

## APPLICATION MANUAL AND RECOMMENDATIONS FOR THERMO-LAG<sup>®</sup> E100

**DOCUMENT No.:** 041420-IFRM-E100-A

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THERMO-LAG® E100 & THERMO-LAG® E100 S



## SECTION -: REVISION SUMMARY

Revision	Date	Amendments
A	04.22.20	First revision
B	07.15.20	Amend section 7.4.H, Maximum Time Header from Hours to Days

## SECTION -. INTRODUCTION

### Audience

We assume that applicators of CARBOLINE products understand the terminology associated with our products and the various pieces of spray equipment and application techniques.

The installation of the THERMO-LAG E100 and THERMO-LAG E100 S Fire Barrier Systems shall be performed only by contractor personnel trained or qualified by CARBOLINE in the installation of the materials.

### Locating Information

This guide incorporates a number of aids to help you locate information easily.

- Table of Contents
- Figure and Table Listings
- Page Headers and Footers
- Frequent Section, Subsection, and Topic Headings

### Numbering System

To avoid a cumbersome numbering system, only chapters, sections, and subsections have a numerical designation. For example, “2.3.1” represents Chapter 2, Section 3, Subsection 1.

Illustrations and drawings generally appear at the end of this document.

### Breakdown of Information

Frequent section and subject headings highlight other significant information within a chapter. Heading type style and indentations indicate the level of importance for the topics.

### Related Publications and Documents

This document occasionally refers to other Guides, data sheets, or specifications that may be helpful. Copies are available from CARBOLINE. Related information can be accessed at [www.Carboline.com](http://www.Carboline.com).

*Other documents that may be helpful, include:*

- OSHA - Occupational Safety and Health Administration Safety Rules
- National Spray Equipment Manufacturer’s Association Precautions for Spraying
- Power tools, hand tools or other mechanical equipment operating procedures.

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## SECTION -. SAFETY PRECAUTIONS

THERMO-LAG E100 and THERMO-LAG E100 S materials weigh approximately 10.5 – 11.5 pounds per gallon. Caution should be taken when lifting and moving the material to prevent injury.

Observe the National Spray Equipment Manufacturers Association precautions for spraying.

**DO NOT** point spray gun at any part of the human body.

### Notes on Installation

#### *Basis for Installation Procedures in This Guide*

The installation steps and procedures in this guide were prepared with the best available data. All of the steps and procedures presented in this guide are based upon tests. As additional test and installation data becomes available, including revised installation procedures, CARBOLINE may update and modify this guide.

**Note:** This is a general Application Manual and cannot cover all possible situations which may arise in the field. For technical assistance, contact CARBOLINE's Fireproofing Technical Service Group at: 1-800-848-4645.

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## SECTION 1. GENERAL CONDITIONS

### 1.1 SCOPE

This Application Manual describes the requirements for the application of the THERMO-LAG E100 AND THERMO-LAG E100 S Fire Barrier Systems to steel surfaces for the commercial and light industrial markets, based on the requirements of ASTM E119 and UL 263. For the application to any other substrates, markets or specifications, contact CARBOLINE Technical Service or your local CARBOLINE Sales Representative.

### 1.2 QUALITY CONTROL MANUAL

#### 1.2.1 QUALIFICATIONS OF APPLICATORS/RESPONSIBILITIES OF PERSONNEL

The application shall be performed by a Qualified Applicator having CARBOLINE training with proper equipment and experience.

#### 1.2.2 REQUIREMENTS

In order to qualify, an Applicator shall:

- a) Undergo specific training by CARBOLINE
- b) Be experienced in the application of thick film coatings, preferably epoxy based.
- c) Have the necessary approved spray application equipment and recommended quality control instrumentation.
- d) Have in place an acceptable QA/QC system and be prepared to permit CARBOLINE audits.
- e) Understand and recognize their statutory obligations with regard to health and Safety.

#### 1.2.3 SAFETY PRECAUTIONS

The Applicator shall follow standard industrial hygiene practices for the handling of chemical coatings and shall conform to applicable codes of practice, regulations, and Owner Safety rules in all respects. Reference THERMO-LAG E100 and THERMO-LAG E100 S SDS for additional information and instruction.

Where power tools hand tools, spray equipment or other mechanical equipment are being used, the proper operating procedures for each tool or piece of equipment, as well as eye, hearing and respiratory protection should be followed. Equipment used to apply THERMO-LAG E100 and THERMO-LAG E100 S is under high pressure. Any injury caused by high pressure liquids can be serious and immediate medical attention should be sought.

### 1.3 DELIVERY

Material shall be delivered to the site in original, unopened containers, bearing clearly visible product names, batch number, name of manufacturer, expiration date, certification mark, and storage instructions.

### 1.4 STORAGE

Material not in immediate use shall be stored off the ground in a covered area assigned for that purpose. The materials in storage shall be protected from temperatures above 100°F (38°C) and below 32°F (0°C).

Prior to use with plural component equipment, THERMO-LAG E100 shall be pre-heated to a minimum of 70°F (21°C) and a maximum of 110°F (43°C). Prior to use with single component equipment, THERMO-LAG E100 S shall be pre-heated to a minimum of 70°F (21°C) and a maximum of 90°F (32°C).

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## 1.5 PROTECTION OF ADJACENT SURFACES

The applicator shall mask off all adjacent areas and equipment from material overspray during the application. Overspray shall be removed promptly before material has cured. When applying these coating in windy conditions, additional precautions to control overspray should be undertaken.

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## SECTION 2. MATERIALS

THERMO-LAG E100 Fire Barrier Systems consist of the following materials:

### 2.1 PRIMERS

Prior to use, all primer systems must be accepted by CARBOLINE prior to use under THERMO-LAG E100 or THERMO-LAG E100 S. The acceptable primer system shall be applied to properly prepared surfaces in accordance with the manufacturer's and project specifications in a range of 3 – 5 mils (75 – 125 microns) DFT per SSPC PA2. Final dry film thickness in excess of this value shall be agreed upon by CARBOLINE in writing. Refer to Appendix A, Carboline's Approved Primer List.

The general requirement for steel preparation before the application of an approved primer should meet SSPC-SP6, with a 1.5-2.0 mil (37-50 micron) angular profile. Contact Carboline Technical Service for surface preparation recommendations and specific primer requirements.

For field applications, existing coatings must attain a minimum 3A rating in accordance with ASTM D3359 Method A, X cut adhesion test. If acceptable, clean and lightly abrade in accordance with SSPC-SP2 or SP3 to roughen and de-gloss the surface. If not acceptable, the coating must be removed and areas re-primed with a compatible primer. If primer coating has acceptable adhesion, but is not compatible or compatibility is unknown, a tie-coat primer can be applied as a bonding or barrier coating. Contact Carboline Technical Service for a list of approved tie-coat primers and specific primer requirements.

Primer recoat intervals may vary from the published product datasheet when using under intumescent fireproofing products. Consult Carboline Technical Service for recommended cure times before applying Carboline intumescent products.

### 2.2 THERMO-LAG E100 AND THERMO-LAG E100 S

THERMO-LAG E100 is a 100% solids, two component, thermally activated, intumescent epoxy coating formulated for plural component and trowel applications. Thermo-Lag E100 is supplied in full pails (4.5 gallons / 17 L).

THERMO-LAG E100 S is a 95% solids, two component, thermally activated, intumescent epoxy coating formulated for single component, and trowel applications. Thermo-Lag E100 S is supplied in half full pails (2.25 gallons / 8.5 L) to facilitate batch mixing.

### 2.3 TOPCOATS

All topcoat systems must be approved by Carboline prior to use over THERMO-Lag E100 and THERMO-Lag E100 S.. Refer to Appendix B, Carboline's Approved Topcoat List for various approved topcoat systems.

Contact Carboline Technical Service for topcoat recommendations for interior general purpose, interior conditioned space, and exterior environments.

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## SECTION 3. PUMP REQUIREMENTS

### 3.1 APPROVED PLURAL COMPONENT RIG FOR THERMO-LAG E100

Only use Thermo-Lag E100 for plural component applications. The following approved plural component manufacturers are suitable for the application of THERMO-LAG E100:

- ECCO
- Graco
- Spray-Quip, Inc.
- WIWA
- ESCS

Contact Carboline Fireproofing Technical Service for specific plural component equipment recommendations.

It is essential that all the equipment used by the applicator is properly maintained. It is necessary to regularly change items such as seals, gun tips, packing and hoses.

Every applicator shall obtain a parts list and/or manual from the manufacturer for the proper operation of the equipment and its maintenance. All guidelines for equipment settings stated herein are starting points that may require adjustments to be made for specific pump models and site conditions. Any company which has not utilized the specific pump prior to applying THERMO-LAG E100 shall be trained in the proper operation of the pump by the pump manufacturer. CARBOLINE takes no responsibility for the lack of proper instruction on the use of the pump.

Poorly maintained equipment will not function properly and may cause the ratio of components A and B, (set at 1:1), to vary. The permitted ratio tolerance of components A and B is +/- 5% (by volume). The Applicator shall perform at least 2 ratio checks (by volume) per shift collecting a minimum of 2.5 gallons (10 liters) of components A and B during each check.

Ratio checks shall only be performed by pumping both components into separate pails simultaneously.

### 3.2 SINGLE LEG PUMP REQUIREMENTS FOR THERMO-LAG E100 S

Fluid to Air Pump:                      Ratio of 45:1 or greater.  
   Minimum ¾" outlet on high pressure side with an output of 3.3 gallons/minute (minimum)

Electric Airless Spray Pump:      Graco Mark V

Hopper feed is required with quick disconnect or camlock fittings and solvent resistant seals for all single leg applications. Please contact Carboline Technical Service for recommended pump setup options.



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## SECTION 4. SURFACE PREPARATION AND PRIMING

### 4.1 DEGREASING, BLASTING AND PRIMING

#### 4.1.1 DEGREASING

All surfaces shall be cleaned and degreased prior to grit blasting the steel per SSPC SP1. When selecting a cleaning method, the primer manufacturer's and project recommendations must be adhered to.

When it is necessary to clean the surface of THERMO-LAG before applying a further coat or top coating, solvent wiping with toluene, Thinner #19 or Thinner #242E is recommended.

#### 4.1.2 BLASTING

All blasting abrasive shall be dry, clean and free from contaminants. Where grit is used, contact primer manufacturer for specific details on acceptable blast abrasive and other industry standards.

#### 4.1.3 CARBON STEEL SURFACE PREPARATION

The general requirement for steel preparation before the application of an approved primer shall meet SSPC SP6 (Sa 2), with an angular anchor profile of 1.5 – 2.0 mils (37 – 50 microns). Refer to specific primer's product datasheet for specific requirements.

#### 4.1.4 GALVANIZED SURFACE PREPARATION

Galvanizing requires a roughened surface for optimum adhesion/performance of high build epoxies. Remove any contaminants per SSPC SP1; ensure there are no chemical treatments that may interfere with adhesion; and abrade the surface to establish a suitable roughness per SSPC-SP7 (Sa1) with a minimum angular anchor profile of 1.5 – 2 mils (37 – 50 microns). Prime with Carboguard 893 SG Primer @ 3 – 5 mils (75 – 125 microns) (DFT) per SSPC PA2.

#### 4.1.5 STAINLESS STEEL SURFACE PREPARATION

All steel surfaces shall be blasted to a SSPC-SP7 (Sa 1) with a minimum angular anchor profile of 1.5 – 2 mils (37 – 50 microns). Prime with Carboguard 893 SG Primer @ 3 – 5 mils (75 – 125 microns) (DFT) per SSPC PA2.

#### 4.1.6 PRIMING

Only primer systems acceptable by CARBOLINE shall be used under THERMO-LAG E100 and THERMO-LAG E100 S. The primer shall be applied in accordance with the manufacturer's and project's specification. Refer to Appendix A, CARBOLINE's Approved Primer List.

The primer system thickness range shall be between 3 – 5 mils (75 – 125 microns) (DFT) per SSPC PA2. Any other final dry film thickness in excess of this value shall be agreed upon by CARBOLINE in writing.

##### 4.1.6.1 PRIMER THICKNESS

As previously stated, controlling the thickness of applied primers is very important. The following method will be the only one accepted by CARBOLINE:

- a) Use a flat polished steel plate to calibrate the measuring device to zero.
- b) Calibrate equipment device to a known thickness using manufacturers supplied shims.
- c) Use the measuring device to measure individual primer coats and multi-coat thicknesses.
- d) Record measurements at the rate specified by the project.
- e) Thickness of primer must be sufficient to fully cover blast profile.

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## 4.1.6.2 PRIMER REACTIVATING

If multiple primer coats are required, care must be taken to ensure that the manufacturers recommended maximum recoat time has not been exceeded.

## 4.1.6.3 PRIMER ADHESION

The coating inspector for the project must be satisfied that the adhesion values of the primer system meet the project specification.

For field applications, existing coatings must attain a minimum 3A rating in accordance with ASTM D3359 Method A, X cut adhesion test. If acceptable, clean and lightly abrade in accordance with SSPC-SP2 or SP3 to roughen and de-gloss the surface. If not acceptable, the coating must be removed and areas re-primed with a compatible primer. If primer coating has acceptable adhesion, but is not compatible or compatibility is unknown, a tie-coat primer can be applied as a bonding or barrier coating. Contact Carboline Technical Service for a list of approved tie-coat primers and specific primer requirements

## 4.2 SURFACE PREPARATION WHERE AN EXISTING / NON-APPROVED PRIMER WAS INSTALLED

This section applies to areas where an existing / non-approved primer system has been installed and the existing surface was prepared to SSPC-SP6 (Sa 2) with a minimum of 1.5 – 2 mils (37 – 50 microns) profile.

Ultra-high-pressure water jetting may be employed to remove a primer or other coating where no dry blast surface preparation is permitted. Thoroughly water jet the surface until the original blasted surface has been revealed. The cleaned surface should be blown dry with clean, dry compressed air to remove water residues. Immediately after, the clean surface shall be primed with an approved wet blast type primer, in accordance with the manufacturer's and project specification. Contact CARBOLINE for the current list of acceptable wet blast type primers.

No wet blast system shall be used without first consulting with CARBOLINE prior to startup of the project.

**Note: Ultra high-pressure water jetting will not generate an accepted profile on steel that has not been previously profiled.**

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## SECTION 5. MATERIAL PREPARATION & GENERAL CONSIDERATIONS

### 5.1 MATERIAL PRE-HEATING

Prior to introduction into spray equipment the material shall be pre-heated to a minimum of 70°F (21°C) for 24 hours prior to application. Cold material will not spray well and material that is over-heated will reduce the pot-life and working time. Material can be heated using heated storage units or hot rooms. These are normally constructed from storage containers that are insulated to maintain desired temperature and fitted with a suitable temperature controllable heater. Smaller custom-made hot boxes can be used for small projects to heat enough pails to maintain daily production. In hot climates the material may have to be maintained at a cooler temperature to stay within application range. Material temperature can be measured using a probe thermometer or IR gun.

Do not use electric jacket heaters that wrap around the outside of the pails. These can overheat the outside perimeter of the pails and “cook” the material around the inside making the material unusable.

### 5.2 MIXING & MIX RATIO

Thoroughly mix Parts A and B well - separately - before using. Use 1/2" electric or air driven drill with a rectangular paddle mixer. Must be 300 rpm under load (minimum). Mix staged material until completely blended and a uniform, consistent color is achieved. For plural component applications, ratio checks shall only be performed by pumping both components into separate pails simultaneously. Mix ratio of Part A and Part B shall be 1:1 by volume.

### 5.3 TERMINATION ONTO NON-FIREPROOFED STEEL

Where the material terminates to non-fire protected steel, the THERMO-LAG E100 or THERMO-LAG E100 S shall be sprayed to the specified thickness and beveled on a 45° angle down to the substrate. The top coat system shall continue down onto the non-fireproofed substrate (minimum 2" or 50 mm) to insure a proper seal.

### 5.4 MOCK-UP INSTALLATION

Prior to actual production work, a representative sample shall be prepared following all specified procedures and approved thickness / finish / surface quality. This sample must then be approved by representatives of the owner, applicator, architect and any others having a vested interest in the installation. The actual production work must follow, and conform to, the standards and approved finish / surface quality of the site sample.

The site sample is a mandatory requirement and shall be made available to all parties throughout the completion of the project.

### 5.5 RECORD KEEPING

The maintaining of proper records is an essential requirement for all THERMO-LAG projects. The minimum requirements will be established by the project specification.

### 5.6 WELD CUT BACK

It is often necessary to mask off areas on the structure before the application of THERMO-LAG E100 or THERMO-LAG E100 S to allow for future welding. As heat is generated during the welding process, either during a preheating stage and/or during the welding itself, it is important that a suitable distance is left around the weld area to prevent damage to the adjacent THERMO-LAG E100 or THERMO-LAG E100 S.

For small weld attachments such as the addition of clips and hangers, a cutback distance of 2" (50 mm) on each side of the weld areas should be sufficient. When carrying out welding close to THERMO-LAG E100 or THERMO-LAG E100 S, a discoloration may be noted.

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This discoloration denotes that the THERMO-LAG has received too much heat and the bond to the steel is likely to have been affected. When this happens, the discolored THERMO-LAG must be removed as described in Removal and Repair Procedures. For larger welds, i.e. full girth, a cutback of 12" (300 mm) each side of the weld area may be sufficient.

The cutback distances given below assume that the weld will be made at the center and are given as recommendations only. The precise nature of the weld, including the mass of steel and the method of preheating used, will determine the precise distance. As indicated above, discoloration of the THERMO-LAG E100 or THERMO-LAG E100 S will denote that an insufficient cutback distance has been used.

WELD CUT BACK DISTANCE		
Weld Preheat Temp	Time (hour)	Total Cutback (Inches / mm)
212°F / 100°C	4-8	30" / 750
212°F / 100°C	8-12	40" / 1000
302°F / 150°C	4-8	30-40" / 750-1000
302°F / 150°C	8-12	40-50" / 1000-1250

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## SECTION 6. THERMO-LAG E100 PLURAL APPLICATION PROCEDURES

### 6.1 Surface Preparation

- A. Surface must be clean, dry and free of any dirt, oil, grease or other contamination prior to surface preparation.
- B. Clean surface to specified standard, typically SSPC-SP1.
- C. The general requirement for steel preparation before the application of an approved primer should meet SSPC-SP6, with a 1.5-2.0 mil (37-50 micron) angular profile. Contact Carboline Technical Service for recommendations and specific primer requirements.

### 6.2 Primer Application

- A. All surfaces must be clean, dry and properly prepared as stated above prior to primer application.
- B. All primers must be approved by Carboline prior to use and applied within manufacturers' and projects' stated specifications. If an unknown primer has been applied, contact your Carboline Fireproofing representative for recommendations.
- C. The primer thickness range shall be between 3-5 mils (75-125 microns) DFT per SSPC-PA2. Any other final DFT in excess of this value shall be agreed upon by Carboline in writing.

### 6.3 Thermo-Lag E100 Plural Component Equipment Requirements

**Plural Pump:** All plural component equipment shall be approved by CARBOLINE prior to use. The startup procedures below are **general guidelines only**. Adjustments may be required to meet site conditions. Always follow specific equipment manufacturer guidelines for equipment operation.

**Ratio:** The pump shall be set for a 1:1 ratio and it is important to check this ratio before beginning any work.

Gun:	WIWA 500F PFP gun or equivalent Carboline approved mastic gun with high pressure swivel
Tip Size:	0.027" - 0.035" Graco XHD Heavy duty RAC non-diffuser tips
Fan Size:	6" - 10"
Hose Bundle:	¾" (100' maximum)
Whip Hose:	½" (20' maximum)
Pressure at Gun:	2500 - 3500 psi
Air Requirements:	185 cfm @ 100 psi per unit. Use moisture and oil traps.
Static Mixer:	Standard 12 turn ¾" mixer (required)

### 6.4 Thermo-Lag E100 Plural Component Application

Thermo-Lag E100 (100% solids) is used for plural component applications and is available in full 9-gallon kits. Thermo-Lag E100 S shall not be used for plural component application.

#### **(Environmental)**

- A. Before applying Thermo-Lag E100, confirm that proper environmental conditions are met. Minimum ambient temperature: 41°F (5°C) and rising, maximum relative humidity 85%, steel surface temperature must be 5°F (3°C) above the dew point.
- B. Confirm that the surface has been prepared to specification.
- C. Verify that a Carboline approved primer has been correctly installed to correct thickness and is properly cured. Ensure that the application is within the primer's recoat window.
- D. Confirm that adjacent areas are properly masked off.
- E. THERMO-LAG E100 must be protected from direct rain until it has reached sufficient cure. If water contamination does occur to uncured THERMO-LAG E100, any uncured material must be removed and reapplied prior to topcoating.

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### (Material)

- A. Material shall be pre-heated to a minimum of 70°F (21°C) prior to introduction to the pumping units.
- B. Thoroughly mix Parts A and B well - separately - before using. Use 1/2" electric or air driven drill with a rectangular paddle mixer. Must be 300 rpm under load (minimum).

### (Equipment Setup)

- A. The pump and all lines shall be clean and free from any contamination.
- B. Prior to equipment startup, ensure all pressure is removed from lines.
- C. If using pump with holding tanks, use transfer pumps and begin filling unit with material.
- D. Continue pumping Part A and Part B until a steady flow of material is present at the end of each fluid delivery hose.
- E. Adjust tank heaters to 120°F (49°C), not exceed 130°F (54°C).
- F. Set inline fluid heaters to achieve 100°F - 120°F (38°C - 49°C).
- G. Set hose bundle material line heaters to 125°F - 135°F (52°C - 57°C).
- H. Circulate Thermo-Lag E100 until the material reaches the temperatures stated above. Material temperature should not exceed 125°F (52°C).
- I. Adjust the air pressure to pump manufacturer recommendations.
- J. If using pressurized tanks, please contact Carboline Fireproofing Technical Service for recommendations.
- K. Perform a minimum of 2 ratio checks per shift. To perform ratio check, direct the material discharge into empty Part A and Part B pails, turn the air on to the main pump. Keep pumping until both or one of the pails are full to the lowest indentation of the pail. If pails contain equal volumes, the 1:1 ratio has been achieved. The exit material temperature at the mixing block must be within stated range above.

### (Application)

- A. The exit temperature at the gun should be 100 °F - 125°F (38°C - 52°C).
- B. Apply enough pressure to the main pump to achieve a proper fan pattern.
- C. Typical film build for plural application is 60-200 mils (1.5-5 mm) per coat.
- D. Lighter coats will have a better surface appearance.
- E. Care shall be taken to keep the fan pattern at an angle of 90 degrees to the surface and at 12" (305mm) to 18" (457mm) away from the surface. A brush and/or roller can be used to improve the surface quality.
- F. Special care should be taken when spraying flange edges on structural steel members to ensure complete coverage and a consistent thickness. The normal spray pattern on the outside and the inside surfaces of the flanges should cause the material to flow and wrap around the edge of the flange. If the coating on the flange edge is uneven after application, the edge shall be rolled lightly in order to provide an even surface.
- G. Allow material to sufficiently gel prior to back rolling (typically 20-30 minutes @ 70°F (21°C, if required).
- H. If backrolling, use solvent resistant short napped mohair rollers. Use toluene, Plasite Thinner #19 or Thinner #242E to keep roller moist which will prevent roller from sticking to the material. CARBOLINE recommends the use of solvent resistant spray bottles to minimize the use of solvents. Excessive build-up of material in angle areas can be removed or leveled by rolling the surface with a solvent resistant short napped mohair roller. Do not use excessive solvent during rolling, as this will retard the surface cure of the material.
- I. Allow material to cure between coats, the material must be clean and sufficiently cured prior to applying subsequent coats of THERMO-LAG E100. Please reference recoat table below for guidance:

THERMO-LAG E100 RECOAT INTERVALS		
Temperature (°F / °C)	Minimum Time (Minutes)	Maximum Time (Hours)
50°F / 10°C	60	72
77°F / 25°C	30	72
85°F / 29°C	30	48
95°F / 35°C	30	48
110°F / 43°C	30	24

If the overcoat time has been exceeded, the surface of the THERMO-LAG E100 must be reactivated as described below:

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Greater than 72 hours but less than 7 days: THERMO-LAG E100 and THERMO-LAG E100 S must be solvent wiped with toluene, Plasite Thinner #19 or Thinner #242E to reactivate the surface and remove contaminants.

7 Days or beyond: The material must be "Sweep Blasted" or abraded to remove any contamination or particulate. The freshly blasted or abraded surface must then be solvent wiped toluene or Plasite Thinner #19 or Thinner #242E to reactivate the THERMO-LAG E100 and to remove contaminants.

- J. Continue to build material at 60-200 mils (1.5 – 5 mm) per coat to specified thickness.
- K. The Applicator shall take frequent WFT measurements during application, using a penetrating measuring device to ensure that the coating is uniformly applied at the required film thickness. The thickness checks shall be made as required by the project.
- L. The final thickness shall be specified in project drawings and owner specifications. Thicknesses for THERMO-LAG E100 are outlined in published fire test designs. If no standard or guidance exists in project specification, Technical Manual 12-B and/or SSPC PA2 can be used for reference. All matters relating to thickness shall be decided between the owner and the applicator prior to the startup of the job.

### 6.5 Topcoat Application

- A. For interior general purpose, exterior, or shop applied projects, a topcoat is always required. For interior conditioned space applications, a topcoat is optional. Please refer to Appendix B for a list of approved topcoats and thicknesses.
- B. Follow minimum and maximum topcoat intervals in the table below. If this time is exceeded, the area should be sweep blasted or abraded with 40 grit paper (or approved equal), then solvent wiped, prior to topcoating.

THERMO-LAG E100 TOPCOAT INTERVALS		
Temperature (°F / °C)	Minimum Time (Hours)	Maximum Time (Days)
70°F / 21°C	10	7

- C. Carboline approved topcoats or topcoat systems can be used to meet project specifications for color, finish, service requirements and UV protection.
- D. Confirm that Thermo-Lag E100 has been applied to the specified dry film thickness by using an electronic or magnetic dry film thickness gauge.
- E. The Thermo-Lag E100 must be sufficiently cured and be clean, dry and free of any contamination prior to topcoat application.
- F. All topcoats must be approved by Carboline prior to use.
- G. Ensure topcoat is applied within manufacturers' and projects' stated ambient conditions, temperature and relative humidity specifications.
- H. The topcoat shall be applied in accordance with the manufacturer and project specification. Refer to the Thermo-Lag E100 design for topcoat requirements.

### 6.6 Safety

- A. Only trained and qualified applicators should install Thermo-Lag E100.
- B. Follow all safety precautions on the Thermo-Lag E100 SDS when applying this material.
- C. Always use appropriate personal protective equipment and wash with hot soapy water if necessary.
- D. Ensure proper maintenance and cleaning of the equipment.

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## SECTION 7: THERMO-LAG E100 S SINGLE COMPONENT APPLICATION PROCEDURES

Thermo-Lag E100 S is used for single component applications and is available in half kits to facilitate batch mixing of the material (half pail of part A and half pail of part B). Thermo-Lag E100 can be used for single leg application, please contact Carboline Fireproofing Technical Service for procedures.

### 7.1 Surface Preparation

- A. Surface must be clean, dry and free of any dirt, oil, grease or other contamination prior to surface preparation.
- B. Clean surface to specified standard, typically SSPC-SP1.
- C. The general requirement for steel preparation before the application of an approved primer should meet SSPC-SP6, with a 1.5-2.0 mil (37-50 micron) angular profile. Contact Carboline Technical Service for recommendations and specific primer requirements.

### 7.2 Primer Application

- A. All surfaces must be clean, dry and properly prepared as stated above prior to primer application.
- B. All primers must be approved by Carboline prior to use and applied within manufacturers' and projects' stated specifications. If an unknown primer has been applied, contact your Carboline Fireproofing representative for recommendations.
- C. The primer thickness range shall be between 3-5 mils (75-125 microns) DFT per SSPC-PA2. Any other final DFT in excess of this value shall be agreed upon by Carboline in writing.

### 7.3 Thermo-Lag E100 S Single Component Requirements

**Fluid to Air Ratio Pump:** All fluid to air ratio pumps shall be approved by CARBOLINE prior to use. The startup procedures below are **general guidelines only**. Adjustments may be required to meet site conditions. Always follow specific equipment manufacturer guidelines for equipment operation.

Gun:	WIWA 500F PFP gun or equivalent Carboline approved mastic gun with high pressure swivel
Tip Size:	0.027" - 0.035" Graco XHD Heavy duty RAC non- diffuser tips
Fan Size:	6" - 10"
Material Hose:	Solvent Resistant: 3/4" I.D. (50' max.) + 1/2" I.D. (25' max.) whip hose
Air Requirements:	As per specific pump requirements
Static Mixer:	Standard 12 turn 3/4" mixer (optional)

**Note:** When spraying THERMO-LAG E100 S through single component airless equipment, the working pot life to achieve a good spray pattern will be approximately 30-40 minutes once the material is mixed at 70°F (21°C). In order to spray THERMO-LAG E100 S with this equipment set up, the material shall be thinned with toluene, Plasite Thinner #19, Thinner #242E or CARBOLINE approved equivalent. Maximum thinner added not to exceed 1 quart (1 liter) per 4.5 gallon (3.79 L) kit. Thinning the material will slow the curing process and reduce film build. The product film build with this set up is 80-100 mils (2 - 2.5 mm) per coat. CARBOLINE must approve the use of other thinners prior to start up.

**Electric Airless Pump:** Graco Mark V (This equipment option is only recommended for small projects. THERMO-LAG E100 S does require additional solvent in order to be properly atomized through this equipment set up. The material must be thinned with toluene, Plasite Thinner #19, Thinner #242E or CARBOLINE approved equivalent. Maximum thinner added not to exceed 40 ounces (1.2 liter) per 4.5 gallon (3.79 L) kit. When spraying THERMO-LAG E100 S through this electric airless equipment, the working pot life to achieve a good spray pattern will be approximately 30-40 minutes once the material is mixed at 70°F (21°C). Thinning the material will slow the curing process and reduce film build. The maximum film build with this set up is 80-100 mils (1.5-2 mm) per coat. CARBOLINE must approve the use of other thinners prior to start up.

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Gun:	WIWA 500F PFP gun or equivalent Carboline approved mastic gun with high pressure swivel
Tip Size:	0.027" - 0.035" Graco Heavy duty RAC non- diffuser tips
Fan Size:	6" - 10"
Material Hose:	Solvent Resistant: 3/8" I.D. 50' Max.

**Note:** When spraying THERMO-LAG E100 S through single component airless equipment, the working pot life to achieve a good spray pattern will be approximately 30-40 minutes once the material is mixed at 70°F (21°C). In order to spray THERMO-LAG E100 S with this equipment set up, the material shall be thinned with toluene, Plasite Thinner #19, Thinner #242E or CARBOLINE approved equivalent. Maximum thinner added not to exceed 1 quart (1 liter) per 4.5 gallon (3.79 L) kit. Thinning the material will slow the curing process and reduce film build. The product film build with this set up is 80-100 mils (2 - 2.5 mm) per coat. CARBOLINE must approve the use of other thinners prior to start up.

### 7.4 Thermo-Lag E100 S Single Component (batch mix) Application

#### **(Environmental)**

- A. Before applying Thermo-Lag E100 S, confirm that proper environmental conditions are met. Minimum ambient temperature: 41°F (5°C) and rising, maximum relative humidity 85%, steel surface temperature must be 5°F (3°C) above the dew point.
- B. Confirm that the surface has been prepared to specification.
- C. Verify that a Carboline approved primer has been correctly installed to correct thickness and is properly cured. Ensure that the application is within the primer's recoat window.
- D. Confirm that adjacent areas are properly masked off.
- E. THERMO-LAG E100 S must be protected from direct rain until it has reached sufficient cure. If water contamination does occur to uncured THERMO-LAG E100, any uncured material must be removed and reapplied prior to topcoating.

#### **(Material)**

- A. Material must be heated to a minimum of 70°F (21°C) - 90°F (32°C) to spray through this airless equipment set up.
- B. Thoroughly mix Parts A and B well - separately - before using. Use 1/2" electric or air driven drill with a rectangular paddle mixer. Must be 300 rpm under load (minimum).
- C. Add thinner into part B and mix thoroughly.
- D. Stage Part B onto Part A and mix thoroughly until uniform consistency and color is achieved.

#### **(Equipment Setup)**

- A. The pump, hopper and all lines shall be clean and free from any contamination.
- B. Pour mixed material into hopper.
- C. Remove spray gun from the end of the hose.
- D. Turn pump pressure up only high enough to move material to the end of the delivery line.
- E. Turn off air and replace spray gun.
- F. Increase air pressure until appropriate fan pattern is achieved.

#### **(Application)**

- A. Apply enough pressure to the main pump to achieve a proper fan pattern.
- B. Typical film build for single component application is 80-100 mils (2- 2.5 mm) per coat. When using a Graco Mark V, film builds are reduced.
- C. Lighter coats will have a better surface appearance.
- D. Care shall be taken to keep the fan pattern at an angle of 90 degrees to the surface and at 12-18" (305-457 mm) away from the surface. A brush and/or roller can be used to improve the surface quality.

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- E. Special care should be taken when spraying flange edges on structural steel members to ensure complete coverage and a consistent thickness. The normal spray pattern on the outside and the inside surfaces of the flanges should cause the material to flow and wrap around the edge of the flange. If the coating on the flange edge is uneven after application, the edge shall be rolled lightly in order to provide an even surface.
- F. Allow material to sufficiently gel prior to back rolling (typically 20-30 minutes @ 70°F (21°C))
- G. If backrolling, use solvent resistant short napped mohair rollers. Use toluene, Plasite Thinner #19 or Thinner #242E to keep roller moist which will prevent roller from sticking to the material. CARBOLINE recommends the use of solvent resistant spray bottles to minimize the use of solvents. Excessive build-up of material in angle areas can be removed or leveled by rolling the surface with a solvent resistant short napped mohair roller. Do not use excessive solvent during rolling, as this will retard the surface cure of the material.
- H. Allow material to cure between coats, the material must be clean and sufficiently cured prior to applying subsequent coats of THERMO-LAG E100 S. Please reference recoat table below for guidance:

THERMO-LAG E100 RECOAT INTERVALS		
Temperature (°F / °C)	Minimum Time (Hours)	Maximum Time (Days)
50°F / 10°C	5	7
77°F / 25°C	4	7
85°F / 29°C	4	7
95°F / 35°C	2	7
110°F / 43°C	2	7

If the overcoat time has been exceeded, the surface of the THERMO-LAG E100 S must be reactivated as described below:

Greater than 72 hours but less than 7 days: THERMO-LAG E100 S must be solvent wiped with toluene, Plasite Thinner #19 or Thinner #242E to reactivate the surface and remove contaminants.

7 Days or beyond: The material must be "Sweep Blasted" or abraded to remove any contamination or particulate. The freshly blasted or abraded surface must then be solvent wiped toluene or Plasite Thinner #19 or Thinner #242E to reactivate the THERMO-LAG E100 S and to remove contaminants.

- I. Continue to build material at 80-100 mils (2-2.5 mm) per coat to specified thickness.
- J. The Applicator shall take frequent WFT measurements during application, using a penetrating measuring device to ensure that the coating is uniformly applied at the required film thickness. The thickness checks shall be made as required by the project.
- K. The final thickness shall be specified in project drawings and owner specifications. Thicknesses for THERMO-LAG E100 are outlined in published fire test designs. If no standard or guidance exists in project specification, Technical Manual 12-B and/or SSPC PA2 can be used for reference. All matters relating to thickness shall be decided between the owner and the applicator prior to the startup of the job.

### 6.5 Topcoat Application

- A. For interior general purpose, exterior, or shop applied projects, a topcoat is always required. For interior conditioned space applications, a topcoat is optional. Please refer to Appendix B for approved topcoats.
- B. The typical minimum topcoating time for THERMO-LAG E100 S is 48 hours at 70°F (21°C). The maximum allowable time to topcoat the THERMO-LAG E100 S is 7 days at 70°F (21°C). If this time is exceeded, the area should be sweep blasted or abraded with 40 grit paper (or approved equal), then solvent wiped, prior to topcoating.
- C. Follow minimum and maximum topcoat intervals in the table below. If this time is exceeded, the area should be sweep blasted or abraded with 40 grit paper (or approved equal), then solvent wiped, prior to topcoating.

THERMO-LAG E100 S TOPCOAT INTERVALS		
Temperature (°F / °C)	Minimum Time (Hours)	Maximum Time (Days)
70°F / 21°C	48	7

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- D. Carboline approved topcoats or topcoat systems can be used to meet project specifications for color, finish, service requirements and UV protection.
- E. Confirm that Thermo-Lag E100 S has been applied to the specified dry film thickness by using an electronic or magnetic dry film thickness gauge.
- F. The Thermo-Lag E100 S must be sufficiently cured and be clean, dry and free of any contamination prior to topcoat application.
- G. All topcoats must be approved by Carboline prior to use.
- H. Ensure topcoat is applied within manufacturers' and projects stated ambient conditions, temperature and relative humidity specifications.
- I. The topcoat shall be applied in accordance with the manufacturer and project specification. Refer to the Thermo-Lag E100 S design for topcoat requirements.

### 6.6 Safety

- A. Only trained and qualified applicators should install Thermo-Lag E100 S.
- B. Follow all safety precautions on the Thermo-Lag E100 S SDS when applying this material.
- C. Always use appropriate personal protective equipment and wash with hot soapy water if necessary.
- D. Ensure proper maintenance and cleaning of the equipment.

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### SECTION 8. THERMO-LAG E100 OR E100S TROWEL APPLICATION PROCEDURES

Both Thermo-Lag E100 (100% solids) and Thermo-Lag E100 S (95% solids) can be trowel applied. Thermo-Lag E100 S is recommended for trowel applications and is available in half kits to facilitate batch mixing of the material (half pail of part A and half pail of part B). Please note Thermo-Lag 100 or E100 S can be mixed by any volume, provided that the ratio is 1:1

#### 8.1 Surface Preparation

- A. Surface must be clean, dry and free of any dirt, oil, grease or other contamination prior to surface preparation.
- B. Clean surface to specified standard, typically SSPC-SP1.
- C. The general requirement for steel preparation before the application of an approved primer should meet SSPC-SP6, with a 1.5-2.0 mil (37-50 micron) angular profile. Contact Carboline Technical Service for recommendations and specific primer requirements.

#### 8.2 Primer Application

- A. All surfaces must be clean, dry and properly prepared as stated above prior to primer application.
- B. All primers must be approved by Carboline prior to use and applied within manufacturers' and projects' stated specifications. If an unknown primer has been applied, contact your Carboline Fireproofing representative for recommendations.
- C. The primer thickness range shall be between 3-5 mils (75-125 microns) DFT per SSPC-PA2. Any other final DFT in excess of this value shall be agreed upon by Carboline in writing.

#### 8.3 Thermo-Lag E100 S Trowel Application

##### *(Environmental)*

- A. Before applying Thermo-Lag E100 S, confirm that proper environmental conditions are met. Minimum ambient temperature: 41°F (5°C) and rising, maximum relative humidity 85%, steel surface temperature must be 5°F (3°C) above the dew point.
- B. Confirm that the surface has been prepared to specification.
- C. Verify that a Carboline approved primer has been correctly installed to correct thickness and is properly cured. Ensure that the application is within the primer's recoat window.
- D. Confirm that adjacent areas are properly masked off.

##### *(Mixing)*

- A. Pre-heat material to 70-90°F (21-32°C).
- B. Mix material using ½" drill capable of achieving 300 rpm (minimum) under load with a rectangular mixing paddle.
- C. Thoroughly mix part A and part B separately prior incorporating them together.
- D. Mix until homogeneous mix and consistent color is achieved.
- E. Thermo-Lag 100 or E100 S can be mixed by any volume, provided that the ratio is 1:1
- F. Stage part B on top of part A (material can be left staged during 8 hour production schedule, but do not leave staged material overnight as it will begin to catalyze at interface between part A and part B).
- G. For trowel applications, no thinner is required. If thinning is desired to increase the pot life and enhance workability, Thermo-Lag E100 S may be thinned up to 5% by volume with Carboline Thinner #19, Thinner #242 or approved equal
- H. Once mixed, Thermo-Lag E100 S will have a working pot life of approximately 45 minutes.
- I. After material is mixed, it should be poured out of mass onto a table or flat surface which prevents the material from setting up too quickly.
- J. A mixed kit of Thermo-Lag E100 S should be split between 4-5 workers to facilitate application within working time.

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## **(Application)**

- A. Typical film build for trowel application is 160-200 mils (4-5 mm) per coat (un-thinned).
- B. Lighter coats will have a better surface appearance.
- C. Allow material to sufficiently gel prior to back rolling (typically 20-30 minutes @ 70°F (21°C)).
- D. Allow applied material to cure sufficiently to support the weight and trowel application of subsequent coats. The thickness which can be applied in a single coat and cure times will depend on the temperature, humidity and applicator technique.
- E. Build material to final thickness in as many coats required. Use mohair rollers (moistened with Carboline Thinner #19, Thinner #242 or approved equal) or trowel to smooth any imperfections in the coating.
- F. Once material has reached sufficient cure (overnight), the surface imperfections can be smoothed out using a hand rasp and/or power sander if necessary.
- G. Surface finish must meet project specifications.

## **8.4 Topcoat Application**

- A. Carboline approved topcoats or topcoat systems can be used to meet project specifications for color, finish, service requirements and UV protection.
- B. Ensure that the Thermo-Lag E100 S system has been properly installed
- C. Confirm that Thermo-Lag E100 S has been applied to the specified dry film thickness by using an electronic or magnetic dry film thickness gauge.
- D. The Thermo-Lag E100 S must be sufficiently cured and be clean, dry and free of any contamination prior to topcoat application.
- E. All topcoats must be approved by Carboline prior to use.
- F. Ensure topcoat is applied within manufacturers' and projects' stated ambient conditions, temperature and relative humidity specifications.
- G. The topcoat shall be applied in accordance with the manufacturer and project specification. Refer to the Thermo-Lag E100 design for topcoat requirements.

## **8.5 Safety**

- A. Only trained and qualified applicators should install Thermo-Lag E100 S.
- B. Follow all safety precautions on the Thermo-Lag E100 S MSDS when applying this material.
- C. Always use appropriate personal protective equipment and wash with hot soapy water if necessary.
- D. Ensure proper maintenance and cleaning of the equipment.

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## SECTION 9. THERMO-LAG E100 & THERMO-LAG E100 S BLOCKOUT APPLICATION PROCEDURES

### 9.1 Surface Preparation

- A. Surface must be clean, dry and free of any dirt, oil, grease or other contamination prior to surface preparation.
- B. Clean surface to specified standard, typically SSPC-SP1.
- C. The general requirement for steel preparation before the application of an approved primer should meet SSPC-SP6, with a 1.5-2.0 mil (37-50 micron) angular profile. Contact Carboline Technical Service for recommendations and specific primer requirements.

### 9.2 Primer Application

- A. All surfaces must be clean, dry and properly prepared as stated above prior to primer application.
- B. All primers must be approved by Carboline prior to use.
- C. Ensure primer is applied within manufacturer's stated ambient conditions, steel temperature and relative humidity specifications.
- D. The primer shall be applied in accordance with the manufacturer's and project's specification.
- E. The primer thickness range shall be between 3-5 mils (75-125 microns) DFT per SSPC-PA2. Any other final DFT in excess of this value shall be agreed upon by Carboline in writing.

### 9.3 Thermo-Lag E100 Trowel or Spray Application

#### *(Environmental)*

- A. Before applying Thermo-Lag, confirm that proper environmental conditions are met. Minimum ambient temperature: 41°F (5°C) and rising, maximum relative humidity 85%, steel surface temperature must be 5°F (3°C) above the dew point.
- B. Confirm that the surface has been prepared to specification.
- C. Verify that a Carboline approved primer has been correctly installed to correct thickness and is properly cured. Ensure that the application is within the primer's recoat window.
- D. Confirm that adjacent areas are properly masked off.

#### *(Mixing)*

- A. Pre-heat material to 70-90°F (21-32°C).
- B. Thoroughly mix part A and part B separately prior incorporating them together.
- C. Mix material using ½" drill with rectangular mixing paddle capable of achieving 300 rpm under load.
- D. Thermo-Lag E100 shall be mixed 1:1 by volume
- E. Stage part B on top of part A
- F. Material can be left staged during 8-hour production schedule, but do not leave staged material overnight as it will begin to catalyze at interface between part A and part B.
- G. Mix staged material until homogenous color and texture is achieved.
- H. For trowel applications, no thinner is required. For spray applications or to increase the pot life and enhance workability, Thermo-Lag E100 may be thinned up to 5% by volume with Carboline Thinner #19, Thinner #242 or approved equal. 1 quart (1 liter) per 4.5-gallon kit maximum.
- I. For trowel applications, mixed material should be poured out of mass onto a table or flat surface which prevents the material from setting up too quickly. A mixed kit of Thermo-Lag E100 S should be split between 4-5 workers to facilitate trowel application within working time. For spray applications, commence spraying immediately after mixing. For complete application procedures refer to sections 6, 7, and 8 of this manual.

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## **(Application)**

- A. Remove topcoat from blockout area and abrade back a minimum of 2" (50 mm) onto existing Thermo-Lag E100 application. Ensure dust and debris is removed prior to application of Thermo-Lag E100. Solvent wipe the exposed edges of the Thermo-Lag E100 to re-activate surface.
- B. Apply material using hawk and trowel or recommended airless equipment. Typical film build for trowel application is 160-200 mils (4-5 mm) per coat (unthinned). Typical film build for spray application is 80-100 mils (2-2.5 mm) per coat (thinned 5% by volume).
- C. Thermo-Lag E100 applied to block-out areas shall be butted to the existing material.
- D. Lighter coats will have a better surface appearance.
- E. Allow material to sufficiently gel prior to back rolling (typically 20-30 minutes @ 70°F (21°C)).
- F. Allow applied material to cure sufficiently to support the weight and application of subsequent coats. The thickness which can be applied in a single coat and cure times will depend on the temperature, humidity and applicator technique.
- G. Build material to final thickness in as many coats required. Use trowels or mohair rollers (moistened with Carboline Thinner #19, Thinner #242 or approved equal) to smooth any imperfections in the coating. Once material has cured, surface imperfections can be improved using a hand rasp or sander. Surface finish must meet project specifications.

## **9.4 Topcoat Application**

- A. Carboline approved topcoats or topcoat systems can be used to meet project specifications for color, finish, service requirements and UV protection. Please refer to Appendix B for approved topcoats and thicknesses.
- B. Ensure that the Thermo-Lag E100 system has been properly installed.
- C. Confirm that Thermo-Lag E100 has been applied to the specified dry film thickness by using an electronic or magnetic dry film thickness gauge.
- D. The Thermo-Lag E100 must be sufficiently cured and be clean, dry and free of any contamination prior to topcoat application.
- E. All topcoats must be approved by Carboline prior to use.
- F. Ensure topcoat is applied within manufacturer's stated ambient conditions, temperature and relative humidity specifications.
- G. The topcoat shall be applied in accordance with the manufacturer and project specification. Refer to the topcoat product data sheet for thickness requirements.

## **9.5 Safety**

- A. Only trained and qualified applicators should install Thermo-Lag E100.
- B. Follow all safety precautions on the Thermo-Lag E100 SDS when applying this material.
- C. Always use appropriate personal protective equipment and wash with hot soapy water if necessary.
- D. Ensure proper maintenance and cleaning of the equipment.

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## SECTION 10. CLEAN-UP PROCEDURES

### 10.1 GENERAL PROCEDURES

The application area shall be maintained in a clean and orderly condition. Following the application, all overspray, debris, and equipment shall be removed and the area left in a condition acceptable to the Owner and General Contractor.

### 10.2 PLURAL COMPONENT CLEAN-UP

Plural component equipment with hot water flush components must be flushed using 150°F (66°C) water, minimum.

Plural component equipment with solvent flush components must be flushed with toluene, Plasite Thinner #19, Thinner #242E, MEK or Carboline approved equivalent.

Static mixers shall be examined and changed after every 2 hours of continuous spraying or when necessary. Mixing block and valves leading to it shall also be inspected and cleaned after each spray period. All other maintenance procedures specified by the equipment supplier shall be followed.

The spray gun, static mixer, block assembly and all hand tools must be immediately hand cleaned at the end of each spray period using toluene, Plasite Thinner #19, Thinner #242E, MEK or Carboline approved equivalent

### 10.3 SINGLE COMPONENT CLEAN-UP

Single component equipment must be flushed with toluene, Plasite Thinner #19, Thinner #242E, MEK or Carboline approved equivalent immediately after every use. The spray gun, static mixer and all hand tools must be immediately hand cleaned at the end of each spray period using toluene, Plasite Thinner #19, Thinner #242E, MEK or Carboline approved equivalent.

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## SECTION 11: REMOVAL AND REPAIR PROCEDURES

### 11.1 REMOVAL

The preferred method is to cut through the THERMO-LAG E100 or THERMO-LAG E100 S at right angles to the substrate with a disc saw around the area to be removed. Make sure that the steel substrate is not damaged. A power chisel can then be used to "chip" away the material from the substrate.

It is essential that proper safety precautions are taken during this operation. Reference shall be made to the products' Safety Data Sheets (SDS) and all site safety requirements.

### 11.2 REPAIRS – GENERAL

In instances when material has been damaged or is in need of repair the following procedures shall be followed:

1. The primer system shall be reinstated to its original specification.
2. Remove all damaged material back to solidly adhered material. All edges can be left as butt joints to a 90° angle or beveled to a 45° angle. All edges must be solvent cleaned and allowed to dry before commencing application. It is important that the newly applied THERMO-LAG E100 or THERMO-LAG E100 S blends into the existing material to achieve a uniform appearance. The material shall be troweled or spray applied to the appropriate thickness based on the project specification and fire test certification.
3. The specified topcoat system shall be applied, based on the original specification, in accordance with Carboline's written instructions.

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## SECTION 12. SHOP APPLICATION CONSIDERATIONS & INFORMATION

### 12.1 SHOP INTRODUCTION

THERMO-LAG E100 is suitable for offsite application where the steel is then later shipped to the job site. This allows for a more consistent application of the material and reduces interference with other trades which may affect application flow. When this type of application is performed, contact CARBOLINE for advice. In general, the application of THERMO-LAG E100 follows the guidelines in this manual. The following additional requirements are necessary:

### 12.2 BLOCK OUT AREAS

Prior to application of the shop fireproofing, define all block out areas or connection points that do not receive THERMO-LAG E100 until after the erection phase of the construction. These areas which are not to receive THERMO-LAG shall be masked off in the proper dimensions, prior to application. The size of the block out shall be determined by the applicator, owner or engineering firm. THERMO-LAG E100 has high bond strength, and cannot be easily removed. For in shop application, the specified topcoat system shall be applied to all THERMO-LAG surfaces. After steel is erected, the topcoat shall be mechanically removed from the edges and back a minimum 2" (50 mm) from the edge of the block out.

Application to the block out areas may now continue, utilizing spray or trowel methods.

The block out edges can be left as butt joints to a 90-degree angle or beveled to a 45-degree angle.

The specified topcoat system shall be applied, based on the original specification, in strict accordance with Carboline's written instructions.

### 12.3 HANDLING, STORAGE AND ERECTION

#### 12.3.1 UNLOADING

The fireproofed steel is typically loaded and unloaded with a crane to permit maximum loading of each truck. It is not advisable to unload fireproofed steel with forklifts, as the steel is nested in ways that forklifts do not easily accommodate and damage to fireproofing may occur.

#### 12.3.2 RIGGING

Wherever possible, steel should not be rigged to the fireproofed portion of the member. Shackles at end holes are a generally acceptable practice and provide the best method for unloading members. Follow all site-specific safety standards for handling structural steel.

#### 12.3.3 DUNNAGE

Members should be stored on proper dunnage (on the block out areas) to avoid exposure to the ground and moisture.

#### 12.3.4 ORIENTATION OF MEMBERS

Members should be stacked with webs vertical to avoid ponding of water and snow. Elevate one end of the steel member to provide water run off.

#### 12.3.5 STACKING

Where members must be double stacked, avoid placing dunnage on the fireproofed surfaces.

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## 12.3.6 RIGGING

Avoid using chokers against fireproofed surfaces. Wherever possible, add erection tabs or bolt holes at the beam ends to allow top rigging without using chokers around the fireproofing. Follow all site specific safety standards for handling structural steel.

## 12.3.7 SWING RADIUS

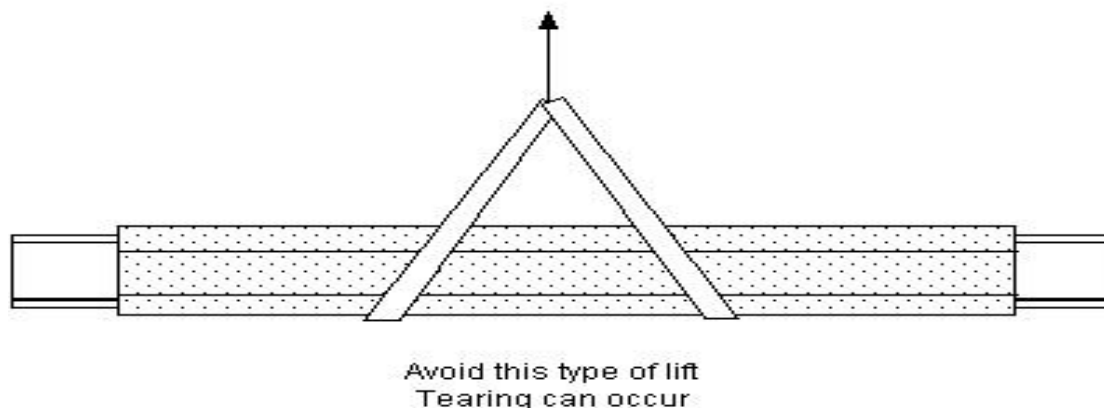
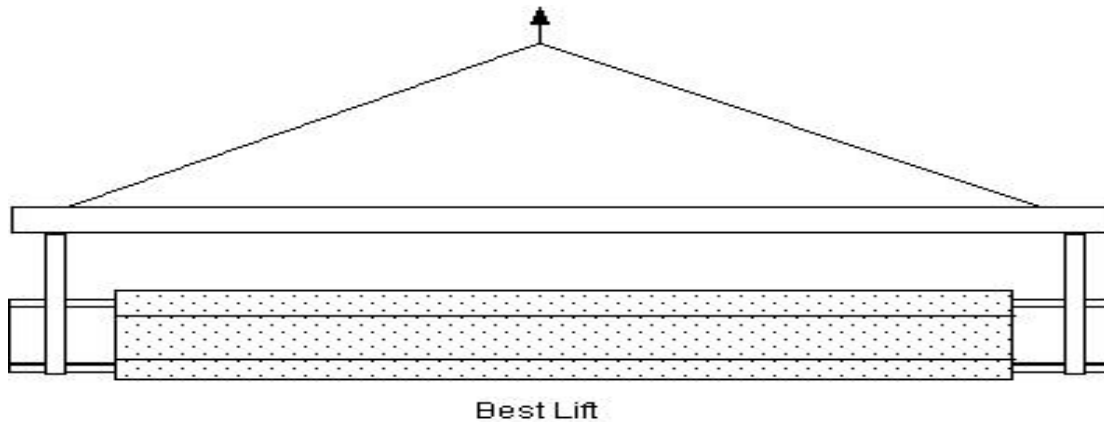
Where infill beams use framing angles, the erector must be aware of the swing radius of the member impacting the fireproofing. This type of connection has a blockout on each side of the holes on the primary member. When the block out dimension is insufficient, the erector is advised to remove a minimal amount of fireproofing on ONE SIDE ONLY. It is better to remove a minimal amount of fireproofing than to make all the connections unnecessarily large. Follow all site specific safety standards.

## 12.3.8 CONSIDER GROUND ASSEMBLY

On repetitive structures and modular construction, pre-assembling the units can minimize the amount of block outs required and damage to the fireproofed steel.

## 12.3.9 LIFTING

All pre-erection projects will require the steel to be lifted onto trucks or into place on the jobsite. All lifting shall be done utilizing the block out areas for strapping, shackling to erection tabs or bolt holes. Lifting should be performed from a 2 point lift so to insure the straps are flat against the steel, so that no slipping and tearing can occur.



### SECTION 13. CONNECTIONS AFTER APPLICATION

#### 13.1 CLAMP ON CONNECTIONS INSTALLED AFTER APPLICATION OF THERMO-LAG E100

Examples of clamp on connections include pipe, sprinkler pipe and utilities support brackets. Small to medium size clamps and clips are usually left unprotected. Large clamps and clip supports are usually protected with the same thickness as the structural member, due to the possibility of heat transfer. These connection details are not usually addressed in the fire test design information. It is recommended that the Authorities Having Jurisdiction be consulted for approval.

Where support clamps are required to be protected, the coating should be applied where the clamps are in contact with the structural member, and for four inches beyond the structural member. Refer to the Thermo-Sorb application instructions above for information including product limitations, required surface preparation, humidity, temperature, application rates, cure times, and topcoat application.

If Thermo-Lag E100 is damaged when the clamped connections are removed, the affected area should be touched up in accordance with the repair procedures above.

#### 13.2 WELDED CONNECTIONS INSTALLED AFTER APPLICATION OF THERMO-LAG E100

Welded items such as plates and wide bracket supports are usually protected with the same Thermo-Lag E100 thickness as the supporting member due to the possibility of heat transfer. These details are usually not addressed in the fire test design information. We recommend the Authorities Having Jurisdiction be consulted for approval and confirmation of their requirements.

Prior to welding connections, remove the Thermo-Lag E100 to a minimum of three inches beyond the area to be welded by using a grinder, utility knife, chisel or sandblasting. Remove an additional ¼ inch of topcoat by using a medium grit sandpaper. After welding is complete, clean the steel surface to remove all dust, grease, dirt, etc...that would affect the bond, and reapply the specified primer. Apply the Thermo-Lag E100 to the areas in need of repair and to the connecting items if required.

#### 13.3 BOLTED STEEL CONNECTIONS INSTALLED AFTER THE APPLICATION OF THERMO-LAG E100

Bolts of threaded rods of ¾ inch diameter or less are usually left unprotected. Bolts or threaded rods greater than ¾ inch diameter are usually protected with the same thickness of Thermo-Lag E100 as the supporting member, due to the possibility of heat transfer. These connection details are usually not addressed in the fire test design information. We recommend the Authorities Having Jurisdiction be consulted for approval and confirmation of their requirements. If drill oil is used, oil should be cleaned as soon as possible.

If Thermo-Lag E100 is damaged after drilling, the damaged area should be touched up in accordance with the repair procedures above.

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### APPENDIX A. ACCEPTABLE PRIMER LIST

Primer (see footnote)	VOC (g/l)	Thermo-Lag E100	Thermo-Lag E100 S	Notes
Carbocoat 115 VOC <sup>(2)</sup>	340	2	2	(1) Designates primers that require a minimum 24 hr. cure @ 70°F before applying intumescent fireproofing. (2) Designates primers that require a minimum 7 day cure @ 70°F before applying intumescent fireproofing. (3) Designates primers that can only be used as tie-coat primers under intumescent fireproofing. (4) For exterior applications, contact Carboline Technical Service before applying Rustbond. (5) Designates primers that require a minimum 4 hr. cure @ 70°F before applying intumescent fireproofing. (6) Designates primer that can be used for clean room applications. (7) Designates primer that is NORSOK compliant.
Carbocoat OEM <sup>(5)</sup> Universal Primer	407	5	5	
Carbocoat 8229 <sup>(2,6)</sup>	268	2,6	2,6	
Carbocrylic 3357 HB <sup>(1,3)</sup>	99	1,3	1,3	
Carboguard 553 <sup>(1)</sup>	80	1	1	
Carboguard 890 <sup>(1)</sup>	214	1	1	
Carboguard 893 SG LT <sup>(1)</sup>	318	1	1	
Carboguard 893 SG <sup>(1)</sup>	336	1	1	
Carbomastic 94 <sup>(1,3,7)</sup>	120	1,3,7	1,3,7	
Carbomastic 94 MC <sup>(1)</sup>	95	1	1	
Carbomastic 15 <sup>(1)</sup>	88	1	1	
Carbomastic 242 <sup>(1)</sup>	327	1	1	
Carbomastic 615 <sup>(1)</sup>	172	1	1	
Carbozinc 858 <sup>(1,7)</sup>	318	1,7	1,7	
Carbozinc 859 <sup>(1)</sup>	326	1	1	
Phenoline 353 <sup>(1)</sup>	206	1	1	
Rustbond <sup>(1,3,4)</sup>	85	1,3,4	1,3,4	
Carbozinc 11 + Carboguard 893 SG <sup>(1)</sup>	479 336	1	1	
Carbozinc 11 + Rustbond <sup>(1,4)</sup>	479 85	1,4	1,4	

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### APPENDIX B. TOPCOAT LIST

Topcoat (see footnote)	VOC (g/l)	Thermo-Lag E100	Thermo-Lag E100 S	Notes
Carbocoat 8215 VOC	336	2,4	2,4	(1) Approved for interior general purpose - exposed to temperature and humidity fluctuations during changing construction conditions. (2) Approved for interior conditioned space - fireproofing is under constant heat; temperature and humidity do not fluctuate. (3) Approved for exterior ratings- exposed to the elements. (4) Approved topcoats tested for clean room applications - Consult Carboline Technical Service for specific details prior to application. (5) For interior conditioned space applications, a topcoat is optional. For interior general purpose, exterior, or shop applied projects, the following topcoats shall be used: <ul style="list-style-type: none"> <li>• Carbomastic 94 &amp; 94 MC at 5 mils DFT.</li> <li>• Carboguard 1340 at 2 mils DFT                             <ul style="list-style-type: none"> <li>○ Carbothane 133 HB at 3 mils DFT</li> <li>○ Carbothane 133 MC at 3 mils DFT</li> </ul> </li> </ul>
Carbothane 133 MC	97	2,	2	
Sanitile 845	97	2,4	2,4	
Carboguard 1340	95	1,2,3,5	1,2,3,5	
Carbothane 133HB	383			
Carboguard 1340	95	1,2,3,5	1,2,3,5	
Carbothane 133 MC	97			
Carbomastic 94	120	1,2,3,5	1,2,3,5	
Carbomastic 94 MC	95	1,2,3,5	1,2,3,5	