

SELECTION & SPECIFICATION DATA

Generic Type	A two component, 100% solids epoxy based intumescent coating for the fire protection of structural steel, spheres, tanks and railcars.
Description	Thermo-Lag® 440-P is designed to fireproof steelwork for up to a 4 hour fire rating, depending on the design. The recommended use for this product is fireproofing of steel beams, columns, pressurized and non pressurized spheres, tanks and railcars to provide hydrocarbon pool fire and jet fire ratings.
Features	<ul style="list-style-type: none"> • UL listed - designs for many types of steel sections up to 4 hour fire ratings for both interior and exterior environments. • Durable finish - provides a hard, durable finish resistant to normal wear. • Thin film coating - offers an economical solution to alternative fireproofing. • VOC compliant • Easy repair - if damaged it can be repaired easily using material as putty.
Color	Part A: White Part B: Beige Mixed: Beige
Finish	Textured *Aesthetics can be improved by trowel and back rolling.
Primer	Thermo-Lag® 440-P must be applied over a compatible primer. If the steel has already been coated with an existing primer, refer to Carboline Technical Service for advice before applying Thermo-Lag® 440-P. Contact Carboline Technical Service for a complete list of approved primers. *The thickness range for primers used under Thermo-Lag® 440 must be 3-5 mils (75-125 microns) DFT per SSPC-PA2.
Film Build	80-200 mils (2-5 mm)
Solids Content	By Volume 100%
Theoretical Coverage Rates	1604 ft ² at 1 mil (149 m ² at 25 microns)
VOC Values	As Supplied : 0.00 lbs/gal (0 g/l)
Mesh	Use FP-Fiberglass Mesh or High Temp Mesh depending on structural steel design. *No mesh is required for tank and sphere applications. Contact Carboline Technical Service for specific design details.
Limitations	Not recommended for steelwork subject to long-term surface temperatures over 175°F (79°C) in normal use.
Topcoats	For interior conditioned space, topcoats are optional. For interior general purpose and exterior use, Carboline approved topcoats are required. Thermo-Lag® 440-P must be applied to the specified DFT and be fully cured before applying a topcoat. The choice of topcoat will depend on project requirements. Contact Carboline Technical Service for a complete list of approved topcoats.

Thermo-Lag 440-P

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SUBSTRATES & SURFACE PREPARATION

General	Remove all oil or grease from the surface to be coated using Thinner #2 or Carboline Surface Cleaner #3.
Steel	Steel preparation before application of approved primer should meet SSPC-SP6 (onshore), SSPC-SP10 (offshore). 1.5-2.0 mil (37-50 micron) angular profile required. *The thickness range for primers used under Thermo-Lag® 440 must be 3-5 mils (75-125 microns) DFT per SSPC-PA2
Galvanized Steel	Steel preparation before priming should meet SSPC-SP7. 1.5-2.0 mil (37-50 micron) angular profile required. Prime with Carboguard 893 SG @ 3-5 mils (75-125 microns) DFT per SSPC-PA2.
Non-Ferrous Metals	Contact Carboline Technical Service for advice.

PERFORMANCE DATA

Test Method	System	Results
ASTM D2240 Hardness	Thermo-Lag 440 P	Shore D - 55 (fully cured) Shore D - 40 (for topcoating)
ASTM D2794 Impact	Thermo-Lag 440 P	24 ft. lb./in.
ASTM D4541 Bond Strength	Thermo-Lag 440 P	300 psi (2.0 MPa) minimum
ASTM D638 Tensile Strength	Thermo-Lag 440 P	1,230 psi (8.4 MPa)
ASTM D695 Compressive Strength	Thermo-Lag 440 P	4,170 psi (28.7 MPa)
ASTM D790 Flexural Strength	Thermo-Lag 440 P	2,310 psi (15.9 MPa)
ASTM E84 Surface Burning	Thermo-Lag 440 P	Class A
Density	Thermo-Lag 440 P	78 pcf (1,249 kg/m³)

*All values derived under controlled laboratory conditions.

MIXING & THINNING

Mixer	Use 1/2" (12.7 mm) electric or air driven drill with a slotted paddle mixer (300 rpm under load).
Mixing	<p>Plural Component Application: For plural component applications, the part A and part B components must be pre-mixed separately before introduction into the plural equipment.</p> <p>Trowel Application: Recommended for small areas only. The product is supplied in 9 gallon (34.0 liter) kits. The product must be mixed in equal volumes of part A and part B. It is recommended to split each kit in half and mix 2.25 gallons (8.5 liters) of part A and 2.25 gallons (8.5 liters) of part B to achieve a maximum mixing volume of 4.5 gallons (17.0 liters). Add up to 1 quart (1 liter) of Carboline Plasite Thinner #19 or Carboline approved equivalent to part B and mix until fully incorporated. Thinning is not required for this application and material should only be thinned as necessary to achieve the desired working time and consistency. Stage material by adding part B on top of part A. Material can be left staged for entire days' production (8 hours), but not overnight. Mix staged material with slotted paddle mixing blade for approximately 2 minutes or until completely blended and consistent color is achieved. Once mixed, material should be immediately poured out of mass onto a clean table or flat working surface to extend the pot life. Mixed material left in the pail will begin to exotherm and diminish pot life. Trowel application should commence immediately after mixing.</p>
Thinning	<p>Plural Component Application: Do not thin</p>

MIXING & THINNING

	Trowel Application: Only thin as required with Plasite Thinner #19 or Carboline approved equivalent – Maximum 1 quart (1 liter) per 4.5 gallon (17.0 liter) kit.
Ratio	1:1
Working Time	30 - 45 minutes @ 75°F (25°C) 15 - 20 minutes @ 100°F (38°C)

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.

General	Use only plural component equipment specifically designed for epoxy based PFP. Consult the manufacturers for specific information: AirTech Spray Systems (Houston, TX) Spray Quip (Houston, TX) Graco (Minneapolis, MN) WIWA (Alger, OH/Lahnau, Germany)
Pump	Plural Component: Graco® XM PFP WIWA® Duomix 333 or Carboline approved equivalent Contact the equipment manufacturers for specific models.
Spray Gun	WIWA 500 PFP, Binks 1M Mastic or equivalent Must be non-wetted spring assembly.
Gun Swivel	5,000 psi (1/2"-3/8")
Spray Tips	0.039" - 0.065" (Use Graco heavy duty RAC non diffuser tips and housing)
Fan Size	6" - 10" (152 mm - 254 mm) depending on section being sprayed
Static Mixer	Standard Static 12 turn 3/4" (19 mm) I.D.
Material Hose	Plural Component: 100' (30.4 m) heated hose bundle with 3/4" (19 mm) I.D. minimum and 3/4" (19 mm) mixer manifold
Whip Hose	20' (6.1 m) of 1/2" (12.7 mm) I.D. minimum
Compressor	185 cfm @ 100 psi (6.9 kPa) minimum. Air volume and pressure required will depend on equipment used.

APPLICATION PROCEDURES

General	Pre-cut all mesh before beginning application. Contact Carboline Technical Service for design details. All mesh must be kept clean and dry. Plural Component Application:
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APPLICATION PROCEDURES

Prior to introduction into the plural component equipment, the product must be preheated to 70°F - 100°F (21°C - 38°C). Perform at least two ratio checks per day and also after any equipment maintenance. Apply first coat at 80-200 mils (2-5 mm). Lighter coats will achieve a smoother finish. Allow material to gel for 15 minutes before installing mesh and backrolling. Apply pre-cut mesh into wet coating using solvent resistant mohair rollers. Use Carboline Plasite Thinner #19 or Carboline approved equal as rolling solvent to mist down rollers to prevent them from sticking to the material. Allow material to cure for approximately 1 hour (depending upon temperature) between coats. Continue building material at 80-200 mils (2-5 mm) per coat to specified thickness.

Trowel Application:

Recommended for small areas only. Prior to trowel application, the material must be preheated to a minimum of 70°F (21°C) to achieve a workable consistency. Once material is mixed, it must be poured out of mass onto a clean table or flat working surface to extend the pot life. The material can then be divided into workable amounts. Trowel apply first coat at 80-200 mils (2-5 mm). Allow material to gel for 15 minutes before installing mesh and backrolling. Apply pre-cut mesh into wet coating using solvent resistant mohair rollers. Use Carboline Plasite Thinner #19 or Carboline approved equal as rolling solvent to mist down rollers to prevent them from sticking to the material. Allow material to set up sufficiently to support the next trowel applied coat. This will range between 1-4 hours between coats. Continue building material at 80-200 mils (2-5 mm) per coat to specified thickness.

Avoid using excessive solvent when backrolling as this can lead to solvent entrapment and lengthen the cure time of the material. Use solvent moistened rollers to back roll material after each subsequent coat to improve finish and level surface if required. Lighter coats will achieve a smoother finish. Contact Carboline Technical Service or refer to the product application manual for more detailed information.

Application Rates

At an ambient temperature of 70°F (21°C), the following application rates are applicable:
80-200 mils (2-5 mm) per coat (wet)
1 hour recoat time between coats
Multiple coats per day

Wet Film Thickness

Frequent thickness measurements with a wet film gauge are recommended during the application process to ensure uniform thickness.

Dry Film Thickness

Final thickness must be measured using an electronic dry film thickness gauge. For method of thickness determination and tolerances refer to: AWCI Technical Manual 12-B (Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire Resistive Materials).

APPLICATION CONDITIONS

Condition	Material	Surface	Ambient	Humidity
Minimum	38°C (100°F)	5°C (41°F)	5°C (41°F)	0%
Maximum	60°C (140°F)	52°C (125°F)	43°C (110°F)	85%

*Air and substrate temperature must be at least 41°F (5°C) and rising. Steel surface temperature should be a minimum of 5°F (3°C) above the dew point. The maximum humidity is 85%. Area must be protected from rain or running water during application until material is cured and topcoated.

CURING SCHEDULE

Surface Temp.	Handle	Recoat	Topcoat	Touch
25°C (77°F)	24 Hours	1 Hour	24 Hours	1 Hour

*Curing times are dependent upon temperature, air movement and humidity. For optimum curing at 75°F (24°C), it is recommended to apply coats at 80-200 mils (2-5 mm) wet per coat. Material can be heated to achieve a quicker recoating and curing schedule.

Material is ready to be topcoated when an average Shore D hardness of 40 is achieved. Consult Carboline Technical Service for specific details.

CLEANUP & SAFETY

Cleanup	Flush static mixer, whip hose, gun and tips with hot water or Carboline approved thinner immediately after each use (depending on pump set up). Use Carboline Plasite Thinner #19 Carboline or approved equal for cleaning solvent. Break down static mixer, gun and tip assembly and hand clean.
Safety	Follow all safety precautions on the Thermo-Lag® 440-P Material Safety Data Sheet. It is recommended that personal protective equipment be worn, including spray suits, gloves, eye protection and respirators when applying Thermo-Lag® 440-P.
Overspray	All adjacent and finished surfaces shall be protected from damage and overspray.
Ventilation	In enclosed areas, ventilation shall not be less than 4 complete air exchanges per hour until the material is cured.

MAINTENANCE

General	If coating becomes damaged, rebuild required thickness by spray or trowel. When dry, smooth and finish with approved topcoat to match. Damaged areas must be abraded back to a firm edge by sanding or scraping. The topcoat should be abraded back by 1" (25.4 mm) from the damaged area. The surface must be clean and dry before re-applying Thermo-Lag® 440-P. The coating shall then be built back to the original thickness. If the mesh is damaged, it must be cut out and replaced as well. Allow to cure and then overcoat with the specified topcoat or system.
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TESTING / CERTIFICATION / LISTING

General	Underwriter's Laboratories, Inc. (UL) U.S. Department of Transportation (DOT) Lloyd's Register of Shipping (LRS) Bundesanstalt Fur Materialprufung (BAM)
Underwriters Laboratories, Inc.	Thermo-Lag® 440-P has been tested in accordance with UL 1709 at Underwriter's Laboratories, Inc. Thermo-Lag® 440-P is listed by UL for the following designs: Columns: XR610 Columns: XR611 Columns: XR614 Columns: X622 *The product should be applied in accordance with the appropriate design.

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PACKAGING, HANDLING & STORAGE

Shelf Life	12 Months *Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.
Shipping Weight (Approximate)	11 lbs. per gallon (1.3 kg per liter)
Flash Point (Setaflash)	Part A: >200°F (>93°C) Part B: >200°F (>93°C)
Storage	Store indoors in a dry environment between 32°F - 100°F (0°C - 38°C).
Packaging	Full Kits: 9.0 gallons (34.0 liters) Part A: 4.5 gallons (17.0 liters) Part B: 4.5 gallons (17.0 liters)

WARRANTY

To the best of our knowledge the technical data contained herein is true and accurate on the date of publication and is subject to change without prior notice. User must contact Carboline Company to verify correctness before specifying or ordering. No guarantee of accuracy is given or implied. We guarantee our products to conform to Carboline quality control. We assume no responsibility for coverage, performance, injuries or damages resulting from use. Carbolines sole obligation, if any, is to replace or refund the purchase price of the Carboline product(s) proven to be defective, at Carbolines option. Carboline shall not be liable for any loss or damage. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY CARBOLINE, EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OF LAW, OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. All of the trademarks referenced above are the property of Carboline International Corporation unless otherwise indicated.