

**SELECTION & SPECIFICATION DATA**

<b>Generic Type</b>	A two component, 95% solids epoxy based intumescent coating for the fire protection of structural steel, spheres, tanks and railcars.
<b>Description</b>	Thermo-Lag 440-SP 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.
<b>Features</b>	<ul style="list-style-type: none"> <li>• UL listed - designs for many types of steel sections up to 4 hour fire ratings for both interior and exterior environments.</li> <li>• Durable finish - provides a hard, durable finish resistant to normal wear.</li> <li>• Thin film coating - offers an economical solution to alternative fireproofing.</li> <li>• VOC compliant</li> <li>• Easy repair - if damaged it can be repaired easily using material as putty.</li> </ul>
<b>Color</b>	Part A: White Part B: Beige Mixed: Beige
<b>Finish</b>	Textured  *Aesthetics can be improved by trowel and back rolling.
<b>Primer</b>	Thermo-Lag 440-SP 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-SP. 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.
<b>Film Build</b>	80-160 mils (2-4 mm)
<b>Solids Content</b>	By Volume 95%
<b>Theoretical Coverage Rates</b>	1523 ft <sup>2</sup> /gallon at 1 mil (38 m <sup>2</sup> /liter at 25 microns)
<b>VOC Values</b>	<b>As Supplied</b> : 0.95 lb/gal (114 g/L)
<b>Mesh</b>	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.
<b>Limitations</b>	Not recommended for steelwork subject to long-term surface temperatures over 175°F (79°C) in normal use.
<b>Topcoats</b>	For interior conditioned space, topcoats are optional. For interior general purpose and exterior use, Carboline approved topcoats are required. Thermo-Lag 440-SP 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.

## SUBSTRATES & SURFACE PREPARATION

<b>General</b>	Remove all oil or grease from the surface to be coated using Thinner 2 or Carboline Surface Cleaner 3.
<b>Steel</b>	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.
<b>Galvanized Steel</b>	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.
<b>Non-Ferrous Metals</b>	Contact Carboline Technical Service for advice.

## PERFORMANCE DATA

All test data was generated under laboratory conditions. Field testing results may vary.

Test Method	Results
ASTM D2240 Hardness	Shore D - 55 (fully cured) Shore D - 40 (for topcoating)
ASTM D2794 Impact	24 ft. lb./in.
ASTM D4541 Bond Strength	Typical Field Value 300 psi (2.07 MPa)
ASTM D638 Tensile Strength	1,230 psi (8.4 MPa)
ASTM D695 Compressive Strength	4,170 psi (28.7 MPa)
ASTM D790 Flexural Strength	2,310 psi (15.9 MPa)
ASTM E84 Surface Burning	Class A
Density	78 pcf (1,249 kg/m <sup>3</sup> )

All values derived under controlled laboratory conditions unless otherwise noted.

## MIXING & THINNING

<b>Mixer</b>	Use 1/2" (12.7 mm) electric or air driven drill with a slotted paddle mixer (300 rpm under load).
<b>Mixing</b>	<p><b>Plural Component Application:</b> For plural component applications, the product is supplied in full 9 gallon (34.0 liter) kits. The part A and part B components must be pre-mixed separately before introduction into the plural equipment.</p> <p><b>Single Component Application:</b> For single component applications, the product is supplied in 4.5 gallon (17.0 liter) kits, one 1/2 full pail of part A and one 1/2 full pail of part B. Add up to 1 quart (1 liter) of Plasite Thinner 19, or Carboline approved equivalent to part B and mix until fully incorporated. 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.</p> <p>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 introduced into single component equipment and spraying should commence.</p> <p><b>Trowel Application:</b> For trowel applications, the product is supplied in 4.5 gallon (17.0 liter) kits, one 1/2 full pail of part A and one 1/2 full pail of part B. Add up to 1 quart (1 liter) of 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.</p>

## MIXING & THINNING

	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.
<b>Thinning</b>	<p><b>Plural Component Application:</b> Do not thin</p> <p><b>Single Component Application:</b> Thin with Plasite Thinner 19, or Carboline approved equivalent – Maximum 1 quart (1 liter) per 4.5 gallon (17.0 liter) kit</p> <p><b>Trowel Application:</b> 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.</p>
<b>Ratio</b>	1:1 (by volume)
<b>Working Time</b>	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.

<b>General</b>	<p>Thermo-Lag 440 SP may be applied by either single component or plural component application. Use only single component or plural component equipment specifically designed for epoxy based PFP. Consult the manufacturers for specific information:</p> <p><b>AirTech Spray Systems</b> (Houston, TX)  <b>Spray Quip</b> (Houston, TX)  <b>Graco</b> (Minneapolis, MN)  <b>WIWA</b> (Alger, OH/Lahnau, Germany)</p>
<b>Airless Spray</b>	<p>Use 45:1 airless (minimum) with Dura Flow lower cylinder (3/4" outlet) / 3.3 gal. per minute to provide an operating pressure of 3,000 p.s.i. (320 kg/cm<sup>2</sup>).</p> <p>*Remove filters and surge tanks. Set bottom ball to greatest travel. Hopper feed required. Teflon packings are recommended.</p>
<b>Pump</b>	<p><b>Single Component:</b>  Graco® Xtreme XL Heavy Fluid Package (with stainless steel hopper feed)  WIWA® Herkules 75:1 (with stainless steel hopper feed) or Carboline approved equivalent</p> <p><b>Plural Component:</b>  Graco® XM PFP  WIWA® Duomix 333  or Carboline approved equivalent</p>
<b>Spray Gun</b>	<p>WIWA® 500 PFP, Binks 1M Mastic or equivalent</p> <p>Must be non-wetted spring assembly.</p>
<b>Gun Swivel</b>	5,000 psi (34.4 MPa) 1/2-3/8" (12.7-9.5 mm)
<b>Spray Tips</b>	0.039-0.065" (Use Graco heavy duty RAC non diffuser tips and housing)

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<b>Fan Size</b>	6-10" (152-254 mm)
<b>Static Mixer</b>	Standard Static 12 turn 3/4" (19 mm) I.D.
<b>Material Hose</b>	<b>Single Component:</b> Use 50' (15.2 m) of high pressure spray line with a minimum I.D. of 3/4" (19 mm) <b>Plural Component:</b> 100' (30.4 m) heated hose bundle with 3/4" (19 mm) I.D. minimum and 3/4" (19 mm) mixer manifold
<b>Whip Hose</b>	20' (6.1 m) of 1/2" (12.7 mm) I.D. minimum
<b>Compressor</b>	Be certain that the air supply is a minimum of 185 cfm @ 100 psi (6.9 KPa). Air volume and pressure required will depend on equipment used.

## APPLICATION PROCEDURES

<b>General</b>	<p>Pre-cut all mesh before beginning application. Contact Carboline Technical Service for design details. All mesh must be kept clean and dry.</p> <p><b>Single Component Application:</b>          Prior to spraying using single component airless equipment, the material must be preheated to a minimum of 70°F (21°C) to achieve a consistent fan pattern. Apply first coat to point of mesh placement at 80-160 mils (2-4 mm). Lighter coats will achieve a smoother finish. Allow material to gel for 20-30 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 4 hours between coats. Continue building material at 80-160 mils (2-4 mm) per coat to specified thickness. Use solvent moistened rollers to back roll material after each subsequent coat to improve finish and level surface.</p> <p><b>Plural Component Application:</b>          Prior to introduction into the plural component equipment, the product must be preheated to 70-100°F (21-38°C). Perform at least two ratio checks per day and also after any equipment maintenance. Apply first coat at 80-160 mils (2-4 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 30 minutes (depending upon temperature) between coats. Continue building material at 80-160 mils (2-4 mm) per coat to specified thickness.</p> <p><b>Trowel Application:</b>          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 80-160 mils (2-4 mm). Allow material to gel for 20-30 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 4 hours between coats. Continue building material at 80-160 mils (2-4 mm) per coat to specified thickness.</p> <p><b>Avoid using excessive solvent when backrolling as this can lead to solvent entrapment and lengthen the cure time of the material.</b> 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</p>
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## APPLICATION PROCEDURES

	smoother finish. Contact Carboline Technical Service or refer to the product application manual for more detailed information.
<b>Application Rates</b>	At an ambient temperature of 70°F (21°C), the following application rates are applicable: 80-160 mils (2-4 mm) per coat (wet) 4 hour recoat time between coats 2 coats per day
<b>Wet Film Thickness</b>	Frequent thickness measurements with a wet film gauge are recommended during the application process to ensure uniform thickness.
<b>Dry Film Thickness</b>	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	70°F (21°C)	41°F (5°C)	41°F (5°C)	0%
Maximum	105°F (41°C)	125°F (52°C)	110°F (43°C)	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
77°F (25°C)	24 Hours	4 Hours	24 Hours	4 Hours

\*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 80-160 mils (2-4 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

<b>Cleanup</b>	Pump, mixer, hose, and gun should be cleaned with Carboline Plasite Thinner 19 or Thinner 76 at least once every 4 hours at 70°F (21°C), and more often at higher temperatures. After each use or any shut down, the pump, mixer, hopper and gun must be completely flushed with solvent. After flushing pump, remove hopper and bottom foot of pump to clean lower ball check valve. Also remove and hand clean gun, tips and tip housing. The hopper and mixing paddle must be kept clean continuously during application to prevent cured material from falling into the foot of the pump.
<b>Safety</b>	Read and follow all caution statements on this product data sheet and on the SDS for this product. Employ normal workmanlike safety precautions. Use adequate ventilation. Keep container closed when not in use.
<b>Overspray</b>	All adjacent and finished surfaces shall be protected from damage and overspray.

### CLEANUP & SAFETY

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<b>Ventilation</b>	When used in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to insure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved respirator.
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### MAINTENANCE

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<b>General</b>	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-SP. 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

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

### PACKAGING, HANDLING & STORAGE

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<b>Packaging</b>	<b>Half kits:</b> 4.5 gallons (17.0 liters) <b>Full kits:</b> 9.0 gallons (34.0 liters)
<b>Shelf Life</b>	12 Months  *Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.
<b>Storage</b>	Store indoors in a dry environment between 32-100°F (0-38°C).
<b>Shipping Weight (Approximate)</b>	11 lb. per gallon (1.3 kg per liter)
<b>Flash Point (Setaflash)</b>	Part A: 76°F (24°C) Part B: 64°F (18°C)

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## **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.