SELECTION & SPECIFICATION DATA

Generic Type	High density cementitious fireproofing designed for the fire protection of exterior and interior structural steel.
Description	A 640 kg/m³ (40 lb./ft³) density, Portland cement based, cementitious fireproofing. It provides both hydrocarbon and cellulosic fire protection for structural steel and can also be used to upgrade the fire resistance of existing concrete. Recommended areas of application include refineries, petrochemical, pharmaceutical facilities, pulp and paper mills, offshore platforms, nuclear and conventional power plants, factories, warehouses, institutional and biomedical facilities.
Features	• Cost effective fireproofing solution • Outstanding coverage, high build • Exceptional durability and toughness • UL 1709 hydrocarbon fire rated up to 4 hours • BS 476 hydrocarbon fire rated up to 4 hours • ISO 22899-1 jet fire rated up to 2 hours • ASTM E119 cellulosic fire rated up to 4 hours • Cryogenic protection against LNG spills and immersion exposures • Resistant to 3 bar blast overpressure • Hose stream resistant • Tolerant to wide range of climates • Lightweight – one-fifth the weight of concrete for equal fire protection • Easy application by spray or trowel • Nonflammable – during or after application • Chloride and sulfide free – no special priming required • Asbestos-free – complies with EPA and OSHA regulations • Non-friable – high impact strength
Colour	Non-Uniform Speckled Grey Product colour may vary due to variations in colour of Portland cement.
Finish	Textured If a smooth finish is required, this may be done by trowel, roller or brush typically within 1 to 2 hours after final application of Pyrocrete 40.
Primer	Pyrocrete 40 neither promotes nor prevents corrosion. The fireproofing should not be considered as part of the corrosion protection system. For applications where primers are required, use a Carboline approved, alkaline resistant primer. Pyrocrete 40 must meet minimum UL bond strength criteria for contour applications where primers are used. Contact the Carboline Fireproofing Technical Service for further information and approved primers.
Application Thickness	12.7 - 15.9 mm (1/2" - 5/8") on initial pass
Theoretical Coverage Rates	1.66 m² at 25.4 mm thick @ 640 kg/m³ (17.9 board foot per bag @ 40 pcf) Field results will vary depending upon application parameters. Coverage based on theoretical gross yield without loss. Material losses during mixing and application must be taken into account when estimating project requirements. Coverage based on 22.7 kg (50 lb.) bags (one board ft = 0.09 m² of material at 25.4 mm thick or one ft² of material at one inch thick).
Limitations	Not recommended for use as a refractory cement or where continuous operating temperatures exceed 93°C (200°F).

SELECTION & SPECIFICATION DATA

Topcoats	Generally not required. In severely corrosive atmospheres, topcoats may be used for added durability and chemical resistance. consult Carboline Fireproofing Technical Service for selection of the coating most suitable for the operating environment. **Seal Coat** – In corrosive environments, use an appropriate topcoat. If topcoating is required, apply Carboguard 1340 as a seal coat. Carboguard 1340 shall be thinned 25% with Carboline Thinner #2. Carboguard 1340 may be applied after 24 hours of final application of Pyrocrete 40. Consult the Carboguard 1340 Product Data Sheet for minimum and maximum cure times. **Top Coat** – Surface hardness should be a minimum Shore D 60 as measured with a durometer prior to application of the topcoat. Normally, this minimum dry time is 10 days at 21°C and 40 days at 4°C, for thickness of 25.4 mm or less. **Caulking** – For exterior installations, Acrilast caulk should be applied at all termination joints between Pyrocrete 40 and the substrate. Contact Carboline Fireproofing Technical Service for full information.

SUBSTRATES & SURFACE PREPARATION

General	Before applying Pyrocrete 40, the substrate coating must be free of all oil, grease, condensation, or other contamination.
Steel	If primer is required, steel preparation before priming should be done in accordance with the recommended primer's product data sheet. Contact Carboline Fireproofing Technical Service for approved primers.
Galvanised Steel	Pyrocrete 40 is usually applied directly over galvanised surface. If priming is required, contact Carboline Fireproofing Technical Service for recommendations.
Concrete	The recommended primer to seal concrete prior to applying Pyrocrete 40 is Carboguard 1340.
Non-Ferrous Metals	Aluminium, copper and other non-ferrous metals shall be primed with one coat of Carboline's Rustbond Penetrating Sealer.
Lathing & Attachments	1.85 kg/m² galvanised metal lath, may be pre-bent and tie-wired into place for appropriate design. Optionally, beam furring clips or electrically welded, pneumatic or self-tapping screws or studs, may be used. **Contour Design -** 1.85 kg/m² galvanised metal lath wrapped around the flange edges toward the web approximately 38 mm. Contour column designs allow the use of 51 mm x 51 mm galvanised or PVC coated hexagonal metal mesh with beam furring clips as an alternate to the 1.85 kg/m² galvanised metal lath. Plastic-nosed corner beads may also be used for better thickness control and aesthetics on flange edges of steel. Please refer to design details. For contour applications on structural members with web span greater than 406 mm or flange widths greater than 304 mm refer to the UL Fire Resistance Directory under "Coating Materials" section. **Boxed Design -** 1.85 kg/m² galvanised metal lath wrapped around member spanning the web, overlapped 25.4 mm and tie-wired on the flange face 304 mm on centre. For large webbed members, additional support for lath may be needed for ease of installation. Plastic-nosed corner beads may also be used for better thickness control and aesthetics. **Tower Skirts and Flat Surfaces -** Require that 1.85 kg/m² galvanised metal lath be anchored on 304 mm to 610 mm centres depending upon requirements. The lath should overlap and be tie-wired. On tower skirts only, PVC coated mesh can be used in lieu of 1.85 kg/m² galvanised lath. Mesh shall be 51 mm x 51 mm) 20 gauge wire coated with PVC as furnished by Carboline. When ram set or welding is prohibited; a pneumatic fastener may be used. On very large areas, control joints are made by scoring halfway through the thickness of Pyrocrete. This is achieved by using the trowel blade edge or an appropriate scoring tool. A preferred option would be the use of plastic-nosed corner beads. Spacing should be on 3 metre centres, both horizontally and vertically. Please refer to design details or contact Carboline Fireproofing Technical Service.

PERFORMANCE DATA (TYPICAL VALUES)

Test Method	Results
ASTM D2240 Durometer Hardness (Shore DO)	64
ASTM D2794 Impact Resistance	Pass (no cracking at 20 foot pounds)
ASTM E136 Combustibility	Pass (non-combustible)
ASTM E605 Density[1]	640 kg/m³ (minimum average)
ASTM E736 Bond Strength (unprimed Steel)[2]	10,267 psf (491 kPa)
ASTM E759 Deflection	Pass
ASTM E760 Bond Impact	Pass
ASTM E761 Compressive Strength	456 psi (3.1 MPa)
ASTM E84 Flame Spread	0
ASTM E84 Smoke Development	10
ASTM E937 Corrosion	0.00 g/mm²
Coverage 22.7 kg (50 lb.) bag	1.66 m² at 25 mm
Explosion Resistance	3 bar
Hose Stream Resistance	Pass
Shrinkage	<0.5%

1 Air dry at ambient conditions until constant weight is achieved. Do not force dry. Use ASTM E605 Positive Bead Displacement modified to use 1 mm ceramic beads.
2 Bond strength testing performed utilising ASTM E736 with AWCI Technical Manual 12-A modifications.
All test data above was generated under laboratory conditions. Field testing results may vary. Physical property data was derived using 21.6 litres (4.75 gallons) of water per 22.7 kg (50 lb.) bag.
Material shall reach a hardness of Shore DO 64 prior to handling and topcoating.
Test reports and additional data available upon written request.

MIXING & THINNING

Mixer

Use a heavy-duty mortar mixer rotating at 40 rpm with rubber tipped blades that will scrape the sides and bottom of the mixer. A 22.7 kg (50 lb.) bag of Pyrocrete 40 typically requires a mixer volume of 227 L (8 ft³) minimum. **Do not use pan type mixers.**

Mixing

Target water level: 18 litres (4.75 gallons)
Add clean, potable water to a mortar mixer with rubber tipped blades. With mixer running slowly, add powder and mix for 5 minutes until a homogeneous mortar-like consistency is achieved. Longer mixing times may result in lower densities. Total water must not exceed 20 litres (5.5 gallons) per 22.7 kg (50 lb.) bag. In cool weather, warm water may be used to enhance application. In hot weather, cold water may be used.

Pot Life

2 hours at 21°C and less at higher temperatures. Pot life ends when the material thickens and becomes unusable. Do not re-temper material.

Density

Target wet density: 897 - 961 kg/m³ (56 - 60 lbs/ft³). Wet density measurements are critical to obtaining correct dry densities. When checking wet densities, use the following procedures:
Equipment needed:
• 1 litre (1000 cc) polyethylene cup
• Small metal spatula
• Scale accurate to 1 gram
Determination of Pyrocrete wet density:
• Weigh the empty cup to the nearest gram, then tare the scale.
• Use the spatula to fill the cup completely with mixed material (do not tamp cup).
• Remove the excess material on top by placing the vertical edge of the spatula on the top edge of the cup. Use a sawing motion to level the mixed Pyrocrete material flush with the top of the cup.
• Weigh the filled cup to the nearest gram.

MIXING & THINNING

• Record the weight of material in grams. This value equals the wet density in grams/litre and kg/m³
• To calculate the wet density of the material in lb./ft³, multiply the value in grams/litre by 0.0624.

Contact Carboline Fireproofing Technical Service for additional details.

APPLICATION EQUIPMENT GUIDELINES

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

Pump

This material can be pumped with a wide range of piston, rotor stator and squeeze pumps designed to pump cement & plaster materials including:
Essick - model# FM9/FM5E (Rotor Stator/2L4)
Putzmeister - model# S5EV(Rotor Stator/2L6)
Hy-Flex - model# HZ-30E(Rotor Stator/2L6)
Hy-Flex - model# H320E (Piston)
Strong Mfg. - model# Spraymate 60 (Rotor Stator/2L6)
Airtech - model# Swinger (Piston)
Mayco - model# PF30 (Dual Piston)
Thomsen - model# PTV 700 (Dual Piston)

Trowel

Standard plasterer's hawk and trowel may be used. A rubber float may also aid in finishing.

Material Hose

Minimum 25.4mm (1”) I.D. hose with 300 psi minimum bursting pressure. For lengths over 15m (50') use 38mm (1½”) I.D. hose. Do not reduce hose diameter by more than 6.4mm (¼’) per 7.6m (25’) unless a tapered conical reducer equipped with swivel fitting is used. A 3m (10’) length of 25.4mm (1”) I.D. hose may be added at the gun for use as a whip.

Nozzle/Gun

Binks - part# 7E2 (47-49 fluid tip / 3/8"-1/2" air cap)
Graco - part# 204000(3/8" - 1/2" fluid tip / air cap)
Speeflow - part# 701(3/8" - 1/2" fluid tip / air cap)
Airtech - Internal mix with 3/8" - 1/2" fluid tip
Standard plasterers gun with 3/8" - 1/2" fluid tip

Compressor

Be certain that the air supply is a minimum 22 cfm at 100 psi (689 kPa) and higher when distances longer than 22 metres (75’) are required.

Air Line

Use 12.7 mm (½”) I.D. line, with a minimum bursting pressure of 100 psi (689 kPa).

APPLICATION PROCEDURES

General

Pyrocrete 40 may be applied by spray and/or trowel. Material build will depend on application method, weather conditions and equipment used. For application overhead, a scratch coat of up to 12.7 mm is recommended to key into the lath. Allow to set for approximately 1 to 2 hours at 21°C before applying the subsequent coats. It is recommended that the total required thickness be applied within a 24 hour period. If this is not possible, the preceding coats should be left as sprayed or scored after application. Product must be dampened with water before application of additional coats.
• Maximum time to achieve the full thickness is 3 days at 21° and 50% relative humidity. This would be less at higher temperatures.
• All additional coats are applied monolithically to the entire perimeter of the member.
• **At no time shall Pyrocrete 40 be applied at a thickness less than 6.4 mm or “skim” coated.**

Finishing

Material can be left as sprayed or finished with a trowel for better aesthetics.

APPLICATION CONDITIONS

Condition	Material	Surface	Ambient	Humidity
Minimum	4°C (40°F)	4°C (40°F)	4°C (40°F)	0%
Maximum	38°C (100°F)	52°C (125°F)	43°C (110°F)	95%

CURING SCHEDULE

Surface Temp.	Dry to Recoat
21°C (70°F)	2 Hours

Fresh Pyrocrete 40 must be protected from rain or running water for 24 hours at 21°C. In low humidity, high temperature, direct sun or wind, the Pyrocrete surface should be kept damp for at least 12 hours by applying a water mist or wrapping in plastic sheets to reduce rapid water loss.
Caution: Do not start work if ambient temperatures are expected to drop below 2°C for 24 hours after application. Material shall reach a hardness of Shore DO 64 prior to handling and topcoating.

CLEANUP & SAFETY

Cleanup | Pump, mixer and hose should be cleaned with clean, potable water at least once every 4 hours at 21°C, and more often at higher temperatures. Sponges should be run through the hoses to remove residual material. Wet Pyrocrete 40 overspray must be cleaned up with soapy or clean, potable water. Cured overspray may require chipping and/or scraping to remove.

Safety | Follow all safety precautions on the Material Safety Data Sheet. It is recommended that personal protective equipment be worn, including spray suits, gloves, eye protection and respirators.

Overspray | Adjacent surfaces shall be protected from damage and overspray. Sprayed fireproofing materials may be difficult to remove from surfaces and may cause damage to architectural finishes. Cured overspray may require chipping and/or scraping to remove.

Ventilation | In enclosed areas, ventilation shall be 4 complete air exchanges per hour until the material is dry.

TESTING / CERTIFICATION / LISTING

Underwriters Laboratories, Inc.

Pyrocrete 40 has been tested by Underwriters Laboratories, Inc. and is classified for exterior or interior use by UL in the following designs:
UL 1709
Rapid temperature rise hydrocarbon fire exposure
Columns – XR705, XR706, XR707 (lath free)
Cryogenic Testing
Tested in accordance to “Specification for Cryogenic Protection and Passive Fire Protection of Structural Members", dated March 2006 from South Hook LNG Terminal Company Ltd. Additional splash and spill testing perform at varying flow rates. All testing has been witnessed by UL.
ASTM E119 (UL 263, NFPA 251)
Cellulosic fire exposure
Columns - X760, X761, X762, X763, X784, X785, Y707, Y708
Roof Assembly – P927, P928, P734, P735, P736, P737, P738, P739, P926, P929
Beams – N737, N738, N739, N740, N771, N772, N773, N774, N775, S717, S719, S731, S732, S733
Floor Ceiling Assembly – D774, D767, D768, D769, D770, D771, D773, D774, D775, D776, D777, D927, D928
Walls – U704
Precast Concrete & Steel Joists – G706, G707, G708, J713, J714, J715, J716

TESTING / CERTIFICATION / LISTING

Intertek	Hose stream endurance testing
BakerRisk	3 bar overblast protection
Lloyd's Register	ISO 22899-1 jet fire certification (2 hour)
Warrington Fire Research Ltd.	BS 476: Part 20: Appendix D hydrocarbon fire exposure WFRC Report No. 128533

PACKAGING, HANDLING & STORAGE

Shelf Life	24 months (minimum) when kept at recommended storage conditions.
Shipping Weight (Approximate)	22.7 kg (50 lb.)
Storage	Store indoors in a dry environment between -29°C - 66°C Material must be kept dry or clumping may occur.
Packaging	22.7 kg (50 lb.) bags

WARRANTY