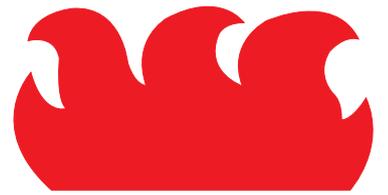


Promat



**CAFCO® 300
Application Guide**



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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

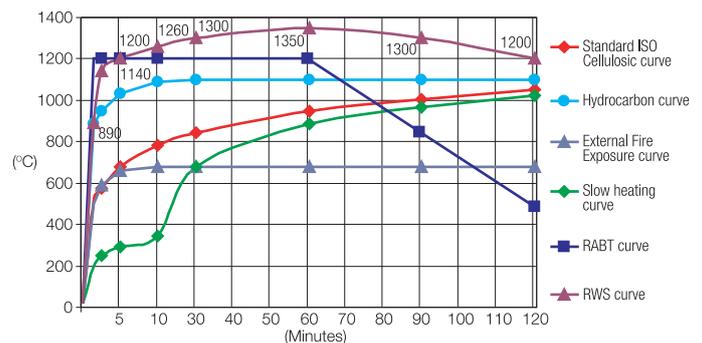
Like fire protection systems, fires are also considered in two categories. They are classified as either cellulosic or hydrocarbon.

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.

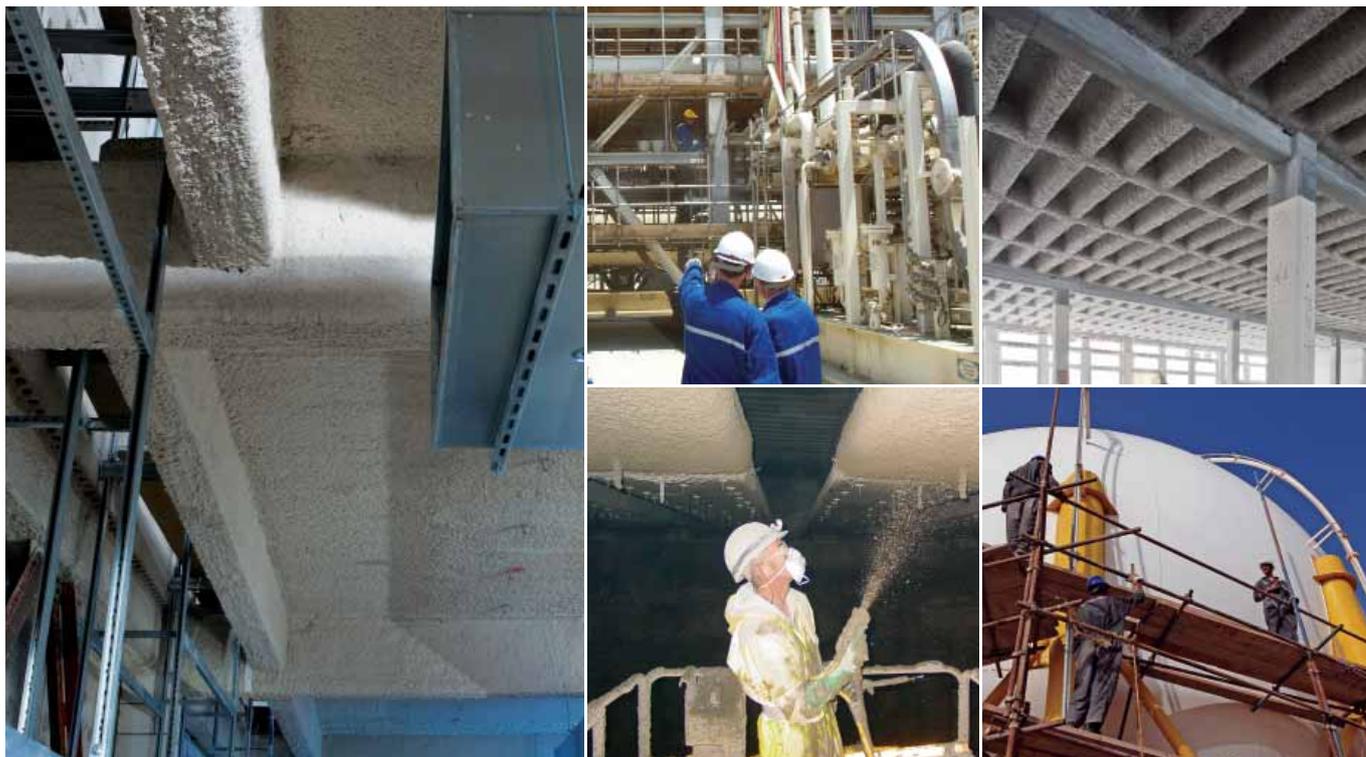
Steel starts to lose its strength at around 550°C when fully loaded. “Standard” testing is based upon exposing protected steel sections to furnace temperatures of 837°C at 30 minutes, 945°C at 60 minutes, 1006°C at 90 minutes and 1049°C at 120 minutes.

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® 300 is a spray or trowel applied, single package factory controlled premix, based on vermiculite and gypsum, for internal use.

CAFCO® 300 is a lightweight wet mix spray applied coating that provides very efficient fire resistance with minimal thickness to steel and concrete frames, metal floor and roof decks, return air plenums and air handling ductwork.

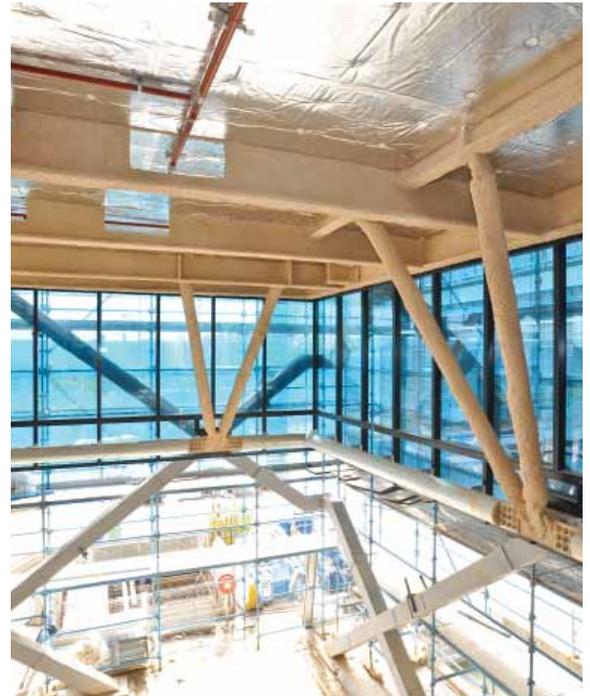
Structures protected with CAFCO® 300 can provide fire resistance for up to 240 minutes.

Building types that will benefit from the use of CAFCO® 300 include a wide range of educational, leisure and entertainment centres, and commercial projects.

CAFCO® 300 can be used in conjunction with CAFCO® Accelerator. See [Appendix A](#) on [page 13](#).

The application methods detailed in this manual should be followed to ensure that the sprayed CAFCO® 300 provides the approximate density of 310kg/m³.

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 15 and 16](#) and, as with any other materials, should be read before working with the CAFCO® 300 product.



Typical mechanical properties

Colour and finish	Off white with a monolithic spray texture
Theoretical coverage (nominal)	217m ² /tonne at 15mm thickness
Number of coats	One or more as required
Cure	By hydraulic set
Initial set	10 to 15 hours at 20°C and 50% RH without accelerator
Density	310kg/m ³ ± 15% without accelerator, approximately 10% less with accelerator in accordance with ASTM E605.
Bond impact	No cracks or delaminations in accordance with ASTM E760
Air erosion resistance	No erosion in accordance with ASTM E859
Compressive strength	1.22kg/cm ² in accordance with ASTM E761
Deflection effect	No spalling, delamination or cracking in accordance with ASTM E759.
Flame spread	Class 0 as defined by relevant Building Regulations
Thermal conductivity	0.078W/mK
Corrosion resistance	Can be applied over unprimed steelwork. Will not adversely affect corrosion rate at steelwork or cause corrosion to occur. In areas where for environmental concerns corrosion resistant systems are desired, CAFCO® 300 can be applied over most primers. See Preparation of Base Surface on page 9 .
pH value	8.0 - 8.5
Fire resistance	Structures protected with CAFCO® 300 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 6, 7 and 21) • USA (ASTM E119) • France (August 1999 Ministry Decree) • Belgium (NBN S21-202) • Germany (DIN 4102: 1977-09 and DIN EN 1363-1:1999-10) • Harmonised European Standard ENV 13381: Part 4 The fire resistance test results relate solely to the constructions and samples tested and test conditions imposed.

Material storage

CAFCO® 300 must be stored in a dry environment. It should be stored off the ground, under a weatherproof cover, and protected from damp surfaces or areas of high humidity. Storage temperatures are not critical as long as dry conditions are maintained.

CAFCO® 300 can be stored up to six months from date of manufacture under dry conditions. It is recommended that material from one shipment be fully utilised before using material from a subsequent shipment. Material damaged by moisture should not be put to use.

Site requirements

Prior to all applications, the CAFCO® applicator should ensure that adequate services and site conditions are present for the application process.

These requirements will include some or all of the following; power, ventilation, water, scaffold, tarpaulins, lighting, waste disposal, compressed air source plus serviced spray machines and adequate spareparts.

Application temperature

When the temperature at the job site is less than 4°C a minimum substrate and ambient temperature of (4°C) shall be maintained before, during and a minimum of 24 hours after the application of CAFCO® 300. Tarpaulin enclosures and temporary heat and/or ventilation may be necessary to maintain the correct conditions.

Ventilation

Allow four air change hours until the product is dry.

Health and safety precautions

CAFCO® 300 contains no asbestos and causes no known health hazards either during or after installation. During application, however, the following precautions should be taken:

- Protect skin from irritation by wearing loose clothing and gloves; wash work clothing separately from other garments.
- Protect eyes and respiratory tract from airborne product by wearing EN149 dust masks and goggles, safety glasses or eye shields.
- Eyes and skin areas that come in contact with CAFCO® 300 should be rinsed with cold, clean water.
- CAFCO® 300 is slippery when mixed with water. Do not allow wet material to remain on scaffolds, ladder rungs or floors. Walking on wet material may result in slips or falls.

Equipment

Mixer

A paddle or ribbon-type plaster mixer (which matches the capacity of the pump and material volume) with a safety cover, rubber tipped blades and provision for quick dumping of mix directly into the pump hopper is required. Mixers with a 155 litres capacity or larger with minimum operating speeds of 35-40rpm are required.

A water-metering device is required to ensure constant water quality per mix. All water meters must be calibrated to ensure proper water to product ratio.

Pumps

1. Piston pumps

These pumps are the most versatile and can be used for low to high

production applications. They should be equipped with a pressure release valve, blowout cap and ball, rated for 54-68kg/cm² at the manifold. Piston pumps have two means of operation:

- Mechanical
- Hydraulic

2. Rotor/stator pumps

These pumps are used for lower production rate jobs and on jobs where the equipment must be located on the floor to be sprayed. Only open throat, screw feed pumps with a soft rubber stator are recommended.

Air compressor

The product requires approximately 62 litres of atomised air for each kilogram of slurry sprayed. A compressor with a capacity of 260-560 litres/minute of free air is recommended for smaller jobs.

A compressor with a capacity of 850-1,130 litres/minute of free air is recommended for large projects. The compressor must be capable of providing a minimum of 4.1-5.5kgf/cm² of pressure at source and 2.7kgf/cm² at the nozzle.

Air hoses

Air hoses should have a minimum 10mm (3/8") inside diameter.

Material hose

1. Rotor stator pump

The material hose should be reinforced, smooth interior vulcanised rubber, as used in the plastering industry. This hose should be capable of handling high pressures consistent with the pump being used.

Flexible Hose (Whip Hose):

- When using 32-51mm inside diameter (ID) material hose, a 3m section of 25mm ID high-pressure hose may be used for sprayer mobility.

Hoses for use with up to 30 metres:

- 25mm diameter in 3m length
- 32mm diameter in 27m length

2. Piston pump

Hoses for use in excess of 30m (central pumping):

Diameter	Maximum length material hose
76mm	15m
51mm	61m
35mm	16m
32mm	8m
25mm	8m

NOTE: The use of hose lengths and diameters depend upon product applied density.

Hose couplings

Screw on type quick connect/disconnect couplings that do not restrict material flow are recommended. A constant inside diameter must be maintained. A long tapered reducer must be used when a reduction in hose diameter is necessary. A safety strap or sling should be used on all hose connections to prevent injury due to coupling failure.

NOTE: Brass or aluminium couplings and reducers should not be used.

Standpipe

Metal standpipe 65-75mm ID must be used when the pumping hose exceeds three storeys or 11m or when required hose length exceeds 102m.

NOTE: Maximum standpipe height is dependent on the type of pump being used. Be sure standpipe height is compatible with pump being used and standpipe and transfer hose are tightly secured and supported.

1. Standpipe couplings

Full taper threaded galvanised steel pipe clamped couplings, with ground unions are recommended.

2. Elbows

Ninety degree rigid elbows with minimum 1m radius shall be provided from the standpipe to the hose.

Spray nozzle assembly

The spray nozzle assembly should consist of a minimum 25mm ID aluminium tube with a blow off tube with a blow off type nozzle cap, nozzle orifice, material and air control valves.

1. Nozzle orifices

13-16mm diameter nozzle orifices with shroud are recommended.

NOTE: For 310kg/m³ density a 16mm orifice with tip shroud is recommended.

Additional equipment

1. Pump remote control

A remote power line and switch (or air line and valve for the pneumatic feed control system) is necessary for on/off control be the sprayer.

2. Power lead-in cord

When using electric equipment it is necessary to size the proper gauge wire to the maximum length of cord being used to prevent excessive voltage drops.

3. Thickness gauge

A CAFCO® designed thickness gauge should be used for measuring the thickness of sprayed material. Inspection or applicator types are available. For central spray applications where the sprayman is out of voice contact with the loader, the use of radio contact is essential.

4. Tools

On all projects there should be a tool box that can be locked. It should contain at least the following items:

Duct tape	Mole grips
Screwdrivers	Extra safety goggles/glasses
Sponges	Extra remote control line
Hose couplings	Extra belts for machines
Extra spray tips	Razor knife
Spanners	Extra water line and washers
Channel-locks	Dust masks
Extra nozzle caps	Hard hats
Scrapers/brooms/shovels	Grease gun
Pipe wrenches	Additional fuses
Fire extinguisher	Volt/amp meter
Extra blow-out cap and ball	Thickness gauge

5. Scaffolding

Rolling scaffold should be provided for applications not accessible from the floor. Scaffold should have large locking wheels that roll easily and a grated floor or platform with holes large enough to allow material through under the sprayer's feet. Scaffolding should be equipped with safety railings around its perimeter approximately waist-high and be in compliance with all safety requirements.

6. Tarpaulin

The use of tarpaulins around the perimeter of the floor being sprayed will contain the spray applied fire resistant materials to the immediate area and prevent potential damage to cars and objects outside their area.

Tarpaulins may also be used to enclose areas in cold weather. This procedure in conjunction with job site heat will maintain correct ambient temperatures. They also help prevent overspray from being blown around during windy days, minimising waste.

7. Masking

CAFCO® 300 overspray may stain masonry and painted surfaces or corrode aluminium and anodised aluminium surfaces. Care should be taken to adequately protect these. Polyethylene or polypropylene plastic film and duct tape are recommended for this purpose.

Project set-up

Efficient project set-up results in an economical installation. Be sure all site requirements have been met.

Application equipment

Select a ground level location that is protected from weather, well drained, easily accessible to truckload deliveries, well ventilated (if using liquid fuel powered equipment) and easily accessible to power and potable water.

A stable platform should be built to allow the machine operator to easily feed the CAFCO® 300 into the mixer. CAFCO® 300 should be stacked off the ground so that it is protected from weather and moisture and is easily accessible to the mixer operator.

Standpipe

Select a standpipe location at either the exterior of the building, through a pipe chase, through an elevator shaft or through a stairwell in the interior of the building. Standpipe should be permanently located until all application work is completed. The standpipe should be erected in a well-supported vertical position. A minimum 1m radius elbow should be connected to the top and bottom of the standpipe. This will assist in an easy connection from the standpipe to the transfer hose and prevent the hose from kinking.

Transfer hose

51-76mm diameter.

Hoses should be kept as straight as possible, avoiding tight bends. Hose lengths should be kept to a minimum.

Tarpaulin

First, secure the tarpaulin to the bottom of the perimeter columns on the floor above the floor to be sprayed. Next, the tarpaulins are draped down over the outside of the building and secured to the bottom of the perimeter columns on the floor being sprayed.

This procedure is repeated until the perimeter columns on the floor being sprayed are enclosed. Tarpaulins are moved by unfastening the bottom of the tarpaulin and lifting it to the floor above the next one to be sprayed. Secure to the bottom of the perimeter columns on that floor.

Care must be taken to clean any material from the tarpaulins so that it does not fall off the building when the tarpaulins are moved. Continue this sequence upward as the job progresses.

Masking

Mask any masonry or painted surface that may be exposed to CAFCO® 300 overspray. Please refer to [Masking](#) on [page 8](#).

Remote control of application machine

Electrical lines for remote control of application machines should follow standpipe and hoses to nozzle. Please refer to [Pump remote control](#) on [page 8](#).

Preparation of base surfaces

Clean substrates

Proper adhesion of CAFCO® 300 depends upon clean substrates. The following conditions should **NOT** exist prior to the application of CAFCO® 300.

- Oily steel decks (residual roll oils).*

- Loose mill scale, loose rust or dirt
- Concrete form oils
- Painted steel surfaces (excluding certain primer types)
- Other foreign materials that may prevent proper bonding to the substrate. Contact the substrate manufacturer for cleaning recommendations.

*The presence of oil on a galvanised floor deck may be detected by spraying a fine mist of water onto the deck. If the water moves or collects into large droplets ("fish eyes") there is probably an oil present. Please contact the steel deck manufacturer for methods of removing the oil.

Flexible substrates

Proper adhesion of CAFCO® 300 depends upon rigid substrates and the absence of damaging forces such as impact or excessive deflection. The following conditions should **NOT** exist prior to the application of CAFCO® 300:

- Roof traffic before the CAFCO® 300 has set.
- Excessive vibration.
- Deck spans with greater than L/240 mid point deflection.

Recommendations of typical substrates

1. Galvanised fluted floor deck

Galvanised fluted floor deck free of paint/primers, oil and coatings can receive direct application of CAFCO® 300. Do not apply CAFCO® 300 to structural steel prior to the completion of concrete work on the supported floor. Clips, hangers, supports, sleeves and other attachments to the substrate are to be placed by others prior to the application of CAFCO® 300.

2. Suspended equipment

Ducts, piping, conduit or other suspended equipment are to be installed after the application.

3. Bare (unpainted/unprimed) structural members

Bare steel structural members free of loose rust, loose mill scale or dirt can receive direct application of CAFCO® 300. Remove all loose rust, loose mill scale or dirt. These conditions are typically corrected by wire brushing or sandblasting.

4. Metal lath

CAFCO® 300 may be applied directly to either painted or galvanised metal lath. Metal lath should be secured so that it is rigid. Non-rigid lath may cause delamination of CAFCO® 300. Refer to metal lath manufacturer's recommendations for installation instructions.

For substrates other than those listed above, please contact Promat Sprays Division.

Primed structural beam and column steel

Primed or painted structural steel may adversely affect the bond of spray applied fire resistive material thus jeopardising the fire resistance rating provided by the material. When primed or painted structural steel is specified, please refer to Promat Sprays Division. Wide flange steel beams and columns may receive direct protection provided all of the following conditions are met:

- For beams, the web depth does not exceed 650mm and the flange width does not exceed 325mm.

- Special consideration may have to be given for need of reinforcement or additional support if the sections as positioned on site do not allow for encapsulation or if there is no re-entrant detail. For greater detail see BS 8202: Part 1, or AS 3784:1.
- Where the conditions apply the CAFCO® 300 must be reinforced with a corrosion protected wire mesh aperture 25mm, 30mm or 50mm mesh x 0.9mm thick. The mesh should be secure to the structural member with welded pins at 500mm centres. The mesh should be approximately located in the middle third of the spray area.

Adhesive and sealer/pre-coat

Cafco BONDSEAL® is a clear drying, water dispersible coating, used as an adhesive and/or sealer in conjunction with CAFCO® 300.

Adhesive

As an adhesive, thoroughly mix three parts Cafco BONDSEAL® to one part potable water and apply as a continuous coating or as a strip of spatter application until the Cafco BONDSEAL® begins to drip. Apply at a rate of 11.1m²/litre for non-porous surfaces and 7.4m²/litre for porous surfaces as mixed. Whilst the adhesive is still tacky apply the first 10-13mm of CAFCO® 300. Allow to set overnight and then apply remaining coats of CAFCO® 300.

Sealer/pre-coat

As a sealer, thoroughly mix one part Cafco BONDSEAL® to three parts potable water and apply at a rate of 3.7m²/litre as mixed. Allow to dry.

Application method

General recommendations

The application of CAFCO® 300 consists of mixing the material with potable water in a paddle or ribbon type mixer. The mixed material is then put into a pump hopper from where it is conveyed through the hose to a spray nozzle, where the slurry is broken up into a fan pattern by air and directed at the surface to be covered in an even, uninterrupted pattern.

Water requirements

The integrity and pumping properties of CAFCO® 300 are largely dependent upon maintaining the correct water amount when mixing. The correct amount of water for mixing CAFCO® 300 is between 34 and 38 litres per bag. Water should be potable and between 10°C and 32°C. Low water temperature may affect the mix time.

Mixing

CAFCO® 300 is delivered to site in 20kg sacks. It is mixed by first measuring the appropriate amount of potable water into the mixer and adding the CAFCO® 300 into the mixer and mixing until the proper density is achieved.

NOTE: Mixer speed should be set to 35-40rpm minimum.

- Low water-to-product ratios results in a mix that is too thick and difficult to pump. Cavitation in the hopper usually occurs, which results in an inconsistent, pulsating spray pattern. High densities are characteristic.
- High water-to-product ratios results in a thin mix that pumps and sprays at a faster rate, but yields thinner coats of material and a rough surface texture. Low densities, material sliding and delaminations are characteristic, as is cracking to the surface of the material.
- Mix the CAFCO® 300 until the optimum mixer slurry density is

achieved (710-730kg/m³). This typically requires three minutes of mixing (based on a mixer speed of 40rpm). See **Appendix B** for estimating CAFCO® 300 mixer density from wet cup weights on [page 14](#).

- After three minutes of mixing, fill a container of known volume. Weigh and determine the density (weight per unit volume) of the slurry.
- If the slurry density is lower than 657kg/m³ decrease the mix time and/or increase the water content.
- If the slurry density is higher than 770kg/m³ increase the mix time and/or decrease the water content.

Pumping and spraying method

Priming pump

It is essential that all pumps and material hoses be primed with water at the start of the application to ensure trouble-free operation. CAFCO® 300 pumped through a dry hose will result in blockages in the hose and/or nozzle. Nozzle orifices shall have a 13-16mm internal diameter.

Pumping

CAFCO® 300 is discharged from the mixer into the pump hopper through the fixed safety grid. When the material has been poured into the hopper, check that it has formed a homogenous slurry without cavitation.

Spraying

Open the air valve, which is typically located on the spray gun. Turn on the pump (by remote switch, if available). Spray into a pail until all the water exits and full pressure builds up. Set the air adjustment to achieve an even fan pattern of CAFCO® 300 using the minimum quantity of air pressure possible. Generally 10psi is recommended.

When the system is correctly set it should give out a dull buzzing sound. If the system is emitting a whistle, the air pressure is too high.

After the system has been purged it is probable that the first priming mix will be too sloppy. Reject this and wait until the material achieves an even consistency.

Make sure that there is no restriction of material. Hold the nozzle perpendicular to the substrate at a distance of 0.3-0.6m. Move the nozzle in a smooth, left to right motion to achieve a full, even pattern. Always position the nozzle perpendicular to the substrate (for coating small sections, a circular movement would be appropriate).

NOTE: Excessive air pressure will increase density and decrease yield.

Spraying distance

Regardless of the substrate being sprayed, it is important to maintain the proper distance between the nozzle and the substrate surface. This distance will vary according to the type of equipment and nozzle in use but should be between 0.3m and 0.6m.

Application thickness

Apply CAFCO® 300 approximately 13-17mm for the initial coat (depending upon water content or orientation of substrate) and 19-25mm on subsequent coats until the final thickness is achieved. Allow the material to set between coats, if the surface of the applied CAFCO® 300 is dry, pre-wet this surface with a water mist before applying the next coat.

Set

CAFCO® 300 will obtain an initial set in approximately three to six hours depending on temperature and humidity. CAFCO® Accelerator is a gypsum accelerator, 1% of which is added to CAFCO® 300 spray applied fire resistive materials to reduce the set time.

CAFCO® Accelerator is applied by using a chemical metering pump that conveys the solution through a hose to the wet mix nozzle where it is mixed with the CAFCO® 300. See [Appendix A](#) for complete application instructions on [page 13](#).

If the concentration of accelerator is raised to 2% this will effectively reduce the density of the sprayed product by approximately 10% without harming its fire proofing efficiency.

NOTE: CAFCO® 300 contains hydraulically setting materials. Do NOT re-temper after initial set.

Finish

Spray application of CAFCO® 300 results in a bold textured finish. If a smoother finish is desired, the final spray applied coat of CAFCO® 300 can be either lightly trowelled or during spraying the air pressure can be increased, this will improve the appearance but at the cost of a heavier density.

When spraying beams it is very important that the top side of the lower flange is sprayed first. Thereafter the section can be sprayed in any order.

Thickness

The thickness of the CAFCO® 300 shall be established by reference to the manufacturers published Hp/A thickness table once the period of protection, the temperature failure point and the period of protection have been established (see separate publication CAFCO® 300 product data sheet).

Proper thickness should be confirmed by using a Promat approved thickness gauge before leaving a floor or spray area.

Excessive thickness may result in delamination and/or prolonged drying time and is the most common reason for reduced yield and excessive shrinkage.

Density

Density must be in accordance with specification requirements. To control the density, the following parameters must be controlled to obtain the proper density:

- Distance of spray nozzle from substrate
- Water-to-product ratio
- Mix time
- Length of standpipe and hose
- Amount of air used at nozzle
- Angle of nozzle to substrate
- Proper orifice size
- Speed (rpm) of mixer

Project shut down

Termination of spray application

- Turn off the pump by remote switch.
- Close material valve (if used).
- Shut off air valve. Leave air valve one quarter open if material valve is not used.

- The maximum time the nozzle can be shut off is 45 minutes, with the nozzle submerged in water to prevent blockage. If a longer shutdown period is necessary, the equipment should be cleaned thoroughly or Extended Set (ES) should be used. See [Appendix C](#) on [page 14](#).

Cleaning of equipment

1. Mixer

After removing any remaining CAFCO® 300 material flush clean with water. Remove any hard buildup of material on blades and sides of mixer.

NOTE: Hard build-up of old material can reduce working life span of fresh material.

2. Pump

Allow sufficient volume of water to be pumped through the system (hose and nozzle) until it is flushed clean. Disconnect the hose at the pump exit and insert a small sponge in the hose. Remove the nozzle and 25mm whip hose and commence pumping water (and the sponge) through the hose. Always maintain some airflow, so that the air hose does not become blocked.

Job precautions

- Never allow the pump to run dry.
- Keep hose lengths to a practical minimum.
- For electric motors, use heavy-duty extension cords with lengths compatible with electrical requirements. Always ground the machine for safety; avoid circuits where other power equipment is being used. Observe all health and safety requirements.
- Do not operate petrol or diesel powered equipment in closed or poorly ventilated rooms. If an exhaust system is used make sure it works adequately. All engine exhaust must be vented to the outside.
- To prevent blockage and rupture of the hoses, the following equipment should be incorporated:
 - a) Rotor stator machine
 - Manually operated dump valve
 - Pressure gauge
 - b) Piston pump machine
 - Pressure relief valve
 - Blow out cap and ball rated at 54-68kgf/cm² fixed at the manifold

NOTE: Extreme caution should be exercised. Hose connections should not reduce the inside diameter of hoses. Improper connections can result in blockage.

- In hot, dry conditions, particularly where strong sunlight or winds are present, it is necessary to protect the surface of the applied CAFCO® 300 from rapid evaporation. Excessive evaporation of water does not permit full hydration of the binders, and full strength of the product will not be developed. Measures to overcome these excessive drying conditions include:
 - a) Shielding the work area from direct sunlight.
 - b) Cooling the substrate by spraying with water before application.
 - c) Working in the evening or early morning.
- Provide natural or mechanical ventilation to a level of four air changes per hour to properly dry the applied fire protection subsequent to its application.
- For short interruptions in spraying, either shut down the pump or direct the slurry back into a suitable container. Do not crimp the hose as this may result in water separation and blockage.
- Mixers should be kept clean at all times.
- It is essential that the mixer be covered and the mixer operator wear an approved dust mask to minimise exposure to dust.

Trouble shooting

This section identifies potential problem areas resulting from either improper application of CAFCO® 300 or equipment failure. Possible reasons for problems have been identified.

Poor appearance of application

- Nozzle not held perpendicular to substrate
- Insufficient atomising of air at the nozzle or too much of atomising air at the nozzle
- Material hoses too long
- Previous coat not sufficiently set
- Nozzle orifice too big for air volume
- Hose size smaller than 25mm
- Equipment not approved
- Water ratio too high

Causes of nozzle/hose blockage

- Pump not properly primed
- Poor cleaning of nozzle and material hose
- Air valve closed at start of spray
- Air stem pushed in too far
- Nozzle orifice too small
- Old material accumulated in pump hopper drain
- Material set up
- Dirty mixer
- Short bell reducers
- Hose lengths too long
- Water ratio too low

Checking for pump trouble

Decreased productivity is often traced directly to worn leathers and balls and seats in the piston pumps or stators in rotor/stator pumps. Ensure equipment is properly maintained and regularly inspected and pump pressures checked.

Repair procedures

CAFCO® 300 that has been damaged or removed may be repaired by spraying or hand trowelling freshly mixed product to the affected areas. The maximum area that can be patched by hand trowelling is 0.3m². This can be extended, but is usually more efficient to spray apply bigger areas. If the thickness of the patch is greater than 13mm, multiple coats will be necessary.

Ensure that the remaining coatings and reinforcements are tight. Use water spray to pre-wet area before commencing repair procedures. The previous surface should be rough in texture to achieve the best possible adhesion.

CAFCO® 300 for fire protection in construction applications

Accelerator application guide

CAFCO® Accelerator is delivered to site in powder form for site mixing (25kg bags).

Equipment	Plastic storage tank, agitator and adjustable flow pump with inlet and outlet hoses.
Mix	25kg bags of accelerator per 52.5 litres of water
Mixing time	Five minutes for 100kg of accelerator
Application	Determine the rate of CAFCO® 300 to be sprayed in an hour and adjust the flow rate of the accelerator in accordance with the Mixing rate below . The accelerator should be introduced at the spray nozzle.
Application temperature	Maintain a substrate and ambient temperature of +4°C prior to, during and for 24 hours after application.

Cautions

Do not add accelerator to the CAFCO® 300 mixer or pump.

CAFCO® Accelerator is slippery. During use this product could cause local skin irritation. Protect skin by wearing loose fitting clothes and gloves. Wash clothing separately from other garments.

To prevent irritation to eyes or respiratory tract from products that may become airborne during use wear dust masks, goggles or safety glasses.

CAFCO® Accelerator may stain or discolour aluminium, metal doors, metal window frames, window glass or other surfaces. Provide masking.

Usage

CAFCO® Accelerator is delivered in 25kg bags in powder form.

Accelerated CAFCO® 300 is not suitable for application directly to concrete. If protection is required to concrete apply 8mm of non-accelerated CAFCO® 300 as an initial coat and allow to set prior to application of CAFCO® 300 or accelerator mix.

The accelerator should be dissolved in water at the rate of 52.5 litres of water to 1 x 25kg bag of accelerator and introduced into the CAFCO® 300 gun head at the **Mixing rate below**.

Mixing rate

20kg bags/hour	Kg/hour	Accelerator (ml/minute) to be added	
		1%*	2%**
5bags	100kg	38ml	76ml
10bags	200kg	76ml	152ml
15bags	300kg	115ml	229ml
20bags	400kg	153ml	305ml
25bags	500kg	191ml	381ml
30bags	600kg	229ml	457ml
35bags	700kg	267ml	533ml
40bags	800kg	305ml	610ml
45bags	900kg	343ml	686ml
50bags	1000kg	381ml	762ml
55bags	1100kg	419ml	838ml
60bags	1200kg	457ml	914ml

* The addition of 1% of accelerator will reduce the set time of CAFCO® 300 to approximately 20 minutes.

** The addition of 2% of accelerator will reduce the set time to 20 minutes and lower the density by approximately 10%.

Usages of percentages of accelerator greater than those specified above may be harmful to the fire protective system.

The performance data herein reflects or expectation based on tests conducted in accordance with recognised standard methods. The sale of these products shall be subject to the terms and conditions of sale set forth in the invoices of Promat.

No agent, employee or representative of any Promat company, of its subsidiary or its affiliated companies, is authorised to modify this statement.

CAFCO® 300 for fire protection in construction applications

Mixer densities

Wet cup weight (g) 1 litre cup	
666	
689	
710	OPTIMUM
730	RANGE
750	
770	

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Appendix C

CAFCO® 300 for fire protection in construction applications

This is an abbreviated guide and is not intended as a substitute for the above titled manual. All applicators should thoroughly review the manual prior to applying this product.

CAFCO® 300 Extended Set (ES) is designed for use with CAFCO® 300 for the purpose of extending the set time of the product up to 72 hours. This allows the applicator to shut down the pump operation at the end of the day without pumping out and flushing the hopper, lines and nozzle. CAFCO® 300 ES must be used in conjunction with CAFCO® Accelerator to activate the ES. CAFCO® 300 can follow the ES without interruption.

Application

- When the material pump hopper is nearly empty of the standard slurry, turn off the accelerator pump. Turn off the feed valve to the nozzle.
- Mix 49 litres of water per bag of CAFCO® 300 ES for two minutes for overnight use. Mix 53 litres of water per bag of CAFCO® 300 ES for two minutes for 72-hour use.
- Fill hopper with CAFCO® 300 ES slurry. The product is tinted "light brick" for identification purposes.
- Pump until "light brick" colour is seen at the spray nozzle.
- Scrape down the sides of the material pump hopper. Pump until the hopper is almost empty, then stop.
- Cover the surface of the remaining slurry in the hopper with plastic sheeting. This will prevent evaporation.
- Remove the nozzle orifice and completely submerge spray nozzle in a container of water.
- Upon restart, prepare accelerator solution in accordance with standard application instructions.
- Remove the plastic sheeting on the pump hopper. Take the spray nozzle out of the water. Install nozzle orifice on the spray nozzle.
- Mix a batch of standard CAFCO® 300 and place into the pump hopper.
- Begin pumping the slurry using accelerator solution in accordance with standard application instructions.
- A thin coating of standard CAFCO® 300 can be applied over the CAFCO® 300 ES product that has been sprayed to cover the tinted material. If you require assistance, please contact Promat Sprays Division Technical Department.

1. PRODUCT INFORMATION

PRODUCT NAME	Cafco® 300
MARKETED BY	Promat International (Asia Pacific) Ltd.
INTENDED USES	Spray or trowel applied control premix powder for fire protection applications in structural steel, concrete frames, metal floors and roof decks.

2. COMPOSITION

HAZARDOUS INGREDIENTS	Conc.	CAS	EINECS	Symbols/Risk phrases
Ground limestone, whiting (Marble respirable)	1-10%	1317-65-3		

3. HAZARDS IDENTIFICATION

The product is classified as non hazardous. No significant hazard.

4. FIRST AID MEASURES

SKIN CONTACT	Wash off immediately with plenty of soap and water. Remove contaminated clothing. Seek medical attention if irritation or symptoms persist.
EYE CONTACT	Irrigate immediately with plenty of water for 15 minutes holding eyelids open. Seek medical attention if irritation or symptoms persist.
INHALATION	Move the exposed person to fresh air, and rest. If symptoms persist, seek medical attention.
INGESTION	Rinse mouth thoroughly. Drink one to two glasses of water. Seek medical attention if irritation or symptoms persist.

5. FIRE FIGHTING MEASURES

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

ENGINEERING MEASURES

Ensure adequate ventilation of the working area.

RESPIRATORY PROTECTION

Suitable protective equipment.

HAND PROTECTION

Chemical resistant gloves (PVC).

EYE PROTECTION

Approved safety goggles.

SKIN AND BODY PROTECTION

Protective clothing.

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 time 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 the nearest Promat Sprays Division office.

9. PHYSICAL AND CHEMICAL PROPERTIES

DESCRIPTION	Powder
COLOUR	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	Irritating to eyes and respiratory system.
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.

RISK PHRASES NSH No significant hazard.

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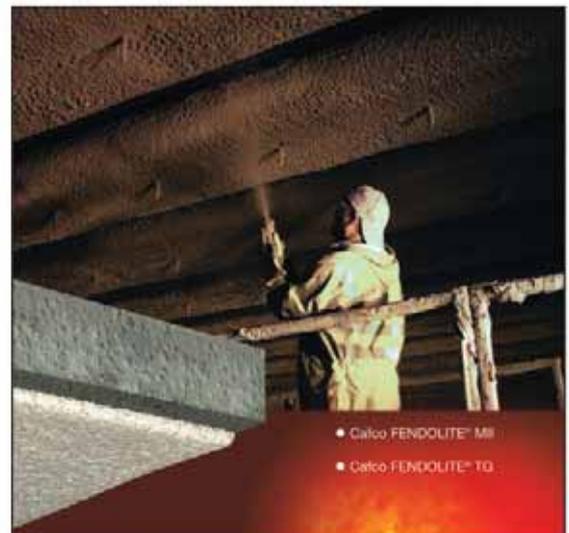
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