Carboline Company
2150 Schuetz Road
St. Louis, MO 63146
Main: 314-644-1000
Fireproofing Tech: 314-665-3291
www.Carboline.com

Thermo-Lag® E100 S

Epoxy Intumescent

www.carboline.com

Table of Contents

Thermo-Lag® E100 S

PRODUCT DATA SHEET

SELECTION & SPECIFICATION DATA

Generic Type	A two component, 95% solids epoxy intumescent fireproofing.
Description	An epoxy intumescent fireproofing for commercial and light industrial applications. It was specifically designed with an advanced formulation to provide 1-3 hour cellulosic fire protection for structural steel beams, I-section columns, tubular columns and pipes without the need for reinforcing mesh. It provides a fast curing, aesthetically pleasing fire protection solution and is rated for both exterior and interior applications.
Features	• Certified to UL 263 / ASTM E119 / NFPA 251 • Exterior and interior rated • High quality aesthetic finish • Does not require reinforcing mesh • Low thickness requirements • High build, fast recoat • Saves application time, lowering installation cost • Rugged durable material suitable for onsite or offsite applications • LEED compliant, low VOC • Extensive outgas testing for controlled cleanroom and sterile environments
Color	Grey
Finish	Slightly Textured
Primer	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. Contact Carboline Technical Service for a complete list of approved primers. Carboline approved primers must be sufficiently cured prior to application of Thermo-Lag E100 S. The general requirement for epoxy primers is a 24 hour cure. Material must be applied after 24 hours and not to exceed the approved primer's maximum recoat window.
Film Build	60-120 mils (1.5-3.0 mm)
Solids Content	By Volume 95%
Theoretical Coverage Rates	1523 ft²/gallon at 1 mil (38 m²/liter at 25 microns)
VOC Values	**As Supplied** : 0.53 lb/gal (64 g/L)
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. Product must be applied to the specified DFT prior to 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

General	Remove all oil or grease from the surface to be coated using Thinner 2 or Carboline Surface Cleaner 3.

SUBSTRATES & SURFACE PREPARATION

Steel	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.
Galvanized Steel	The general requirement for steel preparation before priming should meet SSPC-SP7. 1.5-2.0 mil (37-50 micron) angular profile required. Prime with Carboline approved primer. Contact Carboline Technical Service for recommendations.
Non-Ferrous Metals	Contact Carboline Technical Service for recommendations.
Painted/Primed Structural Steel	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.

PERFORMANCE DATA

Test Method	Results
ASTM D2240 Hardness	> 40 Shore D
ASTM D256 Impact Resistance	0.75 ft*lbs/in
ASTM D4541 Bond Strength	600-1200 psi (4.14-8.27 MPa)
ASTM D4541 Bond Strength	Typical Field Value 300 psi (2.07 MPa)
ASTM D695 Compressive Strength	> 2,330 psi (> 16.0 MPa)
ASTM D790 Flexural Strength	> 1,220 psi (> 8.4 MPa)
ASTM E84 Surface Burning	Class A

All values derived under controlled laboratory conditions unless otherwise noted.

MIXING & THINNING

Mixer	Use 1/2" (12.7 mm) electric or air driven drill with a rectangular paddle mixer. Must be 300 rpm under load (minimum).
Mixing	**Single Component Application:** 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, Thinner 242E or Carboline approved equivalent to part B and mix until fully incorporated. Stage material by adding part B on top of part A. Mix staged material with rectangular paddle mixing blade until completely blended and consistent color is achieved. Once mixed, material should be immediately introduced into single component equipment and spraying should commence. **Trowel Application:** 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, Thinner 242E 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.

MIXING & THINNING

	Mix staged material with rectangular paddle mixing blade 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. For small areas, equal volumes of part A and part B can be mixed as needed. Trowel application should commence immediately after mixing.
Thinning	**Single Component Application:** Thin with Plasite Thinner 19, Thinner 242E or Carboline approved equivalent – Maximum 1 quart (1 liter) per 4.5 gallon (17.0 liter) kit **Trowel Application:** Only thin as required with Plasite Thinner 19, Thinner 242E or Carboline approved equivalent – Maximum 1 quart (1 liter) per 4.5 gallon (17.0 liter) kit.
Ratio	1:1 (by volume)
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	Thermo-Lag E100 S is applied by single component application. Use only single component equipment specifically designed for epoxy based PFP. Consult the manufacturers for specific information and models: **AirTech Spray Systems** **Spray Quip** **Graco** **WIWA**
Pump	**Single Component:** Graco® Xtreme XL Heavy Fluid Package (with stainless steel hopper feed) Graco® Mark V (with stainless steel hopper feed) WIWA® Herkules 75:1 (with stainless steel hopper feed) or Carboline approved equivalent Contact the equipment manufacturers for specific models. Graco® Mark V is recommended for small areas only. Contact Carboline Fireproofing Technical Service for specific mixing and thinning details when using Graco® Mark V equipment.
Spray Gun	WIWA® 500F PFP or equivalent Must be non-wetted spring assembly.
Gun Swivel	5,000 psi (34.4 MPa) 1/2-3/8" (12.7-9.5 mm)
Spray Tips	0.027-0.035" (Use heavy duty RAC non diffuser tips and housing)
Fan Size	6-10" (152-254 mm) depending on section being sprayed
Static Mixer	Standard Static 12 turn 3/4" (19 mm) I.D.

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.

Material Hose	**Single Component:** Use 50' (15.2 m) of high pressure spray line with a minimum I.D. of 3/4" (19 mm) For Graco Mark V option, use 50' (15.2 m) of high pressure spray line (maximum) with a minimum I.D. of 3/8" (9.5 mm) I.D.
Whip Hose	20' (6.1 m) of 1/2" (12.7 mm) I.D. minimum (Not recommended for application with Graco Mark V equipment)
Compressor	185 cfm @ 100 psi (6.9 KPa) minimum

APPLICATION PROCEDURES

General	**Single Component Application:** 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 at 60-120 mils (1.5-3 mm). Allow material to gel for 20-30 minutes before backrolling (only if required). If backrolling, use Plasite Thinner 19, Thinner 242E or 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 60-120 mils (1.5-3 mm) per coat to specified thickness. **Trowel Application:** 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 60-120 mils (1.5-3 mm). Allow material to gel for 20-30 minutes before backrolling (only if required). If backrolling, use Plasite Thinner 19, Thinner 242E or 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 60-120 mils (1.5-3 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.
Wet Film Thickness	Frequent thickness measurements with a wet film gauge are recommended during the application process to ensure uniform thickness.
Dry Film Thickness	For recommended methods 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) or SSPC-PA 2 (The Society for Protective Coatings Paint Application Standard No. 2).

APPLICATION CONDITIONS

Condition	Material	Surface	Ambient	Humidity
Minimum	70°F (21°C)	41°F (5°C)	41°F (5°C)	0%
Maximum	130°F (54°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%. Material must be protected from direct rain until it has reached sufficient cure.

CURING SCHEDULE

Surface Temp.	Touch	Handle	Minimum Recoat Time	Maximum Recoat Time	Minimum Topcoat Time	Maximum Topcoat Time
50°F (10°C)	5 Hours	48 Hours	5 Hours	7 Days	48 Hours	7 Days
70°F (21°C)	4 Hours	48 Hours	4 Hours	7 Days	48 Hours	7 Days
95°F (35°C)	3 Hours	48 Hours	3 Hours	7 Days	48 Hours	7 Days

*Above cure times are based on 50% relative humidity. Curing times are dependent upon temperature, air movement and humidity. Lower temperatures will slow down the curing process and increase recoat intervals, higher temperatures will speed up the curing process and shorten the recoat intervals. The material can be heated to achieve a quicker recoating and curing schedule. For optimum curing, it is recommended to apply coats at 60-120 mils (1.5-3 mm) wet per coat. If maximum recoat or topcoat times are exceeded, the surface must be mechanically abraded and solvent wiped prior to applying additional coats. Consult Carboline Technical Service for specific details.

TESTING / CERTIFICATION / LISTING

Underwriters Laboratories, Inc. | This product has been tested in accordance with the UL Environmental Test Program and is listed and classified by UL for both exterior and interior use.

Intertek | This product has been tested in accordance with ASTM E-119 at Intertek Laboratories and is listed in the following designs:
Wide Flange Columns: CC/IF 180-02
HSS Columns: CC/IF 180-03
Restrained / Unrestrained Beams: CC/IF 180-01

City of Los Angeles | Report: RR 25484

CLEANUP & SAFETY

Cleanup | Pump, mixer, hose, and gun should be cleaned with Plasite Thinner 19, Thinner 76 or Thinner 242E 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.

Safety | 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.

Overspray | All adjacent and finished surfaces shall be protected from damage and overspray.

Ventilation | 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.

MAINTENANCE

General	For patches and repairs, the material can be applied by spray or trowel. Repair areas must be abraded back to a firm edge by sanding or scraping. Remove product from areas in need of repair back to solidly adhered material. Ensure that the primer system is still is tact as well. If not, the primer system shall be reinstated to its original specification. All edges can be left as butt joints at a 90 degree angle or beveled at a 45 degree angle. The topcoat should be abraded back by 1" (25.4 mm) from the repair area. All edges must be solvent cleaned and allowed to dry before commencing application. It is important that the patch area blends into the existing material to achieve a uniform appearance. The product shall then be troweled or spray applied to the appropriate thickness based on the project specification and fire test certification. Once the material has been allowed to sufficiently cure, the specified topcoat system shall be applied, based on the original specification, in strict accordance with Carboline's written instructions.

PACKAGING, HANDLING & STORAGE

Packaging	**Half kits:** 4.5 gallons (17.0 liters) Part A: 2.25 gallons (8.5 liters) Part B: 2.25 gallons (8.5 liters) **Full kits:** 9.0 gallons (34.0 liters) Part A: 4.5 gallons (17.0 liters) Part B: 4.5 gallons (17.0 liters)
Shelf Life	12 Months Shelf life when kept at recommended storage conditions and in original unopened containers.
Storage	Store indoors in a dry environment between 32-120°F (0-49°C). Can be stored down to 20°F (-7°C) for no longer than 30 days. 0-100% Relative Humidity
Shipping Weight (Approximate)	12 lb. per gallon (1.4 kg per liter)
Flash Point (Setaflash)	Part A: 95°F (35°C) Part B: 93°F (34°C)

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.

carboline®
Coatings - Linings - Fireproofing

Safety Data Sheet

Prepared in Accordance with HCS 29 C.F.R. 1910.1200

1. Identification of the Substance/Mixture and the Company/Undertaking

1.1 Product Identifier

Product Name: THERMO-LAG E100 S PART A

Revision Date: 11/05/2018

Supercedes Date: 05/30/2015

1.2 Relevant identified uses of the substance or mixture and uses advised against

Component of multicomponent industrial coatings - Industrial use.

1.3 Details of the supplier of the safety data sheet

Manufacturer:

Carboline Company
2150 Schuetz Road
St. Louis, MO USA 63146

Regulatory / Technical Information:
Contact Carboline Technical Services at
1-800-848-4645

Datasheet Produced by: Schlereth, Ken - ehs@stoncor.com

1.4 Emergency telephone number:

CHEMTREC 1-800-424-9300 (Inside US)
CHEMTREC +1 703 5273887 (Outside US)
HEALTH - Pittsburgh Poison Control 1-412-681-6669

2. Hazard Identification

2.1 Classification of the substance or mixture

Hazardous to the aquatic environment, Chronic, category 2
Eye Irritation, category 2
Flammable Liquid, category 3
Reproductive Toxicity, category 2
Skin Irritation, category 2
Skin Sensitizer, category 1

2.2 Label elements

Symbol(s) of Product

Signal Word

warning

Named Chemicals on Label

TOLUENE, ACRYLATE MONOMER, BISPHENOL A EPOXY RESIN

HAZARD STATEMENTS

Flammable Liquid, category 3	H226	Flammable liquid and vapour.
Skin Irritation, category 2	H315	Causes skin irritation.
Skin Sensitizer, category 1	H317	May cause an allergic skin reaction.
Eye Irritation, category 2	H319	Causes serious eye irritation.
Reproductive Toxicity, category 2	H361	Suspected of damaging fertility or the unborn child.
Hazardous to the aquatic environment, Chronic, category 2	H411	Toxic to aquatic life with long lasting effects.

PRECAUTION PHRASES

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing/eye protection/ face protection.
P284	Wear respiratory protection.
P302+352	IF ON SKIN: Wash with plenty of soap and water.
P305+351+338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing.
P308+313	IF exposed or concerned: Get medical advice/attention
P333+313	If skin irritation or rash occurs: Get medical advice/attention.
P391	Collect spillage.
P403+233	Store in a well-ventilated place. Keep container tightly closed.

2.3 Other hazards

No Information

Results of PBT and vPvB assessment:

The product does not meet the criteria for PBT/VPvB in accordance with Annex XIII.

3. Composition/Information On Ingredients

3.2 Mixtures

Hazardous Ingredients

CAS-No.	Chemical Name	%
25068-38-6	BISPHENOL A EPOXY RESIN	25 - <50
15541-60-3	MELAMINE PYROPHOSPHATE	10 - <25
108-78-1	MELAMINE	10 - <25
13463-67-7	TITANIUM DIOXIDE	2.5 - <10
108-88-3	TOLUENE	2.5 - <10
15625-89-5	ACRYLATE MONOMER	2.5 - <10

1344-28-1	ALUMINA	1.0 - <2.5
68131-74-8	FLY ASH	1.0 - <2.5

CAS-No.	GHS Symbols	GHS Hazard Statements	M-Factors
25068-38-6	GHS07-GHS09	H315-317-319-411	0
15541-60-3	GHS07	H319	0
108-78-1		H303	0
13463-67-7			0
108-88-3	GHS02-GHS07-GHS08	H225-304-315-319-336-361-373	0
15625-89-5	GHS07	H315-317-319-335	0
1344-28-1			0
68131-74-8			0

Additional Information: The text for GHS Hazard Statements shown above (if any) is given in Section 16.

4. First-aid Measures

4.1 Description of First Aid Measures

AFTER INHALATION: Give oxygen or artificial respiration if needed. Remove person to fresh air. If signs/symptoms continue, get medical attention.
AFTER SKIN CONTACT: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If skin irritation persists, call a physician.
AFTER EYE CONTACT: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.
AFTER INGESTION: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. If swallowed, call a poison control centre or doctor immediately.

4.2 Most important symptoms and effects, both acute and delayed

Harmful if swallowed. Irritating to eyes and skin. Risk of serious damage to the lungs (by aspiration). Vapours may cause drowsiness and dizziness.

4.3 Indication of any immediate medical attention and special treatment needed

No information available on clinical testing and medical monitoring. Specific toxicological information on substances, if available, can be found in section 11.
When symptoms persist or in all cases of doubt seek medical advice.

5. Fire-fighting Measures

5.1 Extinguishing Media:

Carbon Dioxide, Dry Chemical, Foam, Water Fog

UNUSUAL FIRE AND EXPLOSION HAZARDS: Flammable liquid. Vapours are heavier than air and may spread along floors. Vapours may form explosive mixtures with air. Vapors may travel to areas away from work site before igniting/flashing back to vapor source. Provide adequate ventilation. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Electrical installations / working materials must comply with the technological safety standards. Wear shoes with conductive soles.

5.2 Special hazards arising from the substance or mixture

No Information

5.3 Advice for firefighters

In the event of fire, wear self-contained breathing apparatus. Cool containers / tanks with water spray. Flammable.

6. Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation. Evacuate personnel to safe areas. Remove all sources of ignition. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. Wear personal protective equipment. For personal protection see section 8.

6.2 Environmental precautions

Do not allow material to contaminate ground water system. Prevent product from entering drains.

6.3 Methods and material for containment and cleaning up

Prevent further leakage or spillage if safe to do so. Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

Please refer to disposal requirements or country specific disposal requirements for this material. See Section 13 for further information.

7. Handling and Storage

7.1 Precautions for safe handling

INSTRUCTIONS FOR SAFE HANDLING : Keep containers dry and tightly closed to avoid moisture absorption and contamination. Prepare the working solution as given on the label(s) and/or the user instructions. Do not breathe vapours or spray mist. Ensure all equipment is electrically grounded before beginning transfer operations. Do not use sparking tools. Do not get in eyes, on skin, or on clothing. Use only with adequate ventilation/personal protection. Wash thoroughly after handling.
PROTECTION AND HYGIENE MEASURES : Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday. When using, do not eat, drink or smoke.

7.2 Conditions for safe storage, including any incompatibilities

CONDITIONS TO AVOID: Heat, flames and sparks.
STORAGE CONDITIONS: Keep container closed when not in use. Store in a dry, well ventilated place away from sources of heat, ignition and direct sunlight.

7.3 Specific end use(s)

No specific advice for end use available.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Ingredients with Occupational Exposure Limits (US)

Name	CAS-No.	ACGIH TWA	ACGIH STEL	ACGIH Ceiling
BISPHENOL A EPOXY RESIN	25068-38-6	N/E	N/E	N/E
MELAMINE PYROPHOSPHATE	15541-60-3	N/E	N/E	N/E
MELAMINE	108-78-1	N/E	N/E	N/E
TITANIUM DIOXIDE	13463-67-7	10 MGM3 10 MGM3	N/E	N/E
TOLUENE	108-88-3	20 PPM	N/E	N/E
ACRYLATE MONOMER	15625-89-5	N/E	N/E	N/E
ALUMINA	1344-28-1	10 MG/M3	N/E	N/E
FLY ASH	68131-74-8	10.00 MG/M3	N/E	N/E

Name	CAS-No.	OSHA PEL	OSHA STEL
BISPHENOL A EPOXY RESIN	25068-38-6	N/E	N/E
MELAMINE PYROPHOSPHATE	15541-60-3	N/E	N/E

MELAMINE	108-78-1	N/E	N/E
TITANIUM DIOXIDE	13463-67-7	15.0 MG/M3	N/E
TOLUENE	108-88-3	200 ppm	560 MGM3, 150 PPM
ACRYLATE MONOMER	15625-89-5	N/E	N/E
ALUMINA	1344-28-1	10 MG/M3 (DUST)	N/E
FLY ASH	68131-74-8	10.00 MG/M3	N/E

FURTHER INFORMATION: Refer to the regulatory exposure limits for the workforce enforced in each country.

8.2 Exposure controls

Personal Protection

RESPIRATORY PROTECTION: In order to avoid inhalation of spray-mist and sanding dust, all spraying and sanding must be done wearing adequate respirator. Use only with ventilation to keep levels below exposure guidelines reported in this document. User should test and monitor exposure levels to ensure all personnel are below guidelines. If not sure, or not able to monitor, use State or federally approved supplied air respirator. For silica containing coatings in a liquid state, and/or if no exposure limits are established above, air-supplied respirators are generally not required.

EYE PROTECTION: Ensure that eyewash stations and safety showers are close to the workstation location. Safety glasses with side-shields.

HAND PROTECTION: Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough. Impervious gloves. Request information on glove permeation properties from the glove supplier. Lightweight protective clothing

OTHER PROTECTIVE EQUIPMENT: No Information

ENGINEERING CONTROLS: Avoid contact with skin, eyes and clothing. Ensure adequate ventilation, especially in confined areas.

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance:	Viscous, White Liquid
Physical State	Liquid
Odor	Epoxy
Odor threshold	N/D
pH	N/D
Melting point / freezing point (°C)	N/D
Boiling point/range	201 F (94 C) - 601 F (316 C)
Flash Point	95F (35C)
Evaporation rate	Slower Than Ether
Flammability (solid, gas)	Not determined
Upper/lower flammability or explosive limits	1.1 - 12.7
Vapour Pressure, mmHg	N/D

Vapour density	Heavier than Air
Relative density	Not determined
Solubility in / Miscibility with water	N/D
Partition coefficient: n-octanol/water	Not determined
Auto-ignition temperature (°C)	Not determined
Decomposition temperature (°C)	Not determined
Viscosity	Unknown
Explosive properties	Not determined
Oxidising properties	Not determined

9.2 Other information

VOC Content g/l:	64
Specific Gravity (g/cm3)	1.399

10. Stability and Reactivity

10.1 Reactivity
No reactivity hazards known under normal storage and use conditions.

10.2 Chemical stability
Stable under normal conditions.

10.3 Possibility of hazardous reactions
Hazardous polymerisation does not occur.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents.

10.6 Hazardous decomposition products
Carbon dioxide (CO2), carbon monoxide (CO), oxides of nitrogen (NOx), dense black smoke.

11. Toxicological Information

11.1 Information on toxicological effects

Acute Toxicity:

Oral LD50: N/D

Inhalation LC50: N/D

Irritation: Unknown

Corrosivity: Unknown

Sensitization: Unknown

Repeated dose toxicity: Unknown

Carcinogenicity: Unknown

Mutagenicity: Unknown

Toxicity for reproduction: Unknown

If no information is available above under Acute Toxicity then the acute effects of this product have not been tested. Data on individual components are tabulated below:

CAS-No.	Chemical Name	Oral LD50	Dermal LD50	Vapor LC50	Gas LC50	Dust/Mist LC50
25068-38-6	BISPHENOL A EPOXY RESIN	11400 mg/kg, rat, oral	23000 mg/kg, dermal, rabbit	>20 mL/kg skin, sensitizer		
15541-60-3	MELAMINE PYROPHOSPHATE	>5000 mg/kg, oral, rat		Not Available	0.000	0.000
108-78-1	MELAMINE	3161 mg/kg, oral, rat	Not Available	3248 mg/m3 8 Hr, Inh, Rat	0.000	0.000
13463-67-7	TITANIUM DIOXIDE	25000 mg/kg, oral (rat)	Not Available	Not Available	0.000	0.000
108-88-3	TOLUENE	5000 mg/kg rat oral	12267 mg/kg, dermal, rabbit	8000 ppm/4 hrs, rat, inhalation	0.000	0.000
15625-89-5	ACRYLATE MONOMER	5000 mg/kg, oral, rat	5170 mg/kg, dermal, rabbit	Not Available	0.000	0.000
1344-28-1	ALUMINA	Not Available		Not Available	0.000	0.000
68131-74-8	FLY ASH	Not Available		Not Available	0.000	0.000

Additional Information:

No Information

12. Ecological Information

12.1 Toxicity:

EC50 48hr (Daphnia):	Unknown
IC50 72hr (Algae):	Unknown
LC50 96hr (fish):	Unknown

12.2 Persistence and degradability: Unknown

12.3 Bioaccumulative potential: Unknown

12.4 Mobility in soil: Unknown

12.5 Results of PBT and vPvB assessment: The product does not meet the criteria for PBT/VPvB in accordance with Annex XIII.

12.6 Other adverse effects: Unknown

CAS-No.	Chemical Name	EC50 48hr	IC50 72hr	LC50 96hr
25068-38-6	BISPHENOL A EPOXY RESIN	2.1 mg/l (daphnia)	11 mg/l (algae)	1.3 mg/l (fish)
15541-60-3	MELAMINE PYROPHOSPHATE	No information	No information	No information
108-78-1	MELAMINE	No information	No information	No information
13463-67-7	TITANIUM DIOXIDE	No information	No information	No information
108-88-3	TOLUENE	6 mg/l (Daphnia magna)	12.5 mg/L (Algae)	5.8 mg/L (Fish)
15625-89-5	ACRYLATE MONOMER	No information	No information	No information
1344-28-1	ALUMINA	No information	No information	No information
68131-74-8	FLY ASH	No information	No information	No information

13. Disposal Considerations

13.1 WASTE TREATMENT METHODS: Do not burn, or use a cutting torch on, the empty drum. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of in accordance with local regulations. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport Information

14.1 UN number	UN1263
14.2 UN proper shipping name	Paint
Technical name	N/A
14.3 Transport hazard class(es)	3
Subsidiary shipping hazard	N/A
14.4 Packing group	III
14.5 Environmental hazards	Marine Pollutant: Yes (Epoxy Resin)
14.6 Special precautions for user	Unknown
EmS-No.:	F-E, S-E
14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code	Unknown

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation for the substance or mixture:

U.S. Federal Regulations: As follows -

CERCLA - Sara Hazard Category

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Flammable (gases, aerosols, liquids, or solids), Reproductive toxicity, Skin Corrosion or Irritation, Respiratory or Skin Sensitization, Serious eye damage or eye irritation

Sara Section 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR part 372:

Chemical Name	CAS-No.
TOLUENE	108-88-3

Toxic Substances Control Act:

All components of this product are either listed on the TSCA Inventory or are exempt.

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

No TSCA 12(b) components exist in this product.

U.S. State Regulations: As follows -

New Jersey Right-to-Know:

The following materials are non-hazardous, but are among the top five components in this product.

Chemical Name	CAS-No.
PENTAERYTHRITOL	115-77-5

Pennsylvania Right-To-Know

The following non-hazardous ingredients are present in the product at greater than 3%.

Chemical Name	CAS-No.
PENTAERYTHRITOL	115-77-5

CALIFORNIA PROPOSITION 65

WARNING: Cancer and Reproductive Harm -- www.P65Warnings.ca.gov

International Regulations: As follows -

*** Canadian DSL:**

No Information

15.2 Chemical Safety Assessment:

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

16. Other Information

Text for GHS Hazard Statements shown in Section 3 describing each ingredient:

H225	Highly flammable liquid and vapour.
H303	May be harmful if swallowed
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.

Reasons for revision

No Information

The information contained herein is, to the best of our knowledge and belief accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by use of this material. It is the responsibility of the user to comply with all applicable federal, state, and local laws and regulations.

carboline®
Coatings - Linings - Fireproofing

Safety Data Sheet

Prepared in Accordance with HCS 29 C.F.R. 1910.1200

1. Identification of the Substance/Mixture and the Company/Undertaking

1.1 Product Identifier

NC27B1NL

Product Name: THERMO-LAG E100 S PART B

Revision Date: 11/05/2018

Supercedes Date: 05/30/2015

1.2 Relevant identified uses of the substance or mixture and uses advised against

Component of multicomponent industrial coatings - Industrial use.

1.3 Details of the supplier of the safety data sheet

Manufacturer:

Carboline Company
2150 Schuetz Road
St. Louis, MO USA 63146

Regulatory / Technical Information:
Contact Carboline Technical Services at
1-800-848-4645

Datasheet Produced by: Schlereth, Ken - ehs@stoncor.com

1.4 Emergency telephone number:

CHEMTREC 1-800-424-9300 (Inside US)
CHEMTREC +1 703 5273887 (Outside US)
HEALTH - Pittsburgh Poison Control 1-412-681-6669

2. Hazard Identification

2.1 Classification of the substance or mixture

Eye Irritation, category 2
Flammable Liquid, category 3
Reproductive Toxicity, category 2
Skin Irritation, category 2

2.2 Label elements

Symbol(s) of Product

Signal Word

warning

Named Chemicals on Label

TOLUENE

HAZARD STATEMENTS

Flammable Liquid, category 3	H226	Flammable liquid and vapour.
Skin Irritation, category 2	H315	Causes skin irritation.
Eye Irritation, category 2	H319	Causes serious eye irritation.
Reproductive Toxicity, category 2	H361	Suspected of damaging fertility or the unborn child.

PRECAUTION PHRASES

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P280	Wear protective gloves/protective clothing/eye protection/ face protection.
P284	Wear respiratory protection.
P305+351+338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing.
P308+313	IF exposed or concerned: Get medical advice/attention
P332+313	If skin irritation occurs: Get medical advice/attention.
P403+233	Store in a well-ventilated place. Keep container tightly closed.

2.3 Other hazards

No Information

Results of PBT and vPvB assessment:

The product does not meet the criteria for PBT/VPvB in accordance with Annex XIII.

3. Composition/Information On Ingredients

3.2 Mixtures

Hazardous Ingredients

CAS-No.	Chemical Name	%
108-88-3	TOLUENE	2.5 - <10
25338-55-0	DIMETHYLAMINO(METHYL)PHENOL	2.5 - <10
90-72-2	TRIS-2,4,6- (DIMETHYLAMINOMETHYL)PHENOL	1.0 - <2.5
68131-74-8	FLY ASH	0.1 - <1.0
108-95-2	PHENOL	0.1 - <1.0

CAS-No.	GHS Symbols	GHS Hazard Statements	M-Factors
108-88-3	GHS02-GHS07-GHS08	H225-304-315-319-336-361-373	0
25338-55-0	GHS05-GHS07	H302-312-314-332	0
90-72-2	GHS07	H315-319	0
68131-74-8			0
108-95-2	GHS05-GHS06-GHS08	H302-311-314-331-341-373	0

Additional Information: The text for GHS Hazard Statements shown above (if any) is given in Section 16.

4. First-aid Measures

4.1 Description of First Aid Measures

AFTER INHALATION: Give oxygen or artificial respiration if needed. Remove person to fresh air. If signs/symptoms continue, get medical attention.
AFTER SKIN CONTACT: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If skin irritation persists, call a physician.
AFTER EYE CONTACT: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.
AFTER INGESTION: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. If swallowed, call a poison control centre or doctor immediately.

4.2 Most important symptoms and effects, both acute and delayed

Harmful if swallowed. Irritating to eyes and skin. Risk of serious damage to the lungs (by aspiration). Vapours may cause drowsiness and dizziness.

4.3 Indication of any immediate medical attention and special treatment needed

No information available on clinical testing and medical monitoring. Specific toxicological information on substances, if available, can be found in section 11.
When symptoms persist or in all cases of doubt seek medical advice.

5. Fire-fighting Measures

5.1 Extinguishing Media:

Carbon Dioxide, Dry Chemical, Foam

UNUSUAL FIRE AND EXPLOSION HAZARDS: Flammable liquid. Vapours are heavier than air and may spread along floors. Vapours may form explosive mixtures with air. Vapors may travel to areas away from work site before igniting/flashing back to vapor source. Provide adequate ventilation. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Electrical installations / working materials must comply with the technological safety standards. Wear shoes with conductive soles.

5.2 Special hazards arising from the substance or mixture

No Information

5.3 Advice for firefighters

In the event of fire, wear self-contained breathing apparatus. Cool containers / tanks with water spray. Flammable.

6. Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation. Evacuate personnel to safe areas. Remove all sources of ignition. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. Wear personal protective equipment. For personal protection see section 8.

6.2 Environmental precautions

Do not allow material to contaminate ground water system. Prevent product from entering drains.

6.3 Methods and material for containment and cleaning up

Prevent further leakage or spillage if safe to do so. Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

Please refer to disposal requirements or country specific disposal requirements for this material. See Section 13 for further

information.

7. Handling and Storage

7.1 Precautions for safe handling

INSTRUCTIONS FOR SAFE HANDLING : Keep containers dry and tightly closed to avoid moisture absorption and contamination. Prepare the working solution as given on the label(s) and/or the user instructions. Do not breathe vapours or spray mist. Ensure all equipment is electrically grounded before beginning transfer operations. Do not use sparking tools. Do not get in eyes, on skin, or on clothing. Use only with adequate ventilation/personal protection. Wash thoroughly after handling.

PROTECTION AND HYGIENE MEASURES : Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday. When using, do not eat, drink or smoke.

7.2 Conditions for safe storage, including any incompatibilities

CONDITIONS TO AVOID: Heat, flames and sparks.

STORAGE CONDITIONS: Keep container closed when not in use. Store in a dry, well ventilated place away from sources of heat, ignition and direct sunlight.

7.3 Specific end use(s)

No specific advice for end use available.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Ingredients with Occupational Exposure Limits (US)

Name	CAS-No.	ACGIH TWA	ACGIH STEL	ACGIH Ceiling
TOLUENE	108-88-3	20 PPM	N/E	N/E
DIMETHYLAMINO(METHYL)PHENOL	25338-55-0	N/E	N/E	N/E
TRIS-2,4,6- (DIMETHYLAMINOMETHYL) PHENOL	90-72-2	N/E	N/E	N/E
FLY ASH	68131-74-8	10.00 MG/M3	N/E	N/E
PHENOL	108-95-2	5 PPM	N/E	N/E

Name	CAS-No.	OSHA PEL	OSHA STEL
TOLUENE	108-88-3	200 ppm	560 MGM3, 150 PPM
DIMETHYLAMINO(METHYL)PHENOL	25338-55-0	N/E	N/E
TRIS-2,4,6- (DIMETHYLAMINOMETHYL) PHENOL	90-72-2	N/E	N/E
FLY ASH	68131-74-8	10.00 MG/M3	N/E
PHENOL	108-95-2	19 MGM3, 5 PPM	N/E

FURTHER INFORMATION: Refer to the regulatory exposure limits for the workforce enforced in each country.

8.2 Exposure controls

Personal Protection

RESPIRATORY PROTECTION: In order to avoid inhalation of spray-mist and sanding dust, all spraying and sanding must be done wearing adequate respirator. Use only with ventilation to keep levels below exposure guidelines reported in this

document. User should test and monitor exposure levels to ensure all personnel are below guidelines. If not sure, or not able to monitor, use State or federally approved supplied air respirator. For silica containing coatings in a liquid state, and/or if no exposure limits are established above, air-supplied respirators are generally not required.

EYE PROTECTION: Ensure that eyewash stations and safety showers are close to the workstation location. Safety glasses with side-shields.

HAND PROTECTION: Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough. Impervious gloves. Request information on glove permeation properties from the glove supplier. Lightweight protective clothing

OTHER PROTECTIVE EQUIPMENT: No Information

ENGINEERING CONTROLS: Avoid contact with skin, eyes and clothing. Ensure adequate ventilation, especially in confined areas.

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance:	Viscous Black Liquid
Physical State	Liquid
Odor	Mercaptan
Odor threshold	N/D
pH	N/D
Melting point / freezing point (°C)	N/D
Boiling point/range	181 F (83 C) - 320 F (160 C)
Flash Point	93F (34C)
Evaporation rate	Slower Than Ether
Flammability (solid, gas)	Not determined
Upper/lower flammability or explosive limits	1.3 - 8.6
Vapour Pressure, mmHg	N/D
Vapour density	Heavier than Air
Relative density	Not determined
Solubility in / Miscibility with water	N/D
Partition coefficient: n-octanol/water	Not determined
Auto-ignition temperature (°C)	Not determined
Decomposition temperature (°C)	Not determined
Viscosity	Unknown
Explosive properties	Not determined
Oxidising properties	Not determined

9.2 Other information

VOC Content g/l:	64
Specific Gravity (g/cm3)	1.47

10. Stability and Reactivity

10.1 Reactivity
No reactivity hazards known under normal storage and use conditions.

10.2 Chemical stability
Stable under normal conditions.

10.3 Possibility of hazardous reactions
Hazardous polymerisation does not occur.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents.

10.6 Hazardous decomposition products
Carbon dioxide (CO2), carbon monoxide (CO), oxides of nitrogen (NOx), dense black smoke.

11. Toxicological Information

11.1 Information on toxicological effects

Acute Toxicity:

Oral LD50: N/D

Inhalation LC50: N/D

Irritation: Unknown

Corrosivity: Unknown

Sensitization: Unknown

Repeated dose toxicity: Unknown

Carcinogenicity: Unknown

Mutagenicity: Unknown

Toxicity for reproduction: Unknown

If no information is available above under Acute Toxicity then the acute effects of this product have not been tested. Data on individual components are tabulated below:

CAS-No.	Chemical Name	Oral LD50	Dermal LD50	Vapor LC50	Gas LC50	Dust/Mist LC50
108-88-3	TOLUENE	5000 mg/kg rat oral	12267 mg/kg, dermal, rabbit	8000 ppm/4 hrs, rat, inhalation	0.000	0.000
25338-55-0	DIMETHYLAMINO(METHYL) PHENOL	500 mg/kg, oral, rat		20 mg/L/ 1 hr. rat	0.000	0.000
90-72-2	TRIS-2,4,6-(DIMETHYLAMINOMETHYL) PHENOL	2169 mg/kg oral	Not Available	Not Available	0.000	0.000
68131-74-8	FLY ASH	Not Available		Not Available	0.000	0.000

108-95-2	PHENOL	317 mg/kg oral	630 mg/kg	316 mg/m3 inhalation	0.000	0.000

Additional Information:
No Information

12. Ecological Information

12.1 Toxicity:

EC50 48hr (Daphnia): Unknown
IC50 72hr (Algae): Unknown
LC50 96hr (fish): Unknown

12.2 Persistence and degradability: Unknown

12.3 Bioaccumulative potential: Unknown

12.4 Mobility in soil: Unknown

12.5 Results of PBT and vPvB assessment: The product does not meet the criteria for PBT/VPvB in accordance with Annex XIII.

12.6 Other adverse effects: Unknown

CAS-No.	Chemical Name	EC50 48hr	IC50 72hr	LC50 96hr
108-88-3	TOLUENE	6 mg/l (Daphnia magna)	12.5 mg/L (Algae)	5.8 mg/L (Fish)
25338-55-0	DIMETHYLAMINO(METHYL)PHENOL	No information	No information	No information
90-72-2	TRIS-2,4,6- (DIMETHYLAMINOMETHYL) PHENOL	No information	84 mg/l (Algae)	175 mg/l (Fish)
68131-74-8	FLY ASH	No information	No information	No information
108-95-2	PHENOL	4.2 mg/l (Daphnia)	No information	0.00175 mg/l (Fish)

13. Disposal Considerations

13.1 WASTE TREATMENT METHODS: Do not burn, or use a cutting torch on, the empty drum. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of in accordance with local regulations. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport Information

14.1	**UN number**	UN1263
14.2	**UN proper shipping name**	Paint
	Technical name	N/A
14.3	**Transport hazard class(es)**	3
	Subsidiary shipping hazard	N/A
14.4	**Packing group**	III
14.5	**Environmental hazards**	Unknown
14.6	**Special precautions for user**	Unknown
	EmS-No.:	F-E, S-E
14.7	**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code**	Unknown

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation for the substance or mixture:

U.S. Federal Regulations: As follows -

CERCLA - Sara Hazard Category

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Flammable (gases, aerosols, liquids, or solids), Reproductive toxicity, Skin Corrosion or Irritation, Serious eye damage or eye irritation

Sara Section 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR part 372:

Chemical Name	CAS-No.
TOLUENE	108-88-3
PHENOL	108-95-2

Toxic Substances Control Act:

All components of this product are either listed on the TSCA Inventory or are exempt.

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

No TSCA 12(b) components exist in this product.

U.S. State Regulations: As follows -

New Jersey Right-to-Know:

The following materials are non-hazardous, but are among the top five components in this product.

Chemical Name	CAS-No.
AMMONIUM POLYPHOSPHATE	68333-79-9
LIQUID POLYSULFIDE POLYMER	68611-50-7
CARBON FIBER	NE
GLASS OXIDE	65997-17-3

Pennsylvania Right-To-Know

The following non-hazardous ingredients are present in the product at greater than 3%.

Chemical Name	CAS-No.
AMMONIUM POLYPHOSPHATE	68333-79-9
LIQUID POLYSULFIDE POLYMER	68611-50-7
CARBON FIBER	NE

CALIFORNIA PROPOSITION 65

WARNING: Cancer and Reproductive Harm -- www.P65Warnings.ca.gov

International Regulations: As follows -

* Canadian DSL:

No Information

15.2 Chemical Safety Assessment:

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

16. Other Information

Text for GHS Hazard Statements shown in Section 3 describing each ingredient:

H225	Highly flammable liquid and vapour.
H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters airways.
H311	Toxic in contact with skin.
H312	Harmful in contact with skin.
H314	Causes severe skin burns and eye damage.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H332	Harmful if inhaled.
H336	May cause drowsiness or dizziness.
H341	Suspected of causing genetic defects.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.

Reasons for revision

No Information

The information contained herein is, to the best of our knowledge and belief accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by use of this material. It is the responsibility of the user to comply with all applicable federal, state, and local laws and regulations.

CARBOLINE THERMO-LAG E100 S TECHNICAL GUIDE SPECIFICATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. This specification covers labor, materials, equipment, and application necessary for, and incidental to, the complete and proper installation of intumescent fire protection for application to steel structures and supports in accordance with all applicable requirements of contract documents.

B. This specification shall be supplemented by the applicable requirements of building codes, insurance rating organizations and all other authorities having jurisdiction.

1.02 RELATED WORK

A. Specified elsewhere:
1. 01010 - Project Summary
2. 01410 - Testing Laboratory Services
3. 05100 - Structural Metal Framing
4. 05120 - Structural steel and metal fabrications with reference to primer receiving fire protection materials
5. 05500 - Structural steel and metal fabrications with reference to primer receiving fire protection materials
6. 07270 – Firestopping and Smoke Seals
7. 09900 - Painting

1.03 QUALITY ASSURANCE

A. Application of fireproofing shall be performed by a qualified applicator acceptable to the Carboline Company, St. Louis, MO.

B. A Certified Installation Certificate must be completed and submitted at end of project.

C. Provide materials and construction for hourly ratings listed in the Intertek or Underwriters Laboratories, Inc. Fire Resistance Directories as calculated by the American Iron and Steel Institute formula.
Wide flange beam (both restrained and unrestrained) and column certification must extend down to W/D 0.44.
Hollow sections certification must extend down to W/D 0.64.

D. The intumescent fire resistive material shall be manufactured under the Follow-Up Service program of Intertek or UL and bear the Intertek or UL label (mark).

E. Field constructed mock-up: Apply sample section to representative substrates on site. Mock-up should include primer, fireproofing at required thickness, density, and finished surface, and all finish coatings.

F. The mock-up shall be approved by the architect and owner representative.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. E84 Surface Burning Characteristics
2. E119 Fire Tests of Building Construction
3. D2240 Durometer Hardness
4. D2794 Impact Resistance
5. D4060 Abrasion Resistance
6. D4541 Bond Strength

B. Intertek or Underwriters Laboratories, Inc. Fire Resistance Directories (UL 263 / ASTM E119).

C. Steel Structures Painting Council (SSPC) Surface Preparation Standards

D. American Iron and Steel Institute, Designing Fire Protection for Steel Columns.

E. AWCI Technical Manual 12-B "Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide", Latest Edition

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's current Product Data and Application Instructions.

B. Fireproofing manufacturer's certification that the materials to be supplied comply with the specifications and are suitable for the use intended.

C. Fireproofing manufacturer's certification that the minimum performance standards as required under Section 2.01-A can be met and test reports supplied as requested.

D. Schedule of Intertek or Underwriters Laboratories, Inc. designs or American Iron and Steel Institute calculations to achieve the required hourly ratings.

E. At completion of project, Certified Installation Certificate.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project in manufacturer's unopened packages, fully identified as to trade name, type and other identifying data. Packaged materials shall bear the appropriate labels, seals of Intertek or UL label (mark) for fire resistive ratings and shall be stored at temperatures between 32º F (0º C) and 100º F (38º C), in a dry interior location away from direct sunlight.

B. Materials shall be used prior to expiration date.

1.07 SITE CONDITIONS

A. When the temperature at the job site is less than 41º F (5º C), a minimum substrate and ambient temperature of 41º F (5º C) shall be maintained prior to and during application. If necessary for job schedule, the General Contractor shall provide enclosures and heat to maintain proper temperatures and humidity levels in the application areas.

B. General Contractor shall provide ventilation for proper drying of the fireproofing during and after its application. In poorly ventilated areas, forced air shall be used to achieve a total air exchange of four times per hour until the material is substantially dry.

C. Relative humidity shall not exceed 85% throughout the total period of application and drying for the intumescent fire resistive material, and must not exceed 85% throughout the application and drying for the protective decorative topcoat.

1.08 SEQUENCING

A. Coordinate application of fireproofing with related work specified in other sections to comply with the following requirements:
1. Prevent deterioration due to exposure to unfavorable environmental conditions.
2. Protect fireproofing from abrasion and other damage likely to occur during construction operations after its application.
3. The installation of piping, ducts, conduit or other suspended equipment shall not commence until the application of the thin-film fire resistive material is complete in that area.
4. Install fireproofing allowing sufficient time for inspection, testing, and correction of defective fireproofing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Compatible metal primer shall be approved and applied in full accordance with the primer manufacturer's written instructions.

B. The intumescent fire resistive material shall be supplied by Carboline. Intumescent fire resistive material shall be applied in accordance with drawings and/or specifications, and shall have been tested in accordance with the procedures of UL 263 or ASTM E119 and reported by Intertek or Underwriters Laboratories, Inc.

C. Intumescent fireproofing shall be applied to provide compliance with all drawings, specifications, and the following performance criteria:
1. ASTM E84 (UL723: Surface Burning Characteristics of Building Materials. Flame Spread Maximum: 5 and Smoke Developed Maximum: 65.
2. ASTM D2240: Durometer Hardness (Shore D Only). Minimum: 40 Shore D (for topcoating)
Minimum: 50 Shore D (fully cured)
3. ASTM D2794: Impact Resistance 0.75 ft*lbs/in minimum

4. ASTM D4541: Bond Strength
   1,200 psi (8.2 MPa) - laboratory tested minimum
   300 psi (2.0 MPa) - field value minimum
5. ASTM D695:
   Compressive Strength 2,330 psi (16.0 MPa).
6. ASTM D790: Flexural Strength > 1,200 psi (8.2 MPa) minimum

D. Fireproofing shall be investigated for exterior and interior use by Underwriters Laboratories, Inc.

E. Fireproofing shall be free of asbestos, mineral fibers, polystyrene, or other known materials which may be considered hazardous either during mixing, application curing, or chemical release in a fire.

F. Topcoat materials shall be as required for color-coding, aesthetics or additional surface protection, approved by the thin-film fire resistive material manufacturer and applied in full accordance with the coating manufacturer's written instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. 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. All areas to receive the fire resistive material shall be clean, dry and free of oil, grease, loose mill scale, dirt, dust or other materials which would impair bond of the thin-film fire resistive material to the surface. Any cleaning of the surfaces to receive fire resistive material shall be the responsibility of the General Contractor or steel erector, as outlined in the structural steel section.

B. Confirm compatibility of surfaces to receive thin-film fire resistive material. Contract Carboline Technical Service for recommendations and specific primer requirements.

C. Verify that objects which will penetrate fireproofing such as clips, hangers, support sleeves, etc. are securely attached to the substrate.

D. Verify that substrates are not obstructed by ducts, piping, equipment, or other construction which might interfere with fireproofing application. If obstruction(s) are evident, General Contractor to have responsible trade remove obstruction until fireproofing is completed in the area.

E. Do not proceed with fireproofing application until all unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates, removing dirt, dust, oil, grease, loose material, incompatible primers, or other substances which may impair bonding of fireproofing to the substrate.

B. Provide drop cloths, masking, or other satisfactory protection for surfaces not to receive fireproofing to prevent damage from overspray.

3.03 APPLICATION

A. The thin-film fire resistive material shall be applied at the required dry film thickness per the appropriate design number guidelines and manufacturers written application instructions.

B. Comply with manufacturers current instructions for equipment and application procedures.

B. Apply fireproofing in thickness required to achieve fire resistance ratings.

C. Before proceeding with the work, the applicator shall apply the thin-film fire resistive material to a section witnessed by the architect's or owner's representative. The application shall be subject to their approval and shall be used as a guide for texture and thickness of the finished work.

3.04 FIELD QUALITY CONTROL

A. In addition to continuous Wet Film Thickness checks performed by applicator during application, the installed intumescent material shall be inspected by a qualified independent testing laboratory for thickness in accordance with the AWCI Technical Manual 12-B "Standard Practice For The Testing and Inspection Of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide", Latest Edition, before application of the topcoat.

B. The results of the above tests shall be made available to all parties at the completion of each area and approved prior to the application of topcoat.

3.05 PROTECTION

A. Coordinate installation of fireproofing with other trades in order to minimize the need to cut or remove fireproofing. As other trades successfully complete installation of their work, maintain protection of fireproofed portions of the structure by repairing any areas which have been removed or damaged.

B. If applicable, the General Contractor shall install barriers to prevent other trades from entering the application area till the material dries.

C. Areas subject to overspray that are to remain permanently exposed as detailed on the drawings, must be covered by drop cloths or other satisfactory protection to prevent contact with fireproofing material.

3.06 PATCHING AND REPAIR

A. All patching of and repair to thin-film fire resistive material, due to damage by other trades, shall be performed under this section and paid for by the trade responsible for the damage. Patching shall be performed by an applicator with expertise in the installation of fire resistive or similar materials. Repair shall be in accordance with design number guidelines and manufacturers written application instructions.

3.07 CLEANING

A. Upon completion of installation, all excess material, overspray and debris shall be cleared and removed from the job site.

B. At completion of fireproofing work, application equipment shall be removed from site.

3.08 SCHEDULE

A. Fire resistance rating in hours shall be the following:

	Hour	Rest.	Unrest.
Floor Assembly	_____	_____	_____
Primary Floor Beams	_____	_____	_____
Secondary Floor Beams	_____	_____	_____
Roof Beams	_____	_____	_____
Columns, Supporting Floor			_____
Columns, Supporting Roof			_____

END OF SECTION

CERTIFICATE OF COMPLIANCE

Certificate Number	20131122-R11193
Report Reference	R11193-20130628
Issue Date	2013-NOVEMBER-22

Issued to:	CARBOLINE CO 350 HANLEY INDUSTRIAL CT ST LOUIS MO 63144
This is to certify that representative samples of	MASTIC AND INTUMESCENT COATINGS Subliming mastic coatings designated as Thermo-Lag E100 S and Thermo-Lag E100.
	Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	ANSI/UL263, Fire Tests of Building Construction and Materials.
Additional Information:	See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Classification Mark should be considered as being covered by UL's Classification and Follow-Up Service.

The UL Classification Mark includes: UL in a circle: with the word "CLASSIFIED" (as shown); a control number (may be alphanumeric) assigned by UL; a statement to indicate the extent of UL's evaluation of the product; and the product category name (product identity) as indicated in the appropriate UL Directory.

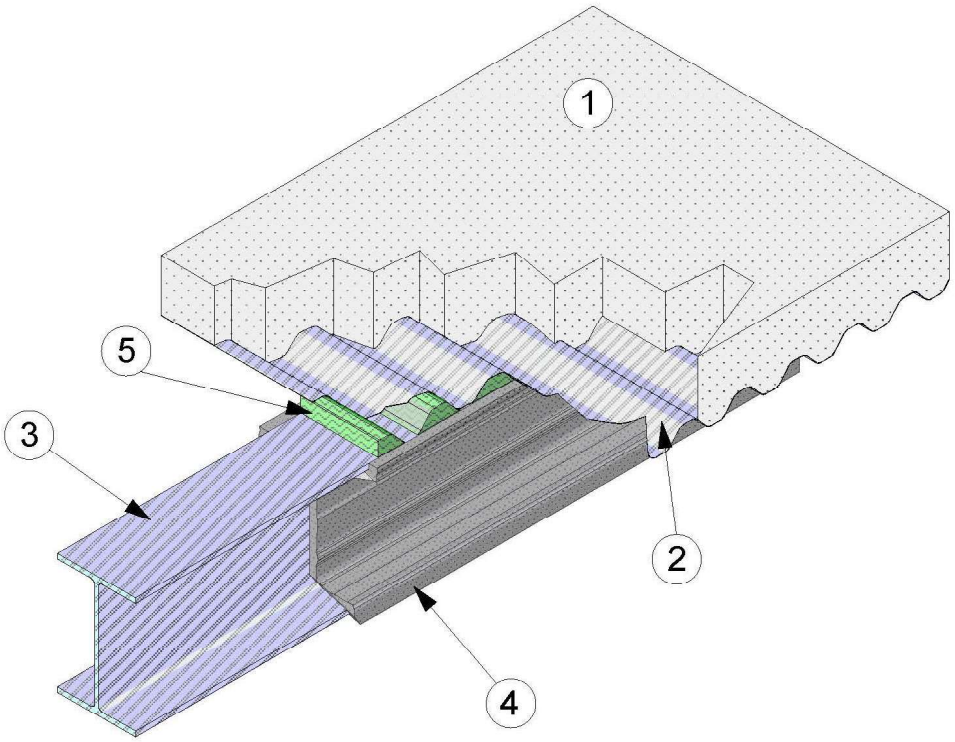
Look for the UL Classification Mark on the product.

William R. Carney

William R. Carney, Director, North American Certification Programs

UL LLC

Carboline Global Inc.
Design No. CC/IF 180-01
Restrained or Unrestrained Beam
Thermo-Lag E100, Thermo-Lag E100 S
ASTM E119
CAN/ULC S101 Restricted Load Maximum 65% of Design Load
Rating: See Table CC/IF 180-01



1. **FLOOR/CEILING ASSEMBLY:** Use a fire-rated floor/ceiling assembly consisting of normal weight or lightweight (min. 105 pcf, 1682 kg/m^3) reinforced concrete. Thickness of concrete floor/ceiling assembly must comply with designated fire resistive rating.

2. **FLUTED STEEL FLOOR UNITS:** Corrugated steel decking, min. 1-1/2 in. deep (38 mm), min. 20 GA.

3. **STEEL STRUCTURAL BEAM:** Use steel sections, I-beam or W-beam, sized in accordance with the Table CC/IF 180-01

4. **FIRE-RESISTIVE COATING:** Refer to Table CC/IF 180-01 for specific application thickness of fire resistive coating.

CERTIFIED MANUFACTURER: Carboline Global Inc.

CERTIFIED PRODUCT: Fire Resistive Coating

MODEL: Thermo-Lag E100/E100S

INTUMESCENT FIREPROOFING – Spray or paint in one or more coats according to manufacturer's instructions to the required thickness.

5. **LISTED MANUFACTURER:** Any Intertek certified mineral wool or ceramic fiber blanket manufacturer that meets the criteria below.

CERTIFIED PRODUCT: Insulation

MODEL: Any Intertek certified mineral wool or ceramic fiber blanket model that meets the criteria below.

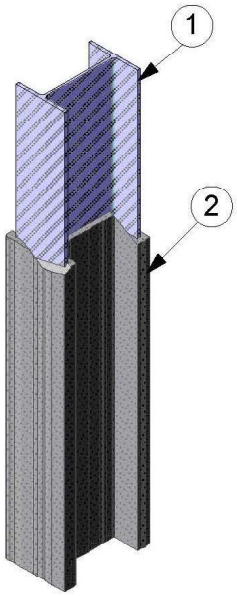
FLUTE FILLER – Completely fill the flutes between steel structural beam (Item 3) and the fluted steel floor unit (Item 2) with 4 pcf mineral wool, 4 pcf ceramic fiber blanket, or spray-applied material according to the manufacturer's instructions to the required minimum thickness.

Table CC/IF 180-01													
HP/A	W/D	30 min.		60 min.		90 min.		120 min.		150 min.		180 min.	
m-1	lb/ft/in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
20	6.68	0.26	0.010	0.62	0.025	0.99	0.039	1.36	0.054	1.73	0.068	2.10	0.083
30	4.46	0.37	0.015	0.90	0.035	1.43	0.056	1.96	0.077	2.49	0.098	3.02	0.019
35	3.82	0.42	0.017	1.03	0.041	1.64	0.065	2.25	0.088	2.85	0.112	3.46	0.136
40	3.34	0.47	0.019	1.16	0.046	1.84	0.072	2.52	0.099	3.20	0.126	3.89	0.153
45	2.97	0.52	0.021	1.28	0.050	2.03	0.080	2.78	0.110	3.54	0.139	4.29	0.169
50	2.67	0.57	0.022	1.39	0.055	2.22	0.087	3.04	0.120	3.86	0.152	4.69	0.184
55	2.43	0.62	0.024	1.51	0.059	2.40	0.094	3.29	0.129	4.18	0.164	5.06	0.199
60	2.23	0.66	0.026	1.62	0.064	2.57	0.101	3.52	0.139	4.48	0.176	5.43	0.214
65	2.06	0.71	0.028	1.72	0.068	2.74	0.108	3.75	0.148	4.77	0.188	5.78	0.228
70	1.91	0.75	0.029	1.82	0.072	2.90	0.114	3.98	0.156	5.05	0.199	6.13	0.241
75	1.78	0.79	0.031	1.92	0.076	3.06	0.120	4.19	0.165	5.32	0.210	6.46	0.254
80	1.67	0.83	0.033	2.02	0.079	3.21	0.126	4.40	0.173	5.59	0.220	6.78	0.267
85	1.57	0.86	0.034	2.11	0.083	3.35	0.132	4.60	0.181	5.84	0.230	7.09	0.279
90	1.49	0.90	0.035	2.20	0.087	3.50	0.138	4.79	0.189	6.09	0.240	7.39	0.291
95	1.41	0.94	0.037	2.29	0.090	3.63	0.143	4.98	0.196	6.33	0.249	7.68	0.302
100	1.34	0.97	0.038	2.37	0.093	3.77	0.148	5.17	0.203	6.57	0.259	7.97	0.314
110	1.22	1.04	0.041	2.53	0.100	4.02	0.158	5.52	0.217	7.01	0.276	8.51	0.335
120	1.11	1.10	0.043	2.68	0.106	4.27	0.168	5.85	0.230	7.43	0.293	9.02	0.355
130	1.03	1.16	0.046	2.83	0.111	4.50	0.177	6.16	0.243	7.83	0.308	9.50	0.374
140	0.95	1.21	0.048	2.96	0.117	4.71	0.185	6.46	0.254	8.21	0.323	9.96	0.392
150	0.89	1.27	0.050	3.09	0.122	4.92	0.194	6.74	0.265	8.57	0.337	10.39	0.409
160	0.84	1.32	0.052	3.21	0.127	5.11	0.201	7.01	0.276	8.90	0.351	10.80	0.425
170	0.79	1.36	0.054	3.33	0.131	5.30	0.208	7.26	0.286	9.23	0.363	11.19	0.441
180	0.74	1.41	0.055	3.44	0.135	5.47	0.215	7.50	0.295	9.53	0.375	11.56	0.455
190	0.70	1.45	0.057	3.55	0.140	5.64	0.222	7.73	0.304	9.83	0.387	11.92	0.469
200	0.67	1.49	0.059	3.65	0.144	5.80	0.228	7.95	0.313	10.10	0.398	12.26	0.483
210	0.64	1.53	0.060	3.74	0.147	5.95	0.234	8.16	0.321	10.37	0.408	12.58	0.495
220	0.61	1.57	0.062	3.83	0.151	6.10	0.240	8.36	0.329	10.62	0.418	12.89	0.507
230	0.58	1.61	0.063	3.92	0.154	6.24	0.246	8.55	0.337	10.87	0.428	13.18	0.519
240	0.56	1.64	0.065	4.01	0.158	6.37	0.251	8.74	0.344	11.10	0.437	13.46	0.530
250	0.53	1.67	0.066	4.09	0.161	6.50	0.256	8.91	0.351	11.32	0.446	13.74	0.541
260	0.51	1.71	0.067	4.16	0.164	6.62	0.261	9.08	0.357	11.54	0.454	14.00	0.551
270	0.50	1.74	0.068	4.24	0.167	6.74	0.265	9.24	0.364	11.74	0.462	14.25	0.561
280	0.48	1.77	0.069	4.31	0.170	6.85	0.270	9.40	0.370	11.94	0.470	14.49	0.570
290	0.46	1.79	0.071	4.38	0.172	6.96	0.274	9.55	0.376	12.13	0.478	14.72	0.579
300	0.45	1.82	0.072	4.44	0.175	7.07	0.278	9.69	0.382	12.31	0.485	14.94	0.588
310	0.43	1.85	0.073	4.51	0.177	7.17	0.282	9.83	0.387	12.49	0.492	15.15	0.597
320	0.42	1.87	0.074	4.57	0.180	7.27	0.286	9.96	0.392	12.66	0.498	15.36	0.605

Consult the listing report on the Directory of Building Products (https://bpdirectory.intertek.com) for the edition of the standard(s) evaluated.

Compliance of the assembly described in this Design Listing with the referenced standard relies on verification that the assembly constructed in the field is consistent with that described herein. Intertek certified products may be verified by the approved Intertek label; other products must be verified by the Authority Having Jurisdiction as meeting the specifications stated herein.

Carboline Global Inc.
Design No. CC/IF 180-02
Column
Thermo-Lag E100 and Thermo-Lag E100 S
ASTM E119
CAN/ULC S101-07
Rating: See Table CC/IF 180-02



1. **SOLID STRUCTURAL STEEL COLUMN:** Use solid steel sections, I-shape or W-shape, having nominal Hp/A, W/D, or A/P section factors based on four-sided exposure. Refer to Table CC/IF 180-02 for specific application thickness of intumescent fireproofing (Item 2A) based on nominal Hp/A, W/D, or A/P section factors.

2. **CERTIFIED MANUFACTURER:** Carboline Global Inc.

CERTIFIED PRODUCT: Fire-Resistive Coating

CERTIFIED MODEL: Thermo-Lag E100 and Thermo-Lag E100 S

Intumescent Fireproofing: Spray or paint on one or more coats according to manufacturer's instructions to required final thickness

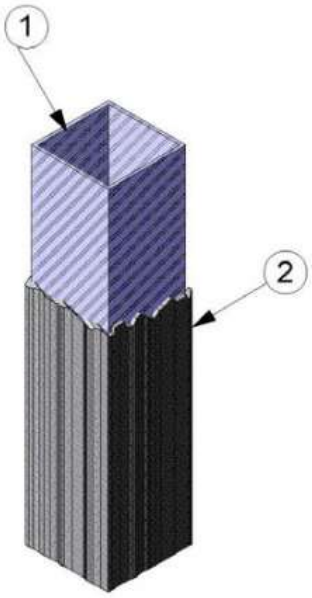
Table CC/IF 180-02											
HP/A	W/D	60 minutes		90 minutes		120 minutes		150 minutes		180 minutes	
1/m	lb/ft/in	mm	in	mm	in	mm	in	mm	in	mm	in
30	4.46	1.0	0.04	2.2	0.09	3.0	0.12	3.0	0.12	3.3	0.13
40	3.34	1.1	0.04	2.4	0.10	3.0	0.12	3.5	0.14	4.2	0.17
50	2.67	1.3	0.05	2.7	0.10	3.3	0.13	4.2	0.17	5.0	0.20
60	2.23	1.5	0.06	2.9	0.11	3.8	0.15	4.8	0.19	5.8	0.23
70	1.91	1.7	0.07	3.1	0.12	4.3	0.17	5.4	0.21	6.5	0.26
75	1.78	1.9	0.07	3.2	0.13	4.5	0.18	5.7	0.22	6.8	0.27
80	1.67	2.0	0.08	3.4	0.13	4.7	0.19	5.9	0.23	7.2	0.28
85	1.57	2.1	0.08	3.5	0.14	4.9	0.19	6.2	0.24	7.5	0.30
90	1.49	2.2	0.08	3.6	0.14	5.1	0.20	6.5	0.26	7.8	0.31
95	1.41	2.2	0.09	3.7	0.15	5.3	0.21	6.7	0.26	8.1	0.32
100	1.34	2.3	0.09	3.8	0.15	5.5	0.22	6.9	0.27	8.4	0.33
110	1.22	2.5	0.10	4.1	0.16	5.9	0.23	7.4	0.29	8.9	0.35
120	1.11	2.7	0.11	4.3	0.17	6.2	0.24	7.8	0.31	9.4	0.37
130	1.03	2.9	0.11	4.6	0.18	6.5	0.26	8.2	0.32	9.9	0.39
140	0.95	3.0	0.12	4.8	0.19	6.8	0.27	8.6	0.34	10.3	0.41
150	0.89	3.2	0.13	5.0	0.20	7.1	0.28	8.9	0.35	10.7	0.42
160	0.84	3.4	0.13	5.3	0.21	7.3	0.29	9.2	0.36	11.2	0.44
170	0.79	3.7	0.15	5.6	0.22	7.4	0.29	9.5	0.37	11.6	0.46
180	0.74	3.9	0.15	5.8	0.23	7.7	0.30	9.8	0.39	12.0	0.47
190	0.7	4.0	0.16	6.0	0.24	8.0	0.31	10.1	0.40	12.3	0.48
200	0.67	4.1	0.16	6.2	0.24	8.2	0.32	10.4	0.41	12.7	0.50
210	0.64	4.2	0.17	6.3	0.25	8.5	0.33	10.6	0.42	13.0	0.51
220	0.61	4.3	0.17	6.5	0.26	8.7	0.34	10.9	0.43	13.4	0.53
230	0.58	4.5	0.18	6.7	0.26	8.9	0.35	11.1	0.44	13.7	0.54
240	0.56	4.6	0.18	6.9	0.27	9.1	0.36	11.4	0.45	14.0	0.55
250	0.53	4.7	0.19	7.0	0.28	9.3	0.37	11.7	0.46	14.3	0.56
260	0.51	4.8	0.19	7.2	0.28	9.5	0.37	11.9	0.47	14.6	0.57
270	0.5	4.9	0.19	7.3	0.29	9.7	0.38	12.2	0.48	14.9	0.59
280	0.48	5.0	0.20	7.4	0.29	9.9	0.39	12.4	0.49	15.1	0.59
290	0.46	5.0	0.20	7.6	0.30	10.1	0.40	12.6	0.50	15.1	0.59
300	0.45	5.1	0.20	7.7	0.30	10.3	0.41	12.8	0.50	15.4	0.61
302	0.44	5.2	0.20	7.7	0.30	10.3	0.41	12.9	0.51	15.5	0.61

Note: A/P = W/D x 144/490

Consult the listing report on the Directory of Building Products (https://bpdirectory.intertek.com) for the edition of the standard(s) evaluated.

Compliance of the assembly described in this Design Listing with the referenced standard relies on verification that the assembly constructed in the field is consistent with that described herein. Intertek certified products may be verified by the approved Intertek label; other products must be verified by the Authority Having Jurisdiction as meeting the specifications stated herein.

Carboline Global Inc.
Design No. CC/IF 180-03
Column
Thermo-Lag E100 and Thermo-Lag E100 S
ASTM E119
CAN/ULC S101
Rating: See Table CC/IF 180-03



1. **HOLLOW STRUCTURAL STEEL COLUMN:** Use hollow steel sections, rectangular-shape (shown) or circular-shape (not shown), having nominal Hp/A or W/D, or A/P section factors based on four-sided exposure. Refer to Table CC/IF 180-03 for specific application thickness of intumescent mastic fireproofing (Item 2) based on nominal Hp/A, W/D, or A/P section factors.

2. **CERTIFIED MANUFACTURER:** Carboline Global Inc.

CERTIFIED PRODUCT: Fire-Resistive Coating

CERTIFIED MODEL: Thermo-Lag E100 and Thermo-Lag E100 S

Intumescent Fireproofing: Spray or paint in one or more coats according to manufacturer's instructions to required final thickness.

Table CC/IF 180-03											
HP/A	W/D	60 minutes		90 minutes		120 minutes		150 minutes		180 minutes	
1/m	lb/ft/in	mm	in	mm	in	mm	in	mm	in	mm	in
22	6.08	0.6	0.02	1.5	0.06	2.4	0.09	3.3	0.13	4.3	0.17
25	5.35	0.7	0.03	1.7	0.07	2.7	0.11	3.7	0.15	4.8	0.19
30	4.46	0.9	0.04	2.0	0.08	3.2	0.13	4.3	0.17	5.6	0.22
35	3.82	1.1	0.04	2.4	0.09	3.5	0.14	4.9	0.19	6.4	0.25
40	3.34	1.3	0.05	2.7	0.11	3.9	0.15	5.5	0.22	7.1	0.28
45	2.97	1.4	0.05	2.9	0.11	4.2	0.17	6.0	0.24	7.8	0.31
50	2.67	1.5	0.06	3.0	0.12	4.6	0.18	6.5	0.26	8.5	0.33
55	2.43	1.6	0.06	3.1	0.12	5.0	0.20	7.0	0.28	9.1	0.36
60	2.23	1.7	0.07	3.2	0.13	5.3	0.21	7.5	0.30	9.7	0.38
65	2.06	1.8	0.07	3.2	0.13	5.6	0.22	8.0	0.31	10.3	0.41
70	1.91	1.9	0.07	3.4	0.13	5.9	0.23	8.4	0.33	10.9	0.43
75	1.78	2.0	0.08	3.6	0.14	6.2	0.24	8.8	0.35	11.4	0.45
80	1.67	2.1	0.08	3.8	0.15	6.5	0.26	9.2	0.36	11.9	0.47
85	1.57	2.1	0.08	3.9	0.15	6.8	0.27	9.6	0.38	12.4	0.49
90	1.49	2.2	0.09	4.1	0.16	7.0	0.28	9.9	0.39	12.9	0.51
95	1.41	2.2	0.09	4.2	0.17	7.3	0.29	10.3	0.41	13.3	0.52
100	1.34	2.2	0.09	4.4	0.17	7.5	0.30	10.6	0.42	13.8	0.54
110	1.22	2.3	0.09	4.6	0.18	8.0	0.31	11.3	0.44	14.6	0.57
120	1.11	2.4	0.10	4.9	0.19	8.4	0.33	11.9	0.47	15.4	0.61
130	1.03	2.5	0.10	5.1	0.20	8.8	0.35	12.4	0.49	16.1	0.63
140	0.95	2.6	0.10	5.3	0.21	9.2	0.36	13.0	0.51	16.8	0.66
150	0.89	2.7	0.11	5.5	0.22	9.5	0.37	13.5	0.53	17.4	0.69
160	0.84	2.8	0.11	5.7	0.22	9.8	0.39	13.9	0.55	18.0	0.71
170	0.79	2.9	0.11	5.9	0.23	10.1	0.40	14.4	0.57	18.6	0.73
180	0,74	2.9	0.12	6.1	0.24	10.4	0.41	14.8	0.58	19.1	0.75
190	0.70	3.0	0.12	6.2	0.24	10.7	0.42	15.2	0.60	19.6	0.77
200	0.67	3.1	0.12	6.4	0.25	10.9	0.43	15.5	0.61		
210	0.64	3.2	0.13	6.5	0.26	11.2	0.44	15.9	0.63		

Note: A/P = W/D x 144/490

Consult the listing report on the Directory of Building Products (https://bpdirectory.intertek.com) for the edition of the standard(s) evaluated.

Compliance of the assembly described in this Design Listing with the referenced standard relies on verification that the assembly constructed in the field is consistent with that described herein. Intertek certified products may be verified by the approved Intertek label; other products must be verified by the Authority Having Jurisdiction as meeting the specifications stated herein.

COMPLIANCE TESTED by berkeley analytical

VOC Emission Test Certificate

Product Name: Thermo-Lag E100

Product Sample Information		**Certificate Information**	
Manufacturer:	Carboline	Certificate No:	170120-02
Manf. Website:	www.carboline.com	Certified By:	Raja S. Tannous, Laboratory Director
CSI Category & No.:	Fireproofing (Division 7)		
Date Produced:	12/29/2016	Date:	January 20, 2017

Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 (Emission testing method for CA Specification 01350)

Acceptance Criteria and Results Demonstrating Compliance of Product Sample to Referenced Standard:

Exposure Scenario[1]	**Individual VOCs of Concern**[2]		**Formaldehyde**[3]		**TVOC**[4]
	Criterion	**Compliant?**	**Criterion**	**Compliant?**	**Range**
School Classroom	≤½ Chronic REL	YES	≤9.0 µg/m^3	YES	≤ 5.0 mg/m^3
Private Office	≤½ Chronic REL	YES	≤9.0 µg/m^3	YES	≤ 5.0 mg/m^3

Product Coverage[5]**:** Not applicable

1. Exposure scenarios & product quantities for classroom & office are defined in Tables 4-2 – 4-5 (CDPH Std. Mtd. V1.1-2010)
2. Maximum allowable concentrations of individual target VOCs are specified in Table 4-1 (*ibid.*)
3. Maximum allowable formaldehyde concentration is ≤9 µg/m^3, effective Jan 1, 2012; previous limit was ≤16.5 µg/m^3 (ibid.)
4. Informative only; predicted TVOC Range in three categories, i.e., ≤0.5 mg/m^3, >0.5 – 4.9 mg/m^3, and ≥5.0 mg/m^3
5. Informative and applicable only to tests of wet-applied products; grams of sample applied per square meter of substrate

Standards & Codes Recognizing CDPH Standard Method V1.1 (partial list)

- ANSI/ASHRAE/USGBC/IES Standard 189.1-2011
- USGBC LEED for Schools, 2009
- Collaborative for High Performance Schools (CHPS), National Core Criteria, 2013
- USGBC LEED Version 4, BD&C, ID&C, 2013
- ANSI/GBI 01-2010, Green Building Assessment Protocol

Narrative: Carboline selected a sample representative of its Thermo-Lag E100 - product and submitted it on 12/30/2016 for testing. Berkeley Analytical measured and evaluated the emissions of VOCs from this sample following CDPH/EHLB/Standard Method V1.1-2010. The results of the test are presented in Berkeley Analytical report, 904-001-02A-Jan1917.

Berkeley Analytical is an independent, third-party laboratory specializing in the analysis of organic chemicals emitted by and contained in building products, finishes, furniture, and consumer products. We are an ISO/IEC 17025 accredited laboratory (IAS, TL-383); all standards used in performing this test are in Berkeley Analytical's scope of accreditation.

LEED® v4 Technical Bulletin
Building Design + Construction

Background
This document outlines Carboline's contributions towards available LEED v4 credits. Carboline is committed to developing and manufacturing environmentally compliant coatings and fire protection products. Carboline fireproofing products can contribute towards points under the LEED Green Building Rating System. The LEED Green Building Rating System does not certify construction products and materials. Instead, entire projects are certified on the basis of the environmental impact of the building materials employed and the overall building design.

What is LEED?
Leadership in Energy and Environmental Design (LEED) is the most widely used green building rating system in the world. LEED was developed by the United States Green Building Council (USGBC) to evaluate the environmental performance of buildings and promote sustainable design methods. LEED certification provides independent verification of environmental features which allow for efficient, high performance, cost-effective building design and construction. There are four levels of certification that can be reached for LEED v4 which are awarded based on achieving a minimum number of points (Certified, Silver, Gold and Platinum).

Carboline products can contribute toward the following LEED v4 credit categories:

Energy & Atmosphere
- ✓ EA Prerequisite – Minimum Energy Performance
- ✓ EA Credit – Optimize Energy Performance

Materials and Resources
Materials and Resources
- ✓ MR Prerequisite: Construction and Demolition Waste Management Planning
- ✓ MR Credit: Building Life Cycle Impact Reduction
- ✓ MR Credit: Building Product Disclosure and Optimization – Sourcing of Raw Materials
- ✓ MR Credit: Building Product Disclosure and Optimization – Material Ingredients

Indoor Environmental Quality
- ✓ EQ Credit: Low-Emitting Materials

Energy and Atmosphere

EA Prerequisite: Minimum Energy Performance

Intent: To reduce the environmental and economic harm of excessive energy use by achieving a minimum level of energy efficiency for the building and its systems.

Requirements: Follow the criteria in the LEED New Construction Energy Design Guide as specified in LEED v4 (page 66).

Carboline Contributions: Carboline wet mix materials provide thermal resistance and noise reduction coefficient values. This will reduce the amount of energy needed for climate control and any added materials needed for soundproofing. This credit only applies to Carboline materials when used within the building envelope.

Carboline Products That Contribute: Pyrolite® 15, Pyrolite® 22, Southwest™ Type 5GP, Southwest™ Type 5MD, Southwest™ Type 5EF, Southwest™ Type 1XR, Southwest™ Type 7GP, Southwest™ Type 7HD, Southwest™ Type 7TB, Southwest™ Type DK 3 Spattercoat, Pyrocrete® 239, Pyrocrete® 40, Pyrocrete® 240 HY, Pyrocrete® 241, Pyrocrete® 241 HD, Hardcoat 4500

EA Credit: Optimize Energy Performance (1-18 points)

Note: This credit requires that an energy analysis be done that includes all energy costs within and associated with the building project. Points for this credit are assigned from 1-18 based on the percentage of energy cost savings the building materials or systems will provide.

Intent: Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

Requirements: Follow the criteria in EA Prerequisite Minimum Energy Performance to demonstrate a percentage improvement in the proposed building performance rating compared with the baseline. Points are awarded according to Table 1 in LEED v4 (page 75). Demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building.

Carboline Contributions: Carboline wet mix materials provide thermal resistance and noise reduction coefficient values. This will reduce the amount of energy needed for climate control and reduce any added materials needed for soundproofing. This credit only applies to Carboline materials when used within the building envelope.

Carboline Products That Contribute: Pyrolite® 15, Pyrolite® 22, Southwest™ Type 5GP, Southwest™ Type 5MD, Southwest™ Type 5EF, Southwest™ Type 1XR, Southwest™ Type 7GP, Southwest™ Type 7HD, Southwest™ Type 7TB, Southwest™ Type DK 3 Spattercoat, Pyrocrete® 239, Pyrocrete® 40, Pyrocrete® 240 HY, Pyrocrete® 241, Pyrocrete® 241 HD, Hardcoat 4500

Materials and Resources

MR Prerequisite: Construction and Demolition Waste Management Planning

Intent: To reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials.

Requirements:
Option 1 (page 106) Diversion (1–2 points)
Path1: Divert 50% and Three Material Streams (1 point)
Divert at least 50% of the total construction and demolition material; diverted materials must include at least three material streams.

OR

Path 2: Divert 75% and Four Material Streams (2 points)
Divert at least 75% of the total construction and demolition material; diverted materials must include at least four material streams. The minimum percentage debris to be recycled or salvaged for each point threshold is as follows: 50%: 1 point, 75%: 2 points

Carboline Contributions: Carboline products are supplied in paper bags, plastic pails or metal pails which can be recycled. The pallets used for shipment are also recyclable.

Carboline Products That Contribute: Pyrolite® 15, Pyrolite® 22, Southwest™ Type 5GP, Southwest™ Type 5MD, Southwest™ Type 5EF, Southwest™ Type 1XR, Southwest™ Type 7GP, Southwest™ Type 7HD, Southwest™ Type 7TB, Southwest™ Type DK 3 Spattercoat, A/D Type TC-55, Pyroprime® 775 WB, Pyrocrete® 239, Pyrocrete® 40, Pyrocrete® 240 HY, Pyrocrete® 241, Pyrocrete® 241 HD, Hardcoat 4500, A/D Firefilm® III, A/D Firefilm® III C, Firefilm® IV, Thermo-Sorb®, Thermo-Sorb® VOC, Thermo-Sorb® E, Thermo-Sorb® 263, Thermo-Lag® 3000, Thermo-Lag® E100, Thermo-Lag® E100 S

MR Credit: Building Life-Cycle Impact Reduction (2-5 points)

Intent: To encourage adaptive reuse and optimize the environmental performance of products and materials.

Requirements: Reuse or salvage building materials from offsite or onsite as a percentage of the surface area as listed in Table 1 (page 91). Include structural elements (e.g., floors, roof decking), enclosure materials (e.g., skin, framing), and permanently installed interior elements (e.g., walls, doors, floor coverings, ceiling systems). Exclude from the calculation window assemblies and any hazardous materials that are remediated as a part of the project.

Materials contributing toward this credit may not contribute toward MR Credit Material Disclosure and Optimization.

Percentage of completed project surface area reused	Points BD&C	Points BD&C (Core and Shell)
25%	2	2
50%	3	3
75%	4	5

Carboline Contributions: Carboline wet mix and intumescent materials are utilized for retrofit and rehab construction. These materials provide fire resistance ratings to unprotected structural members which will bring the existing building up to code. This will eliminate the need to replace the structural elements that were not code compliant.

Carboline Products That Contribute: Pyrolite® 15, Pyrolite® 22, Southwest™ Type 5GP, Southwest™ Type 5MD, Southwest™ Type 5EF, Southwest™ Type 1 XR, Southwest™ Type 7GP, Southwest™ Type 7HD, Southwest™ Type 7TB, Southwest™ Type DK3 Spattercoat, A/D Type TC-55, Pyroprime® 775 WB, Pyrocrete® 239, Pyrocrete® 40, Pyrocrete® 240 HY, Pyrocrete® 241, Pyrocrete® 241 HD, Hardcoat 4500, A/D Firefilm® III, A/D Firefilm® III C, Firefilm® IV, Thermo-Sorb®, Thermo-Sorb® VOC, Thermo-Sorb® E, Thermo-Sorb® 263, Thermo-Lag® 3000, Thermo-Lag® E100, Thermo-Lag® E100 S

MR Credit: Building Product Disclosure and Optimization-Sourcing of Raw Materials (1-2 points)

Intent: To encourage the use of products and materials for which life cycle information is available and that have environmentally, economically, and socially preferable life cycle impacts. To reward project teams for selecting products verified to have been extracted or sourced in a responsible manner.

Requirements:
Option 1 (page 95) Raw Material Source and Extraction Reporting (1 point)
Use at least 20 different permanently installed products from at least five different manufacturers that have publicly released a report from their raw material suppliers which include raw material supplier extraction locations, a commitment to long-term ecologically responsible land use, a commitment to reducing environmental harms from extraction and/or manufacturing processes, and a commitment to meeting applicable standards or programs voluntarily that address responsible sourcing criteria

Carboline Contributions: Carboline has publicly released reports from their raw material suppliers which include raw material supplier extraction locations for our wet mix and intumescent materials fire resistive materials.

Carboline Products That Contribute: Pyrolite® 15, Pyrolite® 22, Southwest™ Type 5GP, Southwest™ Type 5MD, Southwest™ Type 5EF, Southwest™ Type 1XR, Southwest™ Type 7GP, Southwest™ Type 7HD, Southwest™ Type 7TB, Southwest™ Type DK 3 Spattercoat, A/D Type TC-55, A/D Firefilm® III, A/D Firefilm® III C, Firefilm® IV, Thermo-Sorb®, Thermo-Sorb® VOC, Thermo-Sorb® E, Thermo-Sorb® 263, Thermo-Lag® 3000, Thermo-Lag® E100, Thermo-Lag® E100 S

Option 2 (page 95). Leadership Extraction Practices (1 point)
Use products that meet at least one of the responsible extraction criteria below for at least 25%, by cost, of the total value of permanently installed building products in the project.

Recycled content: Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost. Products meeting recycled content criteria are valued at 100% of their cost for the purposes of credit achievement calculation.

Carboline Contributions: Carboline wet-mix products are manufactured with post-consumer recycled materials.

Carboline Products That Contribute: Southwest™ Type 5GP (10% recycled content), Southwest™ Type 5MD (10% recycled content), Southwest™ Type 5EF (10% recycled content).

MR Credit: Building Product Disclosure and Optimization-Material Ingredients (1-2 points)

Intent: To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. To reward raw material manufacturers who produce products verified to have improved life-cycle impacts.

Requirements:
Option 1 (Page 97) Material Ingredient Reporting (1 point)
Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following programs to demonstrate the chemical inventory of the product.

Carboline Contributions: Carboline wet mix and intumescent products have complete Declare Health Product Declaration: The end use product has a published, complete Health Product Declaration with full disclosure of known hazards in compliance with the Health Product Declaration open standard.

Carboline Products That Contribute: Southwest™ Type 5GP, Southwest™ Type 5MD, Southwest™ Type 7GP, Southwest™ Type 7HD, Southwest™ Type 7TB, Southwest™ Type DK 3 Spattercoat, A/D Type TC-55, Pyrocrete® 239, Pyrocrete® 40, Pyrocrete® 241, A/D Firefilm® III, A/D Firefilm® III C, Firefilm® IV, Thermo-Sorb® VOC, Thermo-Sorb® E, Thermo-Sorb® 263, Thermo-Lag® 3000, Thermo-Lag® E100, Thermo-Lag® E100 S

MR Credit: Construction and Demolition Waste Management (1-2 points)

Intent: To reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials.

Requirements:
Option 1 (page 106) Diversion (1–2 points)
Path 1: Divert 50% and Three Material Streams (1 point)
Divert at least 50% of the total construction and demolition material; diverted materials must include at least three material streams.

OR

Path 2: Divert 75% and Four Material Streams (2 points)
Divert at least 75% of the total construction and demolition material; diverted materials must include at least four material streams. The minimum percentage debris to be recycled or salvaged for each point threshold is as follows: 50%: 1 point, 75%: 2 points

Carboline Contributions: Carboline products are supplied in paper bags, plastic pails or metal pails which can be recycled. The pallets used for shipment are also recyclable.

Carboline Products That Contribute: Pyrolite® 15, Pyrolite® 22, Southwest™ Type 5GP, Southwest™ Type 5MD, Southwest™ Type 5EF, Southwest™ Type 1XR, Southwest™ Type 7GP, Southwest™ Type 7HD, Southwest™ Type 7TB, Southwest™ Type DK 3 Spattercoat, A/D Type TC-55, Pyroprime® 775 WB, Pyrocrete® 239, Pyrocrete® 40, Pyrocrete® 240 HY, Pyrocrete® 241, Pyrocrete® 241 HD, Hardcoat 4500, A/D Firefilm® III, A/D Firefilm® III C, Firefilm® IV, Thermo-Sorb®, Thermo-Sorb® VOC, Thermo-Sorb® E, Thermo-Sorb® 263, Thermo-Lag® 3000, Thermo-Lag® E100, Thermo-Lag® E100 S

Indoor Environmental Quality

EQ Credit: Low Emitting Materials (1-3 points)

Intent: To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

Requirements: This credit includes requirements for product manufacturing as well as project teams. It covers volatile organic compound (VOC) emissions in the indoor air and the VOC content of materials as well as the testing methods by which indoor VOC emissions are determined. Different materials must meet different requirements to be considered compliant for this credit. The building interior and exterior are organized in seven categories, each with different thresholds of compliance. The building interior is defined as everything within the waterproofing membrane. The building exterior is defined as everything outside and inclusive of the primary and secondary weatherproofing system such as waterproofing membranes and air- and water-resistive barrier materials.

Option 1 (Page 118) Product Category Calculations (1-3 points)

Achieve the threshold level of compliance with emissions and content standards for the number of product categories listed in Table 2 (page 118).

Category	Threshold	Emission & Content Requirements
Interior paints and coatings applied onsite	At least 90% by volume for emissions, 100% for VOC content	• General Emissions Evaluation for paints and coatings applied to walls, floors and ceilings • VOC content requirements for wet applied products
Interior adhesives and sealants applied onsite	At least 90% by volume, for emissions 100% for VOC content	• General Emissions Evaluation • VOC content requirements for wet applied products
Ceilings, walls, thermal and acoustic insulation	100%	• General Emissions Evaluation • Healthcare, schools only
Healthcare and schools projects only: Exterior applied products	At least 90% by volume	• General Emissions Evaluation • Exterior applied products

Emissions and Content Requirements

To demonstrate compliance, a product or layer must meet all of the following requirements, as applicable.

Inherently non-emitting sources: Products that are inherently non-emitting sources of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) are considered fully compliant without any VOC emissions testing if they do not include integral organic-based surface coatings, binders, or sealants.

General emissions evaluation: Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario. The default scenario is the private office scenario. The manufacturer's or third-party certification must state the exposure scenario used to determine compliance. Claims of compliance for wet-applied products must state the amount applied in mass per surface area.

Manufacturers' claims of compliance with the above requirements must also state the range of total VOCs after 14 days (336 hours), measured as specified in the CDPH Standard Method v1.1:

- 0.5 mg/m3 or less;
- between 0.5 and 5.0 mg/m3; or
- 5.0 mg/m3 or more.

Additional VOC content requirements for wet-applied products: In addition to meeting the general requirements for VOC emissions (above), on-site wet-applied products must not contain excessive levels of VOCs, for the health of the installers and other trade workers who are exposed to these products. To demonstrate compliance, a product or layer must meet the following requirements, as applicable. Disclosure of VOC content must be made by the manufacturer. Any testing must follow the test method specified in the applicable regulation.

- All paints and coatings wet-applied on site must meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
- All adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005, Adhesive and Sealant Applications as analyzed by the methods specified in Rule 1168. The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.
- For projects outside the U.S., all paints, coatings, adhesives, and sealants wet-applied on site must either meet the technical requirements of the above regulations or comply with applicable national VOC control regulations such as the European Decopaint Directive (2004/42/EC), the Canadian VOC Concentration Limits for Architectural Coatings, or the Hong Kong Air Pollution Control (VOC) Regulation.

As there is no fireproofing category in the LEED v4, the SCAQMD regulations are commonly used to designate specialty coatings classifications for LEED applications. The SCAQMD (Rule #1113) outlines the current VOC limits as of January 1, 2014 for several categories of specialty coatings as follows:

Specialty Coating Type	Current VOC Limit (g/l)
Concrete surface retarders	50
Driveway Sealers	50
Faux finishing coatings	200
Fireproofing coatings	**150**
Graphic art coatings	150
Mastic coatings	100
Metallic pigmented coatings	150
Anti-graffiti coatings	50

The following Carboline products meet current VOC requirements:

Carboline Compliant Fireproofing Products	VOC Limit (EPA Method 24) (g/l)
A/D Firefilm® III	20 g/l
A/D Firefilm® III C	20 g/l
Firefilm® IV	4 g/l
Thermo-Sorb® VOC	142 g/l
Thermo-Sorb® E	147 g/l
Thermo-Sorb® 263	148 g/l
Thermo-Lag® E100	13 g/l
Thermo-Lag® E100 S	64 g/l
Thermo-Lag® 3000 A	13 g/l
Thermo-Lag® 3000 SA	64 g/l
A/D Type TC-55	0 g/l
Pyroprime® 775 WB	81 g/l
Southwest™ Series	0 g/l
Pyrolite® Series	0 g/l
Pyrocrete® Series	0 g/l

Carboline Contributions: Carboline has wet mix and intumescent materials that meet the required VOC limits and VOC emissions requirements for this credit.

Carboline Products That Contribute: Pyrolite® 15, Pyrolite® 22, Southwest™ Type 5GP, Southwest™ Type 5MD, Southwest™ Type 5EF, Southwest™ Type 1XR, Southwest™ Type 7GP, Southwest™ Type 7HD, Southwest™ Type 7TB, Southwest™ Type DK 3 Spattercoat, A/D Type TC-55, Pyroprime® 775 WB, Pyrocrete® 239, Pyrocrete® 40, Pyrocrete® 240 HY, Pyrocrete® 241, Pyrocrete® 241 HD, Hardcoat 4500, A/D Firefilm® III, A/D Firefilm® III C, Firefilm® IV, Thermo-Sorb® VOC, Thermo-Sorb® E, Thermo-Sorb® 263, Thermo-Lag® 3000, Thermo-Lag® E100, Thermo-Lag® E100 S

Manufacturing Locations

Products manufactured in Louisa, VA:
Pyrolite® 15, Pyrolite® 22, Southwest™ Type 5GP, Southwest™ Type 5MD, Southwest™ Type 5EF, Southwest™ Type 1XR, Southwest™ Type 7GP, Southwest™ Type 7HD, Southwest™ Type 7TB, Southwest™ Type DK 3 Spattercoat, Pyrocrete® 239, Pyrocrete® 40, Pyrocrete® 240 HY, Pyrocrete® 241, Pyrocrete® 241 HD, Hardcoat 4500

Products manufactured in Green Bay, WI:
Pyroprime® 775, Thermo-Sorb® E, Thermo-Sorb® 263,

Products manufactured in Dayton, NV:
Thermo-Sorb®, Thermo-Sorb® VOC, Thermo-Sorb® E, Thermo-Sorb® 263, Thermo-Lag® 3000, Thermo-Lag® E100, Thermo-Lag® E100 S

Products manufactured in Lake Charles, LA:
A/D Firefilm® III, A/D Firefilm® III C, Firefilm® IV, A/D Type TC-55, Thermo-Sorb®, Thermo-Sorb® VOC, Thermo-Sorb® E, Thermo-Sorb® 263, Thermo-Lag® 3000, Thermo-Lag® E100, Thermo-Lag® E100 S

Raw Material Extraction Locations

NOTE: For raw material extraction locations and distance to manufacturing plants, please contact your local Carboline technical sales representative or Carboline fireproofing technical service.

Thermo-Lag Series
Thermo-Lag E100, E100 S, 3000-P & 3000-SP

Intended for exterior/interior use, Carboline's Thermo-Lag product line, consisting of epoxy based intumescents, were designed for high durability, fast application and permanent exposure to exterior environments and where the highest level of physical performance is required. Materials can be applied both onsite & offsite for improved project scheduling. These products have been subjected to a myriad of destructive exposures to simulate real-world performance in commercial/residential & industrial/petrochemical environments.

Performance dashboard

Features & functionality

Unmatched flexibility, resistance to handling damage and cold weather cracking

Ideal for off-site application, fast cure, high build

Easy 1:1 mixing ratio

Visit Carboline for more product information

Thermo-Lag E100
Thermo-Lag E100 S
Thermo-Lag 3000-P
Thermo-Lag 3000-SP

Environment & materials

Improved by:

Certified to UL 263 / ASTM E119 / NFPA 251 for commercial and light industrial fire protection in exterior environments (Thermo-Lag E100 Series)

Certified to UL 1709, UL 2431, NORSOK M-501, and more for hydrocarbon fires in refineries, power plants, LNG facilities, etc. (Thermo-Lag 3000 Series)

Certifications & rating systems:

Environmental Product Declaration (EPD)

ASTM E84 - UL 723 - Class A

SCAQMD Rule 1113 Compliant

Tested to meet (CDPH) Standard Method v1.2

MasterFormat® 07 81 23

Thermo-Lag Series Guide Specs
For spec help, contact us or call 281.414.9710

See LCA, interpretation & rating systems

SM Transparency Report (EPD)™

VERIFICATION	LCA
3rd-party reviewed	✓
Transparency Report (EPD)	
3rd-party verified	✓

Validity: 20230213 – 20280212

Decl #: CAR-20230213-003

This environmental product declaration (EPD) was externally verified, according to NSF PCR for Architectural Coatings, and ISO 14025:2006, by Jack Geibig, President, Ecoform.

Ecoform, LLC
11903 Black Road,
Knoxville, TN 37932
www.ecoform.com

(865) 850-1883

SUMMARY

Reference PCR

NSF PCR for Architectural Coatings: NAICS 325510, 2022

Regions; system boundaries
North America; Cradle to grave

Functional unit / reference service life:
1 m^2 of covered and protected substrate; 60 years

LCIA methodology: TRACI 2.1

LCA software; LCI database
SimaPro Developer 9.4
EcoInvent 3.8, US-EI 2.2, and ELCD databases.

LCA conducted by: Sustainable Minds

Public LCA:
Life Cycle Assessment of Carboline Intumescent Fire-Resistive Materials

Carboline Global Inc.
2150 Schuetz Rd.
St. Louis, MO 63146
https://www.carboline.com/
314-644-1000

Contact us

LCA results & interpretation

Thermo-Lag Series

Life cycle assessment

Scope and summary

○ Cradle to gate ○ Cradle to gate with options ✓ Cradle to grave

Product description
Carboline's Thermo-Lag series includes four products: Thermo-Lag E100, Thermo-Lag E100-S, Thermo-Lag 3000, and Thermo-Lag 3000-SP. Thermo-Lag products are two-component epoxy-based thin-film, intumescent coating products for structural steel. They allow the designer to express the structure as an artform in buildings where fire resistance ratings are required. In a fire, they soften and expand to form thick meringue-like layers, which insulate the structure and protect the steel from fire.

Functional unit
The functional unit is **one square meter** of covered and protected substrate for a period of 60 years (the assumed average lifetime of a building).

Application and maintenance: Since Thermo-Lag products fall under the primer designation and are applied to interior architecture, a 5-year market-based lifetime was adopted in the LCA models. One initial coating application and 11 recoats are required because the average life span of a building is assumed to be 60 years. The preferred waste management option for leftover paint is 100% incinerated.

Colorant: Colorants are not added to the fireproofing coatings themselves, neither at the point of sale nor at the point of application as defined in the application manuals and are therefore not included in the scope of this study.

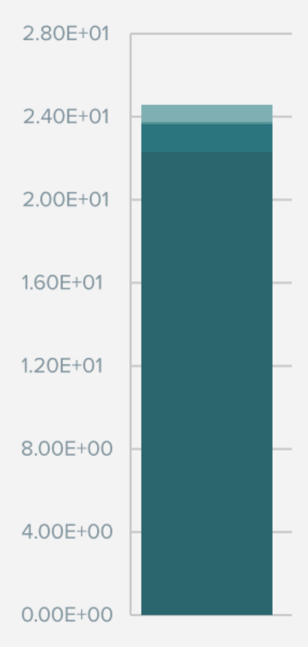
Manufacturing data
Time coverage: The data covers annual manufacturing data for the 2021 calendar year from Carboline's manufacturing plant in Dayton, Nevada. This period of time was chosen in order to capture a representative picture of businesses activities at Carboline.

Geographical coverage: The geographical coverage for this study is based on United States system boundaries for all processes and products.

Material composition greater than 1% by weight

MATERIAL	AVG % WT.
Acid catalyst	20-30%
Curing agent	20-30%
Resin	10-20%
Spumific	10-20%
Resin	10-20%
Carbon donor	5-10%
Additives	10-20%

Total impacts by life cycle stages [mPts/per func unit]



LIFE CYCLE STAGE	MPTS/FUNC. UNIT
Product stage	2.24E+01
Design and construction	1.25E+00
Use and maintenance	9.91E-02
End of life	8.60E-01

A variation of 10 to 20% | A variation greater than 20%

What's causing the greatest impacts

All life cycle stages
The product stage (Stage 1) accounts for the highest contribution to impacts, primarily because of the impacts associated with raw material manufacturing. The design and construction stage (Stage 2) is the next highest contributor for all impact categories except for global warming, smog, eutrophication, and carcinogenics. The use and maintenance stage (Stage 3) accounts for a minimum contribution to almost all impact categories due to the low energy required for spray application.

Product stage
The raw material manufacturing phase (1-1) is the largest contributor to all impact categories. This holds true for the LCA results of each of Carboline's Thermo-Lag products. Raw material manufacturing accounts for over 50% of the impact in each category for most of the products. Thermo-Lag 3000-SP is the only exception; however, raw material manufacturing still contributes ~45% to smog and ~48% to ecotoxicity impact categories.

Design and construction
The design and construction stage (Stage 2) is the next highest contributor to most of the impact categories, including ozone depletion, acidification, non carcinogenics, respiratory effects, ecotoxicity, and fossil fuel depletion. For the Thermo-Lag series, stage 2 contributes over 20% to total ozone depletion. The contributions to transportation are caused by the use of truck and trailer transportation.

Use and maintenance
It's worth noting that the VOC emissions released in the drying phase (phase 3-2) affect the variability in potential smog formation impacts. According to the product data sheets, Thermo-Lag E 100-S and Thermo-Lag 3000-SP release more VOCs during the drying process than the other two products. This results in phase 3-2 having a greater contribution to smog formation (over 30%) for Thermo-Lag E 100-S and Thermo-Lag 3000-SP.

End of life
For the Thermo-Lag series, the second highest impact to the global warming, eutrophication, and carcinogenics categories comes from the end-of-life stage (Stage 4).

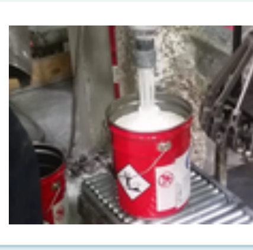
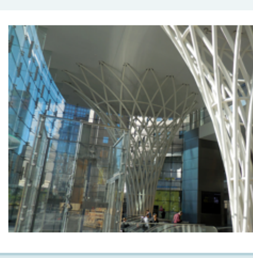
Sensitivity analysis
A sensitivity analysis was performed to check the robustness of the results when the mass of specified raw materials was changed by +/-20%. These raw materials were chosen based on a combination of relatively higher contribution to the results.

Global warming potential was evaluated for sensitivity since Carboline is interested in the potential CO2-equivalent emissions of its products. The resulting variation in the total life cycle impacts is less than 10%, implying that the system is not sensitive to this assumed value.

Carboline is committed to finding new and efficient alternatives in manufacturing, raw material sourcing, and logistics to improve sustainability efforts. One of Carboline's most impactful contributions is the creation of the SLOB Program (slow moving and obsolete inventory). To reduce hazardous waste generation, the SLOB Program was designed to provide optics to Carboline's Inventory Analytics Team to review inventory close to expiration. Preventative measures are taken to rework inventory or sell this material at a discounted rate, with the ultimate goal of preventing little to zero waste of unused material. As an RPM company, Carboline is dedicated to working towards reaching the goals that have been set through RPM's Building a Better World Program. These goals include reducing energy consumption, landfill contributions, and water reuse/conservation opportunities.

See how we make it greener

LCA results

LIFE CYCLE STAGE	STAGE 1 PRODUCT STAGE	STAGE 2 DESIGN AND CONSTRUCTION	STAGE 3 USE AND MAINTENANCE	STAGE 4 END OF LIFE
Information modules: Included (X) | Excluded* (MND)	1-1 Raw material manufacturing	2-1 Transportation to distribution center	3-1 Coating application	4-1 Transportation to disposal site
No stages are excluded	1-2 Transportation of raw materials to plants	2-2 Transportation to point of sale	3-2 Emissions from drying	4-2 End-of-life management
	1-3 Coating manufacturing	2-3 Transportation to application site	3-3 Necessary maintenance and repaints	
				

SM Single Score

Learn about SM Single Score results

Impacts of the coating used for covering 1 square meter of substrate	2.24E+01 mPts	1.25E+00 mPts	9.91E-02 mPts	8.60E-01 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage	Energy used for raw material extraction (electricity and fuels).	Trucks and trailer transportation (fuel consumption).	Energy and electricity consumed for coating application and recoats.	Incineration of the waste coating.

Thermo-Lag E100: TRACI v2.1 results per functional unit

LIFE CYCLE STAGE		STAGE 1 PRODUCT STAGE	STAGE 2 DESIGN AND CONSTRUCTION	STAGE 3 USE AND MAINTENANCE	STAGE 4 END OF LIFE
Ecological damage					
Impact category	Unit				
Acidification	kg SO_2 eq	8.16E-01	3.70E-02	3.66E-04	3.82E-03
Eutrophication	kg N eq	2.12E-01	7.71E-03	3.06E-05	2.74E-02
Global warming (embodied carbon)	kg CO_2 eq	1.70E+02	2.13E+01	9.39E-02	3.62E+01
Ozone depletion	kg CFC-11 eq	1.94E-05	5.07E-06	3.84E-09	5.42E-08
Human health damage					
Impact category	Unit				
Carcinogenics	CTU_h	8.12E-06	1.95E-08	1.79E-10	1.42E-07
Non-carcinogenics	CTU_h	1.76E-05	2.99E-06	3.02E-09	2.52E-07
Respiratory effects	kg $PM_{2.5}$ eq	1.16E-01	7.46E-03	2.15E-05	3.04E-04
Smog	kg O_3 eq	8.90E+00	4.75E-01	1.16E+00	5.28E-02
Additional environmental information					
Impact category	Unit				
Fossil fuel depletion	MJ, LHV	3.04E+02	4.51E+01	1.24E-01	4.84E-01
Ecotoxicity	CTU_e	2.30E+02	6.04E+01	7.08E-03	8.49E+00

See the additional content required by the NSF PCR for architectural coatings on page 4 of the **Transparency Report PDF**.

Thermo-Lag E100-S: TRACI v2.1 results per functional unit

LIFE CYCLE STAGE		STAGE 1 PRODUCT STAGE	STAGE 2 DESIGN AND CONSTRUCTION	STAGE 3 USE AND MAINTENANCE	STAGE 4 END OF LIFE
Ecological damage					
Impact category	Unit				
Acidification	kg SO_2 eq	6.37E-01	2.82E-02	2.91E-04	2.95E-03
Eutrophication	kg N eq	1.29E-01	5.87E-03	2.43E-05	2.11E-02
Global warming (embodied carbon)	kg CO_2 eq	1.36E+02	1.62E+01	7.46E-02	2.78E+01
Ozone depletion	kg CFC-11 eq	1.48E-05	3.86E-06	3.05E-09	4.26E-08
Human health damage					
Impact category	Unit				
Carcinogenics	CTU_h	6.52E-06	1.49E-08	1.42E-10	1.09E-07
Non-carcinogenics	CTU_h	1.35E-05	2.28E-06	2.40E-09	1.94E-07
Respiratory effects	kg $PM_{2.5}$ eq	9.43E-02	5.68E-03	1.70E-05	2.35E-04
Smog	kg O_3 eq	7.08E+00	3.62E-01	4.42E+00	4.07E-02
Additional environmental information					
Impact category	Unit				
Fossil fuel depletion	MJ, LHV	2.52E+02	3.44E+01	9.84E-02	3.80E-01
Ecotoxicity	CTU_e	1.86E+02	4.60E+01	5.62E-03	6.54E+00

See the additional content required by the NSF PCR for architectural coatings on page 4 of the **Transparency Report PDF**.

Thermo-Lag 3000: TRACI v2.1 results per functional unit

LIFE CYCLE STAGE		STAGE 1 PRODUCT STAGE	STAGE 2 DESIGN AND CONSTRUCTION	STAGE 3 USE AND MAINTENANCE	STAGE 4 END OF LIFE
Ecological damage					
Impact category	Unit				
Acidification	kg SO_2 eq	7.89E-01	3.75E-02	3.65E-04	3.81E-03
Eutrophication	kg N eq	1.89E-01	7.80E-03	3.05E-05	2.73E-02
Global warming (embodied carbon)	kg CO_2 eq	1.73E+02	2.15E+01	9.36E-02	3.60E+01
Ozone depletion	kg CFC-11 eq	2.00E-05	5.13E-06	3.83E-09	5.41E-08
Human health damage					
Impact category	Unit				
Carcinogenics	CTU_h	8.16E-06	1.98E-08	1.79E-10	1.41E-07
Non-carcinogenics	CTU_h	1.79E-05	3.03E-06	3.01E-09	2.51E-07
Respiratory effects	kg $PM_{2.5}$ eq	1.15E-01	7.55E-03	2.14E-05	3.03E-04
Smog	kg O_3 eq	8.15E+00	4.81E-01	1.16E+00	5.27E-02
Additional environmental information					
Impact category	Unit				
Fossil fuel depletion	MJ, LHV	3.15E+02	4.57E+01	1.23E-01	4.82E-01
Ecotoxicity	CTU_e	2.44E+02	6.12E+01	7.06E-03	8.47E+00

See the additional content required by the NSF PCR for architectural coatings on page 4 of the **Transparency Report PDF**.

Thermo-Lag 3000-SP: TRACI v2.1 results per functional unit

LIFE CYCLE STAGE		STAGE 1 PRODUCT STAGE	STAGE 2 DESIGN AND CONSTRUCTION	STAGE 3 USE AND MAINTENANCE	STAGE 4 END OF LIFE
Ecological damage					
Impact category	Unit				
Acidification	kg SO_2 eq	6.17E-01	3.11E-02	2.91E-04	3.00E-03
Eutrophication	kg N eq	1.32E-01	6.49E-03	2.43E-05	2.14E-02
Global warming (embodied carbon)	kg CO_2 eq	1.38E+02	1.79E+01	7.47E-02	2.83E+01
Ozone depletion	kg CFC-11 eq	1.57E-05	4.27E-06	3.06E-09	4.33E-08
Human health damage					
Impact category	Unit				
Carcinogenics	CTU_h	6.77E-06	1.64E-08	1.43E-10	1.11E-07
Non-carcinogenics	CTU_h	1.50E-05	2.52E-06	2.40E-09	1.98E-07
Respiratory effects	kg $PM_{2.5}$ eq	9.57E-02	6.28E-03	1.71E-05	2.39E-04
Smog	kg O_3 eq	6.60E+00	4.00E-01	4.42E+00	4.14E-02
Additional environmental information					
Impact category	Unit				
Fossil fuel depletion	MJ, LHV	2.57E+02	3.80E+01	9.86E-02	3.87E-01
Ecotoxicity	CTU_e	2.20E+02	5.09E+01	5.63E-03	6.66E+00

See the additional content required by the NSF PCR for architectural coatings on page 4 of the **Transparency Report PDF**.

References

LCA Background Report
Carboline Intumescent fireproofing coating LCA Background Report (public version), Carboline 2022; SimaPro Analyst 9.4; Ecoinvent 3.4 and US ecoinvent (US -EI 2.2) database; TRACI 2.1

PCRs

PCR for Architectural Coatings: NAICS 325510
Valid through Feb. 29, 2023. PCR review conducted by Thomas P. Gloria (Industrial Ecology Consultants), Ph. D; Mr. Bill Stough (Sustainable Research Group); Dr. Michael Overcash (Environmental Clarity).

NSF Program Operator Instructions

ISO 14025, "Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services"

Download PDF SM Transparency Report, which includes the additional EPD content required by the NSF PCR.

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. Environmental declarations from different programs (ISO 14025) may not be comparable. In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the building level per ISO 21930 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

Rating systems

The intent is to reward project teams for selecting products from manufacturers who have verified improved life-cycle environmental performance.

LEED BD+C: New Construction | v4 - LEED v4
Building product disclosure and optimization
Environmental product declarations

○ Industry-wide (generic) EPD	½product
✓ Product-specific Type III EPD	1 product

LEED BD+C: New Construction | v4.1 - LEED v4.1
Building product disclosure and optimization
Environmental product declarations

○ Industry-wide (generic) EPD	1 product
✓ Product-specific Type III EPD	1.5 product

BREEAM New Construction 2018
Mat 02 - Environmental impacts from construction products
Environmental Product Declarations (EPD)

○ Industry-average EPD	.5 points
○ Multi-product specific EPD	.75 points
✓ Product-specific EPD	1 point

SM Transparency Report (EPD)™

VERIFICATION	LCA
3rd-party reviewed	✓
	Transparency Report (EPD)
3rd-party verified	✓

Validity: 20230213 – 20280212
Decl #: CAR-20230213-003

This environmental product declaration (EPD) was externally verified, according to NSF PCR for Architectural Coatings, and ISO 14025:2006, by Jack Geibig, President, Ecoform.

Ecoform, LLC
11903 Black Road,
Knoxville, TN 37932
www.ecoform.com
(865) 850-1883

SUMMARY
Reference PCR
NSF PCR for Architectural Coatings: NAICS 325510, 2022
Regions; system boundaries
North America; Cradle to grave
Functional unit / reference service life:
1 m^2 of covered and protected substrate; 60 years
LCIA methodology: TRACI 2.1
LCA software; LCI database
SimaPro Developer 9.4
EcoInvent 3.8, US-EI 2.2, and ELCD databases.
LCA conducted by: Sustainable Minds
Public LCA:
Life Cycle Assessment of Carboline Intumescent Fire-Resistive Materials

Carboline Global Inc.
2150 Schuetz Rd.
St. Louis, MO 63146
https://www.carboline.com/
314-644-1000

Contact us

How we make it greener

Thermo-Lag Series

Collapse all

See LCA results by life cycle stage

RAW MATERIAL ACQUISITION

Carboline is dedicated to improving raw material sustainability efforts. These initiatives include researching alternative methods to acquire raw materials, while being conscience of their environmental impact and opting for suppliers who place emphasis on sustainable manufacturing techniques/renewable energy processes.

TRANSPORTATION

In an effort to reduce multiple long distance LTL shipments, Carboline has initiated pooling orders from local warehousing sites vs. shipping individual orders from multiple manufacturing and warehousing locations throughout the country.

MANUFACTURING

Carboline is always exploring solutions to reduce energy usage throughout the production process. Some of these initiatives include –

- Installing VFD drives to reduce electrical usage for mixing units
- Upgrading air driers with the intent of generating better air, which could result in using less air in the production process
- Researching solar installation at Carboline's Dayton, Nevada manufacturing site

END OF LIFE

Carboline fireproofing products provide long-term protection to the structures to which they are applied and were designed to outlive the expected lifespan of a building. Essentially, the only waste generated is at the time of demolition or if any repairs need to be made to the building.

SM Transparency Report (EPD)™

VERIFICATION	LCA
3rd-party reviewed	✓
	Transparency Report (EPD)
3rd-party verified	✓

Validity: 20230213 – 20280212

Decl #: CAR-20230213-003

This environmental product declaration (EPD) was externally verified, according to NSF PCR for Architectural Coatings, and ISO 14025:2006, by Jack Geibig, President, Ecoform.

Ecoform, LLC
11903 Black Road,
Knoxville, TN 37932
www.ecoform.com
(865) 850-1883

SUMMARY

Reference PCR

NSF PCR for Architectural Coatings: NAICS 325510, 2022

Regions; system boundaries
North America; Cradle to grave

Functional unit / reference service life:
1 m^2 of covered and protected substrate; 60 years

LCIA methodology: TRACI 2.1

LCA software; LCI database
SimaPro Developer 9.4
EcoInvent 3.8, US-EI 2.2, and ELCD databases.

LCA conducted by: Sustainable Minds

Public LCA:
Life Cycle Assessment of Carboline Intumescent Fire-Resistive Materials

Carboline Global Inc.
2150 Schuetz Rd.
St. Louis, MO 63146
https://www.carboline.com/
314-644-1000

Contact us

Additional EPD content required by: NSF PCR: Architectural Coatings

Data

Background This product-specific declaration was created by collecting life cycle data for the Thermo-Lag Series covering 1 m² of substrate for a period of 60 years (the assumed average lifetime of a building). Databases adopted in the model include ecoinvent v3, US-EI 2.2, and ELCD databases.

Allocation The allocation methods used were examined according to the allocation rules in the NSF PCR for Architectural Coatings. The only manufacturing input that needed allocation was electricity since there is only one single meter that includes the production of multiple Carboline IFRM products. The allocation of electricity was based on the percentage of production for individual products divided by total site production output. In addition, there is no co-product produced in the manufacturing process.

Cut-off criteria A minimum of 95% of the total mass, energy, and environmental relevance for the system were captured. The total of neglected input flows per module does not exceed 5% of energy usage, mass, and environmental impacts. The cut-off rules do not apply to hazardous and toxic properties, which must be listed even when the given process unit is under the cut-off criterion. No known flows are deliberately excluded from this declaration; therefore, these criteria have been met. No biogenic carbon enters the product system.

Quality All primary data were collected for one year to ensure representativeness of annual business activities and post-consumer contents. Except for overseas transportation, secondary datasets for the US were used since Carboline products are expected to be applied in the US. The overall quality of the data used in this study is considered to be good and representative of the described systems.

Major system boundary exclusions:

- Capital goods & infrastructure; maintenance and operation of support equipment;
- Manufacture & transport of packaging materials not associated with final product;
- Human labor and employee transport;
- Building operational energy and water use not associated with final product.

Major assumptions and limitations:

- Material input and transportation distances are averages and do not reflect changes in material efficiency and supplier locations.
- Proxy materials were used when matching secondary data sets were not identified.
- Generic data sets used for material inputs, transport, and waste processing are considered good quality, but actual impacts from material suppliers, transport carriers, and local waste processing may vary.
- LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Relevant technical properties

PRODUCT	E 100	E 100-S	3000	3000-SP	Unit
Density	1.32	1.32	1.32	1.32	kg/L
Dry Film Thickness (DFT) / coat	80	60	80	60	mils
Reference flow per functional unit	17.7	13.6	17.6	13.9	kg
Packaging for finished products	Steel pail	Steel pail	Steel pail	Steel pail	--
Packaging volume	17	17	17	17	L

Scenarios and additional technical information

PARAMETER (for 1 kg finished product)	VALUE	UNIT
Design and construction [Stage 2]		
Vehicle type	Lorry, 16-32 ton	
Average packaging weight for 1 kg coating		
Thermo-Lag E100	0.075	kg
Thermo-Lag E100-S	0.153	kg
Thermo-Lag 3000	0.076	kg
Thermo-Lag 3000-SP	0.153	kg
Distance from manufacturer to distribution center		
Thermo-Lag E100	2864*	km
Thermo-Lag E100-S	2584.1*	km
Thermo-Lag 3000	2917.1*	km
Thermo-Lag 3000-SP	2878.1*	km
Distance from distribution center to point of sale	804.5	km
Distance from point of sale to application site	0	km
Use and maintenance [Stage 3]		
Application scrap assumed	10	%
Spray equipment assumed	Graco Mark V Airless	
Electricity consumption	2.09	kWh
Sprayer flow rate	1.35	gpm
Waste materials at the application site before waste processing (product scrap and packaging waste)		
Product scrap	0.1	kg
Packaging waste recycling - Thermo-Lag E100	0.075	kg
Packaging waste recycling - Thermo-Lag E100-S	0.153	kg
Packaging waste recycling - Thermo-Lag 3000	0.076	kg
Packaging waste recycling - Thermo-Lag 3000-SP	0.153	kg
Output materials from on-site waste processing	0	kg
Biogenic carbon contained in packaging	0	kg CO_2
VOC emissions from drying (EPA Method 24)		
Thermo-Lag E100	13	g/L
Thermo-Lag E100-S	64	g/L
Thermo-Lag 3000	13	g/L
Thermo-Lag 3000-SP	64	g/L
Necessary maintenance and repaints		
Product life for functional unit	60	years
Coating type/environment	Indoor	
Market-based lifetime	5	years
Initial coating application	1	time
Maintenance recoat	11	times
No colorants are added	–	–

*Average transportation distances between the manufacturing plant and the distribution centers were provided by Carboline based on sales data.

End of life [Stage 4]

Assumptions for scenario development	Manual deconstruction, sent for incineration by truck		
End-of-life products (incineration)	Collected with mixed construction waste	1	kg
Recovery	Reuse	0	kg
	Recycling	0	kg
	Landfill	0	kg
Waste transport (incineration)		11.27	km
Removals of biogenic carbon (excluding packaging)		0	kg CO_2

Thermo-Lag E 100: LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	Stage 1 - Product stage			Stage 2 - Design and construction			Stage 3 - Use and maintenance			Stage 4 - End of life		Total
		1-1	1-2	1-3	2-1	2-2	2-3	3-1	3-2	3-3	4-1	4-2	
LCIA results (per m² covered and protected substrate for a period of 60 years)													
Ozone depletion	kg CFC-11 eq	1.48E-05	4.03E-06	5.43E-07	3.96E-06	1.11E-06	0	3.20E-10	0	3.52E-09	1.56E-08	3.87E-08	**2.45E-05**
Global warming	kg CO_2 eq	1.37E+02	1.70E+01	1.63E+01	1.66E+01	4.67E+00	0	7.82E-03	0	8.61E-02	6.53E-02	3.61E+01	**2.28E+02**
Smog	kg O_3 eq	6.70E+00	1.70E+00	5.09E-01	3.71E-01	1.04E-01	0	2.62E-04	1.16E+00	2.89E-03	1.46E-03	5.14E-02	**1.06E+01**
Acidification	kg SO_2 eq	6.84E-01	8.77E-02	4.48E-02	2.89E-02	8.11E-03	0	3.05E-05	0	3.35E-04	1.14E-04	3.71E-03	**8.58E-01**
Eutrophication	kg N eq	1.98E-01	8.44E-03	5.31E-03	6.02E-03	1.69E-03	0	2.55E-06	0	2.80E-05	2.37E-05	2.74E-02	**2.47E-01**
Carcinogenics	CTUh	7.19E-06	1.43E-08	9.15E-07	1.53E-08	4.28E-09	0	1.49E-11	0	1.64E-10	6.00E-11	1.42E-07	**8.28E-06**
Non-carcinogenics	CTUh	1.51E-05	2.04E-06	4.81E-07	2.33E-06	6.56E-07	0	2.52E-10	0	2.77E-09	9.18E-09	2.43E-07	**2.08E-05**
Respiratory effects	kg $PM_{2.5}$ eq	9.61E-02	1.05E-02	9.80E-03	5.82E-03	1.64E-03	0	1.79E-06	0	1.97E-05	2.29E-05	2.81E-04	**1.24E-01**
Ecotoxicity	CTUe	1.72E+02	4.05E+01	1.75E+01	4.72E+01	1.33E+01	0	5.90E-04	0	6.49E-03	1.86E-01	8.31E+00	**2.99E+02**
Fossil fuel depletion	MJ surplus	2.48E+02	3.57E+01	2.00E+01	3.52E+01	9.90E+00	0	1.03E-02	0	1.14E-01	1.39E-01	3.45E-01	**3.50E+02**
Resource use indicators													
Renewable primary energy used as energy carrier (fuel)	MJ, LHV	7.24E+01	2.28E-01	1.82E+01	2.24E-01	6.30E-02	0	8.35E-03	0	9.18E-02	8.82E-04	2.74E-03	**9.11E+01**
Renewable primary resources with energy content used as material	MJ, LHV	5.55E+01	8.26E-02	3.01E+00	8.18E-02	2.30E-02	0	2.57E-03	0	2.83E-02	3.22E-04	9.32E-04	**5.88E+01**
Total use of renewable primary resources with energy content	MJ, LHV	1.28E+02	3.11E-01	2.12E+01	3.06E-01	8.60E-02	0	1.09E-02	0	1.20E-01	1.20E-03	3.67E-03	**1.50E+02**
Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	2.35E+03	2.38E+02	2.03E+02	2.35E+02	6.60E+01	0	1.41E-01	0	1.55E+00	9.25E-01	2.27E+00	**3.10E+03**
Non-renewable primary resources with energy content used as material	MJ, LHV	1.17E+00	7.65E-04	1.11E-02	7.03E-04	1.97E-04	0	1.20E-09	0	1.32E-08	2.76E-06	1.29E-05	**1.19E+00**
Total use of non-renewable primary resources with energy content	MJ, LHV	2.36E+03	2.38E+02	2.03E+02	2.35E+02	6.60E+01	0	1.41E-01	0	1.55E+00	9.25E-01	2.27E+00	**3.10E+03**
Hazardous waste disposed	kg	0	0	3.02E+00	0	0	0	0	0	0	0	0	**3.02E+00**
Non-hazardous waste disposed	kg	0	0	2.90E-01	0	0	0	0	0	0	0	0	**2.90E-01**
Hydro/wind power	MJ, LHV	0	0	1.41E+00	0	0	0	0	0	0	0	0	**1.41E+00**
Fossil energy	MJ, LHV	0	0	2.77E+01	0	0	0	0	0	0	0	0	**2.77E+01**
Bio-energy	MJ, LHV	0	0	8.83E-01	0	0	0	0	0	0	0	0	**8.83E-01**
Nuclear- energy	MJ, LHV	0	0	9.64E+00	0	0	0	0	0	0	0	0	**9.64E+00**
Other-energy	MJ, LHV	0	0	4.82E-01	0	0	0	0	0	0	0	0	**4.82E-01**
Renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Non-renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Recycled materials	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Recovered energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Secondary materials	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Use of net fresh water resources	m³	1.92E+02	2.25E+00	4.99E+00	2.19E+00	6.16E-01	0	2.53E-04	0	2.78E-03	8.62E-03	2.81E-02	**2.02E+02**
Output flows and waste category indicators													
High-level radioactive waste, conditioned, to final repository	kg	2.65E-02	8.34E-05	7.01E-04	8.09E-05	2.27E-05	0	5.45E-07	0	6.00E-06	3.18E-07	1.17E-06	**2.74E-02**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	6.41E-05	3.53E-05	3.55E-06	3.48E-05	9.78E-06	0	6.01E-09	0	6.61E-08	1.37E-07	3.41E-07	**1.48E-04**
Components for re-use	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Materials for recycling	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Materials for energy recovery	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Exported energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbon emissions and removals													
Biogenic carbon removal from product	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from product	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon removal from packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from combustion of waste from renewable sources used in production processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Calcination carbon emissions	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbonation carbon removals	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbon emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**

Thermo-Lag E 100-S: LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	Stage 1 - Product stage			Stage 2 - Design and construction			Stage 3 - Use and maintenance			Stage 4 - End of life		Total
		1-1	1-2	1-3	2-1	2-2	2-3	3-1	3-2	3-3	4-1	4-2	
LCIA results (per m² covered and protected substrate for a period of 60 years)													
Ozone depletion	kg CFC-11 eq	1.10E-05	3.13E-06	6.30E-07	2.95E-06	9.17E-07	0	2.54E-10	0	2.80E-09	1.28E-08	2.97E-08	**1.87E-05**
Global warming	kg CO_2 eq	1.06E+02	1.32E+01	1.67E+01	1.24E+01	3.85E+00	0	6.22E-03	0	6.84E-02	5.39E-02	2.78E+01	**1.80E+02**
Smog	kg O_3 eq	5.20E+00	1.28E+00	5.95E-01	2.76E-01	8.59E-02	0	2.08E-04	4.42E+00	2.29E-03	1.20E-03	3.95E-02	**1.19E+01**
Acidification	kg SO_2 eq	5.23E-01	6.67E-02	4.77E-02	2.15E-02	6.69E-03	0	2.42E-05	0	2.67E-04	9.36E-05	2.85E-03	**6.69E-01**
Eutrophication	kg N eq	1.17E-01	6.50E-03	5.99E-03	4.48E-03	1.39E-03	0	2.02E-06	0	2.23E-05	1.95E-05	2.10E-02	**1.56E-01**
Carcinogenics	CTUh	5.13E-06	1.11E-08	1.38E-06	1.13E-08	3.53E-09	0	1.19E-11	0	1.31E-10	4.94E-11	1.09E-07	**6.65E-06**
Non-carcinogenics	CTUh	1.13E-05	1.59E-06	5.74E-07	1.74E-06	5.40E-07	0	2.00E-10	0	2.20E-09	7.57E-09	1.87E-07	**1.60E-05**
Respiratory effects	kg $PM_{2.5}$ eq	7.25E-02	8.01E-03	1.38E-02	4.33E-03	1.35E-03	0	1.42E-06	0	1.56E-05	1.89E-05	2.16E-04	**1.00E-01**
Ecotoxicity	CTUe	1.28E+02	3.16E+01	2.62E+01	3.51E+01	1.09E+01	0	4.69E-04	0	5.15E-03	1.53E-01	6.39E+00	**2.39E+02**
Fossil fuel depletion	MJ surplus	2.07E+02	2.77E+01	1.73E+01	2.62E+01	8.16E+00	0	8.20E-03	0	9.02E-02	1.14E-01	2.65E-01	**2.87E+02**
Resource use indicators													
Renewable primary energy used as energy carrier (fuel)	MJ, LHV	5.51E+01	1.77E-01	1.52E+01	1.67E-01	5.19E-02	0	6.63E-03	0	7.30E-02	7.27E-04	2.10E-03	**7.07E+01**
Renewable primary resources with energy content used as material	MJ, LHV	2.89E+01	6.41E-02	2.50E+00	6.09E-02	1.89E-02	0	2.05E-03	0	2.25E-02	2.65E-04	7.17E-04	**3.16E+01**
Total use of renewable primary resources with energy content	MJ, LHV	8.40E+01	2.41E-01	1.77E+01	2.28E-01	7.09E-02	0	8.68E-03	0	9.55E-02	9.92E-04	2.82E-03	**1.02E+02**
Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	1.91E+03	1.85E+02	1.98E+02	1.75E+02	5.44E+01	0	1.12E-01	0	1.23E+00	7.62E-01	1.74E+00	**2.52E+03**
Non-renewable primary resources with energy content used as material	MJ, LHV	4.48E-01	5.93E-04	1.46E-02	5.23E-04	1.63E-04	0	9.53E-10	0	1.05E-08	2.28E-06	9.93E-06	**4.63E-01**
Total use of non-renewable primary resources with energy content	MJ, LHV	1.91E+03	1.85E+02	1.98E+02	1.75E+02	5.44E+01	0	1.12E-01	0	1.23E+00	7.62E-01	1.74E+00	**2.52E+03**
Hazardous waste disposed	kg	0	0	2.39E+00	0	0	0	0	0	0	0	0	**2.39E+00**
Non-hazardous waste disposed	kg	0	0	2.30E-01	0	0	0	0	0	0	0	0	**2.30E-01**
Hydro/wind power	MJ, LHV	0	0	1.12E+00	0	0	0	0	0	0	0	0	**1.12E+00**
Fossil energy	MJ, LHV	0	0	2.21E+01	0	0	0	0	0	0	0	0	**2.21E+01**
Bio-energy	MJ, LHV	0	0	7.03E-01	0	0	0	0	0	0	0	0	**7.03E-01**
Nuclear- energy	MJ, LHV	0	0	7.67E+00	0	0	0	0	0	0	0	0	**7.67E+00**
Other-energy	MJ, LHV	0	0	3.84E-01	0	0	0	0	0	0	0	0	**3.84E-01**
Renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Non-renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Recycled materials	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Recovered energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Secondary materials	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Use of net fresh water resources	m³	1.70E+02	2.31E+00	8.34E+00	2.17E+00	6.75E-01	0	2.01E-04	0	2.21E-03	9.44E-03	2.72E-02	**1.83E+02**
Output flows and waste category indicators													
High-level radioactive waste, conditioned, to final repository	kg	2.11E-02	6.48E-05	9.17E-04	6.02E-05	1.87E-05	0	4.33E-07	0	4.76E-06	2.62E-07	9.00E-07	**2.22E-02**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	4.78E-05	2.74E-05	3.77E-06	2.59E-05	8.06E-06	0	4.78E-09	0	5.25E-08	1.13E-07	2.62E-07	**1.13E-04**
Components for re-use	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Materials for recycling	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Materials for energy recovery	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Exported energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbon emissions and removals													
Biogenic carbon removal from product	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from product	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon removal from packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from combustion of waste from renewable sources used in production processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Calcination carbon emissions	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbonation carbon removals	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbon emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**

Thermo-Lag 3000: LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	Stage 1 - Product stage			Stage 2 - Design and construction			Stage 3 - Use and maintenance			Stage 4 - End of life		Total
		1-1	1-2	1-3	2-1	2-2	2-3	3-1	3-2	3-3	4-1	4-2	
LCIA results (per m² covered and protected substrate for a period of 60 years)													
Ozone depletion	kg CFC-11 eq	1.54E-05	4.00E-06	5.46E-07	4.02E-06	1.11E-06	0	3.19E-10	0	3.51E-09	1.55E-08	3.85E-08	**2.52E-05**
Global warming	kg CO_2 eq	1.40E+02	1.69E+01	1.62E+01	1.69E+01	4.66E+00	0	7.80E-03	0	8.58E-02	6.52E-02	3.60E+01	**2.31E+02**
Smog	kg O_3 eq	6.85E+00	1.70E+00	5.11E-01	3.77E-01	1.04E-01	0	2.62E-04	1.16E+00	2.88E-03	1.46E-03	5.12E-02	**9.84E+00**
Acidification	kg SO_2 eq	6.91E-01	5.31E-02	4.49E-02	2.94E-02	8.10E-03	0	3.04E-05	0	3.34E-04	1.13E-04	3.70E-03	**8.31E-01**
Eutrophication	kg N eq	1.77E-01	6.82E-03	5.17E-03	6.12E-03	1.69E-03	0	2.54E-06	0	2.79E-05	2.36E-05	2.73E-02	**2.24E-01**
Carcinogenics	CTUh	7.22E-06	1.52E-08	9.22E-07	1.55E-08	4.27E-09	0	1.49E-11	0	1.64E-10	5.98E-11	1.41E-07	**8.32E-06**
Non-carcinogenics	CTUh	1.52E-05	2.25E-06	4.82E-07	2.37E-06	6.54E-07	0	2.51E-10	0	2.76E-09	9.16E-09	2.42E-07	**2.12E-05**
Respiratory effects	kg $PM_{2.5}$ eq	9.78E-02	7.10E-03	9.88E-03	5.92E-03	1.63E-03	0	1.78E-06	0	1.96E-05	2.28E-05	2.80E-04	**1.23E-01**
Ecotoxicity	CTUe	1.81E+02	4.53E+01	1.76E+01	4.80E+01	1.32E+01	0	5.88E-04	0	6.47E-03	1.85E-01	8.28E+00	**3.14E+02**
Fossil fuel depletion	MJ surplus	2.60E+02	3.56E+01	2.01E+01	3.58E+01	9.87E+00	0	1.03E-02	0	1.13E-01	1.38E-01	3.44E-01	**3.62E+02**
Resource use indicators													
Renewable primary energy used as energy carrier (fuel)	MJ, LHV	7.52E+01	2.27E-01	1.82E+01	2.28E-01	6.29E-02	0	8.32E-03	0	9.16E-02	8.80E-04	2.73E-03	**9.41E+01**
Renewable primary resources with energy content used as material	MJ, LHV	4.57E+01	8.25E-02	3.02E+00	8.32E-02	2.29E-02	0	2.57E-03	0	2.82E-02	3.21E-04	9.29E-04	**4.90E+01**
Total use of renewable primary resources with energy content	MJ, LHV	1.21E+02	3.10E-01	2.12E+01	3.11E-01	8.58E-02	0	1.09E-02	0	1.20E-01	1.20E-03	3.66E-03	**1.43E+02**
Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	2.44E+03	2.38E+02	2.04E+02	2.39E+02	6.59E+01	0	1.40E-01	0	1.54E+00	9.23E-01	2.26E+00	**3.19E+03**
Non-renewable primary resources with energy content used as material	MJ, LHV	8.31E-01	7.19E-04	1.12E-02	7.14E-04	1.97E-04	0	1.20E-09	0	1.32E-08	2.76E-06	1.29E-05	**8.43E-01**
Total use of non-renewable primary resources with energy content	MJ, LHV	2.44E+03	2.38E+02	2.04E+02	2.39E+02	6.59E+01	0	1.40E-01	0	1.54E+00	9.23E-01	2.26E+00	**3.19E+03**
Hazardous waste disposed	kg	0	0	3.01E+00	0	0	0	0	0	0	0	0	**3.01E+00**
Non-hazardous waste disposed	kg	0	0	2.91E-01	0	0	0	0	0	0	0	0	**2.91E-01**
Hydro/wind power	MJ, LHV	0	0	1.41E+00	0	0	0	0	0	0	0	0	**1.41E+00**
Fossil energy	MJ, LHV	0	0	2.79E+01	0	0	0	0	0	0	0	0	**2.79E+01**
Bio-energy	MJ, LHV	0	0	8.87E-01	0	0	0	0	0	0	0	0	**8.87E-01**
Nuclear- energy	MJ, LHV	0	0	9.67E+00	0	0	0	0	0	0	0	0	**9.67E+00**
Other-energy	MJ, LHV	0	0	4.84E-01	0	0	0	0	0	0	0	0	**4.84E-01**
Renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Non-renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Recycled materials	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Recovered energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Secondary materials	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Use of net fresh water resources	m³	1.87E+02	2.17E+00	4.58E+00	2.19E+00	6.03E-01	0	2.52E-04	0	2.77E-03	8.44E-03	2.74E-02	**1.97E+02**
Output flows and waste category indicators													
High-level radioactive waste, conditioned, to final repository	kg	2.86E-02	8.23E-05	7.06E-04	8.22E-05	2.27E-05	0	5.43E-07	0	5.98E-06	3.18E-07	1.17E-06	**2.95E-02**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	6.54E-05	3.52E-05	3.56E-06	3.54E-05	9.76E-06	0	5.99E-09	0	6.59E-08	1.37E-07	3.40E-07	**1.50E-04**
Components for re-use	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Materials for recycling	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Materials for energy recovery	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Exported energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbon emissions and removals													
Biogenic carbon removal from product	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from product	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon removal from packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from combustion of waste from renewable sources used in production processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Calcination carbon emissions	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbonation carbon removals	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbon emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**

Thermo-Lag 3000-SP: LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	Stage 1 - Product stage			Stage 2 - Design and construction			Stage 3 - Use and maintenance			Stage 4 - End of life		Total
		1-1	1-2	1-3	2-1	2-2	2-3	3-1	3-2	3-3	4-1	4-2	
LCIA results (per m² covered and protected substrate for a period of 60 years)													
Ozone depletion	kg CFC-11 eq	1.15E-05	3.58E-06	6.40E-07	3.34E-06	9.34E-07	0	2.55E-10	0	2.80E-09	1.31E-08	3.03E-08	**2.00E-05**
Global warming	kg CO_2 eq	1.07E+02	1.45E+01	1.68E+01	1.40E+01	3.92E+00	0	6.23E-03	0	6.85E-02	5.49E-02	2.83E+01	**1.84E+02**
Smog	kg O_3 eq	5.24E+00	7.47E-01	6.04E-01	3.12E-01	8.75E-02	0	2.09E-04	4.41E+00	2.30E-03	1.22E-03	4.02E-02	**1.15E+01**
Acidification	kg SO_2 eq	5.24E-01	4.44E-02	4.83E-02	2.43E-02	6.81E-03	0	2.43E-05	0	2.67E-04	9.54E-05	2.91E-03	**6.51E-01**
Eutrophication	kg N eq	1.20E-01	6.16E-03	6.09E-03	5.07E-03	1.42E-03	0	2.03E-06	0	2.23E-05	1.99E-05	2.14E-02	**1.60E-01**
Carcinogenics	CTUh	5.34E-06	1.55E-08	1.42E-06	1.28E-08	3.60E-09	0	1.19E-11	0	1.31E-10	5.04E-11	1.11E-07	**6.90E-06**
Non-carcinogenics	CTUh	1.17E-05	2.78E-06	5.84E-07	1.97E-06	5.51E-07	0	2.00E-10	0	2.20E-09	7.71E-09	1.90E-07	**1.78E-05**
Respiratory effects	kg $PM_{2.5}$ eq	7.35E-02	8.19E-03	1.41E-02	4.90E-03	1.37E-03	0	1.42E-06	0	1.56E-05	1.92E-05	2.20E-04	**1.02E-01**
Ecotoxicity	CTUe	1.36E+02	5.75E+01	2.69E+01	3.97E+01	1.11E+01	0	4.69E-04	0	5.16E-03	1.56E-01	6.50E+00	**2.78E+02**
Fossil fuel depletion	MJ surplus	2.07E+02	3.18E+01	1.74E+01	2.97E+01	8.31E+00	0	8.22E-03	0	9.04E-02	1.16E-01	2.70E-01	**2.95E+02**
Resource use indicators													
Renewable primary energy used as energy carrier (fuel)	MJ, LHV	5.74E+01	2.03E-01	1.52E+01	1.89E-01	5.29E-02	0	6.65E-03	0	7.31E-02	7.41E-04	2.14E-03	**7.32E+01**
Renewable primary resources with energy content used as material	MJ, LHV	2.92E+01	7.37E-02	2.51E+00	6.89E-02	1.93E-02	0	2.05E-03	0	2.25E-02	2.70E-04	7.30E-04	**3.19E+01**
Total use of renewable primary resources with energy content	MJ, LHV	8.67E+01	2.76E-01	1.77E+01	2.58E-01	7.22E-02	0	8.69E-03	0	9.56E-02	1.01E-03	2.87E-03	**1.05E+02**
Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	1.91E+03	2.12E+02	2.00E+02	1.98E+02	5.55E+01	0	1.12E-01	0	1.23E+00	7.77E-01	1.78E+00	**2.58E+03**
Non-renewable primary resources with energy content used as material	MJ, LHV	4.46E-01	6.50E-04	1.49E-02	5.92E-04	1.66E-04	0	9.55E-10	0	1.05E-08	2.32E-06	1.01E-05	**4.62E-01**
Total use of non-renewable primary resources with energy content	MJ, LHV	1.91E+03	2.12E+02	2.00E+02	1.98E+02	5.55E+01	0	1.12E-01	0	1.23E+00	7.77E-01	1.78E+00	**2.58E+03**
Hazardous waste disposed	kg	0	0	2.39E+00	0	0	0	0	0	0	0	0	**2.39E+00**
Non-hazardous waste disposed	kg	0	0	2.31E-01	0	0	0	0	0	0	0	0	**2.31E-01**
Hydro/wind power	MJ, LHV	0	0	1.12E+00	0	0	0	0	0	0	0	0	**1.12E+00**
Fossil energy	MJ, LHV	0	0	2.20E+01	0	0	0	0	0	0	0	0	**2.20E+01**
Bio-energy	MJ, LHV	0	0	7.01E-01	0	0	0	0	0	0	0	0	**7.01E-01**
Nuclear- energy	MJ, LHV	0	0	7.65E+00	0	0	0	0	0	0	0	0	**7.65E+00**
Other-energy	MJ, LHV	0	0	3.83E-01	0	0	0	0	0	0	0	0	**3.83E-01**
Renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Non-renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Recycled materials	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Recovered energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Secondary materials	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Use of net fresh water resources	m³	1.75E+02	2.16E+00	8.37E+00	2.01E+00	5.63E-01	0	2.01E-04	0	2.21E-03	7.89E-03	2.36E-02	**1.88E+02**
Output flows and waste category indicators													
High-level radioactive waste, conditioned, to final repository	kg	2.17E-02	7.34E-05	9.35E-04	6.81E-05	1.91E-05	0	4.34E-07	0	4.77E-06	2.67E-07	9.16E-07	**2.28E-02**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	4.93E-05	3.14E-05	3.82E-06	2.93E-05	8.21E-06	0	4.78E-09	0	5.26E-08	1.15E-07	2.67E-07	**1.22E-04**
Components for re-use	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Materials for recycling	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Materials for energy recovery	kg	0	0	0	0	0	0	0	0	0	0	0	**0**
Exported energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbon emissions and removals													
Biogenic carbon removal from product	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from product	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon removal from packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Biogenic carbon emission from combustion of waste from renewable sources used in production processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Calcination carbon emissions	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbonation carbon removals	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**
Carbon emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	**0**

INTERNATIONAL LIVING FUTURE INSTITUTE℠

Declare℠

Thermo-Lag E100 S
Carboline Global, Inc.

Final Assembly: Dayton, Nevada, USA
Life Expectancy: Life of Structure Year(s)
End of Life Options: Landfill (100%)

Ingredients:

Unnamed Material: Ammonium polyphosphate; Phenol, 4,4'-(1-methylethylidene)bis-, polymer with (chloromethyl)oxirane; Propane, 1,2,3-trichloro-, polymer with 1,1'-[methylenebis(oxy)]bis[2-chloroethane] and sodium sulfide (Na2(S$x)), reduced; 1,3-Propanediol, 2,2-bis(hydroxymethyl)-; Melamine; Melamine polyphosphate; Titanium dioxide; Toluene; Aluminum Oxide; Ashes (residues); Glass, oxide, chemicals; Graphite; Phenol, [(dimethylamino)methyl]-; Phenol, 2,4,6-tris[(dimethylamino)methyl]-; Trimethylolpropane Triacrylate/2-Hydroxypropyl Acrylate; Phenol

Living Building Challenge Criteria:

I-13 Red List:

☐ LBC Red List Free
☐ LBC Red List Approved
■ Declared

% Disclosed: 100% at 100ppm
VOC Content: 64 g/L

I-10 Interior Performance: CDPH Standard Method v1.1-2010
I-14 Responsible Sourcing: Not Applicable

CRB-0015
EXP. 01 JUN 2024
Original Issue Date: 2019