

Promat



Cafco MANDOLITE® CP2 Application Guide



Corporate Information

Pages 2-5

About Promat Sprays Division _____ **2-3**

R&D Principles of Promat Sprays Division _____ **4-5**

Material Guidance

Pages 6-16

Caico MANDOLITE® CP2 _____ **6**

Material & Site Requirements _____ **7-8**

Application Procedure _____ **9-13**

Repair Procedure & Theoretical Coverage _____ **14**

QA/QC Procedure _____ **15-16**

Miscellaneous

Pages 17-21

Material Safety Data Sheets _____ **17-18**

Project Reference _____ **19-21**



In today's changing world, the only constant is change itself and nowhere is it more profound than in the structures we build and the way we use them. Indeed, most modern buildings are considered, with some justification, as icons of progress, very visible symbols of economic development and sophistication.

The language of architecture is continually shifting, as societies and people change, so understandably do their built structures. Today, buildings face a multiplicity of demands largely unheard of less than a generation ago.

A series of functional spaces — conveniently joined together with some design tolerance for engineering trends, patterns of usage, prevailing weather conditions and local geography — no longer suffice in today's world of multi-tasking expectations.

Not surprisingly, the building industry itself has progressed in quantum leaps, particularly in terms of materials and methodology. Indeed, many consider so-called inanimate modern buildings as living, organic structures that, like the human bodies they mimic, need very special understanding and care.

Modern buildings — whether they are office towers or residential blocks, shopping malls, airport complexes or high tech factories — take on and assume a life of their own.

Most structures are very complicated, to say the least, for they must adequately meet a bewildering range of aesthetic, functional, financial, legal and ecological standards while providing a safe environment in the service of humanity.

Despite numerous safety measures, fire is still without doubt the most common risk to buildings and one that continues to cause thousands of deaths and the loss of untold millions of dollars each and every year, despite well-intended and scientific efforts to prevent it from arising in the first place.

Increasing awareness for fire safety in the construction industry

Like the complex structures they aim to protect, fire control is a continually evolving science. It generally starts with the idea that a bucket of water or sand in the right hands at the right time and place can make all the difference between a minor incident and a major disaster. Unfortunately, most built environments are considerably more complicated where the risk of a fire depends on a building's use, location, size, number and type of occupants, design and construction. In general, the larger the building, the greater the risk to life and property.

A vital factor in reducing risk is to provide physical barriers to the spread of fire within the building by dividing the building into a series of compartments bounded by fire resisting walls and floors. This concept is fundamentally effective and generally referred to as "compartmentation". Each compartment, regardless of penetrations, is fire-proofed to an optimum level to prevent the spread of fire, smoke and toxic gases. Compartmentation is a vital and integral component of Promat fire protection philosophy.

Fortunately, huge advances in fire science technology continue to be made and the range of brilliant, innovative materials for eventual fire safety application is becoming widely available and lower in cost. The efforts the fire industry makes today and tomorrow, along with the scientific materials applied to building safety, will generate untold benefits in the future.

It is the combination of scientific thinking and the development of remarkable, in some-cases truly space-age materials that positions advanced fire safety design squarely at the core of modern building techniques.

The Promat organisation has offices, factories and workshops all over the world, forming a global network of specific knowledge centres concerning fire protection and high temperature insulation.

Promat environmental, health and safety (EHS) policies

Promat International Asia Pacific is one of the main subsidiaries of Belgium's Etex Group of companies. Headquartered in Brussels, Etex consists of some 78 factories and numerous other business units, employing more than 14,000 people worldwide.



The Etex Group not only offers a support structure of knowledge, production and research and development but an in-depth commitment to sustainable development.

As ecologically sustainable issues become increasingly important and the focus of mounting concern in a rapidly globalising world, Etex has consistently articulated a well-defined environmental, health and safety policy as a benchmark for all its member companies.

Going green, a burning issue for the times?

Despite being surrounded by the steel, concrete and glass of crowded, modern urbanity, Promat is profoundly aware that Mother Nature will always hold the key to a successful and sustainable built environment, an undeniable fact of life often overlooked in cities dominated by personal, climate-controlled spaces. Recycling plastic bags and using less fossil fuels for example, is praiseworthy but no longer enough. It is obvious that society must do much more for the environment, both directly and indirectly.

Etex Group and Promat policies are based on a sound value system of corporate social responsibility. The Group's very own Environment, Health 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 the Asia Pacific region, environmental awareness varies, reflecting contrasts in the different stages of socioeconomic development and maturity. Environmental issues are clearly on the agenda and destined to generate more significance in the years ahead.

A good example, for instance, is Promat support, adherence to and respect for environmental issues highlighted by the Green Building Council of Australia. The company's participation in this not-for-profit initiative will help to promote the transition of building design, construction and operation to optimum green principles. The Singapore Building and Construction Authority's Green Building Scheme is another good strategy for encouraging green building design. Similar green principles are core Promat corporate beliefs.

In other Asia Pacific states, plans are well underway to ensure that all future buildings will effectively address and resolve numerous environmental concerns.

Sensible and pragmatic Environment Management Systems are tools for the effective management of the impact of a building's footprint and an organisation's activities related to environmental issues. Certified to international standard ISO 14001, Promat aims to achieve environmental gains through the implementation of effective environmental management. Adherence to this standard ensures environmental issues are integral components of routine decision-making practice.

Promat EHS policy is a long-term commitment to the future

Promat remains alert and mindful of the fact that the future is sure to demand much more of us in environmental initiatives. There will certainly be daunting challenges ahead, requiring constant adaptation, as in the past.

The company's new production lines in factories across the world are very reassuring. There's very little waste and considerable attention given to energy saving. Clearly, environmental responsibility and good business are not mutually exclusive, particularly if the accumulated experience and considerable resources available to Promat are used sensibly and wisely.

As a global leader in the business of the proactive fire protection, Promat fittingly also takes a proactive approach to environmental, health and safety issues.

Starting in 2005, Promat implemented its own Environment, Health & Safety policy, entitled "Promat - Towards Sustainable Growth".

So in doing, Promat is committed to:

- the creation of a safe working environment for all its employees and the societies in which the company works,
- control and minimise possible negative impact on the environment,
- include EHS concerns in the development of its products and systems,
- continuous improvement of its EHS performance,
- transparency and open dialogue based on facts and figures with all its stakeholders,
- the principle that EHS Due Diligence shall be used as standard practice for Mergers and Acquisitions, Investments and Divestments.

The policy applies to all Promat entities and necessary resources are allocated to enable correct implementation of its EHS policy.

Before making critical investment or acquisition decisions, the environmental, health and safety aspect is systematically evaluated.

Accordingly, Promat has developed a checklist which enables the company to form an accurate overview of the relevant EHS aspects in a relatively short space of time.

Environmental policies are a continuing and evolutionary process

It should always be noted that — to be relevant, meaningful and accurate — realistic environmental policies must continually evolve... after all, the world around us is constantly changing, too.

A good reflection of this point of view are the recent additions to the Etex Group's EHS policy.

These take a broad view of pertinent ecological issues, along a time line from 2008 and 2011, while looking at specific considerations, which include:

- Occupational Health & Safety Assessment Series (OHSAS) Certification*
- Environmental reporting
- Accident analysis

*The Etex Group and Promat are rightly concerned with all matters related to ISO14001 certification, the universally recognised principles for most environmental management matters.

Now, however, the group insists that all group factories comply with OHSAS certification. Implementation is expected to be completed before 2010.

Although not an international standard, OHSAS Certification attracts increasing recognition around the world. It is formulated and implemented on a framework of corporate occupational health and safety policies, planning, implementation and operations, checking and corrective action, management reviews and continual improvement.

Research & development drives growth of sophisticated fire protection technologies

Fire protection nowadays is divided into two broad categories. These are described as “active” and “proactive” (or “passive”) systems.

“Active” fire protection measures are those that use an integrated system consisting of sprinklers and alarms requiring electricity and water to realise their full potential in fire situations.

On the other hand, “proactive” fire protection systems do not require power or water to operate in the event of a fire. They are designed and built into the structure to protect on demand, as and when necessary.

It is the research and development to proactive fire protection that Promat has devoted many years and considerable resources. Today, Promat is long recognised worldwide as a leading provider of passive fire protection systems, a reputation reinforced by more than six decades of leading edge research and development.

Promat run continual investigation programmes at the PRTC facilities in Belgium. The PRTC testing laboratories are accredited to EN45001. The PRTC furnaces are state-of-the-art and offer multiple possibilities for the testing of construction systems under development. Promat also operate fully accredited (ISO 17025) R & D laboratories located in Australia and Malaysia which are used extensively to ensure all Promat systems are suited to Asia Pacific markets.

All Promat materials are manufactured in accordance with accredited EN ISO9001: 2000 and ISO14001 quality and environmental management systems. Comprehensive testing of all Promat products and systems has been carried out by independent and nationally approved laboratories around the world in order to meet the relevant sections of BS476, AS1530, EN and ISO etc, as well as many other international test standards.



Our accumulated knowledge and technical expertise is available to all clients and customers who specify Promat proactive fire protection. Full technical and sales support teams are available to provide information and assistance to help in the design and installation of all Promat fire protection solutions.

Defining modern era proactive fire protection

An active fire protection system reacts to conditions caused by a fire such as heat, smoke or light and then tries to control the blaze. This is usually done either by drenching via a sprinkler system, by creating a warning via a smoke alarm, or by activating a fire defence system such as a fire curtain.

Active fire protection is undoubtedly very effective, but has the in-built disadvantage of being dependent upon each of the various elements of the chosen system working, as and when they should. Any vandalism of the water feed mechanism, damage to the operating valves, or simple ignorance, can render the system inoperative. It would be unwise, therefore, to construct a building’s fire defence around a single system that cannot always be guaranteed.

A proactive fire protection system on the other hand, insulates a structure and prevents the building from collapsing or prevent a fire from spreading beyond the compartment of origin when subjected to the effects of fire. Such protection can buy significant time for the building occupants or users to escape.

It is also the time in which fire fighting services can arrive at the scene, safely enter and remain in the building in order to contain and extinguish the conflagration.

Many proactive fire protection materials also give added benefits such as thermal and acoustic insulation.

However, to optimise fire protection, active and proactive systems must be seen as complementary, not competitive. Legislation frequently recognises this by allowing them to work in tandem. For example, if sprinklers are employed, a reduced degree of proactive protection can sometimes be allowed.

Not all blazes are the same, defining types of fire

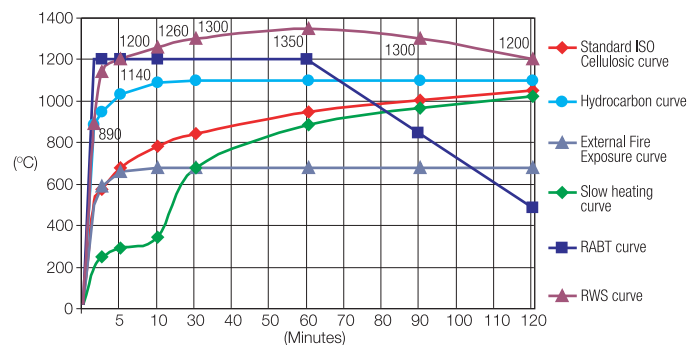
Like fire protection systems, fires are also considered in two categories. They are classified as either cellulosic or hydrocarbon.

In fire protection terms, the difference between the two types of fire is not the temperature but the time it takes for the fire to reach its maximum temperature range. Under test conditions a hydrocarbon fire will reach a temperature of 900°C in less than 5 minutes, while a cellulosic fire will take 45 minutes to reach the same level (please refer to **Figure 1**).

Cellulosic fires are those that are sustained by cellulosic products – e.g. timber, fabrics or paper – and usually encountered in buildings such as offices, hospitals shopping malls and schools etc.

Hydrocarbon fires are those generated by chemicals or fuels, e.g. gas or petroleum. A third possible sub-section of the hydrocarbon fire is a fire in a tunnel or in other confined, enclosed spaces. Here, the basic concept is a burning fuel tanker and as such the fire is fundamentally hydrocarbon in nature, but the testing temperature is to 1350°C rather than the 1100°C of the “standard” hydrocarbon or cellulosic fire. For a detailed discussion of the special requirements in tunnels, please refer to the SPRAYED COATING PROTECTION FOR TUNNEL LININGS handbook from Promat Sprays Division.

Figure 1: Comparison of typical cellulosic and hydrocarbon time/temperature curves



The need to protect against cellulosic fires

Proactive fire protection is designed to insulate steel, timber or concrete structures. The technique ensures that the substrate temperature does not reach the level that causes the steel to buckle and collapse, or the concrete to spall.

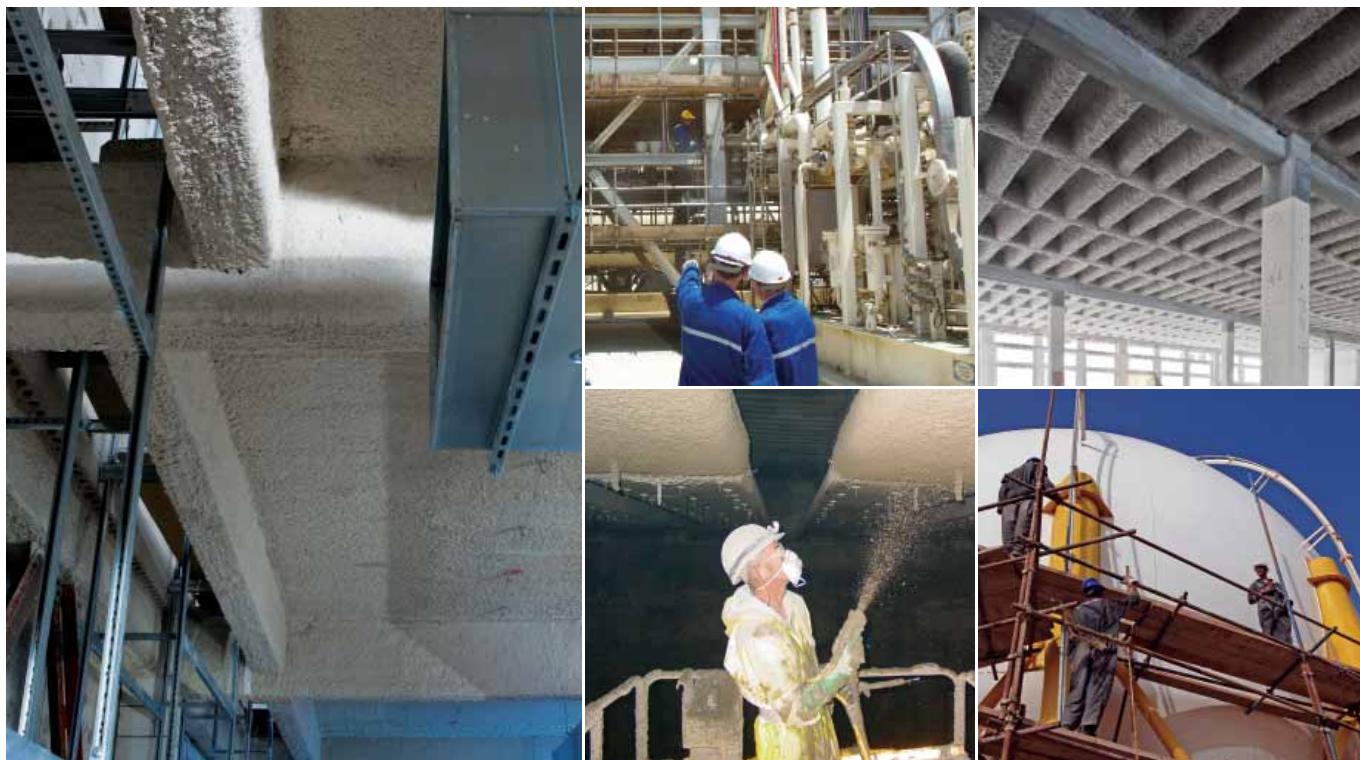
Steel starts to lose its strength at around 550°C when fully loaded. “Standard” testing is based upon exposing protected steel sections to furnace temperatures of 837°C at 30 minutes, 945°C at 60 minutes, 1006°C at 90 minutes and 1049°C at 120 minutes.

If a fully loaded beam or column is exposed to these temperatures, failure is deemed to occur when the steel deflects to its maximum before collapse when all, or part of the coating falls off. Obviously, if the coating comes away, the protected steel section is exposed to the fire and rapidly reaches failure temperature.

In addition to its ability to prevent structural steel from reaching the temperature at which it will collapse, a proactive fire protection product itself must not significantly contribute to the quantity of combustible material in a building. This is a Building Regulations requirement and is tested by the fire testing laboratories.

Proactive fire protection products are therefore tested for the extent of their inherent fire resisting properties, including:

- combustibility,
- rate of surface spread of flame and
- contribution to fire propagation.



Diversity of Promat Sprays Division operations and proactive fire protection solutions

Promat is probably the largest supplier of proactive fire protection to the construction and petrochemical industries in the world. Promat also has considerable specialist expertise in tunnel fire protection internationally.

Construction industry

With more than 50 years experience in the development, specification and supply of fire protective coatings for structural steel and concrete substrates required in multi storey buildings, hospitals, airports, office towers and the like. Well over 30,000,000m² of building structures have been protected.

Petrochemical industry

- On-shore petrochemical complexes
With 30 years experience in on-shore petrochemical complexes throughout the world. In excess of 4,000,000m² of equipment structures pipe racks and storage vessels have been protected.
- Off-shore installations
With 25 years experience on off-shore installations throughout the world. Greater than 3,000,000m² of oil and gas production facilities have been protected.

Tunnel linings

With more than 40 years experience in tunnel fire protection. In this time, substantially more than 1,000,000m² of tunnel lining have been protected using Promat cementitious spray materials.

The chart below indicates which generic sprayed coating materials are applicable within specific industries.

Industry/Material	Cafco FENDOLITE® MII	Cafco MANDOLITE® 550	Cafco MANDOLITE® CP2	CAFCO® 300	Cafco BLAZESHIELD® II	Cafco SPRAYFILM® WB3
Construction			●	●	●	●
Petrochemical	●	●				
Tunnel Linings	●					

NOTES:

- ⁽¹⁾ Vermiculite and Portland cement or gypsum based wet mix sprays. These sprayed coatings need to be mixed on site with water to form a slurry prior to being conveyed under pressure through a hose to a spray nozzle where compressed air is introduced prior to application. These sprayed coatings have been tested to ensure they will achieve the required insulation in fire protection applications and require no activation by heat or flame. Details of installation procedure, theoretical coverage, site quality control and health and safety of other Cafco products are discussed in separate application manuals, available upon request.
- ⁽²⁾ Mineral wool cement based dry mix spray. This sprayed coating coating does not need to be premixed with water. Instead, the material is conveyed in its original state by air under low pressure. Atomised water is introduced at the spray nozzle prior to application. This sprayed coating has been tested to ensure it will achieve the required insulation in a fire protection application and requires no activation by heat or flame.
- ⁽³⁾ Water based intumescent paint coating. Cafco SPRAYFILM® WB3 is a waterborne intumescent coating material. Details of application, substrate preparation, top coating and calculation of Hp/A section factors of Cafco SPRAYFILM® WB3 are discussed in a separate application guide.

General information

Cafco MANDOLITE® CP2 is a spray applied, single package factory controlled premix, based on vermiculite and Portland cement, for internal use.

Cafco MANDOLITE® CP2 produces a monolithic coating able to withstand the thermal shocks experienced in high intensity cellulosic fires. Concrete structures in particular, will be protected from explosive spalling when coated with Cafco MANDOLITE® CP2.

Although low in density, thus significantly reducing dead load, Cafco MANDOLITE® CP2 is highly durable and will not crack or spall under mechanical impact.

Cafco MANDOLITE® CP2 may be applied within environments where limited exposure to the elements is likely throughout the building phase of the project, e.g. perimeter beams.

Cafco MANDOLITE® CP2 is used for application to steel and concrete frames, metal floor or roof decks, and return air plenums. It may be easily removed and reinstated locally when additional fixings are required. Building types that will benefit from the use of Cafco MANDOLITE® CP2, include a wide range of educational, leisure and entertainment centres, commercial or industrial projects.

With regard to all statutory requirements for appropriate safeguards against exposing employees and the public to health and safety risks, the material safety data sheet (MSDS) can be found on [pages 17 and 18](#) and, as with any other materials, should be read before working with the Cafco MANDOLITE® CP2 product.



Typical mechanical properties

Colour and finish	Off-white with a monolithic spray texture
Theoretical coverage (nominal)	172m ² /tonne at 15mm thickness
Number of coats	One or more as required
Cure	By hydraulic set
Initial set	2 to 6 hours at 20°C and 50% RH
Density	390kg/m ³ ± 15% (when fully cured following installation)
Bond impact	No cracks or delaminations in accordance with the criteria of ASTM E760
Air erosion resistance	No erosion in accordance with the criteria of ASTM E859
Compressive strength	563kPa accordance with the criteria of ASTM E761
Deflection effect	No cracks or delaminations within normal code limits
Combustibility	Non combustible in accordance with BS 476: Part 4
Flame spread	Class 0 as defined by relevant Building Regulations
Smoke generation	Does not contribute to smoke generation
Thermal conductivity	0.095W/mK at 20°C
Corrosion resistance	Cafco MANDOLITE® CP2 can be applied over unprimed steel with no adverse effects on adhesion. Cafco MANDOLITE® CP2 does not promote corrosion. See Preparation on page 7 & 8 .
pH value	12.0-12.5
Fire resistance	Structures protected with Cafco MANDOLITE® CP2 have undergone fire resistance tests up to 240 minutes in approved independent laboratories to recognised standards throughout the world, including: <ul style="list-style-type: none"> • Australia (AS 1530: Part 4) • UK (BS 476: Parts 20-21: 1987) • Germany (DIN 4102) • USA (ASTM E119 UL263) The tests also comply with International Standard ISO 834. Cafco MANDOLITE® CP2 protected structures have been successfully tested under BS 476: Part 21 to failure temperatures of up to 800°C. This allows the specifier the freedom to adopt a fire engineering approach to fire resistance in accordance with BS 5950: Parts 3 and 8, as well as relevant Eurocodes.

Site requirements

Material storage

1. Bagged material

These materials must be kept dry until ready for use. They should be stored off the ground, undercover, and away from wet or damp surfaces or areas of very high humidity. Storage temperatures are not critical as long as dry conditions are maintained.

They can be stored for up to 12 months from date of shipment under good, dry conditions.

2. Water based coatings

These products should be protected from frost and temperatures above 45°C. They should not be stored in high ambient temperatures or in direct radiant sunlight.

On-site application requirements

The applicator should ensure that adequate services are available on the site, e.g. suitable electrical supply, compressed air, clean potable water, surplus water and waste disposal facilities, heating and lighting if required.

1. Weather protection

The materials must be protected from extremes of weather (freezing or warm drying winds, radiant heat or running water) during application and initial curing.

The materials should not be applied unless the substrate and air temperatures are at least 2°C and rising. Do not apply if the substrate or air temperatures are less than 4°C and falling.

Maximum air and substrate temperature 45°C. Surface temperature should be at least 2°C above dew point temperature.

2. Drying

Provision should be made for adequate ventilation during and after application until the coating is fully cured.

3. Masking

In some cases it may be necessary to mask off surrounding areas to protect from overspray.

Equipment

Equipment suitable for the application of Promat Spray materials is widely available throughout the world. It is important, however, that any plant used should conform to the required technical specification indicated within this section.

Other types of equipment apart from those defined there may be satisfactory, e.g. certain types of continuous mixers and piston pumps, but it is in the applicator's interest that such equipment is tested by practical trials and agreed suitable for use by Promat Sprays Division.

1. Equipment for the application of Cafco MANDOLITE® CP2

- A spraying machine based on a metal rotor/flexible stator, e.g. mono pump is recommended.
- A mechanical mixer, e.g. paddle blade or drum type concrete mixer should be used. Minimum capacity 100/150 litre.

Rotational speed 20-30rpm under load, maximum 35rpm free running.

Paddle blade mixers should be equipped with rubber (or synthetic equivalent) tipped blades to wipe the drum wall during mixing.

Small capacity mixers and mixers with too high a rotational speed should not be used as they are detrimental to Promat Spray products.

- An air compressor of adequate capacity is required. This may form an integral part of the spray machine or stand alone as a separate unit.

A capacity of 0.42m³ per minutes free air delivery (FAD) and a pressure of 3.5kgf/cm² is normally suitable at the spray head.

In cases where an air driven spray machine is utilised then reference should be made to the manufacturer to determine the necessary air capacity required to drive the equipment.

- A suitable sprayhead must be used in the application of Promat sprayed cementitious materials. Promat Sprays Division produce a sprayhead tailor-made for this purpose and full details are available on request.
- Where it is impractical to use the main plant for the purposes of applying the keycoat, a hopper gun should be used.

Hopper guns are generally based on a gravity feed principle using a 10mm face plate, such as are available from Putzmeister.

2. Equipment for the application of CAFCO® PSK 101

Most industrial airless spray types are suitable. Use of 0.28-0.38mm spray nozzle with appropriate filters. Typical angle of fan is 30-60 degrees subject to substrate shape.

Surface preparation

It is the responsibility of the applicator to ensure that all substrates to be protected are in a suitable condition to accept the coating. The substrate to be coated should be clean, dry and free from dust, loose millscale, loose rust, oil or any other condition preventing good adhesion. The substrate should also be chemically resistant to Portland cement.

Where substrates or conditions other than those given in the following are encountered, please seek Promat Sprays Division for advice.

1. Bare steel

Cafco MANDOLITE® CP2 has excellent adhesion to bare steel and since it is alkaline in nature, is likely to provide some measure of protection against corrosion. The alkalinity of the material will, however gradually decrease with time due to carbonation of the free lime in the Portland cement. Once the alkalinity has declined below a certain level, the fire protective material cannot assist in corrosion protection.

Promat Sprays Division therefore makes no claims as to the effectiveness of their materials as an anti-corrosion treatment to steel. It is recommended that all steel is primed for exterior use. However, it is for the building designer to decide whether the risk of corrosion in the interior environment warrants the use of priming or any anti-corrosion system.

2. Primed steel

Painted surfaces should be in a sound condition, fully cured and solvent released. The paint should have been applied in accordance with the paint manufacturer's instructions to the appropriate thickness.

Since Caferc MANDOLITE® CP2 contains Portland cement, it should not be applied to alkali sensitive primers, e.g. those containing an alkyd binder. Any paint system used should therefore be stable when exposed to an alkaline pH of 12-12.5, e.g. two-pack epoxy resins are normally suitable.

3. Alkyd primed steel

In situations where an alkyd primer has already been applied to the structural steel it will be necessary to apply CAFCO® PSK 101 to act as a barrier coat between the alkyd primer and the Portland cement contained in Caferc MANDOLITE® CP2.

For information on the application of CAFCO® PSK 101 in this situation, please refer to [Application of CAFCO® PSK 101 to incompatible primers](#) on [page 10 to 11](#).

4. Galvanised steel

Caferc MANDOLITE® CP2 has good adhesion to clean, hot dipped galvanised steel. A slight surface reaction can occur between Caferc MANDOLITE® CP2 and the galvanising but this does not appear to have any significant effects on the Caferc MANDOLITE® CP2 or the galvanised steel, unless the material is in a continually wet environment. Under these conditions, a more extensive reaction may occur and pre-treatment with a suitable coating is advisable (e.g. CAFCO® PSK 101) as well as the use of an external grade fire protection material.

5. Composite beam and floor assemblies

A series of fire resistance tests have been undertaken by the Steel Construction Institute, to examine the effects of leaving unfilled the void formed by a trapezoidal deck and its supporting beam in composite construction.

The results of these tests indicate that for fire resistance periods of up to 90 minutes, the void may be left unfilled providing the design is fully composite although some increase in the thicknesses applied to the remaining three sides of the beams would be required.

In the case of non-composite construction or periods of fire resistance in excess of 90 minutes, the voids must be filled.

For specific advice and recommendations, please consult Promat Sprays Division.

6. Old, unknown or suspected multi-layer paint systems or substrates previously coated with asbestos

Occasionally during building refurbishment work, or when a change of use of a building occurs, old primed steelwork not previously fire protected or steelwork which was previously covered with sprayed asbestos for fire resistance purposes may require treatment with Caferc MANDOLITE® CP2.

These backgrounds are not suitable for direct application of our products. Under these circumstances, please follow the procedures outlined on [Substrates previously coated with asbestos](#) on [page 13](#).

7. Expanded metal or ribbed metal lath

Expanded metal or ribbed metal lath may also be used to provide a suitable background over unacceptable backgrounds. For method of use with Caferc MANDOLITE® CP2, over metal lath backgrounds see [Expanded metal lath for applications to soffits with unsuitable finishes](#) and [Expanded metal lath for bridging between two substrates](#) on [page 13](#).

8. Aluminium

Aluminium and aluminium alloy surfaces are alkali sensitive and require special treatment. It is recommended that a suitable etch primer be used. Promat Sprays Division can offer advice to suit particular circumstances.

9. Concrete

Most regular concrete substrates are suitable as a background for Caferc MANDOLITE® CP2. The concrete surface must be free from all release agents, contaminants and impurities. Special concretes with very high or very low suction properties or unusual thermal movement characteristics may require special treatment. Please consult Promat Sprays Division.

10. Gypsum plaster and plasterboard

As Caferc MANDOLITE® CP2 materials contain Portland cement they should not be applied to gypsum plaster or plasterboard backgrounds.

11. Wood

Given the high shrinkage and moisture movement characteristics of timber it is not considered desirable to apply cementitious spray materials direct to those surfaces for the purposes of fire resistance.

Where situations arise which call for Caferc MANDOLITE® CP2 to come into contact with wood then the wood should be pre-treated with a suitable sealer, e.g. CAFCO® PSK 101.

Application

General recommendation

Cafco MANDOLITE® CP2 is a factory controlled pre-mix which only requires the addition of potable water on-site to produce a mix of pumpable consistency.

Cafco MANDOLITE® CP2 requires 20-24 litres of water per 12.5kg bag.

Prior to the application the material, the following points should be clearly noted:

- Sufficient material should be conveniently placed by the pump and mixing equipment to ensure continuity of feed supply.
- Pump and mixing equipment should be positioned to optimise the spray area available.
- Prior to application, substrate and air temperature readings should be taken where relevant, as the products may suffer permanent damage when:
 - they are frozen before they are cured sufficiently to resist disruption by freezing, or
 - their cure is affected by rapid migration of moisture due to excessive heat.
- The following factors may assist application in cold weather: warm mixing water may be used (up to 35°C); shielding the work area from cooling winds; using a heated enclosure. Care should be taken to prevent excessive rapid evaporation of water; any masking for the protection of sensitive areas should be carried out prior to commencement of application.

Mixing

The following procedure is only applicable to conventional mixers and mono-pumps:

- Make sure that the mixer and all tools are clean.
- Ensure that mixing water is of a clean, potable quality.
- Place most of the required mixing water into the mixer.
- Partially set, frozen or lumpy material must be rejected.
- Add the bagged material steadily. Add remainder of the mixing water slowly until air entrainment occurs, normally after 90 seconds from commencement of the mix.
- Mixing time is 3 minutes to ensure correct properties of the mix. As a general rule of thumb, do not vary from the recommended quantities of water.

Provided that mixing is almost continuous, the next batch can be prepared without washing out the mixer. The measured mixing water should be poured into the mixer so that it washes the remnants of the previous mix from the walls of the mixer.

- The workability of the mix will depend on ambient conditions. However, as a guide and based on an ambient temperature of 20°C and a relative humidity of 50%, up to 1 hour should be considered typical for Cafco MANDOLITE® CP2.
- If the mixer is to be left for an extended period of time then it should be thoroughly cleaned with water and left ready for further use.
- Additional water must not be added to regain workability. Unworkable material must be rejected. Any partially set material left in the mixer must be cleaned out before further batches are mixed.
- For Cafco MANDOLITE® CP2, 480-640kg/m³ of wet bulk density should be obtained at discharge from the mixer if mixing and water quantities are correct.

Spraying

To bare steel or galvanised steel

Cafco MANDOLITE® CP2 does not require a keycoat for application to bare steel or clean galvanised steel.

- Check the condition of the substrate to ensure that it is clean, dry and free from dust, loose millscale, loose rust, oil or any other condition that would prevent good adhesion.
- Arrange the spraying machine and the spray lines for convenient access so that the operator has freedom of movement over the area to be sprayed.
- Check that the spraying machine is clean and fully operational.
- Where a pump has not received a continuous supply of material, e.g. morning start up, clean water should be passed through the pump, hose and sprayhead.

When the mixed material is introduced into the pump sufficient material should be allowed to pass through the spray head to ensure that all traces of surplus pre-delivery water are removed and the correct mix consistency is reached.

- The correct amount of air introduced at the nozzle is essential to ensure consistency of texture and correct density of material. Air pressure of 2.1-3.5kgf/cm² and in the case of the sprayhead 2.1-2.8kgf/cm² at the sprayhead is suitable.
- Materials should be sprayed with minimum air pressure consistent with satisfactory application to give an even coating over the background building up in a series of passes. Even coats are obtained with steady sweeps of the sprayhead which is held, whatever possible, at 90° to the work surface. The sprayhead must not be held stationary.
- Wet bulk density at nozzle discharge should be 690-980kg/m³.

NOTE: Density figures determined under laboratory conditions.

- The materials have been designed so that they pump easily but stiffen and become cohesive as they are placed on the desired surface. This enables the specified thickness to be built up with the minimum number of coats (often only one).
- Do not apply a single coat of less than 8mm.
- Coating thicknesses should be continuously checked to ensure that the correct thickness is applied.
- Where structures include a horizontal surface that requires coating on the top side (e.g. top of the bottom flange of a beam) the first spray pass should be made on to that surface. This will avoid the possibility of reduced bond strength resulting from application onto loose over-spray which can sometimes occur from prior applications to the other surfaces.

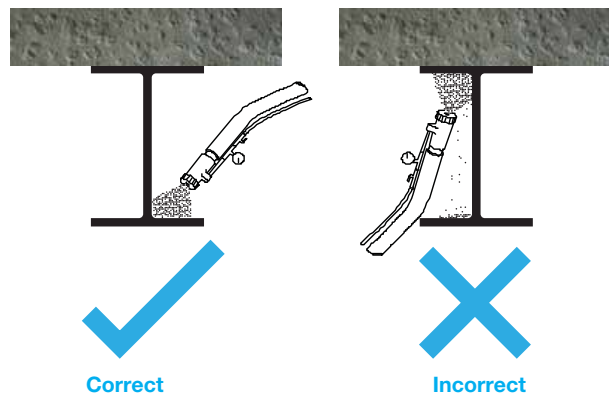


Figure 1: Appropriate spraying procedure for applying Cafco MANDOLITE® CP2 to beams etc

- l) When applying the materials to beams and columns it is important that the coating thickness around the flange edges is the same as the thickness on the remainder of the section. Failure to observe this means that the full fire resistance may not be obtained.

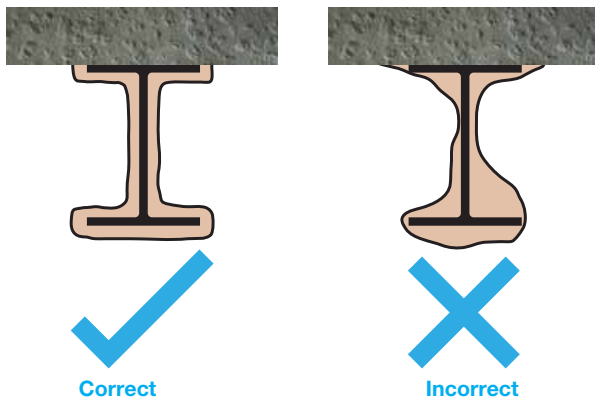


Figure 2: Uniformity of Cafco MANDOLITE® CP2 coating thickness

- m) For situations where the materials are applied in more than one coat, the preceding coat should be left with a spray texture finish or well scratched to ensure good bonding of subsequent coats.
- n) The time between coats will be subject to the environmental conditions at the time of application, however, 2-6 hours are recommended for guidance.

NOTE: If the surface has become very dry, it should be well dampened with clean water before applying further coats, but must not exhibit a water sheen. Subsequent coats, if required, should be ideally applied within 48 hours of initial set of preceding coat.

Working with compatible primers

Given the range and complexity of priming systems currently available, their compatibility with Cafco MANDOLITE® CP2 is an important consideration.

A key coat will be required on a compatible primer, e.g. two pack epoxies.

Should there be any uncertainty with regard to primer compatibility, reference should be made to Promat Sprays Division.

Given that primer compatibility has been determined the following procedures should be adopted prior to the application of the fire protective coating.

1. Keycoat

It is the responsibility of the applicator to ensure that the background to be treated is in a suitable condition to accept the keycoat. The applied primer should be in a fit condition to receive the fire protective system, i.e. fully cured, bonded, solvent released and applied to specified thickness.

The function of the keycoat is to provide a tough, textured, strongly adhering mechanical key under ambient conditions for subsequent coats of Cafco MANDOLITE® CP2.

The keycoat is made up from a mixture of Cafco FENDOLITE® MII and CAFCO® SBR Bonding Latex. Cafco MANDOLITE® CP2 should not be used for this purpose.

2. Preparation

- Make sure that the mixing equipment is clean.
- Add one volume of mixing water and one volume of CAFCO® SBR Bonding Latex to the mixer, i.e. replace 50% of the mixing water normally used for the mixing of Cafco FENDOLITE® MII with

CAFCO® SBR Bonding Latex. Please refer to **Mixing** on page 9.

This is best achieved before the mixing procedure is undertaken, i.e. by removing 50% of the CAFCO® SBR Bonding Latex from its container and replacing it with water. This will ensure that the correct proportions of water/CAFCO® SBR Bonding Latex are always introduced with the Cafco FENDOLITE® MII during the mixing procedure.

On no account should the CAFCO® SBR Bonding Latex be added neat to the Cafco FENDOLITE® MII dry premix as lumps will be formed.

- Add the Cafco FENDOLITE® MII slowly whilst mixing until a creamy pumpable consistency has been obtained.
- Mixing time 3 minutes.
- Unless a further mix is to be prepared immediately the mixing equipment should be thoroughly washed with clean water immediately after use.
- Given the degree of coverage achieved from a one bag mix of keycoat (minimum 50m²) it may not be considered desirable to utilise the main mixing and spray plant. In such cases small quantities may be mixed in a bucket and applied by hopper gun (see **Equipment for the application of Cafco MANDOLITE® CP2** on page 7) or CAFCO® PSK 101 may be applied following the procedure given on **Application** and **Limitation of application** on page 11.
- **ON NO ACCOUNT IS KEYCOAT TO BE APPLIED IN ANY OTHER MANNER THAN BY THE SPRAY PROCESS INDICATED BELOW.**

3. Application

- Spray the keycoat so as to give a 20-50% coverage of the background with blobs of material approximately 5mm in diameter. Best control will be obtained if the material is sprayed at a low throughput, e.g. 7 litres/minute using an 11mm internal diameter spray nozzle at low air pressure 0.7kgf/cm².

The keycoat must be evenly applied over the total area to be protected.

- The keycoat must then be allowed to cure and dry thoroughly before proceeding with the application of the main fire protective coating. Since this is likely to take 10-36 hours, depending on drying conditions, it is advisable to complete as much of the keycoat as possible in any one area before subsequent application of the fire protective coating. Application of the keycoat is quickly completed, so good access and freedom of movement is important.
- Clean up all overspray or spills with water before the keycoat sets as the cured material is very difficult to remove.
- Equipment used should be thoroughly cleaned immediately after application is complete.

NOTE: On no account is keycoat to be applied in any other manner than by the spray process indicated above.

Application of CAFCO® PSK 101 to incompatible primers

The application of cementitious coatings onto incompatible primers such as alkyds gives rise to the risk of chemical reaction between the two materials, leading to partial or total bond failure.

Such a reaction may take 12 weeks (or longer) to become identifiable and can be recognised by a characteristic cracking pattern, a hollow sound from the fire protective coating when tapped or in the worst case material falling away from the substrate.

Identification of this reaction can sometimes be made by a characteristic “bleeding” of the primer into the fire protective coating.

CAFCO® PSK 101 has been specifically developed as an alternative keycoat system for application in situations where an alkyd primer has already been applied to the substrate.

When applied following the procedures indicated below CAFCO® PSK 101 acts as a sealer coat between the two systems.

1. Surface preparation

Surfaces to be coated must be dry and free from oil, grease, and visible moisture (including condensation), dirt, loose paint, dust or other materials or conditions likely to impair adhesion of the CAFCO® PSK 101.

Old, unknown or unsuspected multi-layer paint system must not be overcoated without reference to **Old, unknown or suspected multi-layer paint systems or substrates previously coated with asbestos** on [page 8](#).

2. Application

CAFCO® PSK 101 must not be thinned and should be applied by one of the following methods:

- Airless spray: Most types are suitable. Use 0.28-0.38mm spray nozzle with appropriate filters. Typical angle of fan 30-60 degrees subject to substrate shape.
- Rollers: Use of lambswool roller is recommended.
- Brush: For best results, use a wide soft nylon brush of the type recommended for use with water based coatings. The use of brush should only be considered for very small areas of application, i.e. less than 1m².

3. Limitation of application

Suitable surfaces which may be overcoated with CAFCO® PSK 101 include properly applied and cured alkyd primers.

Optimum time before overcoating with either a further coat of CAFCO® PSK 101 or Cafco MANDOLITE® CP2 is 2 months.

4. Number of coats

Normally one, but additional coats can be applied as required.

Optimum thickness : 125 microns WFT

69 microns DFT

Thickness range : 100-150 microns WFT

55-82 microns DFT

NOTE: Do not apply less than 100 microns WFT.

5. Re-Coating

Ensure that the surface condition meets the requirements of **Surface preparation** and **Limitation of application**, [above](#).

6. Preparation

Touch dry: ½-1 hour at 20°C and 50% RH

Fully dry : 2-6 hours at 20°C and 50% RH

Drying times will vary with ambient conditions, but high humidity and low air change will hinder cure.

Once dry, application of Promat Sprays fire protective systems may take place following the procedures commencing on [page 9](#).

Mesh reinforcement/retention

General consideration

For general use in the construction industry, Cafco MANDOLITE® CP2 does not require any form of mesh reinforcement/retention. However, mesh will generally be required if one or more of the following conditions are encountered:

- No re-entrant detail exists, i.e. there is no opportunity for the fire protection coating to “lock around” the substrate.
- Where vibration, mechanical damage and a possibility of subsequent debonding exists.
- Where the web depth between the flanges exceeds 650mm and/or the flange width exceeds 325mm.
- Where the diameter of a hollow section exceeds 325mm.
- When any one face of a rectangular or square hollow section (RHS/SHS) used as a beam exceeds 325mm.
- Where a continuous application is required between two adjacent but separate substrates (but not bridging a movement joint).

Recommended types

- Galvanised hexagonal mesh of size 50mm x 50mm x 1.0mm.
- Galvanised hexagonal mesh of size 50mm x 50mm x 1.4-1.6mm.
- Plastic coated galvanised 50mm x 50mm hexagonal mesh.
- Galvanised expanded metal lath BB 264 (1.61kg/m²).
- Riblath 271 (2.22kg/m²).
- Riblath 267 (stainless, 1.51kg/m²).

Other galvanised expanded metal lath may be suitable but must be confirmed as such by Promat Sprays Division in writing prior to their use on site.

Types of application

The aforementioned recommended mesh types fall into two categories:

1. Hexagonal reinforcing mesh

Hexagonal reinforcing mesh, e.g. CAFCO® Plastic Coated Galvanised Mesh, may be required on a steel beam or column and will generally be fixed to and around the profile of the substrate so as to be within the mid third of the applied coating thickness.

Partial meshing of deep web/wide flange sections, e.g. plate girders, is acceptable providing the following conditions are observed:

- The unmeshed portion of the web must not exceed 650mm above or below the centralised meshed area.
- The unmeshed portion of the flange should not exceed 325mm before re-entrant detail occurs.
- The minimum width of mesh reinforcement permitted on either web or flange is 300mm.

2. Retention lath mesh

Retention lath mesh can provide a suitable background on unsuitable substrates, e.g. old, poor quality concrete. It may also be used to bridge a gap between, for example, a pair of parallel beams (not over a building movement joint) or to bridge a gap between a steel beam or column and an adjacent wall where there is no possibility of protecting the back face of the beam.

Cafco MANDOLITE® CP2 is suitable for application to the profile of a section. It may also be used over expanded metal lath (EML) providing the following limitations are observed:

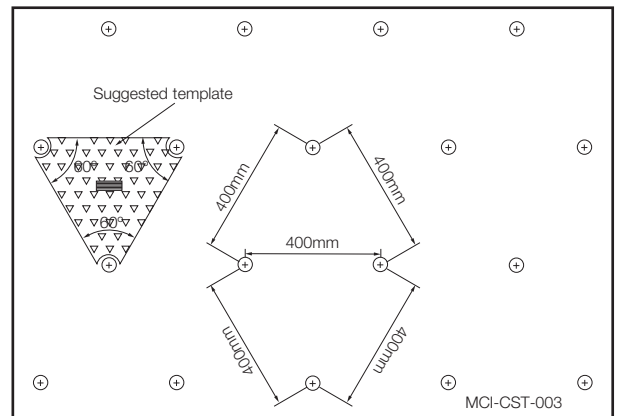
- It may be applied to EML used to bridge gaps between parallel sections or a section adjacent to a wall where the back face of the beam cannot be protected.

NOTE: The EML may be fixed to the steel section but must not be fixed to the wall.

- It may be applied to Riblath securely fixed to a soffit coated with an unsuitable finish.

Fixing methods

The reinforcing mesh, e.g. CAFCO® Plastic Coated Galvanised Mesh, should be fixed to the steel substrate using capacitor discharge (stud welded) pins or (where permitted) percussion type fixings at approximately 400mm centres on a staggered pitch.



- Stainless steel stud welded pins of size 3mm diameter x 11mm long with stainless steel bridge clips or CAFCO® Helical CD Weld Pins 2mm diameter x 11mm long should be used to secure the plastic coated mesh.

NOTE: No clips are required with Helical Pins.

- Mild steel pins of not less than 3mm diameter (length to suit applied thickness) with galvanised non return (speed fix) washers should be used to secure galvanised hexagonal reinforcing mesh.
- The welded pins should be capable of being bent once through an angle of 45° and back to their original position without failure at the welded joint. In the case of helical pin, rotated through 90° and back to its original position without failure at the welded joint. See **QA/QC procedures** on pages 15.
- Self-adhesive, glued or plastic pins must not be used without prior consultation and confirmation in writing by Promat Sprays Division, as their performance under fire conditions is generally inadequate for normal failure criteria. Such fixings may be approved by Promat when they act as a temporary fixing to assist location of reinforcing mesh where the fire protective material cannot fall away under fire conditions. These and similar applications must be approved in writing by Promat before commencement of work.
- When mesh is applied it must be overlapped by at least 50mm at the joins. No more than 3 layers should overlap at any one point.
- For thickness of fire spray up to 45mm the mesh may be applied prior to application. It is important that the mesh is not hard up against the substrate, therefore once secured by clips, the mesh should be pulled away from the substrate so as to lie substantially in the middle third of the thickness being applied.
- Where the thickness exceeds 45mm the mesh may be fixed to a suitable length pin after application of approximately half the fire spray thickness.
- **When reinforcing mesh is used, the minimum practical thickness of Cafco MANDOLITE® CP2 that may be applied increases from 8mm to 15mm.**

Application over old, unknown or suspected multi-layer paint systems

Method 1

- Shot blast all steel surfaces to remove all contamination, rust, paint, etc. and proceed as for application to bare steel. See [Spraying on page 9](#).

Method 2

- Remove loose rust or flaky paint by manual or power wire brushing. Locally grind back to bright metal and fix stud welded pins to the substrate at 400mm centres (maximum). Alternatively percussion fixings may be used. Apply one coat of CAFCO® PSK 101 (see [Application of CAFCO® PSK 101 to incompatible primers on page 10 to 11](#)). Fix hexagonal reinforcing mesh (e.g. CAFCO® Plastic Coated Galvanised Mesh) to pins and ensure that it will be in the mid third of the applied thickness. Apply Cafco MANDOLITE® CP2.

NOTE: Although the application described in this method will provide the required fire resistance, our experience with this type of application suggests that cracking and disbonding may occur but since the materials will be reinforced their stability in fire can be assured.

Method 3

- Use an alternative product such as Promat board systems.

Substrates previously coated with asbestos

In situations where asbestos has been removed from a steel (or other substrate) it is normal practice to encapsulate any residual fibres remaining on the substrate (which have not been removed in the stripping process) with a PVA or other approved encapsulant.

Since shot blast cleaning of this type of substrate is not likely to be permitted for safety reasons, we recommend that expanded metal lath or Riblath is fitted to form a box encasement of the beam or column and that Cafco MANDOLITE® CP2 is applied.

Alternatively, Promat board systems may be applied.

NOTE: When asbestos has been removed from a soffit, see guidance given in Composite Beam And Floor Assemblies on page 8.

Expanded metal lath for applications to soffits with unsuitable finishes

When it is necessary to apply Cafco MANDOLITE® CP2 to a new concrete (or metal deck) soffit to increase its fire resistance this can be generally achieved by direct spray application.

If during a refurbishment project, for example, an old or previously painted or plastered soffit or a soffit from which asbestos has been removed is required to be upgraded, direct application of Cafco MANDOLITE® CP2 is not recommended due to the possibility of chemical incompatibility between the existing treatment (or residual asbestos encapsulant) and a Portland cement based coating.

In such situations it is recommended that Cafco MANDOLITE® CP2 is applied to galvanised Riblath 271 (or equal) that has been fixed to the soffit in accordance with manufacturer's recommendations using suitable metal fixings at maximum 600mm centres.

Expanded metal lath for bridging between two substrates

Where a "bridge" situation exists between two sections, e.g. steel beam to steel beam or steel beam (or column) to wall and spray application of the back face of the section is not physically possible,

Cafco MANDOLITE® CP2 may be applied to a metal lath which spans the gap. The type of lath and fixing method will vary and may involve consideration of differential movement. Where such situations are found to exist, please refer to Promat.

NOTE: The minimum practical thickness that may be applied to a metal lath substrate is 13mm proud of lath surface.

Surface finish

Cafco MANDOLITE® CP2 is designed for spray application to achieve a textured finish. In certain special circumstances it may, however, be levelled after application; for example, where it is deemed necessary to rectify any minor imperfections in profile. If it is necessary to reduce the thickness significantly it is better to cut the material with a tensioned wire or metal trowel.

Once levelled, an immediately application of thin spray coat of Cafco MANDOLITE® CP2 will help if necessary to disguise any trowel marks.

Thickness control

When each surface to be protected is required to have the same thickness, as in the case of steel "I" section columns and beams, at least one thickness measurement every 3 metres should be taken on each surface of the flanges and the web. On steel I sections, the spray coating on the flange should not be permitted to taper off toward the flange edge. Where there appears to be such tapering, the thickness should be checked across the flange and over the flange edges at the recommended nominal 3 metre intervals. It is considered advisable to record measured thicknesses.

Conditions of Acceptance for reduced thickness in accordance with BS 8202 : Part 1 : 1987 Code of Practice for the Selection and Installation of Sprayed Mineral Coatings Section 9.9.4:

"Where the thickness is found to be less than the specified thickness, the area may be reconsidered for acceptance, subject to the following conditions:

- The deficient area is not greater than 1m², the thickness is not less than 85% of the specified thickness; no other deficient area occurs within 3m of the area in question.
- The deficient area is not greater than 0.2m², the thickness is not less than 75% of the specified thickness; no other deficient area occurs within 1m of the area in question."

Repair procedures

When site alterations etc. cause local damage during the application period, Cafco MANDOLITE® CP2 is normally and routinely repaired by a further spray application.

If, however, subsequent damage occurs either accidentally or deliberately it is usually more convenient to effect repairs by the use of a hand applied patching mix.

Cafco MANDOLITE® CP2 should not be hand applied direct from the mixer. A Cafco MANDOLITE® CP2 patching mix has been developed for this purpose.

NOTE: Hand patching to Cafco MANDOLITE® CP2 is limited to areas not exceeding 1.5m².

Instruction for application

- Cut away any loose Cafco MANDOLITE® CP2 chamfering any sharp edges. Where hexagonal mesh is exposed, clear the material away from the mesh and ensure that it remains substantially in the mid third of the final coating thickness.
- Remove loose dust.
- Mix the Cafco MANDOLITE® CP2 patching mix with clean drinkable water to a consistency suitable for application with a trowel.
- A 12.5kg bag of Cafco MANDOLITE® CP2 patching mix will require approximately 20 litres of mixing water.
- For areas of potential difficulty, and where a full thickness of coating has to be reinstated, e.g. the underside of a beam and no reinforcing mesh is present. It is advisable to fix galvanised hexagonal mesh to the substrate.

If mesh was used in the original application but has been removed subsequently together with Cafco MANDOLITE® CP2, an additional section of mesh must be reinstated. The mesh should be pulled away from the surface of the steel to sit substantially within the mid third of the final applied thickness.

- Where the material to be patched has become very dry it is likely to require dampening with clean water. If more than 12mm thickness is required it may be necessary to apply the material in more than one coat.
- Apply the Cafco MANDOLITE® CP2 patching mix with a trowel allowing some overlap onto the existing material.
- If more than one coat is required, allow the preceding coat to take its initial set.
- Preceding coats should be left with a rough finish or scratched to ensure good bonding of subsequent coats.
- For small areas, e.g. less than 0.5m² it is likely that Cafco MANDOLITE® CP2 patching mix can be applied in one thickness to the total required thickness.

If the area of damage is larger than 0.5m² then more than one coat may be applied as required.

Additional surface finishes

Additional surface finishes may be applied to Cafco MANDOLITE® CP2 but they must be of a type approved by Promat, e.g. CAFCO® TOPCOAT 200. Application of incorrect or incompatible top coats can adversely affect the properties of the fire protective coatings.

Before applying any surface finish other than CAFCO® TOPCOAT 200 the fire protective material should be allowed to cure and dry for as long as possible and at least until its colour changes from the grey colour of the wet material to a light grey of the drier material.

CAFCO® TOPCOAT 200

Topcoating of cementitious products with paints of low water vapour permeability can, due to variations in vapour pressure, result in blistering on the paint. CAFCO® TOPCOAT 200 is a specially formulated coating of high water vapour permeability for the following performance:

- To protect against ingress from washdown water, chemical spills, rainfall, sprinkler deluge systems.
- To reduce the carbonation rate of Portland cement based products thereby extending their corrosion protection properties for a longer time period.

CAFCO® TOPCOAT 200 is flexible, flame retardant and mould resistant with excellent resistance to CO² diffusion.

Other finishes

Emulsion paints may be used for purely decorative purposes. The paints should be of good quality and suitable for direct application to concrete substrates. The coating thickness should be kept to a minimum. Application is normally by airless or conventional spray.

For coatings other than those outlined above, please refer to Promat Sprays Division.

Theoretical coverage

Cafco MANDOLITE® CP2

The following theoretical coverage figures are given for guidance only. Practical coverage will be influenced by such factors as mixing, pumping and spraying techniques which can affect applied density and wastage, the degree of site control, size and shape of items being protected, frequency of stoppages:

- Cafco MANDOLITE® CP2 based on a density of 390kg/m³ (285m²/tonne) or 3.65m²/12.5kg bag, both at 10mm thick.
- Minimum 50m²/bag of Cafco FENDOLITE® MII keycoat and 10 litres of CAFCO® SBR Bonding Latex.
- Cafco MANDOLITE® CP2 patching mix according to [Repair procedures](#) on [this page](#).

Water based coatings

CAFCO® PSK 101 & CAFCO® TOPCOAT 200

The coverage figures quoted are calculated by a method adopted for paints. Practical coverage will depend on several factors, e.g. surface texture, application techniques, substrate porosity and can best be determined by practical trial.

- 8m²/litre of CAFCO® PSK 101 at 125 microns WFT.
- 5m²/litre of CAFCO® TOPCOAT 200 at 200 microns WFT.

NOTE: Promat Sprays Division will not be held responsible for actual coverage rates achieved on site or the extent of wastage as these matters are outside our control.

QA/QC procedures

These quality assurance/quality control (QA/QC) procedures are for the guidance of both the client and the applicator. They may be amended for specific contracts by prior agreement with Promat Sprays Division.

- Cafco MANDOLITE® CP2 is produced in modern, highly automated plant, subject to stringent quality control procedures. The effective utilisation of these products requires equal attention to site quality control.
- The applicator is responsible for ensuring that all raw materials as delivered to site are of the correct type and in good condition. If there is any variation, he must consult with the client and/or Promat Sprays Division for clarification. The applicator should produce a raw materials quality control sheet, indicating inspection of each delivery to determine acceptance. This sheet is to be made available to the client and Promat on request.
- Once raw materials are accepted into store at site, the applicator is responsible for ensuring that they are stored in suitable conditions and are used within their prescribed storage life (where applicable).
- The applicator should have on site at least one person who has attended an introductory course in the application techniques of Cafco MANDOLITE® CP2.
- The applicator should appoint one person from his team on site to organise the QA/QC procedure as required.
- A typical sample should be prepared as part of the contract to act as a reference in matters of mesh location and fixing (where required), spray thickness and surface texture. This sample could either be a special item or, more usually, a site beam or column. This typical sample area should be approved by the client's representative in writing and clearly identified so that it may be used as an aid to settle any subsequent disputes that may arise.

Quality control/inspection

1. Substrates inspection

Check that the substrate is in a suitable condition before proceeding. It should be dry and free from oil, grease, loose rust, dirt, dust, scale or any other material likely to impair adhesion.

2. Pin fixing

Where required, the welded pin areas shall be inspected for:

- Correct grinding of surface to bright metal.
- Correct type, spacing and fixing of pins, including a 45° bend test for straight pins or a 90° rotation test for a CAFCO® Helical CD Weld Pin, at not less than one test per square meter. Maximum allowable failure rate of not more than 10%.

3. Keycoat for application to compatible primers

Check the keycoat has been applied correctly and is adhering well to the substrate.

4. CAFCO® PSK 101 for application to incompatible primers

Check the CAFCO® PSK 101 has been applied in accordance with Promat recommendations.

5. Mesh fittings

The mesh should be a galvanised hexagonal, e.g. CAFCO® Plastic Coated Galvanised Mesh, in 50mm x 50mm x 1-1.6mm wire diameter.

Check the fitting of the retention mesh; ensure that clips are fitted

correctly and that overlaps between sections of mesh are to specification. Prior to commencement of spraying, the mesh should be checked to ensure it is pulled away from the substrate to lie substantially in the middle third of the final coating thickness. The effectiveness of the entire retention system is negated if mesh is left hard against the substrate.

6. Weather conditions

Prior to application, substrate and air temperatures should be taken. Freshly applied wet cementitious products such as Cafco MANDOLITE® CP2 may suffer permanent damage if they are frozen prior to their initial set taking place. The temperature during application should therefore be recorded. The product should not be applied unless the substrate and air temperature is at least 2°C and rising or if the substrate or air temperature is less than 4°C and falling. The following factors may assist application in cold weather:

- Warm mixing water may be used (up to 35°C).
- Shielding the work area from cooling winds.
- Using a heated enclosure. Care should be taken to prevent excessive evaporation of water.

The maximum air and substrate temperature at which Cafco MANDOLITE® CP2 should be applied is 45°C. The surface to be protected should also be at least 2°C above the dew point temperature.

Density measurement and slump test

1. Density measurement

During normal spraying operation, take a daily sample of material from both the mixer and spray nozzle working in the normal mode. The samples should be taken in a standard container of known volume (without the use of agitation to increase packing rate).

Using the edge of a trowel or a tensioned wire, level the top of the samples by cutting back immediately after spraying or sampling from the mixer.

Do not compress the sample.

Weight the samples within ten minutes and record the bag numbers, the time the samples were taken and from the weight and volume, calculate the wet densities and record these values.

2. Slump test (only required on material from mixer)

Apparatus:

- A flat clean plate.
- Straight edge for levelling, e.g. palette knife.
- 150mm rule.
- Plastic slump tube, i.e. 104mm ID x 120mm long = 1 litre volume.
- Spring balance reading, i.e. 2kg in grams.
- Plastic bags sufficient to contain 2 litres and strong enough to hang on spring balance.

Procedure:

- Identify and record bag numbers and note number of bag(s) used for mix.
- Record mix water quantity used and mix time.
- As mix is being discharged into hopper, fill the plastic tube (preplaced on flat plate) with mix and cut back to level off at top. Do not agitate or compress the sample into the tube.
- Raise tube slowly and carefully vertically until the sample has slumped back out onto the plate.

- Place the tube upright on the plate adjacent to the slumped material.
- Using the straight edge and 150mm rule measure and record the vertical distance from the top of the tube to the top of the concave depression at the top of slumped material.
- Place slumped material into plastic bag.
- Weigh bag plus sample and record result.

NOTE: The plastic tube has a volume of one litre, therefore weight of the sample in grams taken from above procedure will represent density in grams per litre which is numerically the same as density in kg/m³.

3. Results

The value results obtained by following the foregoing procedure should lie within the following ranges:

- Density from mixer discharge at 480-640kg/m³
- Density at sprayhead at 690-980kg/m³
- Slump at 55-75mm

Surface finish

Cafco MANDOLITE® CP2 is a fire protective coating for steel and other substrates. Its role is to provide enhanced fire resistance in a cellulosic fire to commercial structures.

The specified thicknesses are a minimum requirement, minor thickness variations may occur.

The surface finish should be even with a fine textured spray. The aesthetic appearance of the surface is a matter of personal preference. However, if points above are recognised and control of thickness is maintained as described below, the result should be satisfactory. If a particular aesthetic standard is required, however, this should be clearly specified and allowed for in the typical sample area.

Thickness control

As prescribed in [Thickness control](#), page 13.

Surface treatments

Where required, check the topcoat paint has been applied in accordance with the specification and/or the manufacturer's recommendations.

Completed areas

Completed areas should be checked by the client with the applicator in attendance and passed in writing as acceptable before the applicator vacates the area.

Repair work

If the applicator is requested by the client to return to a completed area for repair work, the repair should conform to the relevant requirements in this application manual.

The applicator should not return to a completed area to carry out repair work unless he has written confirmation that such repair work is released to him.

Independent quality checking

The client may appoint an independent testing house to carry out

quality checking.

The following procedure for sampling and sample evaluation is the method recommended by Promat Sprays Division for checking the mix quality of Cafco MANDOLITE® CP2. Any amendments or other methods of quality checking should be submitted to Promat in writing for evaluation.

1. Method of sampling

During normal application procedure, the sample should be sprayed into two moulds without any alterations to sprayhead or machine settings (305mm x 305mm x 75mm mould size should be used).

The moulds should be coated with a release agent prior to sample taking to allow for easy demoulding after initial set.

The material in the mould should be equal to the depth of the mould. Any high spots should be removed with a cheese wire or cut with the edge of a trowel. The samples should not be tamped, vibrated or trowelled level.

2. Dry bulk density determination

- Demould sample not less than 48 hours after initial spraying into mould.
- Weigh sample and record.
- Allow sample to condition at room temperature for a minimum of 7 days.
- Place sample in oven at temperature of 50°C (in accordance with BS 8202 : Part 1 : 1987 – Appendix B – Density Test).
- Weigh sample every 24 hours until three identical consecutive weights are obtained. The sample is then deemed to have reached equilibrium.
- Sample should be measured accurately using Vernier callipers and dimensions recorded.
- From the final dried weight and measurement of sample, the dry bulk density of the sample can be determined.
- For Cafco MANDOLITE® CP2 the dry bulk density should not be less than 331kg/m³ for fire protective purposes.

Health and safety precautions

Please contact the nearest office of Promat Sprays Division for the Material Safety Data Sheet (MSDS) of Cafco MANDOLITE® CP2 product.

1. PRODUCT INFORMATION

PRODUCT NAME	Cafco MANDOLITE® CP2
MARKETED BY	Promat International (Asia Pacific) Ltd.
INTENDED USES	Spray applied, factory controlled premix powder for fire protection applications in concrete structures and withstanding the thermal shocks experienced in a high intensity cellulosic fire.

2. COMPOSITION

HAZARDOUS INGREDIENTS	Conc.	CAS	EINECS	Symbols/Risk phrases
Ground limestone, whiting (Marble respirable)	10-20%	1317-65-3		
Portland Cement (Portland cement respirable dust)	30-40%	65997-15-1		Xi;R38 Xi;R41 Xi;R43

3. HAZARDS IDENTIFICATION

Irritating to skin. Risk of serious damage to eyes. May cause sensitisation by skin contact.

4. FIRST AID MEASURES

SKIN CONTACT	Irritating to skin. Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In the case of skin irritation or allergic reactions see a physician.
EYE CONTACT	Irritating to eyes. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If eye irritation persists, consult a specialist.
INHALATION	Irritating to respiratory system. Move to fresh air. Consult a physician after significant exposure.
INGESTION	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Consult a physician if necessary. DO NOT INDUCE VOMITING.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA	Use extinguishing media appropriate to the surrounding fire conditions.
----------------------------	---

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS	Ensure adequate ventilation of the working area. Wear suitable protective equipment.
ENVIRONMENTAL PRECAUTIONS	Do not allow product to enter drains. Prevent further spillage if safe.
CLEAN UP METHODS	Sweep up. Transfer to suitable, labelled containers for disposal. Clean spillage area thoroughly with plenty of water.

7. HANDLING AND STORAGE

HANDLING	Avoid contact with eyes and skin. Ensure adequate ventilation of the working area. Adopt best manual handling considerations when handling, carrying and dispensing.
STORAGE	Keep in a cool, dry, well ventilated area. Keep containers tightly closed.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE LIMITS

Ground limestone, whiting (Marble respirable)	WEL 8 hours limit ppm: – WEL 15 minutes limit ppm: –	WEL 8 hours limit mg/m ³ : 4 WEL 15 minutes limit mg/m ³ : –
Ground limestone, whiting (Marble total inhalable)	WEL 8 hours limit ppm: – WEL 15 minutes limit ppm: –	WEL 8 hours limit mg/m ³ : 10 WEL 15 minutes limit mg/m ³ : –
Ground limestone, whiting (Limestone respirable)	WEL 8 hours limit ppm: – WEL 15 minutes limit ppm: –	WEL 8 hours limit mg/m ³ : 4 WEL 15 minutes limit mg/m ³ : –
Ground limestone, whiting (Limestone total inhalable)	WEL 8 hours limit ppm: – WEL 15 minutes limit ppm: –	WEL 8 hours limit mg/m ³ : 10 WEL 15 minutes limit mg/m ³ : –
Ground limestone, whiting (Calcium carbonate respirable)	WEL 8 hours limit ppm: – WEL 15 minutes limit ppm: –	WEL 8 hours limit mg/m ³ : 4 WEL 15 minutes limit mg/m ³ : –
Ground limestone, whiting (Calcium carbonate total inhalable dust)	WEL 8 hours limit ppm: – WEL 15 minutes limit ppm: –	WEL 8 hours limit mg/m ³ : 10 WEL 15 minutes limit mg/m ³ : –
Portland cement (Portland cement respirable dust)	WEL 8 hours limit ppm: – WEL 15 minutes limit ppm: –	WEL 8 hours limit mg/m ³ : 4 WEL 15 minutes limit mg/m ³ : –
Portland cement (Portland cement total inhalable dust)	WEL 8 hours limit ppm: – WEL 15 minutes limit ppm: –	WEL 8 hours limit mg/m ³ : 10 WEL 15 minutes limit mg/m ³ : –

ENGINEERING MEASURES

Ensure adequate ventilation of the working area.

RESPIRATORY PROTECTION

Dust mask approved to EN 149:2001 FFP1.

HAND PROTECTION

Chemical resistant gloves (PVC).

EYE PROTECTION

Approved safety goggles.

SKIN AND BODY PROTECTION

Protective clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

DESCRIPTION	Powder
COLOUR	Light Grey
WATER SOLUBILITY	Slightly soluble in water

10. STABILITY AND REACTIVITY

STABILITY	Stable under normal conditions.
MATERIALS TO AVOID	Acids.

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION

Ground limestone, whitening	Oral Rat LD50 = 5001mg/kg
ACUTE TOXICITY	Inhalation of dust may cause shortness of breath.
CORROSIVITY	May cause sensitisation by skin contact.
REPEATED OR PROLONGED EXPOSURE	Repeated or prolonged exposure may cause dermatitis.

12. ECOLOGICAL INFORMATION

No data is available on this product.

13. DISPOSAL CONSIDERATIONS

Dispose of in compliance with all local and national regulations.

14. TRANSPORT INFORMATION

The product is not classified as dangerous in the meaning of transport regulations.

15. REGULATORY INFORMATION

LABELLING	The product is classified in accordance with 67/548/EEC.
SYMBOLS	X_i (Xi - Irritant)
RISK PHRASES	R38 Irritating to skin. R41 Risk of serious damage to eyes. R43 May cause sensitisation by skin contact.
SAFETY PHRASES	S22 Do not breathe dust.S24 Avoid contact with skin. S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37/39 Wear suitable gloves and eye/face protection. P10 Contains chromium VI. May produce an allergic reaction.

16. OTHER INFORMATION

TEXT OF RISK PHRASES IN SECTION 2	R38 Irritating to skin. R41 Risk of serious damage to eyes. R43 May cause sensitisation by skin contact.
--	--

The information supplied in this Material Safety Data Sheet is designed only as guidance for the safe use, storage and handling of the product. This information is correct to the best available knowledge and belief at the date of publication. However, no guarantee is made to its accuracy. This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any other process. For further technical information, please consult your nearest Promat Sprays Division office.



Above:
One Raffles Quay Project, Singapore



This page:
School Package 2C-Sports Hall, Singapore





Above:
School Package 2C-Sports Hall, Singapore

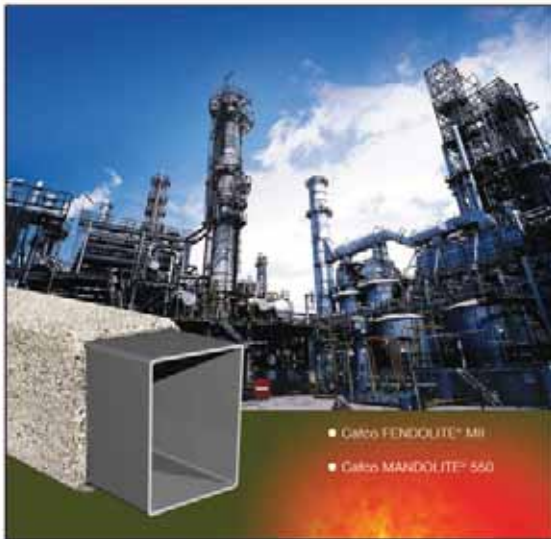
Below:
Art_School, Singapore





Sprayed Coating Protection

For The Petrochemical Industry



- Calco FENDOLITE® MII
- Calco MANDOLITE® 550

www.promat-spray.com



Sprayed Coating Protection

For The Construction Industry



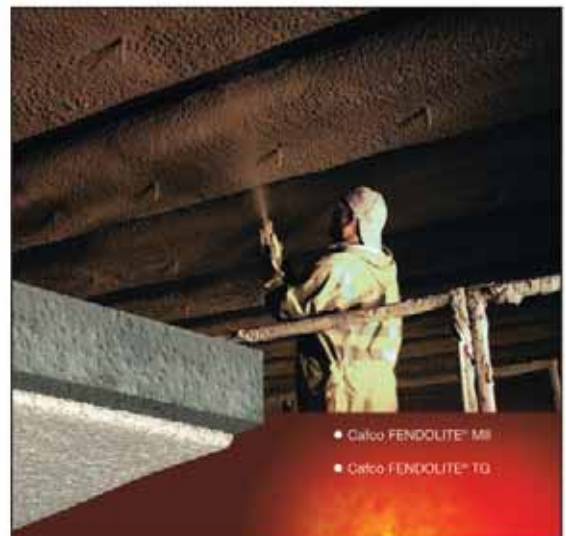
- Calco COF® 300
- Calco MANDOLITE® CP2
- Calco BLAZESHIELD® II
- Calco SPRAYFILM® WB3

www.promat-spray.com



Sprayed Coating Protection

For Tunnel Linings



- Calco FENDOLITE® MII
- Calco FENDOLITE® TO

www.promat-tunnel.com

***These titles also available from
Promat Sprays Division Asia Pacific***

For latest information of the Promat Asia Pacific organisation, please refer to www.promat-ap.com

ASIA PACIFIC HEADQUARTERS

Promat International (Asia Pacific) Ltd.

Unit 19-02-01, Level 2 PNB Damansara
No.19 Lorong Dungun, Damansara Heights
50490 Kuala Lumpur
MALAYSIA
Tel: +60 (3) 2095 5111
Fax: +60 (3) 2095 6111
Email: spraysinfo@promat-ap.com

AUSTRALIA

Promat Australia Pty. Ltd.

1 Scotland Road
Mile End South, SA 5031
Tel: 1800 PROMAT (776 628)
Fax: +61 (8) 8352 1014
Email: spraysinfo@promat.com.au

New South Wales Office

Promat Australia Pty. Ltd.

Unit 1, 175 Briens Road
Northmead, NSW 2152
Tel: 1800 PROMAT (776 628)
Fax: +61 (2) 9630 0258
Email: spraysinfo@promat.com.au

Victoria Office

Promat Australia Pty. Ltd.

Suite 205, 198 Harbour Esplanade
Docklands, VIC 3008
Tel: 1800 PROMAT (776 628)
Fax: 1800 334 598
Email: spraysinfo@promat.com.au

Queensland Office

Promat Australia Pty. Ltd.

Unit 2 Level 1
49 Gregory Tce
Spring Hill, QLD 4000
Tel: 1800 011 376
Fax: 1800 334 598
Email: spraysinfo@promat.com.au

CHINA

Promat China Ltd.

Room 503, Block B, Qi Lin Plaza
13-35 Pan Fu Road
510180 Guangzhou
Tel: +86 (20) 8136 1167
Fax: +86 (20) 8136 1372
Email: spraysinfo@promat-ap.com

Beijing Office

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: spraysinfo@promat-ap.com

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: spraysinfo@promat-ap.com

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
Fax: +91 (11) 2577 8414
Email: spraysinfo@promat-ap.com

Bangalore Office

Promat International (Asia Pacific) Ltd.

(India Representative Office)
Cabin No.BC-9 & BC-10
Oculus Workspaces, No.66/1, 2nd Floor
Coles Road, Frazer Town
560005 Bangalore
Tel: +91 (80) 4031 4151
Fax: +91 (80) 4125 2135
Email: spraysinfo@promat-ap.com

Mumbai Office

Promat International (Asia Pacific) Ltd.

(India Representative Office)
Stylus Serviced Offices
Ground Floor, Velocity
Phase 1, Logitech Park
Andheri Kurla Road, Andheri East
400072 Mumbai
Tel: +91 (22) 6769 4567
Fax: +91 (22) 6769 4568
Email: spraysinfo@promat-ap.com

MALAYSIA

Promat (Malaysia) Sdn. Bhd.

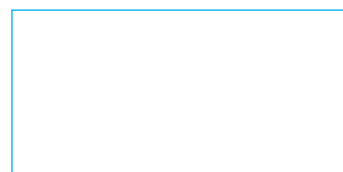
Unit 19-02-01, Level 2 PNB Damansara
No.19 Lorong Dungun, Damansara Heights
50490 Kuala Lumpur
Tel: +60 (3) 2095 8555
Fax: +60 (3) 2095 2111
Email: spraysinfo@promat-ap.com

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: spraysinfo@promat-ap.com

Your local Promat supplier



For Promat International groups worldwide:
www.promat-international.com

1. This document is produced on the basis of information and experience available at the time of preparation. Promat is constantly reviewing and updating all of its test data and reserves the right to change products and specifications without notice.

2. Promat is not responsible if recipients of fire test reports, assessments or literature incorrectly interpret said contents and use products based on those interpretations.