rescue and Fire Fighting Facility are trained to fight fires related to airport activities. Regular testing and continuous training is considered routine.

The potential pollutant source from testing and training activities is the Aqueous Film-Forming Foam (AFFF) used in most airport fire-suppression activities.

The Airport Rescue and Fire Fighting Facility is obliged to follow the department's usual pollution prevention practice to prevent any foam or water from entering the storm drain system during training and testing. This in turn establishes a very clear yardstick to follow in the event of actual fire.

It is obviously essentially to develop very clear site emergency plans which, amongst others, take into account action required to control on-site run-off of water used to fight any fire.

Firefighting run-off may be polluting due to the actual materials on site, their combustion by-products as well as the use of firefighting foam. Clearly, maximum effort must always be directed at fire prevention. Every effort should be made to avoid creating the circumstances that lead to an actual event occurring.

In fact, fire has much in common with pollution. Both appear to be never ending issues. Measures to prevent or reduce pollution must therefore be included in every firefighting strategy. PFT

The Airport Rescue and Fire Fighting Facility at Hong Kong International Airport *(right)* and Tampa International Airport in Florida *(below)*.

INDUSTRY REVIEW

Planning and management policies have positive effect on pollution –

# Environmental effects of the constr

At a time when climate change, preserving the natural ecology while minimising the impact of the built environment, building "intelligent" buildings and optimising available natural resources are key issues for all citizens of Planet Earth, the construction industry is increasingly in the news. Usually for all the wrong reasons.

We all tend to look at construction activity, sometimes with an element of reasonable justification, as a tangible symbol of economic prosperity and perhaps even as mirror to the sophistication of the society we live in. At best, construction is a temporary but necessary evil.

## The impact of increasing urbanisation

Nowhere is this more obvious than in the large urban conurbations many of us like to call "home sweet home". In fact, many countries look with pride and mixed blessings at their ever-expanding cities, warts and all, as visible signs of continuing success.

After all, they argue, as societies shift away from rural, agrarian-based economies to manufacturing and service industries, metropolitan areas are a magnet for people and their aspirations.

Many cities then get a larger slice of the budget pie to adequately service their ever-expanding populations. Not surprisingly, cities frequently go on to generate a disproportionate share of their nation's GDO wealth.

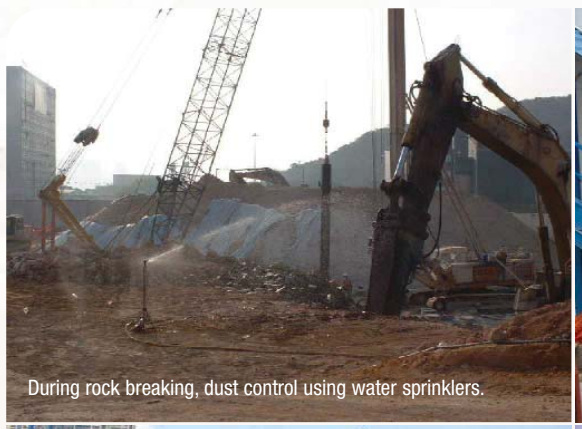
The United Nations estimates that 60 percent of the world's population will be city dwellers by 2025. As urban populations inevitably and inexorably continue to grow, there will be greater societal and political pressure to plan and adequately meet their lifestyle needs for residential, working and recreational space. Congestion and pollution seem to be a price we are resigned to paying in the name of so-called material well-being.

Environmentalists argue rather convincingly that many of the dynamics that drive cities forward are simply not environmentally friendly nor sustainable, even in the short to medium term. The evidence that fuels the greenhouse effect and global warming is overwhelming and much of it is generated by urban areas. Many cities play a huge and contributing role in environmental degradation, way out of proportion to their geographic size.

As cities continue to grow, more questions are being focused on specific locations and specific industries. One of the most obvious sources of urban pollution is the construction industry. The amount of pollution it generates can be conspicuous to the naked eye, especially against an urban backdrop and frequently the subject of community-wide complaint.

Most of the opposition comes from concerned citizens. Legislators are obliged to introduce more stringent regulations. There's little choice, otherwise the goose that lays the golden egg simply won't survive.

### *Some environmentally concerned practices to be enforced during the construction*



During rock breaking, dust control using water sprinklers.


Waste paper collected for recycling.

For better dust screening, provide higher than working level dust screens.

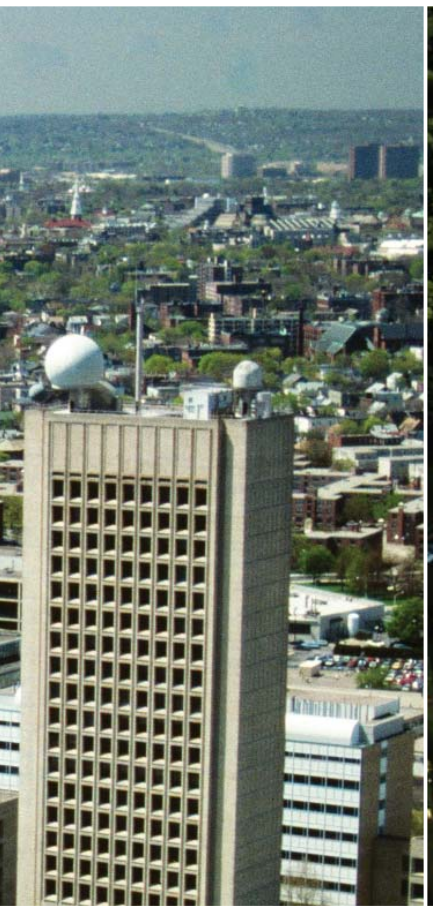
Deploy and regularly check approved biological sewage treatment facilities.

## Inevitable but manageable pollution caused by construction sites

Construction is a brutally intense, invasive process that nearly always disturbs the site and surrounding environment. Careful planning and management of construction activities can prevent major damage to the site and to a large extent to the surrounding neighbourhood. Construction pollution is caused by natural or anthropogenic forces or both.

As the ground is exposed, water from the excavation and precipitation caused by rain are likely to carry soil and other debris off the site, into local and regional waterways. This includes the transportation of potentially toxic materials.

As construction continues, its impact increases exponentially, both locally and further field. For instance, the lungs of many cities – parks and other green areas – invariably suffer in the process of urban modernisation, renovation and construction.



# ruction industry

As the world today continues with the high rise developments and increasingly sophisticated building construction techniques – for commercial, residential or recreational applications – we should remain mindful of and responsible for possible environmental effects during construction activities.

Common pollutants from construction sites and activities include sediment from soil erosion, construction materials and wastage such as paint solvents, concrete and drywalls etc. Landscaping run-off can also contain high levels of fertilisers, pesticides and spilled oil, fuel and other fluids from construction vehicles and equipment.

Construction sites, particularly if they occur in any density (as well as the buildings eventually built on the site) also trap ambient heat, adding to local burdens and ultimately to the effects of global warming.

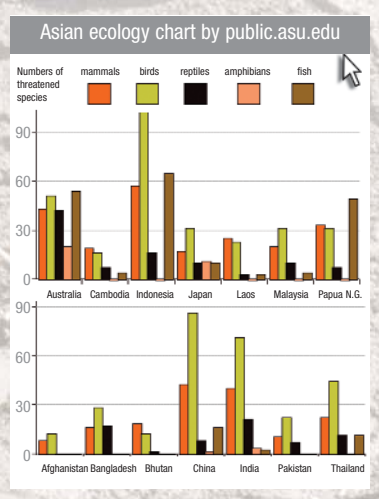
This in turn creates greater downstream demand on increasingly expensive energy resources for cooling sun-baked city dwellers. Communities are encouraged to plant more trees, use reflective roofing materials and cultivate rooftop gardens. They may take years to grow but eventually create long term benefits. Similarly, through concerted planning, education and enlightened management and work site practices, the pollution generated by construction sites can be minimised. Legislation reinforces the message.

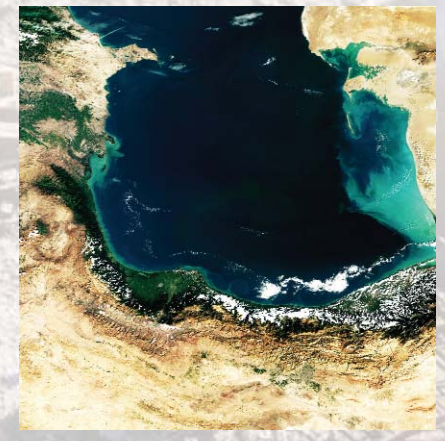
## Management of waste matter at construction sites

Earth moving and utility excavations at construction sites tend to increase the sediment load in storm water during rainfall. Reclamation adds usable land area but has a habit of removing wetlands – natural water filters that can break down many pollutants before they reach other water bodies or enter the food chain – from the ecosystem forever.

Oil, debris, paint and other harmful chemicals also join water run-off and sediment from construction sites. Soil and sediment smother and kill aquatic life. They also absorb and carry with them other toxins that reduce water quality. Oil, grease, degreasers and other chemicals soak into the ground, eventually reaching the water table and underground aquifiers, contaminating drinking water, ultimately causing health problems.

Asian ecology chart by public.asu.edu



With a surface area of 371,000km², the Caspian Sea is regarded either as the largest lake or the smallest inland sea in the world. Its calm and slightly salty water fills a depression which extends 1200km north to south and lies between Europe and Asia. The waters of the Caspian, currently measured at 28m below normal sea level, have fluctuated in the past, usually as a result of variations caused by evaporation and activities such as construction of shipping facilities.

Toxins such as paint and other hazardous materials harm and kill fish and aquatic life and land animals drinking the water. Wind plays a significant role in spreading materials such as dust and soil around a site and into adjacent areas.

## Useful strategies for controlling worksite pollution

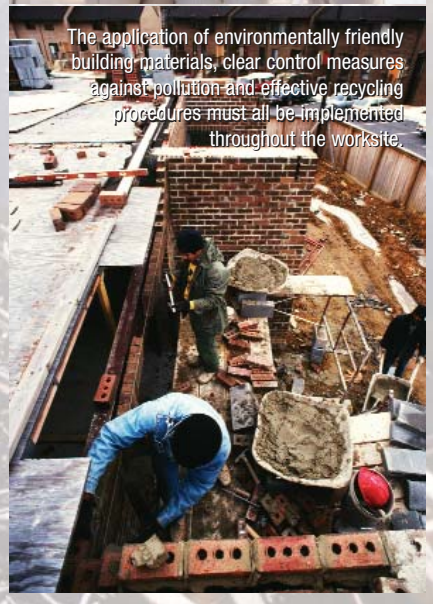
Sound, integrated and flexible management policies can have a significant effect on pollution levels generated by construction sites. Two comprehensive strategies are particularly useful, mitigating pollution during construction.

The first layer of defence against construction pollution involves limiting the production of dust and debris in the first place. Less volatile demolition practices – disassembling components rather than using a wrecking-ball, for example – and use of benign building materials are two good examples.

The second tier against construction pollution involves methodologies to curtail the spread of the pollution generated. Natural forces such as wind and storm water flow can be controlled to limit their ability to pick up and carry off dust and debris.

Quantity surveyors and sensible purchasing decisions on materials beforehand are prudent considerations for any construction project.

Securing piles of excavated earth, wetting or compacting loose soil and bordering the site with natural filtration barriers such as hay bales are just three examples of effective control techniques.



The application of environmentally friendly building materials, clear control measures against pollution and effective recycling procedures must all be implemented throughout the worksite.

Waste matter associated with building/housing construction include unused and excess material generated during site excavation, site clearance, construction and renovation activities. Waste may be concrete, brick and asphalt rubble, wood and wood by-products, plaster, metal, plastics and insulation. Waste can comprise approximately 15 to 30% of all waste disposal used in routine landfill. Some waste products may also contain toxic constituents that pose a risk to human health and the environment. Local governments typically pass ordinance restricting or prohibiting disposal of construction and development debris in landfills. Many materials first require substantial recycling procedures.

Clearly, quantity surveying and purchasing decisions associated with any construction project can have a direct and billable bearing on the amount of waste generated and energy required. In fact, construction usually produces a greater percentage of garbage that ends up in the country's landfills than any other activity. For every square foot of building space, 1.1kg of waste (approximately 11kg per m²) are produced.

Market and government agencies and market forces must continue to orchestrate and encourage recycling in the same way that they promote the use of local products.

CONTINUED ON PAGE 8

Speed of economic success turns spotlights on built environment –

# More “proactive” fire solutions good for China’s booming electronics factories?

Twenty five years of “socialist market economy” have produced remarkable results for China. Known globally, the “made in China” marque has definitely moved up-market in recent years to dominate manufacturing in the high demand Information Technology and consumer electronics industries. Overall, however, it is the uneven success and the breakneck speed of the dynamic economy of the world’s largest importer of raw materials that concerns some business analysts.

The country is also enjoying a boom in the construction industry, not just to ready the capitol city Beijing for the 2008 summer Olympic Games but at most levels of national life – from stadiums to housing, from strategic infrastructural projects to a wide range of much-needed factories.

Some observers note that when it comes to regulatory agency approvals, many different interpretations of building codes complicate the overlapping and complex decision-making process. The current situation not only points to the need for the regulatory environment to be reviewed, enhanced and if possible standardised, but for general awareness for protection of the built environment to be increased rapidly wherever possible.

There is much at stake for the rate of change in China is truly astonishing. Nowhere is change more noticeable than in factories and industrial areas devoted to the manufacture of consumer electronics and information technology equipment.

## Overview of factory buildings for China’s electronic industry

Virtually everything these days – from laptop computers to automobiles, digital cameras to ships, mobile phone to heavy industrial equipment – is manufactured in China.

Manufacturers continue to relocate to take advantage of China’s low wage structure, stable political environment, ready availability of skilled workers, talented R&D personnel, accessible land and reasonably priced investment capital. It’s a powerful package too attractive to resist.

As a result, new industrial zones and factories are popping up all over the country with remarkable rapidity. However, the bases for many IT products are located in three main areas – the Yangtze River Delta (with Shanghai, China’s premier business centre, at its focal point), the Pearl River Delta concentrating considerable resources in Guangzhou and Hong Kong in the south and the Bohai Bay Rim Region. The three regions generate in excess of 90% sales revenue of China electronic industry.

The electronics industry in China’s Central and Western areas looks to key cities such as Xi’an, Chengdu, Changsha and Wuhan.

Nevertheless, China’s IT product manufacturing techniques have reached international mainstream level with design & testing technologies not far behind. To sustain development and adequately meet future demand, China’s factories will have to be built to high international standards  incorporating modern construction and fire protection technologies.

**Foreign investment in China’s electronics industry in the last decade**

Data by the Third National Industrial Census, China.

| Electronic sectors | Market growth from the early 90's | Number of foreign investors (Asia) | (From outside Asia) |
|---|---|---|---|
| Transmission equipment | 40.47% | 54 | 44 |
| Communication switching equipment | -18.57% | 44 | 58 |
| Consumer communication products | 182.03% | 69 | 132 |
| Communication terminal products | 326.87% | 41 | 70 |
| Radar | 19.33% | 1 | 1 |
| Broadcast and television equipment | -5.14% | 16 | 25 |
| Computers | 173.64% | 43 | 65 |
| Vacuum tubes | 13.00% | 20 | 21 |
| Semi-conductor device | 18.33% | 43 | 79 |
| Integrated circuits | 199.57% | 34 | 66 |
| Electronic components | 32.00% | 302 | 594 |
| Television sets | 25.30% | 30 | 57 |
| Radio and sound recording equipment | 24.19% | 71 | 148 |
| Electronic calculators | 113.60% | 10 | 32 |
| Communication equipment repairs | 60.43% | 2 | 2 |
| Television equipment repairs | -85.26% | 1 | 0 |
| Computer repairs | 180.15% | 0 | 1 |
| Other electronics equipment | -5.59% | 113 | 137 |
| Other electronics equipment repairs | 383.14% | 5 | 6 |

## Fire protection for factory buildings manufacturing electronics

Single floor or multi level factory buildings for the electronics industry have many characteristics in common. Invariably they have huge floor areas and clear height in which high fire load and high density of labour occupation are standard expectations. With a multiplicity of services required and a plethora of cables to power and drive sensitive computer networks, complicated wall or floor penetration and big size ductwork or cable trays are par for the course.

A typical factory building for the electronics industry certainly challenges architects and designers when creating effective fire protection solutions.

Unfortunately, in China at least, fire safety consultants tend to specialise only in particular or specific solutions. It is unusual to find an individual or an organisation with expertise in various options and who can offer a balanced approach which, for example, coordinates active and passive fire protection into a single integrated strategy.

An historical point of view which emphasises the role of “active” fire protection equipment and systems as primary, frontline fire protection measures within factory buildings may have something to do with the prevailing monoculture.

All too often, engineers, insurers and fire authorities examine factory drawings and make recommendations for extensive fire suppression systems – including fire detection, fire alarm and other fire fighting equipment – with scant regard for the other, equally if not more effective, so-called passive fire protection measures.

At this point in time in China, few designers fully understand the inter-relationship between “active” and “passive” or indeed “proactive” fire protection systems.

Proactive or Passive Fire Protection should be perceived as all-encompassing fire safety concepts embracing the passive (i.e. non “active”) measures in a fire containment design while supplementing and augmenting other active measures.

The proactive approach must ideally start as early as the building design stage and address comprehensive solutions to potential fire problems. These systems do not require power or water to operate in case of fire. Many people in the industry refer to these measures as “sleeping policemen”.

There are many categories of passive fire protection options and many of these options or principles of fire protection understandably have different functions and effects.

## The fundamentals and principles of compartmentation

The division of the building into dedicated fire zones or self-contained compartments perhaps offers the most effective means of limiting fire damage.

Compartmentation is designed to contain the fire within the zone of origin, thus limiting or inhibiting its spread. Essentially, compartmentation “buys” time and as such provides at least some protection for the rest of the building and its occupants, even if fire fighting and first aid facilities are accessible. Compartmentation delays the spread of fire prior to the arrival of the fire brigade. In the event of fire within a building  designed around the principles of compartmentation, the size of the damaged area also depends on the layout of the fire resisting barriers within the building.

A typical and well laid out electronics factory inevitably features many different areas for different functions such as manufacturing, general office, M&E room, products receiving area and evacuation staircase etc. It is essential that each of these functioning areas be considered and designed as an independent fire compartment with fire rated partitions and other protective measures installed between and in these areas.

In China, the requirement of fire resistance period for these partitions is typically 3 or 4 hours. The compartmentation area and the number of evacuation staircases must meet or exceed the minimum requirement of the local building code.

Frequently in China, partition height can range between 8 and 12 metres or more. Therefore, quick and easy to install, light weight dry wall systems represent enormous benefits. In steel structure buildings, for example, the selection of a light weight dry wall system makes it possible to reduce the cross section size of loadbearing structural elements.

Factory projects for Intel in Chengdu, Nokia in Dongguan (see pictures at right) and Jabil in Guangzhou all chose Promat 3 and 4 hour fire resistant partition systems. It is noteworthy that the latter project features partition heights in excess of 14 metres.

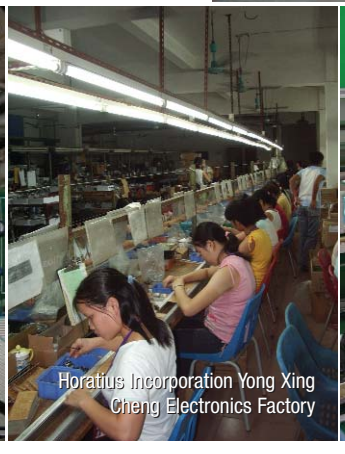
To maintain compartment integrity, all doors, roller shutters and windows set in fire resistant partitions must have similar fire resistance ratings.

CONTINUED ON PAGE 8

Typical architecture of electronics factories in China. *Closewise from above:* Hangzhou Youwang Technology Factory, SEL Scientific Electronics Factory, Lion Electronics Enterprises Dongguan Factory and Ningbo Yinzhou Qinxin Electronics Component Factory.

The Electronics Assembly Division, Shanghai Electronicsun

Xiaoshan Botao Electronics Factory



Horatius Incorporation Yong Xing Cheng Electronics Factory

SEL Scientific Electronics Factory, Yue Shan Village, Dongguan city

经济成功的快速将焦点转向建筑工业的环境 –

# 更多“被动式”防火措施是否对中国兴旺的电子工厂有佳？

二十五年来，中国的社会主义经济建设取得了举世瞩目的成就。众所周知，无论在高端信息　技术设备领域，还是在消费电子产品等其它领域，“中国制造”目前在国际市场上都占据着无可质疑的统治地位。中国制造业的飞速发展，对建筑业中的基础设施建设和工业厂房建设同样起到了推波助澜的作用。但是，在这种跳跃式的发展过程中所表现出来的问题同样值得我们去关注。

观察人士指出，在工业厂房建设项目中，由于不同参与人员对建筑防火规范的不同理解和认识，经常导致项目在消防验收过程中出现问题或争议。尤其在电子工业厂房建设项目中，这种现象表现得尤为突出。杜绝此类现象出现，不但需要对现有规范进行完善和更新，更需要通过各种手段来加强从业人员对建筑防火规范的理解和认识。

## 中国电子工业厂房发展现状

近些年来，得益于中国稳定的政治环境、廉价的劳动力及土地供应和日益增强的科研实力，国际知名的电子信息技术产品制造商对投资于中国均趋之若鹜。目前，中国电子工业的发展主要集中在珠江三角洲、长江三角洲和环渤海经济圈等三个重点经济区域，以上三个区域每年创造的经济产值占到中国整个电子工业总产值的90%以上。在中国中西部地区，电子工业的发展重点集中在西安、成都、长沙和武汉等主要城市。

作为电子工业蓬勃发展的结果，中国以上地区大型、先进的电子工业厂房也如雨后春笋般的不断拔地而起。但是由于中国在这类大型、先进的电子工业厂房设计及建设方面经验不足，同时也由于相关建筑设计防火规范及消防监管等方面存在的一些漏洞，目前中国已建或在建的电子工业厂房大部分存在不同程度的防火安全隐患。

如果说中国的电子工业产品的设计、测试和加工制造技术已经达到了国际主流技术水平，那么为了维持这种发展势头及满足长远的需要，中国电子工业厂房的建设和防火安全更应该满足严格的国际标准要求。

## 电子工业厂房的防火考虑

一般来讲，无论是单层还是多层电子工业厂房，都具有建筑面积大、静空高、火灾荷载大和劳动力密集等特点。这一特点对建筑设计人员如何有效的解决防火安全问题提出了严峻的挑战。

在中国，设计师在考虑防火安全问题时往往是片面的，很少有设计师能够做到同时考虑主动防火和被动防火措施，并提出科学合理的综合防火解决方案。设计师和消防管理部门历来只重视主动防火措施，如喷淋、火灾报警系统等，而对被动防火措施（如疏散路径的设置、防火墙、防火封堵和承重构件的防火保护等）未给予足够的重视。

实际上，实现一个完美的建筑物防火解决方案，主、被动防火措施缺一不可，两者的作用是相辅相成的。尤其是被动防火措施，在建筑物的初始设计阶段，就要给予充分的考虑。根据实现功能的不同，可以选择不同的被动防火应用系统。

## 防火分区

把建筑物在平面内划分成多个独立的防火分区，是减少火灾直接经济损失的最有效的被动防火解决方案。合理设置的防火分区，可以有效的将火灾限制在初发单元，从而保证人员的安全疏散和减少因火灾扩散带来的经济损失，并可以为消防救援人员赶往火灾现场赢取宝贵的时间。

对电子工业厂房而言，防火分区的设置首先必须满足国家规范对分区面积限制的要求，同时根据使用功能的不同，防火分区一般应划分为生产区、办公区、货物接收区、设备房和疏散楼梯等，防火分区之间必须设置有效的防火墙或其它形式的防火隔断以阻止火灾的蔓延。在中国，规范规定防火墙的耐火极限为3小时或4小时。防火墙内部设置的防火门、防火卷帘或防火窗同样需要满足相应规范的要求。

在实际电子工业厂房项目中，防火墙的高度经常会达到8米、10米甚至更高，在这种情况下，重量轻、安装简便的硅酸钙板防火墙系统具有明显的优势。尤其对多层钢结构电子工业厂房，轻质墙体还可以降低承重构件的荷载，从而有效地降低主体结构的钢结构用量，节约成本。

目前，中国已经建成的主要电子工业厂房如成都英特尔(Intel)、东莞诺基亚(Nokia)和广州捷普电子(Jabil)等均采用了3或4小时的保全轻质防火墙系统，尤其是在广州捷普电子项目中，防火墙的高度达到14米。

## 防火封堵

电子工业厂房内部敷设的电缆、管道等经常需要穿越多个防火分区，并在防火墙或楼板的贯穿部位留下防火薄弱环节，从而形成火灾或有毒烟气的蔓延途径，破坏防火分区。有毒烟气的扩散，不但会威胁到物业使用者的生命安全，同时也给消防救援工作带来困难。

根据统计数字的表明，在普通的电子工业厂房中，80%以上的防火墙或楼板存在管线贯穿　现象，贯穿构件主要包括供电电缆、通信电缆、通风/排烟风管、空调风管和消防水管等。同时，建筑物本身的构造缝如伸缩缝、变形缝、外墙/幕墙与楼板之间的缝隙等也经常成为火灾或有毒烟气的蔓延途径。

由于普通建筑灰泥具有干缩开裂和耐火性能差等特点，所以采用普通的建筑灰泥对上述贯穿或构造缝隙进行封堵无法解决该问题。只有采用特制的并通过相应防火测试的防火封堵材料才可以有效的阻止火灾和有毒烟气通过以上途径蔓延。

## 结论

- 一个合理的电子工业厂房应综合考虑主动防火措施和被动防火措施。
- 在设计阶段，需要首先考虑防火分区的设置。
- 贯穿或构造缝隙必须采用通过相应防火测试的防火封堵材料进行封堵。PFT

CONTINUED FROM PREVIOUS PAGES

# China's booming electronics factories

## Other fire stopping products and systems

Most building codes recommend fire-resistant walls and floors that compartmentalise a structure into controlled segments, restricting the spread of flame and smoke in the event of a fire. However, penetration by wires, cables, pipes, ducts and structural elements which create openings also compromise the compartment's fire safety.

In the event of fire, openings in walls, floors and ceilings created by penetrations can act as blowtorches, accelerating the transfer of fire and toxic gasses from one space to another. Smoke and toxic gas movement in a structure is one of the most serious issues in fire safety. Smoke migration can affect building occupants as well as the search and rescue teams and firefighters far quicker than flames and high temperatures. Effective sealing of such openings is essential to restore the intended rating of walls and floors.

In a typical electronics factory building, some 80% of fire barrier penetrations are directly related to the provision of mechanical services such as electrical wiring, communication cabling, ventilation and air conditioning components as well as pipes for automatic fire sprinkler systems. Structural features like expansion joints, space between curtain walls and floor slabs and floor-to-wall joints also disrupt barriers and require deliberate and effective fire stopping measures.

Specific seals are clearly needed to restrict fire and smoke propagation through penetration openings. However, empirical evidence suggests that conventional materials such as drywall mud, grout or caulks simply cannot maintain the integrity of a penetrated fire barrier. Due to the forces of expansion and contraction, conventional materials are inclined to dry and rapidly shrink, becoming brittle and fragile and then cracking.

Only a properly formulated, tested and correctly installed penetration seal is capable of effectively and dependably restricting and stopping the spread of smoke and toxic fumes under actual fire conditions. Code-approved penetration seal materials must be certified in accordance with nationally recognised standards which involves severe testing to simulate fire emergency conditions.

A good fire solution for an electronic industry factory building should be a combination of "active" and "proactive" fire protection measures. During the design stage, the fundamental principles of fire compartmentation should first be considered widely and within the overall context of a total, integrated fire protection strategy. Penetration openings must be properly sealed with tested or approved fire resistant materials. PFT



# Environmental effects of the construction industry

## Construction activities also have temporary effects

The impact of construction also has numerous and temporary environmental effects. These typically include air pollution from dust and construction equipment, increased run-off and soil erosion and significant expansion of construction noise.

Construction and its related activities may disturb the usual local balance. Pre-construction surveys are recommended to identify areas and species that require concern or protection or both. All sensitive habitat and wetland areas must be identified well in advance, preferably at the earliest, design stage to reduce ultimate impact.

Construction noise varies depending on the construction process, type and condition of equipment used, phase of the construction, specific tasks being performed and the general layout of the construction site.

## Noise is the most disturbing pollution force of all

In general, construction activities for the proposed project should take place on week days between the hours of 7am and 6pm. However, based on scheduling and assessment of their level of disturbance, some activities may take place outside the usual time frame. For example, after 6pm and at weekends.

Overall, construction noise levels are predicated and governed primarily by the noisiest equipment. For most construction equipment, the engine (usually diesel) is the source of dominant noise. However, there are wide fluctuations in noise emissions of similar equipment and the techniques used by the equipment operator.

On average, the maximum allowable level of noise at construction sites is usually around 80dB, considerably lower than an average karaoke lounge or discotheque.

However, allowable noise levels vary depending on location of construction – residential, commercial or industrial area – and also on the time of day or night of construction activities.

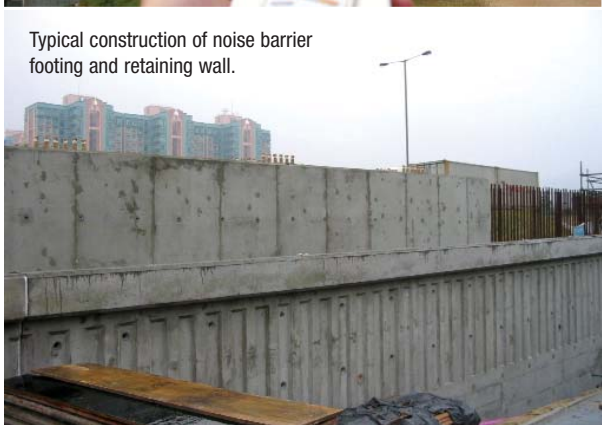
Fortunately, there are numerous preventive measures available to control noise pollution and reduce intrusion without placing unreasonable constraint on the construction process or substantially increasing costs.

These include noise and vibration monitoring to ensure that contractors take all reasonable steps to minimise impact when working near sensitive areas, regular noise testing and inspection of equipment to ensure that all on site equipment is in good working condition and effectively muffled.

It also pays to implement an active and effective community liaison programme. This should be designed to keep residents adequately informed about construction plans so they can plan and schedule around peak noise or vibration levels. An effective liaison programme is also a two way street to channel the residents' ideas, comments and complaint back to the construction site owner and master contractor. PFT

### *Noise control is essential throughout construction*

Effective and regular noise monitoring and assessment on a neighbouring school construction site.



Typical construction of noise barrier footing and retaining wall.



## Promat International Asia Pacific Organisations

**Promat**

**The ProActive Fire Protection Systems Provider**

**www.promat-ap.com**

**ASIA PACIFIC REGIONAL HEADQUARTERS, MALAYSIA**

**Promat International (Asia Pacific) Ltd.**
Unit 19-02-01, Level 2 PNB Damansara, No.19 Lorong Dungun, Damansara Heights, 50490 KL
Tel: +60 (3) 2095 5111 Fax: +60 (3) 2095 6111 Email: info@promat-ap.com

**AUSTRALIA**

**Promat Australia Pty. Ltd.**
1 Scotland Road, Mile End South, Adelaide, SA 5031
Tel: +61 1800 30 20 20 Fax: +61 (8) 8352 1014 Email: mail@promat.com.au

**Promat Australia Pty. Ltd.**
Unit 1, 175 Briens Road, Northmead, NSW 2152
Tel: +61 1800 30 20 20 Fax: +61 (2) 9630 0258 Email: mail@promat.com.au

**Promat Australia Pty. Ltd.**
3/273 Williamstown, Port Melbourne, VIC 3207
Tel: +61 1800 30 20 20 Fax: +61 (3) 9645 3844 Email: mail@promat.com.au

**Promat Australia Pty. Ltd.**
Locked Bag 8, Subiaco, WA 6904
Tel: +61 1800 30 20 20 Fax: +61 1800 33 45 98 Email: mail@promat.com.au

**CHINA**

**Promat China Ltd.**
Room 504, Block B, Qi Lin Plaza, 13-35 Pan Fu Road, 510180 Guangzhou
Tel: +86 (20) 8136 1167 Fax: +86 (20) 8136 1372 Email: info@promat.com.cn

**Promat North China** *(Division of Promat China Ltd.)*
Room 1507 Building 5, SOHO Xiandaicheng, No.88 Jianguo Road, Chaoyang District, 100022 Beijing
Tel: +86 (10) 8589 1254 Fax: +86 (10) 8589 2904 Email: info@promat.com.cn

**HONG KONG**

**Promat International (Asia Pacific) Ltd.**
Room 1010, C.C. Wu Building, 302-308 Hennessy Road, Wanchai
Tel: +852 2836 3692 Fax: +852 2834 4313 Email: apromath@promat.com.hk

**INDIA**

**Promat International (Asia Pacific) Ltd.** *(India Representative Office)*
610-611, Ansal Imperial Tower, C-Block, Community Centre
Naraina Vihar, Naraina, 110028 New Delhi
Tel: +91 (11) 2577 8413 +91 (99) 6705 0813 (west area) +91 (99) 8994 0505 (south area)
Fax: +91 (11) 2577 8414 Email: info-india@promat-asia.com

**MALAYSIA**

**Promat (Malaysia) Sdn Bhd.**
Unit 19-02-01, Level 2 PNB Damansara, No.19 Lorong Dungun, Damansara Heights, 50490 KL
Tel: +60 (3) 2095 8555 Fax: +60 (3) 2095 2111 Email: info@promat.com.my

**SINGAPORE**

**Promat Building System Pte. Ltd.**
10 Science Park Road, #03-14 The Alpha, Singapore Science Park II, Singapore 117684
Tel: +65 6776 7635 Fax: +65 6776 7624 Email: info@promat.com.sg

**VIETNAM**

**Promat International (Asia Pacific) Ltd.** *(Vietnam Representative Office)*
Room 606 Giay Viet Plaza, 180-182 Ly Chinh Thang Street, Ward 9, District 3, Hochiminh City
Tel: +84 (8) 931 5964 (south area) +84 (4) 565 8101 (north area)
Fax: +84 (8) 931 5964 (south area) +84 (4) 565 8677 (north area)
Email: phuong@promat-asia.com (south area) trangoc@promat-asia.com (north area)