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

Thermo-Sorb® 263

Solvent Based Intumescent

Table of Contents

Thermo-Sorb® 263

PRODUCT DATA SHEET

SELECTION & SPECIFICATION DATA

Generic Type	A single pack, solvent based intumescent coating for fire protection of interior structural steel.
Description	A thin film intumescent coating designed for the fire protection of steelwork for up to a 4 hour fire rating depending on the design. The recommended use for this product is fireproofing of interior steel beams, columns, tubes and pipes.
Features	• UL/ULc listed for both interior general purpose and interior conditioned space applications. • Smooth, decorative finish. • Durable, hard dust free surface resistant to normal wear • Thin film, economical fireproofing solution • VOC compliant • LEED compliant
Color	White
Finish	Smooth
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 application and a complete list of approved primers.
Wet Film Thickness	35 mils (0.89 mm) per coat Excessive film build beyond recommended thickness per coat will result in extended drying time and potential sagging of applied material. During the drying process, the coating will shrink due to the evaporation of solvent.
Dry Film Thickness	26.7 mils (0.7 mm) per coat Must be applied to the specified DFT and be dry before applying a topcoat. The dry film thickness shall be checked using an electronic or magnetic thickness gauge.
Practical Yield	1,222 ft^2 at 1 mil (113.5 m^2 at 25 microns) Practical yield based on ASTM D2697 (utilizing Linseed Oil). Testing performed after a 72 hour drying period of the sample. Allow for loss in mixing and application.
VOC Value(s)	Per EPA Method: 1.24 lb/gal (149 g/L) These are nominal values and may vary slightly with color. Product contains VOC-exempt dimethyl carbonate and t-butyl acetate. Check local regulations regarding product usage.
Limitations	Not for use in exterior environments or for interior steelwork that will be exposed to freeze/thaw cycling or long-term surface temperatures over 140°F (60°C) in normal use.
Topcoats	For interior conditioned space, topcoats are optional. For interior general purpose, Carboline approved topcoats are required. Thermo-Sorb 263 must be applied to the specified DFT and be dry before applying a topcoat. Shore DO readings are to be taken to verify level of cure. Press the Shore DO gauge firmly to the surface and hold for a minimum of 10 seconds. When the Shore DO value is 80 and the drop off is less than 5 points, the material is considered dry and ready for top coat application. The choice of topcoat will depend on project requirements. Contact Carboline Technical Service for a complete list of approved topcoats.

SUBSTRATES & SURFACE PREPARATION

General

All surfaces must be primed with compatible primer and be clean, dry and free of oil, grease, loose mill scale, dirt, dust or other materials which would impair the bond of material to the substrate. Surface preparation must meet the requirements of the primer being used. The general requirement for interior steel is SSPC-SP2 or SP3. Contact Carboline Technical Service for recommendations and specific primer requirements.

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

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

Test Method	Results
ASTM D2240 Hardness	Shore DO - 85+ (fully dried) Shore DO - 80 (dry for top coating)*
ASTM D2794 Impact	44 in-lbs
ASTM D4060 Abrasion Resistance	0.299 g/1,000 cycles
ASTM D4541 Bond Strength	550 psi (3.79 MPa)
ASTM D4541 Bond Strength	Typical Field Value 200 psi (1.38 MPa)
ASTM D695-15 Compressive Strength	1,316 psi (9.1 mPa)
ASTM E84 Surface Burning	Class A
Density	89.24 lbs/ft^3 (1.43 g/cm^3)

All values derived under controlled laboratory conditions unless otherwise noted.
*Shore DO readings are to be taken to verify the level of cure. Press the Shore DO gauge firmly to the surface and hold for a minimum of 10 seconds. When the Shore DO value is 80 and the drop off is less than 5 points, the material is considered dry and ready for top coat application.

MIXING & THINNING

Mixing

Must be mixed using a 1/2" (12.7 mm) electric or air driven drill with a slotted paddle or Jiffy mixer blade. Mix material for a minimum of 5 minutes to achieve the necessary texture required before spraying.

*NOTE: Keep container covered while spraying to maximize application properties.

Thinning

Thinning is not required. For optimum aesthetics, product may be thinned up to 5% with Thinner 188E or Thinner 242E maximum 32 oz. (0.95 L) per 5 gallons (18.9 L). Thinning will affect the film build properties and extend the cure time of the coating.

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.

Airless Spray	Use 1.35 gal. (5.1 L) per minute electric airless (minimum) to provide an operating pressure of 4,000 psi (276 bar). Must have 30 mesh inline filter installed. Remove rock catcher from siphon tube.
Spray Gun	Graco silver Gun with gun swivel, Contractor Gun (with filter removed) or equivalent
Spray Tips	0.021-0.029" (Ex. Graco LTX423 Blue RAC X SwitchTip and Guard). Maximum 4,000 psi.
Fan Size	6-10" (152-254 mm) depending on section being sprayed
Hose Length	150' (45 m) maximum pump dependent 75' (22 m) *
Material Hose	3/8" (9.5 mm) I.D. minimum 1/2” (12.7 mm) I.D. minimum *
Whip Hose	1/4" (6.3 mm) I.D. minimum (optional)

APPLICATION PROCEDURES

General	May be applied by spray, trowel, brush or roller. Spray application is recommended for the optimum production, coverage and finish. When applying by trowel, brush or roller, work from a small container and mix material frequently. The original pail should be kept tightly closed.
Airless Spray	Applying thin coats in a number of quick passes allows greater control over quantities, thickness and finish. In most conditions, it is advantageous to apply two thin coats rather than one thick coat.
Application Rates	At an ambient temperature of 70°F (21°C), the following application rates are applicable: Spray / trowel: 35 mils (0.89 mm) per coat (wet) Brush / roll: 10 mils (0.25 mm) per coat (wet) 4 hour recoat time between coats
Wet Film Thickness	Frequent thickness measurements with a wet film gauge are recommended during the application process to ensure uniform thickness.
Dry Film Thickness	Final thickness must be measured using an electronic dry film thickness gauge. For method of thickness determination and tolerances refer to: AWCI Technical Manual 12-B (Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire Resistive Materials).

APPLICATION CONDITIONS

Condition	Material	Surface	Ambient	Humidity
Minimum	70°F (21°C)	50°F (10°C)	50°F (10°C)	0%
Maximum	105°F (41°C)	125°F (52°C)	110°F (43°C)	85%

*Thermo-Sorb 263 may be applied when the material temperature range is between 51°F (10.5°C) and 69°F (20.5°C) provided that the material hose used shall be a minimum 1/2” (12.7 mm) I.D., shall be no greater than 75’ (22 m) in length and no whip line is to be used.
Steel surface temperature should be a minimum of 5°F (3°C) above the dew point. Heavy rain or water running over the surface of recently applied material can cause surface patterning if the material has not formed a skin. Cold steel temperature may result in lower first coat application thickness.

CURING SCHEDULE

Surface Temp.	Dry to Recoat
70°F (21°C)	4 Hours

*Based on 50% relative humidity. For optimum curing, it is recommended to apply one coat at 35 mils (889 microns) wet per day. Drying Time will vary with temperature and humidity conditions. Shore DO readings are to be taken to verify the level of cure. Press the Shore DO gauge firmly to the surface for a minimum of 10 seconds. When the Shore DO value is 80 and the drop off is less than 5 points, the material is considered dry and ready for top coat application. Air movement and thinner coats will assist drying. Higher film thicknesses will require longer drying times before topcoating.

CLEANUP & SAFETY

Cleanup | Pump, Gun, Tips and Hoses and mixer should be cleaned at least once per day with: Plasite Thinner 19, Thinner 2, Toluene, MEK, MIBK or Xylene.

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 | If coating becomes damaged, rebuild required thickness by spray or trowel. When dry, smooth and finish with approved topcoat to match. Damaged areas must be abraded back to a firm edge by sanding or scraping. The topcoat should be abraded back by 1" (25.4 mm) from the damaged area. The surface must be clean and dry before re-applying. The coating shall then be built back to the original thickness, allowed to dry, then overcoated with the specified topcoat or system.

TESTING / CERTIFICATION / LISTING

Underwriters Laboratories, Inc. | Tested in accordance with ASTM E-119 (UL 263) at Underwriter's Laboratories, Inc. UL/cUL listed for interior environments for the following:
Wide Flange Columns: Y642
Tube Columns: Y643
Pipe Columns: Y644
Restrained and Unrestrained Beams: N645
Beams (Protected Deck): E704
Beams (Unprotected Deck): D995, D996

*The product should be applied in accordance with the appropriate design.

PACKAGING, HANDLING & STORAGE

Packaging | 5 gallons (18.9 L)

Shelf Life | 12 months (when kept at recommended storage conditions and in original unopened containers).

PACKAGING, HANDLING & STORAGE

Storage	Store indoors in a dry environment between 32-105°F (0-40.6°C)
Shipping Weight (Approximate)	5 Gallon kit - 64.3 lb (29.2 kg)
Flash Point (Setaflash)	54°F (12.2°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 to UN GHS Revision 3

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

1.1 Product Identifier NC29S1NL

Product Name: THERMO-SORB 263

Revision Date: 09/22/2017

Supercedes Date: 03/28/2017

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

Monocomponent industrial coating - 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: Alotta, Vicki - 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

Flammable Liquid, category 2
Reproductive Toxicity, category 2

2.2 Label elements

Symbol(s) of Product

Signal Word

danger

Named Chemicals on Label

TOLUENE

HAZARD STATEMENTS

Flammable Liquid, category 2	H225	Highly flammable liquid and vapour.
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.
P235	Keep cool.
P284	Wear respiratory protection.
P308+P313	IF exposed or concerned: 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	%
616-38-6	DIMETHYL CARBONATE	10-25
13463-67-7	TITANIUM DIOXIDE	10-25
108-78-1	MELAMINE	2.5-10
108-88-3	TOLUENE	2.5-10
64742-95-6	AROMATIC HYDROCARBON	1.0-2.5
138265-88-0	ZINC BORATE	1.0-2.5
540-88-5	TERT-BUTYL ACETATE	0.1-1.0

CAS-No.	GHS Symbols	GHS Hazard Statements	M-Factors
616-38-6	GHS02	H225	0
13463-67-7			0
108-78-1		H303	0
108-88-3	GHS02-GHS07-GHS08	H225-304-315-319-336-361-373	0
64742-95-6	GHS02-GHS07-GHS08-GHS09	H226-304-315-319-332-335-336-411	0
138265-88-0	GHS06	H331	0
540-88-5	GHS02-GHS07	H225-332-335-336	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

For personal protection see section 8. Ensure adequate ventilation. Evacuate personnel to safe areas. Evacuate personnel to safe areas. Remove all sources of ignition. 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.

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). 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. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing. Use only with adequate ventilation/personal protection.
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	%	ACGIH TLV-TWA	ACGIH TLV-STEL	OSHA PEL-TWA	OSHA PEL-CEILING	OEL Note
DIMETHYL CARBONATE	10-25	N/E	N/E	N/E	N/E	
TITANIUM DIOXIDE	10-25	10 MGM3	N/E	10 MGM3	N/E	
MELAMINE	2.5-10	N/E	N/E	N/E	N/E	
TOLUENE	2.5-10	20 PPM	N/E	375 MGM3	N/E	
AROMATIC HYDROCARBON	1.0-2.5	N/E	N/E	N/E	N/E	
ZINC BORATE	1.0-2.5	10 MG/M3	NE	NE	NE	
TERT-BUTYL ACETATE	0.1-1.0	200 PPM	N/E	950 MGM3	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: 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.

OTHER PROTECTIVE EQUIPMENT: Ensure that eyewash stations and safety showers are close to the workstation location. Lightweight protective clothing

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:	White Viscous Liquid
Physical State	LIQUID
Odor	Aromatic
Odor threshold	Not Determined
pH	Not Determined
Melting point / freezing point (°C)	Not Determined
Boiling point/range (°C)	149 F (65 C) - 393 F (201 C)
Flash Point, (°C)	12
Evaporation rate	Slower Than Ether
Flammability (solid, gas)	N/D

Upper/lower flammability or explosive limits	0.9 - 36.0
Vapour Pressure, mmHg	Not Determined
Vapour density	Heavier than Air
Relative density	N/D
Solubility in / Miscibility with water	Not Determined
Partition coefficient: n-octanol/water	N/D
Auto-ignition temperature (°C)	N/D
Decomposition temperature (°C)	N/D
Viscosity	Not Determined
Explosive properties	N/D
Oxidising properties	N/D

9.2 Other information

VOC Content g/l:	149
Specific Gravity (g/cm3)	1.44

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
616-38-6	DIMETHYL CARBONATE	12900 mg/kg, oral, rat	>2000 mg/kg, dermal, rabbit	Not Available
13463-67-7	TITANIUM DIOXIDE	25000 mg/kg, oral (rat)	Not Available	Not Available
108-78-1	MELAMINE	3161 mg/kg, oral, rat		3248 mg/m3 8 Hr, Inh, Rat
108-88-3	TOLUENE	5000 mg/kg rat oral	12267 mg/kg, dermal, rabbit	8000 ppm/4 hrs, rat, inhalation
64742-95-6	AROMATIC HYDROCARBON	4700 mg/kg, oral, rat	Not Available	3670 ppm/8 hours, rat, inhalation
138265-88-0	ZINC BORATE	>10000 MG/KG ORAL RAT		> 5MG/L
540-88-5	TERT-BUTYL ACETATE	3160 mg/kg, oral, rat	Not Available	4000 ppm/6 hours, rat inhalation

Additional Information:

This product may contain Titanium Dioxide, which is listed by IARC as possibly carcinogenic to humans (Group 2B). This listing is based on inadequate evidence of carcinogenicity in humans and sufficient evidence in experimental animals. The classification(s) is/ are relevant when exposed to these respirable substances in dust or powder form only, including cured product that is subject to sanding, grinding, cutting, or other surface preparation activities.

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
616-38-6	DIMETHYL CARBONATE	100 mg/l (Daphnia magna)	100 mg/l (Algae)	100 mg/l (Zebra Fish)
13463-67-7	TITANIUM DIOXIDE	No information	No information	No information
108-78-1	MELAMINE	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)
64742-95-6	AROMATIC HYDROCARBON	No information	No information	No information
138265-88-0	ZINC BORATE	No information	No information	No information
540-88-5	TERT-BUTYL ACETATE	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 3

Technical name Paint

14.3 Transport hazard class(es) Unknown

Subsidiary shipping hazard N/A

14.4 Packing group II

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:

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

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:

Chemical Name	CAS-No.

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
ACRYLIC COPOLYMER	60381-61-5

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
ACRYLIC COPOLYMER	60381-61-5
PENTAERYTHRITOL	115-77-5
LONG CHAIN CHLORINATED PARAFFIN	85535-86-0

California Proposition 65:

Warning: The following ingredients present in the product are known to the state of California to cause Cancer:

Chemical Name	CAS-No.
TITANIUM DIOXIDE	13463-67-7
ETHYL BENZENE	100-41-4
CUMENE	98-82-8

Warning: The following ingredients present in the product are known to the state of California to cause birth defects, or other reproductive hazards.

Chemical Name	CAS-No.
TOLUENE	108-88-3
METHYL ALCOHOL	67-56-1

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.
H226	Flammable liquid and vapour.
H303	May be harmful if swallowed
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H332	Harmful if inhaled.
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.

FIRE-RESISTANCE DESIGN

Assembly Usage Disclaimer

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

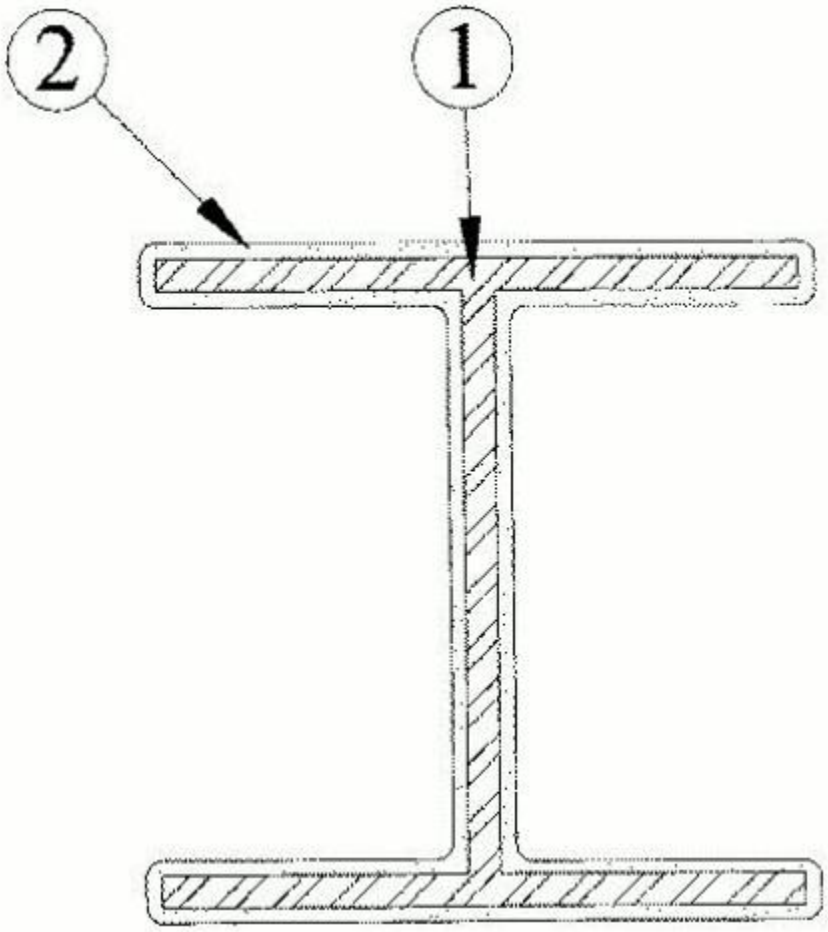
See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. Y642

August 18, 2017

Ratings — 1, 1-1/2, 2, 3 and 4 Hrs. (See Item 2)

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Steel Column —** Wide flange steel columns with the minimum sizes shown in the tables below. Columns shall be free of dirt, loose scale and oil. Column shall be primed with 0.003 in. dry film thickness of modified alkyd, epoxy, organic zinc or inorganic zinc based primer.

2. **Mastic and Intumescent Coating* —** Coating spray, brush or trowel applied directly from containers to desired thickness. See table below for appropriate final dry thickness.

Size	W/D	Hp/A	Ratings, Hr.				
			1 HR	1- 1/2 HR	2 HR	3 HR	4 HR
W6x9	0.34	394	0.141	0.262	NR	NR	NR
W10x12	0.35	383	0.139	0.262	NR	NR	NR
W12x14	0.36	372	0.137	0.254	NR	NR	NR
W12x16	0.41	327	0.128	0.236	NR	NR	NR
W8x13	0.42	319	0.126	0.233	NR	NR	NR
W6x15	0.43	312	0.124	0.230	NR	NR	NR
W10x15	0.43	312	0.124	0.230	NR	NR	NR
W6x12	0.44	304	0.122	0.227	NR	NR	NR
W14x22	0.47	285	0.118	0.218	NR	NR	NR
W8x15	0.48	279	0.116	0.216	NR	NR	NR

W10x17	0.48	279	0.116	0.216	NR	NR	NR
W12x19	0.48	279	0.116	0.216	NR	NR	NR
W8x18	0.5	268	0.113	0.210	NR	NR	NR
W16x26	0.5	268	0.113	0.210	NR	NR	NR
W10x22	0.52	258	0.111	0.205	NR	NR	NR
W10x19	0.53	253	0.109	0.203	NR	NR	NR
W12x26	0.53	253	0.109	0.203	NR	NR	NR
W4x13	0.55	244	0.107	0.198	NR	NR	NR
W5x16	0.55	244	0.107	0.198	NR	NR	NR
W12x22	0.55	244	0.107	0.198	NR	NR	NR
W14X26	0.55	244	0.107	0.198	NR	NR	NR
W6x20	0.56	239	0.106	0.196	NR	NR	NR
W14x16	0.56	239	0.106	0.196	NR	NR	NR
W14x30	0.56	239	0.106	0.196	NR	NR	NR
W8x21	0.57	235	0.071	0.192	0.283	NR	NR
W6x16	0.58	231	0.071	0.192	0.280	0.505	NR
W8x24	0.59	227	0.071	0.190	0.277	0.504	NR
W16x31	0.59	227	0.071	0.190	0.277	0.504	NR
W12x30	0.6	223	0.071	0.187	0.274	0.497	NR
W18x35	0.6	223	0.071	0.187	0.274	0.497	NR
W10x26	0.61	220	0.071	0.185	0.271	0.491	NR
W16x36	0.62	216	0.071	0.183	0.268	0.485	NR
W14x34	0.63	213	0.071	0.182	0.265	0.479	NR
W5x19	0.65	206	0.071	0.178	0.260	0.468	NR
W8x31	0.66	203	0.071	0.176	0.257	0.462	NR
W10x33	0.66	203	0.071	0.176	0.257	0.462	NR
W21x44	0.67	200	0.071	0.174	0.254	0.457	NR
W8x28	0.68	197	0.071	0.172	0.252	0.452	NR
W16x40	0.68	197	0.071	0.172	0.252	0.452	NR
W18x40	0.68	197	0.071	0.172	0.252	0.452	NR
W6x25	0.69	194	0.071	0.171	0.249	0.446	NR

W10x30	0.7	191	0.071	0.169	0.247	0.441	NR
W12x35	0.7	191	0.071	0.169	0.247	0.441	NR
W14x38	0.7	191	0.071	0.169	0.247	0.441	NR
W8x35	0.74	181	0.071	0.163	0.238	0.422	NR
W12x40	0.74	181	0.071	0.163	0.238	0.422	NR
W14x43	0.75	179	0.071	0.161	0.235	0.418	NR
W24x55	0.75	179	0.071	0.161	0.235	0.418	NR
W16x45	0.76	176	0.071	0.160	0.233	0.413	NR
W21x50	0.76	176	0.071	0.160	0.233	0.413	NR
W18x50	0.77	174	0.071	0.158	0.231	0.409	NR
W10x39	0.78	172	0.071	0.157	0.229	0.405	NR
W18x46	0.78	172	0.071	0.157	0.229	0.405	NR
W12x45	0.82	163	0.071	0.151	0.221	0.389	NR
W14x48	0.83	161	0.071	0.150	0.192	0.385	NR
W24x68	0.83	161	0.054	0.123	0.192	0.385	NR
W8x40	0.84	159	0.054	0.123	0.192	0.381	NR
W10x49	0.84	159	0.054	0.123	0.192	0.325	NR
W16x50	0.84	159	0.054	0.123	0.192	0.325	NR
W24x62	0.84	159	0.054	0.123	0.192	0.325	NR
W12x53	0.85	158	0.054	0.123	0.192	0.325	NR
W18x55	0.85	158	0.054	0.123	0.192	0.325	NR
W21x57	0.85	158	0.054	0.123	0.192	0.325	NR
W21x62	0.85	158	0.054	0.123	0.192	0.325	NR
W10x45	0.89	151	0.054	0.123	0.192	0.325	NR
W12x50	0.91	147	0.054	0.123	0.192	0.325	NR
W14x53	0.91	147	0.054	0.123	0.192	0.325	NR
W10x54	0.92	146	0.054	0.123	0.192	0.325	NR
W12x65	0.92	146	0.054	0.123	0.192	0.325	NR
W14x61	0.92	146	0.054	0.123	0.192	0.325	NR
W18x60	0.92	146	0.054	0.123	0.192	0.325	NR
W21x68	0.92	146	0.054	0.123	0.192	0.325	NR

W27x84	0.92	146	0.054	0.123	0.192	0.325	NR
W12x58	0.93	144	0.054	0.123	0.192	0.325	NR
W16x67	0.93	144	0.054	0.123	0.192	0.325	NR
W24x76	0.93	144	0.054	0.123	0.192	0.325	NR
W16x57	0.95	141	0.054	0.123	0.192	0.325	NR
W18x76	0.96	140	0.054	0.123	0.192	0.325	NR
W18x65	0.99	135	0.054	0.123	0.192	0.325	NR
W21x73	0.99	135	0.054	0.123	0.192	0.325	NR
W8x48	1	134	0.054	0.123	0.191	0.325	NR
W30x99	1	134	0.054	0.123	0.191	0.325	NR
W10x60	1.02	131	0.054	0.123	0.188	0.324	NR
W12x72	1.02	131	0.054	0.123	0.188	0.324	NR
W24x84	1.02	131	0.054	0.123	0.188	0.324	NR
W27x94	1.02	131	0.054	0.123	0.188	0.324	NR
W14x68	1.03	130	0.054	0.123	0.186	0.322	NR
W16x77	1.06	126	0.054	0.123	0.182	0.314	NR
W14x90	1.07	125	0.054	0.123	0.181	0.312	NR
W24x104	1.07	125	0.054	0.123	0.181	0.312	NR
W18x71	1.08	124	0.054	0.123	0.180	0.309	NR
W18x86	1.08	124	0.054	0.123	0.180	0.309	NR
W33x118	1.08	124	0.054	0.123	0.180	0.309	NR
W30x108	1.09	123	0.054	0.122	0.178	0.307	NR
W12x79	1.11	121	0.054	0.120	0.176	0.302	NR
W14x74	1.11	121	0.054	0.120	0.176	0.302	NR
W27x102	1.11	121	0.054	0.120	0.176	0.302	NR
W21x83	1.12	120	0.054	0.120	0.175	0.300	NR
W21x101	1.12	120	0.054	0.120	0.175	0.300	NR
W24x94	1.13	119	0.054	0.119	0.174	0.297	NR
W10x68	1.14	118	0.054	0.118	0.172	0.295	NR
W30x116	1.16	115	0.054	0.116	0.170	0.291	NR
W36x135	1.16	115	0.054	0.116	0.170	0.291	NR

W14x99	1.17	115	0.054	0.116	0.169	0.289	NR
W33x130	1.18	114	0.054	0.115	0.168	0.287	NR
W8x58	1.19	113	0.054	0.114	0.167	0.284	NR
W24x117	1.2	112	0.054	0.113	0.166	0.282	NR
W18x97	1.21	111	0.054	0.113	0.164	0.280	NR
W12x87	1.22	110	0.054	0.112	0.163	0.278	NR
W14x82	1.22	110	0.054	0.112	0.163	0.278	NR
W16x89	1.22	110	0.054	0.112	0.163	0.278	NR
W21x111	1.23	109	0.054	0.111	0.162	0.276	NR
W27x114	1.23	109	0.054	0.111	0.162	0.276	NR
W21x93	1.24	108	0.054	0.110	0.161	0.275	NR
W30x124	1.24	108	0.054	0.110	0.161	0.275	NR
W10x77	1.28	105	0.054	0.108	0.157	0.267	NR
W14x109	1.28	105	0.054	0.108	0.157	0.267	NR
W33x141	1.28	105	0.054	0.108	0.157	0.267	NR
W36x150	1.28	105	0.054	0.108	0.157	0.267	NR
W30x132	1.31	102	0.054	0.106	0.154	0.262	NR
W18x106	1.32	101	0.054	0.105	0.153	0.260	NR
W24x131	1.33	101	0.054	0.104	0.152	0.258	NR
W12x96	1.34	100	0.054	0.104	0.152	0.257	NR
W21x122	1.34	100	0.054	0.104	0.152	0.257	NR
W27x146	1.35	99	0.054	0.103	0.151	0.255	NR
W8x67	1.36	99	0.054	0.102	0.150	0.253	NR
W16x100	1.36	99	0.054	0.102	0.150	0.253	NR
W36x160	1.36	99	0.054	0.102	0.150	0.253	NR
W33x152	1.37	98	0.054	0.102	0.149	0.252	NR
W14x120	1.4	96	0.054	0.100	0.146	0.247	NR
W36x170	1.44	93	0.053	0.098	0.143	0.241	NR
W10x88	1.45	92	0.052	0.097	0.142	0.239	NR
W21x132	1.45	92	0.052	0.097	0.142	0.239	NR
W12x106	1.46	92	0.052	0.097	0.141	0.238	NR

W30x173	1.46	92	0.052	0.097	0.141	0.238	NR
W18x119	1.47	91	0.052	0.096	0.140	0.236	NR
W24x146	1.48	91	0.052	0.096	0.140	0.235	NR
W27x161	1.48	91	0.052	0.096	0.140	0.235	NR
W14x132	1.54	87	0.050	0.093	0.135	0.227	NR
W36x182	1.54	87	0.050	0.093	0.135	0.227	NR
W33x201	1.58	85	0.049	0.091	0.132	0.222	NR
W21x147	1.60	84	0.048	0.090	0.131	0.219	NR
W30x191	1.60	84	0.048	0.090	0.131	0.219	NR
W10x100	1.63	82	0.048	0.088	0.129	0.216	NR
W14x145	1.63	82	0.048	0.088	0.129	0.216	NR
W24x162	1.63	82	0.048	0.088	0.129	0.216	NR
W27x178	1.63	82	0.048	0.088	0.129	0.216	NR
W36x194	1.63	82	0.048	0.088	0.129	0.216	NR
W12x120	1.64	82	0.047	0.088	0.128	0.214	NR
W36x230	1.71	78	0.046	0.085	0.124	0.207	NR
W33x221	1.72	78	0.046	0.084	0.123	0.205	NR
W30x211	1.76	76	0.045	0.083	0.121	0.201	NR
W36x210	1.76	76	0.045	0.083	0.121	0.201	NR
W14x159	1.77	76	0.044	0.082	0.120	0.200	NR
W10x112	1.81	74	0.044	0.081	0.118	0.196	NR
W36x245	1.82	74	0.043	0.080	0.117	0.195	NR
W12x136	1.84	73	0.043	0.080	0.116	0.193	NR
W33x241	1.88	71	0.042	0.078	0.114	0.190	NR
W36x260	1.92	70	0.041	0.077	0.112	0.186	NR
W14x176	1.95	69	0.041	0.076	0.111	0.183	0.373
W12x152	2.04	66	0.039	0.073	0.107	0.176	0.373
W36x280	2.06	65	0.039	0.072	0.106	0.174	0.373
W14x193	2.12	63	0.038	0.071	0.103	0.170	0.373
W36x300	2.19	61	0.037	0.069	0.100	0.165	0.373
W12x170	2.26	59	0.036	0.067	0.097	0.160	0.373

W14x211	2.30	58	0.035	0.066	0.096	0.158	0.373
W12x190	2.49	54	0.031	0.055	0.079	0.146	0.373
W14x233	2.52	53	0.031	0.055	0.079	0.141	0.373
W12x210	2.72	49	0.031	0.055	0.079	0.141	0.373
W14x257	2.75	49	0.031	0.055	0.079	0.141	0.373
W12x230	2.94	46	0.031	0.055	0.079	0.141	0.373
W14x283	3.00	45	0.031	0.055	0.079	0.141	0.373
W12x252	3.19	42	0.031	0.055	0.079	0.141	0.373
W14x311	3.26	41	0.031	0.055	0.079	0.141	0.373
W12x279	3.48	38	0.031	0.055	0.079	0.141	0.373
W14x342	3.55	38	0.031	0.055	0.079	0.141	0.373
W12x305	3.75	36	0.031	0.055	0.079	0.141	0.373
W14x370	3.80	35	0.031	0.055	0.079	0.141	0.373
W14x398	4.04	33	0.031	0.055	0.079	0.141	0.373
W12x336	4.07	33	0.031	0.055	0.079	0.141	0.373
W14x426	4.29	31	0.031	0.055	0.079	0.141	0.373
W14x455	4.54	30	0.031	0.055	0.079	0.141	0.373
W14x500	4.91	27	0.031	0.055	0.079	0.141	0.373
W14x550	5.32	25	0.031	0.055	0.079	0.141	0.373
W14x605	5.75	23	0.031	0.055	0.079	0.141	0.373
W14x665	6.21	22	0.031	0.055	0.079	0.141	0.373
W14x730	6.68	20	0.031	0.055	0.079	0.141	0.373

NR-Not Rated

CARBOLINE CO — Type Thermo-Sorb 263. Investigated for Interior Conditioned Space Purpose and Interior General Purpose. (See Item 3)

3. **Top Coat —** For Interior General Purpose Type Carboguard 1340, Type Rustbond Penetrating Sealer FC or Rustbond FC intermediate coat applied over the base coat at 0.002 in. thickness and Type Carbothane 133HB top-coat, Type Carbocrylic 3359 top-coat or Type Carbothane 133VOC top-coat or Carbothane 133MC top-coat applied over the intermediate coat at 0.003 in. thickness.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2017-08-18

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

FIRE-RESISTANCE DESIGN

Assembly Usage Disclaimer

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

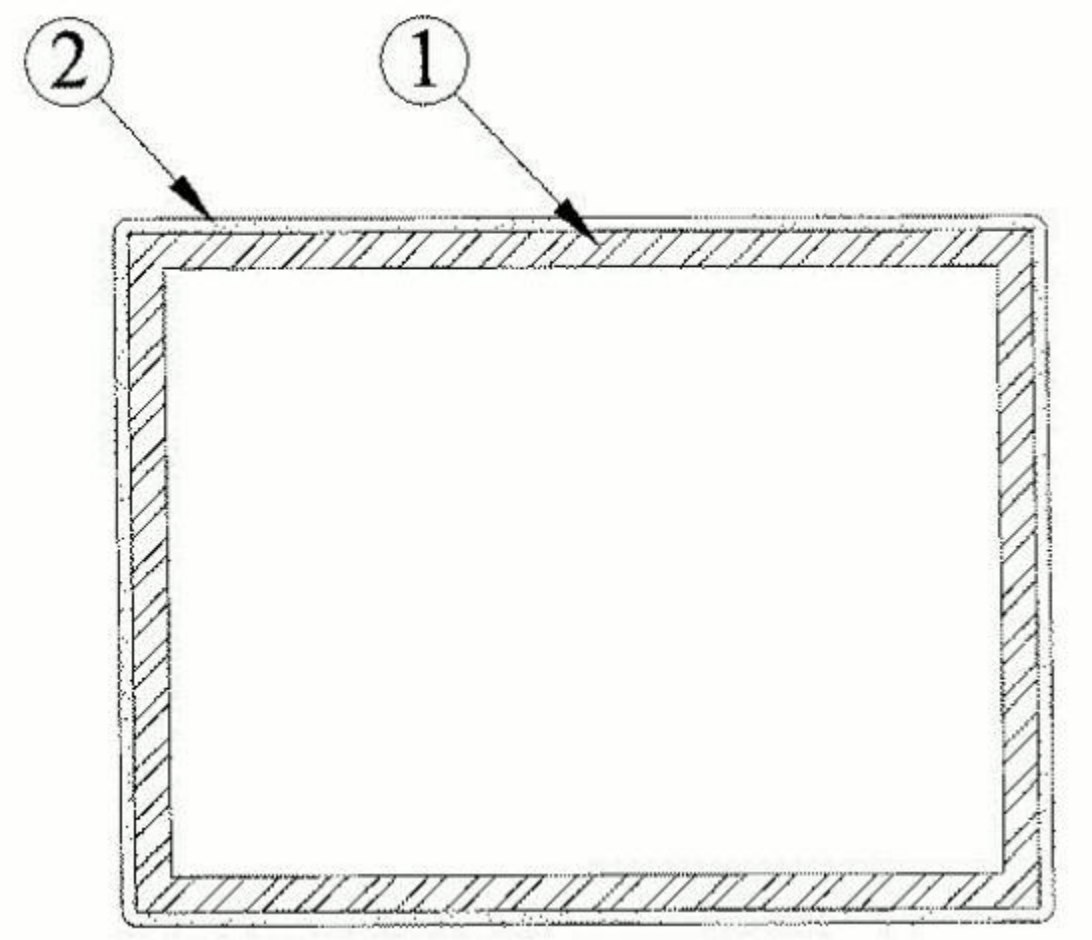
See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. Y643

August 22, 2017

Ratings — 1, 1-1/2, 2, 3 and 4 Hr. (See Item 2)

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Steel Column —** Steel tube columns with the minimum sizes shown in the tables below. Columns shall be free if dirt, loose scale and oil. Column shall be primed with 0.003 in. dry film thickness of modified alkyd, epoxy, organic zinc or inorganic zinc based primer.

2. **Mastic and Intumescent Coating* —** Coating spray, brush or trowel applied directly from containers to desired thickness. See table below for appropriate final dry thickness.

Size	A/P	1 HR	1-1/2 HR	2 HR	3 HR	4 HR
ST 2x2x3/16	0.17	0.226	NR	NR	NR	NR
ST 2.5x2.5x3/16	0.17	0.226	NR	NR	NR	NR
ST 3x2x3/16	0.17	0.226	NR	NR	NR	NR
ST 3x3x3/16	0.18	0.226	NR	NR	NR	NR
ST 3.5x3.5x3/16	0.18	0.226	NR	NR	NR	NR
ST 4x2x3/16	0.18	0.226	NR	NR	NR	NR
ST 4x3x3/16	0.18	0.226	NR	NR	NR	NR
ST 4x4x3/16	0.18	0.226	NR	NR	NR	NR
ST 5x2x3/16	0.18	0.226	NR	NR	NR	NR
ST 5x3x3/16	0.18	0.226	NR	NR	NR	NR
ST 5x4x3/16	0.18	0.226	NR	NR	NR	NR

ST 5x5x3/16	0.18	0.226	NR	NR	NR	NR
ST 6x2x3/16	0.18	0.226	NR	NR	NR	NR
ST 6x3x3/16	0.18	0.226	NR	NR	NR	NR
ST 6x4x3/16	0.18	0.226	NR	NR	NR	NR
ST 6x6x3/16	0.18	0.226	NR	NR	NR	NR
ST 7x3x3/16	0.18	0.226	NR	NR	NR	NR
ST 7x4x3/16	0.18	0.226	NR	NR	NR	NR
ST 7x5x3/16	0.18	0.226	NR	NR	NR	NR
ST 7x7x3/16	0.18	0.226	NR	NR	NR	NR
ST 8x2x3/16	0.18	0.226	NR	NR	NR	NR
ST 8x3x3/16	0.18	0.226	NR	NR	NR	NR
ST 8x4x3/16	0.18	0.226	NR	NR	NR	NR
ST 8x6x3/16	0.18	0.226	NR	NR	NR	NR
ST 8x8x3/16	0.18	0.226	NR	NR	NR	NR
ST 10x2x3/16	0.18	0.226	NR	NR	NR	NR
ST 10x4x3/16	0.18	0.226	NR	NR	NR	NR
ST 10x6x3/16	0.18	0.226	NR	NR	NR	NR
ST 12x2x3/16	0.18	0.226	NR	NR	NR	NR
ST 12x4x3/16	0.18	0.226	NR	NR	NR	NR
ST 12x6x3/16	0.18	0.226	NR	NR	NR	NR
ST 2x2x1/4	0.22	0.226	NR	NR	NR	NR
ST 2.5x2.5x1/4	0.23	0.226	NR	NR	NR	NR
ST 3x2x1/4	0.23	0.226	NR	NR	NR	NR
ST 3x3x1/4	0.23	0.226	NR	NR	NR	NR
ST 3.5x3.5x1/4	0.23	0.226	NR	NR	NR	NR
ST 4x2x1/4	0.23	0.226	NR	NR	NR	NR
ST 4x3x1/4	0.23	0.226	NR	NR	NR	NR
ST 4x4x1/4	0.24	0.135	NR	NR	NR	NR
ST 5x2x1/4	0.24	0.135	NR	NR	NR	NR
ST 5x3x1/4	0.24	0.135	NR	NR	NR	NR
ST 6x2x1/4	0.24	0.135	NR	NR	NR	NR

ST 5x4x1/4	0.24	0.135	NR	NR	NR	NR
ST 5x5x1/4	0.24	0.135	NR	NR	NR	NR
ST 6x3x1/4	0.24	0.135	NR	NR	NR	NR
ST 6x4x1/4	0.24	0.135	NR	NR	NR	NR
ST 7x3x1/4	0.24	0.135	NR	NR	NR	NR
ST 7x4x1/4	0.24	0.135	NR	NR	NR	NR
ST 7x7x1/4	0.24	0.135	NR	NR	NR	NR
ST 8x2x1/4	0.24	0.135	NR	NR	NR	NR
ST 8x3x1/4	0.24	0.135	NR	NR	NR	NR
ST 8x4x1/4	0.24	0.135	NR	NR	NR	NR
ST 8x6x1/4	0.24	0.135	NR	NR	NR	NR
ST 8x8x1/4	0.24	0.135	NR	NR	NR	NR
ST 10x2x1/4	0.24	0.135	NR	NR	NR	NR
ST 10x4x1/4	0.24	0.135	NR	NR	NR	NR
ST 10x6x1/4	0.24	0.135	NR	NR	NR	NR
ST 10x10x1/4	0.24	0.135	NR	NR	NR	NR
ST 12x2x1/4	0.24	0.135	NR	NR	NR	NR
ST 12x4x1/4	0.24	0.135	NR	NR	NR	NR
12X6X1/4	0.24	0.135	NR	NR	NR	NR
ST 12x8x1/4	0.24	0.135	NR	NR	NR	NR
ST 12x12x1/4	0.24	0.135	NR	NR	NR	NR
ST 14x4x1/4	0.24	0.135	NR	NR	NR	NR
ST 14x6x1/4	0.24	0.135	NR	NR	NR	NR
3X3X5/16	0.28	0.124	0.292	0.394	NR	NR
3.5X3.5X5/16	0.28	0.124	0.292	0.394	NR	NR
4x2x5/16	0.28	0.124	0.292	0.394	NR	NR
4X3X5/16	0.28	0.124	0.292	0.394	NR	NR
5x2x5/16	0.28	0.124	0.292	0.394	NR	NR
4X4X5/16	0.29	0.122	0.292	0.385	NR	NR
5X3X15/16	0.29	0.122	0.292	0.385	NR	NR
5X4X5/16	0.29	0.122	0.292	0.385	NR	NR

5X5X5/16	0.29	0.122	0.292	0.385	NR	NR
6x2x5/16	0.29	0.122	0.292	0.385	NR	NR
6X3X5/16	0.29	0.122	0.292	0.385	NR	NR
6X4X5/16	0.29	0.122	0.292	0.385	NR	NR
7X3X5/16	0.29	0.122	0.292	0.385	NR	NR
7X4X5/16	0.29	0.122	0.292	0.385	NR	NR
8X2X5/16	0.29	0.122	0.292	0.385	NR	NR
8X3X5/16	0.29	0.122	0.292	0.385	NR	NR
6X6X5/16	0.3	0.119	0.292	0.377	NR	NR
7X5X5/16	0.3	0.119	0.292	0.377	NR	NR
7X7X5/16	0.3	0.119	0.292	0.377	NR	NR
8X4X5/16	0.3	0.119	0.292	0.377	NR	NR
8X6X5/16	0.3	0.119	0.292	0.377	NR	NR
8X8X5/16	0.3	0.119	0.292	0.377	NR	NR
10X2X5/16	0.3	0.119	0.292	0.377	NR	NR
10X4X5/16	0.3	0.119	0.292	0.377	NR	NR
10X6X5/16	0.3	0.119	0.292	0.377	NR	NR
10X10X5/16	0.3	0.119	0.292	0.377	NR	NR
12X4X5/16	0.3	0.119	0.292	0.377	NR	NR
12X6X5/16	0.3	0.119	0.292	0.377	NR	NR
12X8X5/16	0.3	0.119	0.292	0.377	NR	NR
12X12X5/16	0.3	0.119	0.292	0.377	NR	NR
14X4X5/16	0.3	0.119	0.292	0.377	NR	NR
14X6X5/16	0.3	0.119	0.292	0.377	NR	NR
14X10X5/16	0.3	0.119	0.292	0.377	NR	NR
16X4X5/16	0.3	0.119	0.292	0.377	NR	NR
16X8X5/16	0.3	0.119	0.292	0.377	NR	NR
18X6X5/16	0.3	0.119	0.292	0.377	NR	NR
20X4X5/16	0.3	0.119	0.292	0.377	NR	NR
14X14X5/16	0.31	0.117	0.292	0.369	NR	NR
16X12X5/16	0.31	0.117	0.292	0.369	NR	NR

16X16X5/16	0.31	0.117	0.292	0.369	NR	NR
20X8X5/16	0.31	0.117	0.292	0.369	NR	NR
4X4X3/8	0.34	0.107	0.292	0.344	NR	NR
5X3X3/8	0.34	0.107	0.292	0.344	NR	NR
5X4X3/8	0.34	0.107	0.292	0.344	NR	NR
6X2X3/8	0.34	0.107	0.292	0.344	NR	NR
6X3X3/8	0.34	0.107	0.292	0.344	NR	NR
5X5X3/8	0.35	0.105	0.292	0.336	NR	NR
6X4X3/8	0.35	0.105	0.292	0.336	NR	NR
6X6X3/8	0.35	0.105	0.292	0.336	NR	NR
7X3X3/8	0.35	0.105	0.292	0.336	NR	NR
7X4X3/8	0.35	0.105	0.292	0.336	NR	NR
7X5X3/8	0.35	0.105	0.292	0.336	NR	NR
7X7X3/8	0.35	0.105	0.292	0.336	NR	NR
8X2X3/8	0.35	0.105	0.292	0.336	NR	NR
8X3X3/8	0.35	0.105	0.292	0.336	NR	NR
8X4X3/8	0.35	0.105	0.292	0.336	NR	NR
8X6X3/8	0.35	0.105	0.292	0.336	NR	NR
10X4X3/8	0.35	0.105	0.292	0.336	NR	NR
8X8X3/8	0.36	0.102	0.292	0.328	NR	NR
10X6X3/8	0.36	0.102	0.292	0.328	NR	NR
10X10X3/8	0.36	0.102	0.292	0.328	NR	NR
12X4X3/8	0.36	0.102	0.292	0.328	NR	NR
12X6X3/8	0.36	0.102	0.292	0.328	NR	NR
12X8X3/8	0.36	0.102	0.292	0.328	NR	NR
12X12X3/8	0.36	0.102	0.292	0.328	NR	NR
14X4X3/8	0.36	0.102	0.292	0.328	NR	NR
14X6X3/8	0.36	0.102	0.292	0.328	NR	NR
14X10X3/8	0.36	0.102	0.292	0.328	NR	NR
14X14X3/8	0.36	0.102	0.292	0.328	NR	NR
16X4X3/8	0.36	0.102	0.292	0.328	NR	NR

16X8X3/8	0.36	0.102	0.292	0.328	NR	NR
16X12X3/8	0.36	0.102	0.292	0.328	NR	NR
18X6X3/8	0.36	0.102	0.292	0.328	NR	NR
20X4X3/8	0.36	0.102	0.292	0.328	NR	NR
20X8X3/8	0.36	0.102	0.292	0.328	NR	NR
16X16X3/8	0.37	0.099	0.292	0.320	NR	NR
4X4X1/2	0.44	0.078	0.166	0.263	0.465	NR
5X3X1/2	0.44	0.078	0.166	0.263	0.465	NR
5X5X1/2	0.45	0.075	0.161	0.263	0.465	NR
6X4X1/2	0.45	0.075	0.161	0.263	0.465	NR
6X6X1/2	0.46	0.072	0.157	0.263	0.465	NR
7X5X1/2	0.46	0.072	0.157	0.263	0.465	NR
7X7X1/2	0.46	0.072	0.157	0.263	0.465	NR
8X4X1/2	0.46	0.072	0.157	0.263	0.465	NR
8X6X1/2	0.46	0.072	0.157	0.263	0.465	NR
10X4X1/2	0.46	0.072	0.157	0.263	0.465	NR
8X8X1/2	0.47	0.069	0.153	0.263	0.465	NR
10X6X1/2	0.47	0.069	0.153	0.263	0.465	NR
12X4X1/2	0.47	0.069	0.153	0.263	0.465	NR
12X6X1/2	0.47	0.069	0.153	0.263	0.465	NR
14X4X1/2	0.47	0.069	0.153	0.263	0.465	NR
10X10X1/2	0.48	0.067	0.150	0.263	0.465	NR
12X8X1/2	0.48	0.067	0.150	0.263	0.465	NR
12X12X1/2	0.48	0.067	0.150	0.263	0.465	NR
14X6X1/2	0.48	0.067	0.150	0.263	0.465	NR
14X10X1/2	0.48	0.067	0.150	0.263	0.465	NR
14X14X1/2	0.48	0.067	0.150	0.263	0.465	NR
16X4X1/2	0.48	0.067	0.150	0.263	0.465	NR
16X8X1/2	0.48	0.067	0.150	0.263	0.465	NR
16X12X1/2	0.48	0.067	0.150	0.263	0.465	NR
16X16X1/2	0.48	0.067	0.150	0.263	0.465	NR

18X6X1/2	0.48	0.067	0.150	0.263	0.465	NR
20X4X.5	0.48	0.067	0.150	0.263	0.465	NR
20X8X1/2	0.48	0.067	0.150	0.263	0.465	NR
20X12X1/2	0.48	0.067	0.150	0.263	0.465	NR
8X8X5/8	0.58	0.038	0.108	0.263	0.465	NR
10X10X5/8	0.59	0.035	0.104	0.263	0.465	NR
12X8X5/8	0.59	0.035	0.104	0.263	0.465	NR
16X12X5/8	0.60	0.035	0.104	0.263	0.465	NR
12X12X2	1.67	0.035	0.104	0.248	0.248	0.248

NR - Not Rated

CARBOLINE CO — Type Thermo-Sorb 263. Investigated for Interior Conditioned Space Purpose and Interior General Purpose. (See Item 3)

3. **Top Coat —** Not required for Interior Conditioned Space Purpose. For Interior General Purpose Type Carboguard 1340, Type Rustbond Penetrating Sealer FC or Rustbond FC intermediate coat applied over the base coat at 0.002 in. thickness and Type Carbothane 133HB top-coat, Type Carbocrylic 3359 top-coat or Type Carbothane 133VOC top-coat or Carbothane 133MC top-coat applied over the intermediate coat at 0.003 in. thickness.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2017-08-22

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

UL permits the reproduction of the material contained in the Online Certification Directory subject to the following conditions: 1. The Guide Information, Assemblies, Constructions, Designs, Systems, and/or Certifications (files) must be presented in their entirety and in a non-misleading manner, without any manipulation of the data (or drawings). 2. The statement "Reprinted from the Online Certifications Directory with permission from UL" must appear adjacent to the extracted material. In addition, the reprinted material must include a copyright notice in the following format: "© 2019 UL LLC".

FIRE-RESISTANCE DESIGN

Assembly Usage Disclaimer

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

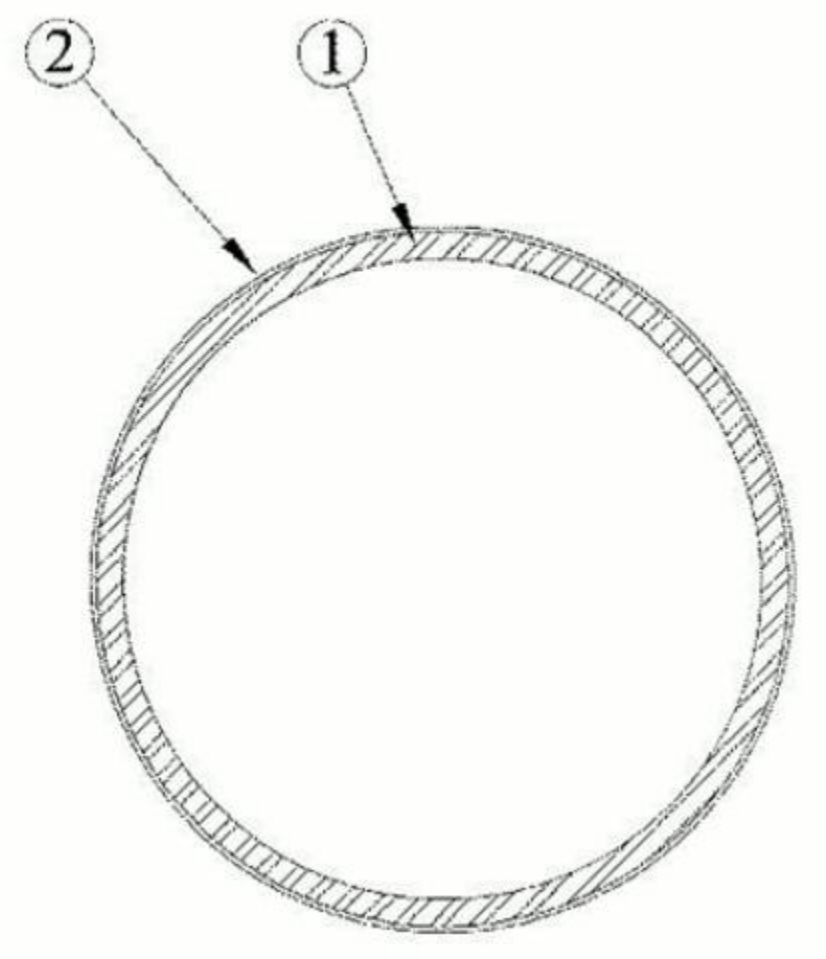
See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. Y644

August 22, 2017

Ratings — 1, 1-1/2 and 2 Hr (See Item 2)

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Steel Column —** Steel pipe columns with the minimum sizes shown in the tables below. Columns shall be free of dirt, loose scale and oil. Column shall be primed with 0.003 in. dry film thickness of modified alkyd, epoxy, organic zinc or inorganic zinc based primer.

2. **Mastic and Intumescent Coating* —** Coating spray, brush or trowel applied directly from containers to desired thickness. See table below for appropriate final dry thickness.

Size	A/P	1 HR	1-1/2 HR	2 HR	3 HR
SP 4x0.188	0.18	0.228	NR	NR	NR
SP 2.5x0.203	0.19	0.228	NR	NR	NR
SP 2x0.218	0.2	0.228	NR	NR	NR
SP 3x0.216	0.2	0.228	NR	NR	NR
SP 3.5x0.226	0.21	0.228	NR	NR	NR
SP 4x0.237	0.22	0.228	NR	NR	NR
SP 8X0.25	0.24	0.228	NR	NR	NR
SP 10X0.25	0.24	0.228	NR	NR	NR
SP 12X0.25	0.25	0.135	NR	NR	NR
SP 14X0.25	0.25	0.135	NR	NR	NR
SP 5X0.258	0.25	0.135	NR	NR	NR

SP 16X0.25	0.25	0.135	NR	NR	NR
SP 18X0.25	0.25	0.135	NR	NR	NR
SP 20X0.25	0.25	0.135	NR	NR	NR
SP 2.5 X 0.276	0.25	0.135	NR	NR	NR
SP 6X0.28	0.27	0.135	NR	NR	NR
SP 3 X 0.3	0.27	0.135	NR	NR	NR
SP 3.5X0.318	0.29	0.12	0.292	0.385	NR
SP 14X0.312	0.31	0.115	0.292	0.373	NR
SP 16X0.312	0.31	0.115	0.292	0.373	NR
SP 4X0.337	0.31	0.115	0.292	0.373	NR
SP 8X0.322	0.31	0.115	0.292	0.373	NR
SP 5X0.375	0.35	0.104	0.292	0.336	NR
SP 10X0.365	0.35	0.104	0.292	0.336	NR
SP 2 X 0.436	0.36	0.102	0.292	0.328	NR
SP 12X0.375	0.36	0.102	0.292	0.328	NR
SP 14X0.375	0.36	0.102	0.292	0.328	NR
SP 16X0.375	0.37	0.102	0.292	0.323	NR
SP 18X0.375	0.37	0.102	0.292	0.323	NR
SP 20X0.375	0.37	0.102	0.292	0.323	NR
SP 8X0.406	0.39	0.096	0.292	0.306	NR
SP 12X0.406	0.39	0.096	0.292	0.306	NR
SP 6X0.432	0.4	0.088	0.292	0.295	NR
SP 14X0.438	0.42	0.085	0.275	0.275	NR
SP 16X0.438	0.43	0.085	0.274	0.274	NR
SP 18X0.438	0.43	0.085	0.274	0.274	NR
SP 2.5 X 0.552	0.45	0.075	0.165	0.263	0.465
SP 8X0.5	0.47	0.069	0.152	0.263	0.465
SP 10X0.5	0.48	0.066	0.151	0.263	0.465
SP 12X0.5	0.48	0.066	0.151	0.263	0.465
SP 14X0.5	0.48	0.066	0.151	0.263	0.465
SP 16X0.5	0.48	0.066	0.151	0.263	0.465

SP 18X0.5	0.49	0.066	0.147	0.263	0.465
SP 20X0.5	0.49	0.066	0.147	0.263	0.465
SP 3X0.6	0.5	0.061	0.141	0.263	0.465
SP 6X0.562	0.51	0.059	0.134	0.263	0.465
SP 12X0.562	0.54	0.052	0.123	0.263	0.465
SP 18X0.562	0.54	0.052	0.123	0.263	0.465
SP 8X0.594	0.55	0.052	0.116	0.263	0.465
SP 10X0.594	0.56	0.052	0.113	0.263	0.465
SP 14X0.594	0.57	0.05	0.109	0.263	0.465
SP 4X0.674	0.57	0.05	0.109	0.263	0.465
SP 4X0.674	0.57	0.05	0.109	0.263	0.465
SP 20X0.625	0.61	0.05	0.109	0.263	0.465
SP 16X0.656	0.63	0.05	0.109	0.263	0.465
SP 6X0.719	0.64	0.05	0.109	0.263	0.465
SP 5X0.75	0.65	0.05	0.109	0.263	0.465
SP 12X0.688	0.65	0.05	0.109	0.263	0.465
SP 8X 0.719	0.66	0.05	0.109	0.263	0.465
SP 10X0.719	0.67	0.05	0.109	0.263	0.465
SP 14X0.75	0.71	0.05	0.109	0.263	0.465
SP 18X0.75	0.72	0.05	0.109	0.263	0.465
SP 20X0.75	0.72	0.05	0.109	0.263	0.465
SP 8X0.812	0.74	0.05	0.109	0.263	0.465
SP 6 X 0.864	0.75	0.05	0.098	0.263	0.465
SP 10X0.844	0.78	0.05	0.098	0.263	0.465
SP 20X0.812	0.78	0.05	0.098	0.263	0.465
SP 12X0.844	0.79	0.035	0.098	0.263	0.465
SP 8 X 0.875	0.79	0.035	0.098	0.263	0.465
SP 16X0.844	0.8	0.035	0.098	0.263	0.465
SP 18X0.938	0.89	0.035	0.098	0.263	0.465
SP 10X1.0	0.91	0.035	0.098	0.263	0.465
SP 12X1.0	0.92	0.035	0.098	0.263	0.465

SP 20X1.031	0.98	0.035	0.098	0.263	0.465
SP 14X 1.094	1.01	0.035	0.098	0.263	0.465
SP 16X1.219	1.13	0.035	0.098	0.263	0.465
SP 14X 1.25	1.14	0.035	0.098	0.263	0.465
SP 20X1.281	1.2	0.035	0.098	0.263	0.465
SP 14X1.406	1.26	0.035	0.098	0.263	0.465
SP 16X1.594	1.44	0.035	0.098	0.263	0.465
SP 18X1.781	1.6	0.035	0.098	0.263	0.465

NR - Not Rated

CARBOLINE CO — Type Thermo-Sorb 263. Investigated for Interior Conditioned Space Purpose and Interior General Purpose. (See Item 3)

3. **Top Coat —** Not required for Interior Conditioned Space Purpose. For Interior General Purpose Type Carboguard 1340, Type Rustbond Penetrating Sealer FC or Rustbond FC intermediate coat applied over the base coat at 0.002 in. thickness and Type Carbothane 133HB top-coat, Type Carbocrylic 3359 top-coat or Type Carbothane 133VOC top-coat or Carbothane 133MC top-coat applied over the intermediate coat at 0.003 in. thickness.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2017-08-22

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

---

should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

BXUV.D995 - FIRE-RESISTANCE RATINGS - ANSI/UL 263

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. D995

January 22, 2019

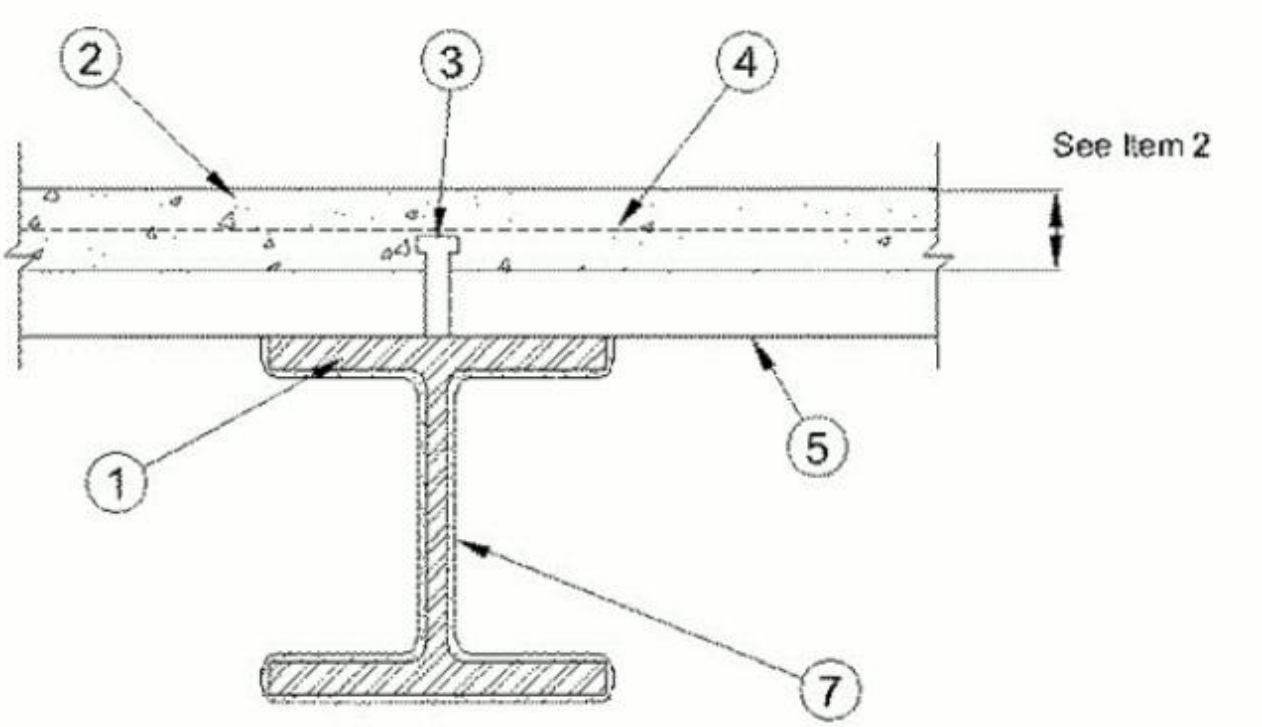
Restrained Assembly Ratings - 2 and 3 Hr. (See Items 2, 5 and 7)

Unrestrained Assembly Ratings - 1, 1-1/2, 2 and 3 Hr. (See Items 2, 5 and 7)

Unrestrained Beam Ratings - 1, 1-1/2, 2 and 3 Hr. (See Items 2, 5 and 7)

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Steel Beams —** Any wide flange steel size shown in the table in Item 7. Beams shall be primed with a modified alkyd, or epoxy based primer.

2. **Normal Weight or Lightweight Concrete —** Normal weight concrete, carbonate or siliceous aggregate, 145 lb/ft or minus 3 lb/ft weight, 3000 psi compressive strength, vibrated. Lightweight concrete, expanded shale, clay or slate aggregate by rotary-kiln method, 102-120 lb/ft weight, 3000 psi compressive strength, vibrated, 4 to 7 percent entrained air. Min thickness shown in the table below:

Restrained Assembly Rating Hr	Concrete (Type)	Concrete Unit Weight pcf	Concrete Thkns In.
1	Normal Weight	147-153	3-1/2
1-1/2	Normal Weight	147-153	4
2	Normal Weight	147-153	4-1/2
3	Normal Weight	147-153	5-1/4
3/4 or 1 (See Item 6)	Lightweight	107-113	2-1/2
1	Lightweight	107-120	2-5/8
1-1/2	Lightweight	107-113	3
2	Lightweight	107-113	3-1/4
2	Lightweight	107-116	3-1/4*
2	Lightweight	114-120	3-1/2
3	Lightweight	107-113	4-3/16
3	Lightweight	114-120	4-7/16

*For use with 2 or 3 in. steel floor and form units only.

3. **Shear Connectors (Optional) —** Studs, 3/4 in. diam by 4-1/2 in. long, headed type or equivalent per AISC specification. Welded to the top flange of the beam, through the deck.

4. **Welded Wire Fabric —** 6x6 — W1.4xW1.4.

5. **Steel Floor and Form Units* —** Composite 1-1/2, 2, or 3 in. deep galv Units. Fluted units may be uncoated. Min gauges 22 MSG for fluted and 20/20 MSG for cellular. Any combination of fluted and cellular units may be used. Spacing of welds attaching units to supports shall be 12 in. OC max unless specified otherwise, adjacent units button-punched or welded together at side joints and, unless specified otherwise for specific unit types, spacing of all side joint fastening systems shall not exceed 36 in. OC.

DESIGN ASSISTANCE CONSTRUCTION SYSTEMS INC — 24 in. wide Type DACS2.0CD, or DACS3.0CD.

NEW MILLENNIUM BUILDING SYSTEMS L L C — 12, 24 or 36 in. wide Types Mac-Lok 2, Mac-Lok 3; 12 in. wide Mac-Way Cellular Types 2-633MTWA, 3-633MTWA, 2-633MTWV, 3-633MTWV. For the 1, 1-1/2, 2h Restrained Assembly Ratings and the 1h Unrestrained Assembly and Beam Rating, 12 in. wide, Type 1.5-633 MTWA may be used. Types Mac-Lok 2, Mac-Lok 3 may be phos/ptd. Two rows of steel studs with discs (Item 7) shall be welded along the sides of the Types 2-633MTWV, 3-633MTWV cellular units a max of 22 in. OC.

NEW MILLENNIUM BUILDING SYSTEMS L L C — 24 or 36 in. wide Types 2.0CD, 3.0CD, 2.0CFD, 3.0CFD, 3.0CFDES ; 24, 30 or 36 in. wide Types 1.5CD, 1.5CDI, 1.5CFD. Fluted units may be phos/painted or galvanized

VULCRAFT, DIV OF NUCOR CORP — 24, 30 or 36 in. wide Type 1.5VLI, 1.5PLVLI, 1.5VLP, 1.5PLVLP; 24 or 36 in. wide Types 2VLI, 2.0PLVLI, 3VLI, 3.0PLVLI, 2VLP, 2.0PLVLP, 3VLP, 3.0PLVLP. Types 1.5VLI, 1.5PLVLI, 2VLI, 2.0PLVLI, 3VLI 3.0PLVLI units may be phos/ptd; 24 or 36 in. wide Types 2VLJ, 3VLJ units (+) may be used for max 2 hr. Restrained Assembly.

(+) Side joints of Type 2VLJ or 3VLJ units may be fastened together with No. 8-3/4 in. long self-drilling Tek screws driven diagonally from the top side through the joint of the units at 36 in. OC max.

The Unrestrained Assembly Rating is equal to the Unrestrained Beam Rating for a max of 3 Hr. and is limited to the following units and limitations:

(a) 1-1/2 in. deep, 24 in. wide, 22 MSG or thicker fluted with clear spans not more than 7 ft 8 in.

(b) 1-1/2 in. deep, 24 in. wide, 20 MSG or thicker fluted with clear spans not more than 8 ft 8 in.

(c) 1-1/2 in. deep, 24 in. wide, 16 MSG or thicker fluted and 18/18 MDG or thicker cellular with clear spans not more than 9 ft 11 in.

(d) 3 in. deep, 36 in. wide, 18 MSG or thicker fluted and 24 in. wide, 20/18 MSG ot thicker cellular with clear spans not more than 13 ft 2 in.

6. **Joint Cover —** (Not Shown) —2 in. wide pressure sensitive cloth tape.

7. **Mastic and Intumescent Coating* —** Coating spray, brush or towel applied directly from containers to desired thickness. See table below for appropriate final dry thickness. After each coat, the surface shall be lightly rolled with a paint roller. Flutes above beam to be completely filled with mineral wool insulation having a minimum density of 6 lb/fte top flange of the beam shall be protected with the same thickness of coating as required on the beam.

Restrained Assembly Rating (Hr)		2			3		
Unrestrained Beam Rating (Hr)		1	1-1/2	2	1-1/2	2	3
Steel Size	W/D	Thickness (In.)					
W6x16	0.67	0.103	0.103	0.143	0.275	0.275	NR
W8x21	0.67	0.103	0.103	0.143	0.275	0.275	NR
W18x35	0.67	0.103	0.103	0.143	0.275	0.275	NR
W6x20	0.68	0.102	0.102	0.143	0.273	0.273	NR
W12x30	0.69	0.101	0.101	0.143	0.270	0.270	NR
W8x24	0.7	0.100	0.100	0.143	0.268	0.268	NR
W10x26	0.7	0.100	0.100	0.143	0.268	0.268	NR
W16x36	0.7	0.100	0.100	0.143	0.268	0.268	NR
W14x34	0.72	0.098	0.098	0.143	0.263	0.263	NR
W21x44	0.74	0.097	0.097	0.143	0.259	0.259	NR
W18x40	0.76	0.095	0.095	0.143	0.256	0.256	NR
W16x40	0.77	0.094	0.094	0.143	0.253	0.253	NR
W5x19	0.78	0.094	0.094	0.143	0.253	0.253	NR
W10x33	0.79	0.093	0.093	0.143	0.250	0.250	NR
W8x31	0.8	0.092	0.092	0.143	0.248	0.248	NR
W12x35	0.8	0.092	0.092	0.143	0.247	0.247	NR
W8x28	0.81	0.092	0.092	0.143	0.246	0.246	0.279
W10x30	0.81	0.092	0.092	0.143	0.246	0.246	0.279
W14x38	0.81	0.092	0.092	0.143	0.246	0.246	0.279
W24x55	0.83	0.09	0.090	0.143	0.243	0.243	0.274
W6x25	0.84	0.09	0.090	0.143	0.241	0.241	0.272

W21x50	0.84	0.09	0.090	0.143	0.241	0.241	0.272
W12x40	0.86	0.088	0.089	0.143	0.237	0.237	0.268
W14x43	0.87	0.088	0.089	0.143	0.236	0.236	0.266
W16x45	0.87	0.088	0.089	0.143	0.236	0.236	0.266
W18x46	0.87	0.088	0.089	0.143	0.236	0.236	0.266
W18x50	0.88	0.087	0.089	0.143	0.235	0.235	0.264
W8x35	0.9	0.086	0.089	0.143	0.231	0.231	0.261
W10x39	0.92	0.084	0.089	0.143	0.227	0.227	0.257
W24x62	0.93	0.084	0.088	0.143	0.226	0.226	0.255
W24x68	0.94	0.084	0.087	0.143	0.225	0.225	0.253
W21x57	0.95	0.083	0.086	0.143	0.223	0.223	0.252
W21x62	0.95	0.083	0.086	0.143	0.222	0.222	0.252
W14x48	0.96	0.082	0.085	0.143	0.221	0.221	0.250
W16x50	0.96	0.082	0.085	0.143	0.221	0.221	0.250
W18x55	0.96	0.082	0.085	0.143	0.221	0.221	0.250
W12x45	0.97	0.082	0.085	0.143	0.220	0.220	0.248
W10x49	1.01	0.079	0.081	0.143	0.214	0.214	0.241
W12x53	1.01	0.079	0.081	0.143	0.214	0.214	0.241
W8x40	1.02	0.079	0.081	0.143	0.213	0.213	0.240
W27x84	1.03	0.078	0.080	0.143	0.211	0.211	0.238
W18x60	1.04	0.078	0.079	0.143	0.210	0.210	0.237
W21x68	1.04	0.078	0.079	0.143	0.210	0.210	0.237
W24x76	1.04	0.078	0.079	0.143	0.210	0.210	0.237
W10x45	1.05	0.077	0.078	0.143	0.208	0.208	0.235
W14x53	1.05	0.077	0.078	0.143	0.208	0.208	0.235
W12x50	1.07	0.076	0.077	0.143	0.206	0.206	0.232
W16x57	1.08	0.076	0.076	0.143	0.204	0.204	0.231
W16x67	1.08	0.076	0.076	0.143	0.204	0.204	0.231
W14x61	1.09	0.075	0.076	0.143	0.203	0.203	0.229
W12x58	1.1	0.075	0.075	0.143	0.202	0.202	0.228

W10x54	1.11	0.074	0.075	0.143	0.201	0.201	0.226
W12x65	1.11	0.074	0.074	0.143	0.200	0.200	0.226
W21x73	1.11	0.074	0.074	0.143	0.200	0.200	0.226
W18x65	1.12	0.074	0.074	0.143	0.199	0.199	0.225
W18x76	1.12	0.074	0.074	0.143	0.199	0.199	0.225
W30x99	1.12	0.074	0.074	0.143	0.199	0.199	0.225
W24x84	1.14	0.073	0.073	0.143	0.196	0.196	0.222
W27x94	1.15	0.073	0.073	0.143	0.196	0.196	0.221
W8x48	1.2	0.07	0.070	0.143	0.189	0.189	0.214
W14x68	1.21	0.07	0.070	0.143	0.189	0.189	0.213
W30x108	1.21	0.07	0.070	0.143	0.189	0.189	0.213
W33x118	1.21	0.07	0.070	0.143	0.189	0.189	0.213
W18x71	1.22	0.07	0.070	0.143	0.188	0.188	0.212
W10x60	1.23	0.069	0.069	0.143	0.187	0.187	0.211
W12x72	1.23	0.069	0.069	0.143	0.187	0.187	0.211
W24x104	1.23	0.069	0.069	0.143	0.187	0.187	0.211
W16x77	1.24	0.069	0.069	0.143	0.186	0.186	0.209
W27x102	1.24	0.069	0.069	0.143	0.186	0.186	0.209
W18x86	1.26	0.068	0.068	0.143	0.184	0.184	0.207
W21x83	1.26	0.068	0.068	0.143	0.184	0.184	0.207
W24x94	1.27	0.067	0.067	0.143	0.182	0.182	0.206
W14x90	1.29	0.067	0.067	0.143	0.180	0.180	0.203
W36x135	1.29	0.067	0.067	0.143	0.180	0.180	0.203
W21x101	1.3	0.066	0.066	0.143	0.180	0.180	0.202
W30x116	1.3	0.066	0.066	0.143	0.180	0.180	0.202
W14x74	1.31	0.066	0.066	0.143	0.179	0.179	0.201
W33x130	1.32	0.066	0.066	0.143	0.177	0.177	0.200
W12x79	1.34	0.065	0.065	0.143	0.176	0.176	0.198
W10x68	1.38	0.064	0.064	0.143	0.172	0.172	0.194
W24x117	1.38	0.064	0.064	0.143	0.172	0.172	0.194

W27x114	1.38	0.063	0.063	0.143	0.172	0.172	0.194
W30x124	1.38	0.063	0.063	0.143	0.171	0.171	0.194
W21x93	1.4	0.063	0.063	0.143	0.170	0.170	0.192
W18x97	1.41	0.062	0.062	0.143	0.169	0.169	0.191
W14x99	1.42	0.062	0.062	0.143	0.169	0.169	0.190
W16x89	1.42	0.062	0.062	0.143	0.169	0.169	0.190
W21x111	1.42	0.062	0.062	0.143	0.168	0.168	0.190
W8x58	1.43	0.062	0.062	0.142	0.167	0.167	0.189
W33x141	1.43	0.062	0.062	0.142	0.167	0.167	0.189
W36x150	1.43	0.062	0.062	0.142	0.167	0.167	0.189
W14x82	1.44	0.061	0.061	0.141	0.166	0.166	0.188
W12x87	1.46	0.061	0.061	0.139	0.164	0.164	0.186
W30x132	1.47	0.061	0.061	0.138	0.164	0.164	0.185
W36x160	1.52	0.059	0.059	0.134	0.160	0.160	0.180
W18x106	1.53	0.059	0.059	0.133	0.159	0.159	0.179
W24x131	1.53	0.059	0.059	0.133	0.159	0.159	0.179
W33x152	1.53	0.059	0.059	0.133	0.159	0.159	0.179
W10x77	1.55	0.058	0.058	0.132	0.158	0.158	0.177
W14x109	1.55	0.058	0.058	0.132	0.158	0.158	0.177
W21x122	1.55	0.058	0.058	0.132	0.158	0.158	0.177
W27x146	1.55	0.058	0.058	0.131	0.158	0.158	0.177
W16x100	1.58	0.057	0.057	0.129	0.155	0.155	0.175
W12x96	1.61	0.056	0.056	0.127	0.153	0.153	0.172
W36x170	1.61	0.056	0.056	0.127	0.153	0.153	0.172
W8x67	1.63	0.056	0.056	0.125	0.151	0.151	0.171
W21x132	1.67	0.055	0.055	0.122	0.149	0.149	0.167
W30x173	1.67	0.055	0.055	0.122	0.149	0.149	0.167
W14x120	1.69	0.054	0.054	0.121	0.147	0.147	0.167
W24x146	1.7	0.054	0.054	0.121	0.147	0.147	0.167
W27x161	1.7	0.054	0.054	0.121	0.147	0.147	0.167

W18x119	1.71	0.054	0.054	0.120	0.146	0.146	0.167
W36x182	1.71	0.054	0.054	0.119	0.146	0.146	0.167
W10x88	1.75	0.046	0.046	0.053	0.064	0.064	0.167
W12x106	1.76	0.046	0.046	0.053	0.064	0.064	0.167
W33x201	1.8	0.046	0.046	0.053	0.064	0.064	0.167
W36x194	1.82	0.046	0.046	0.053	0.064	0.064	0.167
W30x191	1.84	0.046	0.046	0.053	0.064	0.064	0.167
W14x132	1.85	0.046	0.046	0.053	0.064	0.064	0.167
W21x147	1.85	0.046	0.046	0.053	0.064	0.064	0.167
W24x162	1.87	0.046	0.046	0.053	0.064	0.064	0.167
W27x178	1.87	0.046	0.046	0.053	0.064	0.064	0.167
W36x230	1.95	0.046	0.046	0.053	0.064	0.064	0.167
W10x100	1.96	0.046	0.046	0.053	0.064	0.064	0.167
W33x221	1.96	0.046	0.046	0.053	0.064	0.064	0.167
W36x210	1.96	0.046	0.046	0.053	0.064	0.064	0.167
W14x145	1.97	0.046	0.046	0.053	0.064	0.064	0.167
W12x120	1.98	0.046	0.046	0.053	0.064	0.064	0.167
W30x211	2.02	0.046	0.046	0.053	0.064	0.064	0.167
W36x245	2.07	0.046	0.046	0.053	0.064	0.064	0.167
W33x241	2.13	0.046	0.046	0.053	0.064	0.064	0.167
W14x159	2.14	0.046	0.046	0.053	0.064	0.064	0.167
W10x112	2.17	0.046	0.046	0.053	0.064	0.064	0.167
W36x260	2.19	0.046	0.046	0.053	0.064	0.064	0.167
W12x136	2.21	0.046	0.046	0.053	0.064	0.064	0.167
W36x280	2.35	0.046	0.046	0.053	0.064	0.064	0.167
W14x176	2.36	0.046	0.046	0.053	0.064	0.064	0.167
W12x152	2.45	0.046	0.046	0.053	0.064	0.064	0.167
W36x300	2.50	0.046	0.046	0.053	0.064	0.064	0.167
W14x193	2.57	0.046	0.046	0.053	0.064	0.064	0.167
W12x170	2.71	0.046	0.046	0.053	0.064	0.064	0.167

W14x211	2.78	0.046	0.046	0.053	0.064	0.064	0.167
W12x190	2.99	0.046	0.046	0.053	0.064	0.064	0.167
W14x233	3.04	0.046	0.046	0.053	0.064	0.064	0.167
W12x210	3.26	0.046	0.046	0.053	0.064	0.064	0.167
W14x257	3.32	0.046	0.046	0.053	0.064	0.064	0.167
W12x230	3.53	0.046	0.046	0.053	0.064	0.064	0.167
W14x283	3.62	0.046	0.046	0.053	0.064	0.064	0.167
W12x252	3.82	0.046	0.046	0.053	0.064	0.064	0.167
W14x311	3.93	0.046	0.046	0.053	0.064	0.064	0.167
W12x279	4.16	0.046	0.046	0.053	0.064	0.064	0.167
W14x342	4.27	0.046	0.046	0.053	0.064	0.064	0.167
W12x305	4.48	0.046	0.046	0.053	0.064	0.064	0.167
W14x370	4.57	0.046	0.046	0.053	0.064	0.064	0.167
W12x336	4.85	0.046	0.046	0.053	0.064	0.064	0.167
W14x398	4.87	0.046	0.046	0.053	0.064	0.064	0.167
W14x426	5.15	0.046	0.046	0.053	0.064	0.064	0.167
W14x455	5.45	0.046	0.046	0.053	0.064	0.064	0.167
W14x500	5.89	0.046	0.046	0.053	0.064	0.064	0.167
W14x550	6.37	0.046	0.046	0.053	0.064	0.064	0.167
W14x605	6.89	0.046	0.046	0.053	0.064	0.064	0.167
W14x665	7.43	0.046	0.046	0.053	0.064	0.064	0.167
W14x730	7.99	0.046	0.046	0.053	0.064	0.064	0.167

NR - Not Rated

CARBOLINE CO — Type Thermo-Sorb 263. Investigated for Interior Condition Space Purpose and Interior General Purpose. (See Item 8)

8. **Top Coat —** For Interior General Purpose Type Carboguard 1340 or Type Rustbond Penetrating Sealer intermediate coat applied over the base coat at 0.002 in. thickness and Type Carbothane 133HB top-coat, Type Carbocrylic 3359 or Type Carbothane 133VOC top-coat or Carbothane 133MC top-coat applied over the intermediate coat at 0.003 in. thickness.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2019-01-22

FIRE-RESISTANCE DESIGN

Assembly Usage Disclaimer

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. D996

August 17, 2017

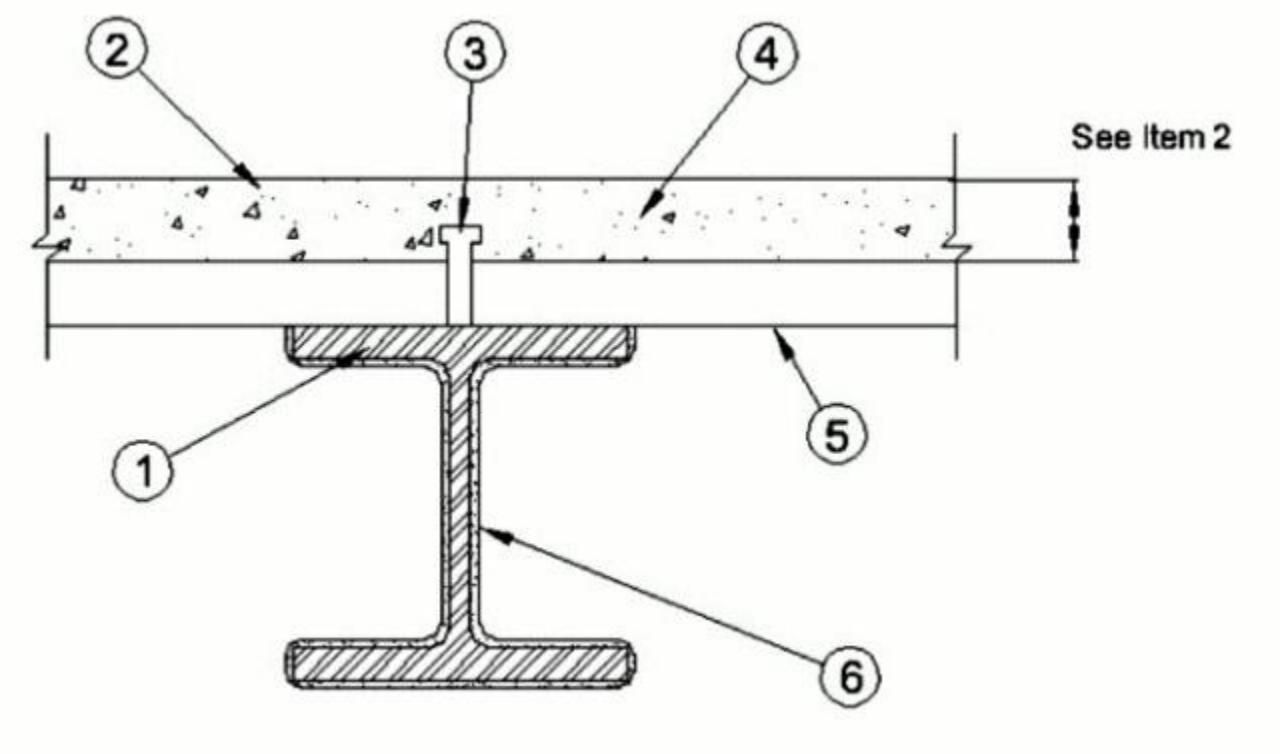
Restrained Assembly Rating - 2 Hr.

Unrestrained Assembly Rating - 0 Hr. (See Item 5)

Unrestrained Beam Rating - 2 Hr.

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Steal Beams —** Min W8x28 wide flange beam. When Item 6, **Mastic and Intumescent Coating*** is used, beam shall be primed with a modified alkyd, or epoxy based primer.

2. **Normal Weight Concrete —** Normal weight concrete, carbonate or siliceous aggregate, 145 lb/ft^2 +/- 3 lb/ft^2, 4000 psi compressive strength, vibrated. Min thickness shown in the table below:

Restrained Assembly Rating Hr	Concrete (Type)	Concrete Unit Weight pcf	Concrete Thkns In.	
2	Normal Weight	142-148	3-3/4	

3. **Shear Connectors —** Studs, 3/4 in. diam by 3-1/2 in. long, headed type or equivalent per AISC specification. Welded to the top flange of the beam, through the deck.

4. **Fiber Reinforcement* —** Fibers shall be added to concrete mix at a rate of 2 lb/yd^3.

5. **Steel Floor and Form Units* —** Composite 2 in. deep galv fluted units. Min gauge 22 MSG. Spacing of welds attaching units to supports shall be 12 in. OC max unless specified otherwise. Adjacent units button-punched or welded together at side joints 36 in. OC max, unless specified otherwise. When max clear span of the steel floor and form units is less than or equal to 10 ft, the unrestrained assembly rating is increased to 2 Hr. to match the unrestrained beam rating. The upper live load limit for all units is 250 psf.
ASC STEEL DECK, DIV OF ASC PROFILES L L C — 36 in. wide Type 2WH-36, 2WHS-36

VERCO DECKING INC - A NUCOR CO — FORMLOK™ deck types PLW2, W2, PLW3, W3. Units are min 24 in. wide and may be galvanized, phos./ptd., or mill finish.

VULCRAFT, DIV OF NUCOR CORP — 24 or 36 in. wide Types 2VLI, 2.0PLVLI, 3VLI, 3.0PLVLI

6. **Mastic and Intumescent Coating* —** Coating spray, brush or towel applied directly from containers to 0.143 in. thickness. Flutes above beam to be completely filled with mineral wool insulation having a minimum density of 6 lb/ft^2.
CARBOLINE CO — Type Thermo-Sorb 263. Investigated for Interior Condition Space Purpose and Interior General Purpose. (See Item 7).

6A. **Spray-Applied Fire Resistive Materials* —** As an alternate to Item 6 — Applied by mixing with water and spraying in more than one coat to the beam to a final thickness of 1-1/16 in. When fluted steel floor units are used, crest areas shall be filled with Spray-Applied Fire Resistive Materials above the beam. Beam surfaces must be clean and free of dirt, loose scale and oil. Min avg and min ind density of 15/14 pcf respectively. Min avg and min ind density of 19/18 pcf respectively for Types 7GP and 7HD. Min avg and min ind density of 22/19 pcf respectively for Types Z-106, Z-106/G, Z-106/HY. For method of density determination, see Design Information Section.
PYROK INC — Type LD

SOUTHWEST FIREPROOFING PRODUCTS CO — Types 4, 5, 5EF, 5GP, 5MD, 7GP, 7HD, 8EF, 8GP, 8MD, 9EF, 9GP, 9MD

GCP APPLIED TECHNOLOGIES INC — Types MK-6/HY, MK-6s, Z-106, Z-106/G, Z-106/HY

7. **Top Coat —** (Not Shown, for use with Item 6, Mastic and Intumescent Coating) — Type Carboguard 1340 or Type Rustbond Penetrating Sealer intermediate coat applied over the base coat at 0.002 in. thickness and Type Carbothane 133HB top-coat or Carbothane 133MC top-coat, Type Carbocrylic 3359 or Type Carbothane 133VOC top-coat applied over the intermediate coat at 0.003 in. thickness.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2017-08-17

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.

- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

FIRE-RESISTANCE DESIGN

Assembly Usage Disclaimer

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. E704

January 22, 2019

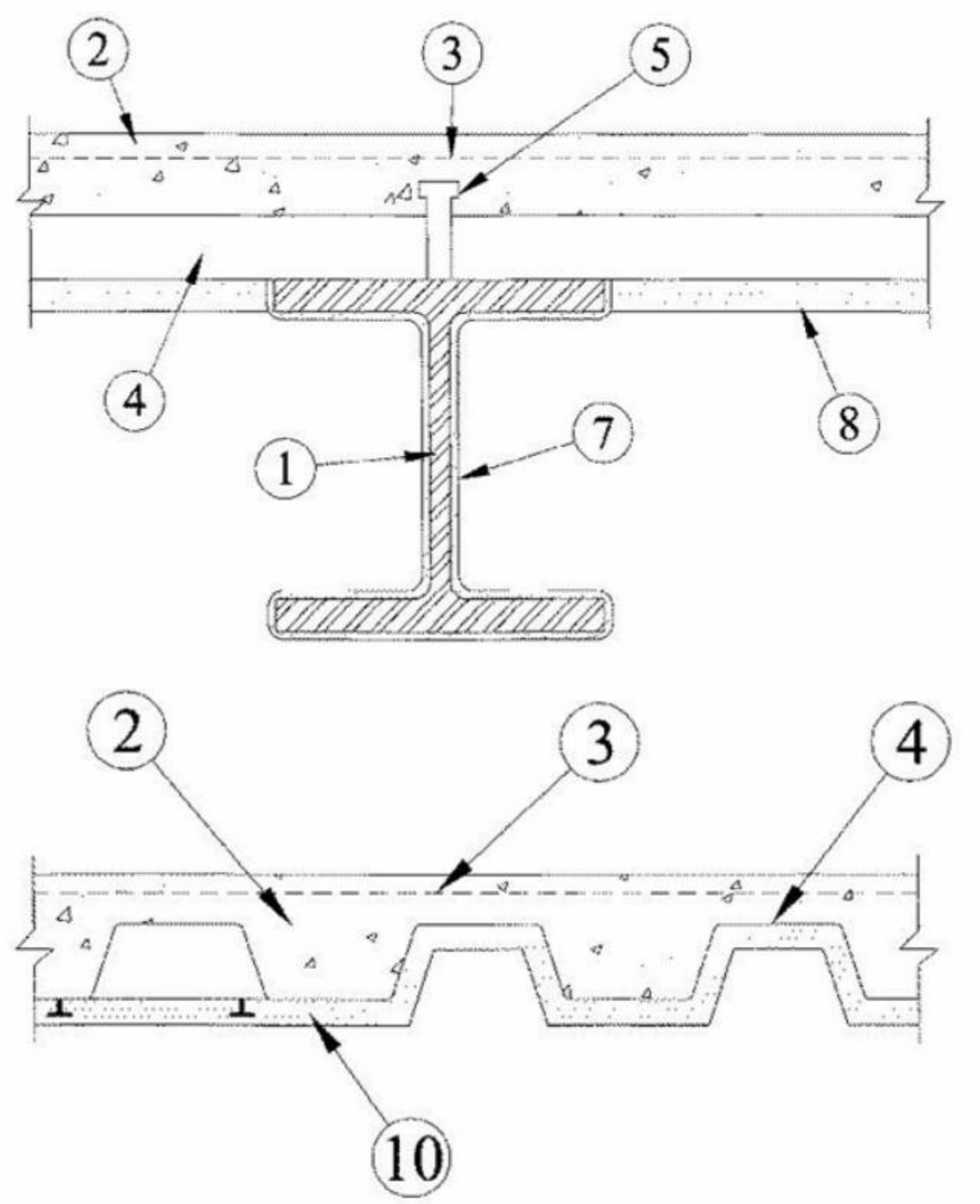
Restrained Assembly Ratings - 2, 3 and 4 Hr. (See Items 7 and 8)

Unrestrained Assembly Ratings - 1, 1-1/2, 2 and 3 Hr. (See Items 7 and 8)

Unrestrained Beam Ratings - 1, 1-1/2, 2 and 3 Hr. (See Items 7 and 8)

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Steel Beams —** Any wide flange steel size shown in the table in Item 7. Beams shall be primed with a red oxide, zinc phosphate primer.

2. **Normal Weight or Lightweight Concrete —** Min thickness above the crest 2-1/2 in. Normal weight concrete, carbonate, or siliceous aggregate, 145 lb/ft or minus 3 lb/ft weight, 3000 psi compressive strength, vibrated. Lightweight concrete, expanded shale, clay or slate aggregate by rotary-kiln method, 102-120 lb/ft weight, 3000 psi compressive strength, vibrated, 4 to 7 percent entrained air.

3. **Welded Wire Fabric —** 6 x 6—W1.4 x W1.4.

4. **Steel Floor and Form Units* —** Composite 1-1/2, 2 or 3 in. deep galv units. Fluted units may be uncoated. Min gauges are 22 MSG for fluted and 20/20 MSG for cellular. Any combination of fluted and cellular units may be used. Spacing of welds attaching units to supports shall be 12 in. OC max unless specified otherwise, adjacent units button-punched or welded together at side joints and, unless specified otherwise for specific unit types, spacing of all side joint fastening systems shall not exceed 36 in. OC.
CANAM STEEL CORP — 36 in. wide Type P-3623, P-3606 and P-3615 composite; 24 in. wide Type P-2432 composite.

DESIGN ASSISTANCE CONSTRUCTION SYSTEMS INC — 36 in. wide Type DACS1.5CD, or 24 in. wide Type DACS2.0CD, or DACS3.0CD.

NEW MILLENNIUM BUILDING SYSTEMS L L C — 12, 24 or 36 in. wide Types Mac-Lok 2, Mac-Lok 3; 12 in. wide Mac-Way Cellular Types 2-633MTWA, 3-633MTWA, 2-633MTWV, 3-633MTWV. For the 1, 1-1/2, 2h Restrained Assembly and Beam Rating and the 1h Unrestrained Assembly and Beam Rating, 12 in. wide, Type 1.5-633 MTWA may be used. Types Mac-Lok 2, Mac-Lok 3 may be phos/ptd. Two rows of steel studs with discs (Item 7) shall be welded along the sides of the Types 2-633MTWV, 3-633MTWV cellular units a max of 22 in. OC.

NEW MILLENNIUM BUILDING SYSTEMS L L C — 24 or 36 in. wide Types 2.0CD, 3.0CD, 2.0CFD, 3.0CFD, 3.0CFDES; 24, 30 or 36 in. wide Types 1.5CD, 1.5CDI, 1.5CFD. Fluted units may be uncoated, phos/painted or galvanized.

VERCO DECKING INC - A NUCOR CO — FORMLOK™ deck types PLB, B, BR, PLW2, W2, PLW3, W3. Units are min 24 in. wide and may be galvanized or phos./ptd. Units may be cellular with the suffix "CD" added to the product name, respectively.

VULCRAFT, DIV OF NUCOR CORP — 24, 30 or 36 in. wide Type 1.5VLI, 1.5PLVLI, 1.5VLP, 1.5PLVLP; 24 or 36 in. wide Types 2VLI, 2.0PLVLI, 3VLI, 3.0PLVLI, 2VLP, 2.0PLVLP, 3VLP, 3.0PLVLP. Types 1.5 VLI, 1.5PLVLI, 2VLI, 2.0PLVLI, 3VLI, 3.0PLVLI units may be phos/ptd; 24 or 36 in. wide Types 2VLJ, 3VLJ units (+) may be used for max 2 hr Restrained Assembly.

(+) Side joints of Types 2VLJ or 3VLJ units may be fastened together with No. 8-3/4 in. long self-drilling Tek screws driven diagonally from the top side through the joint of the units at 36 in. OC max.

5. **Shear Connectors (Optional) —** Studs, 3/4 in. diam (min 1/2 diam for use with steel joists) by 4-1/2 in. long, headed type or equivalent per AISC specificaion. Welded to the top flange of the beam, through the deck.

6. **Joint Cover —** 2 in. wide pressure sensitive cloth tape.

7. **Mastic and Intumescent Coating* —** Coating spray, brush or towel applied directly from containers to desired thickness. See table below for appropriate final dry thickness. After each coat, the surface shall be lightly rolled with a paint roller. Flutes above beam to be completely filled with mineral wool insulation having a minimum density of 6 lb/ft top flange of the beam shall be protected with the same thickness of coating as required on the beam. For unrestrained assembly ratings see Item 8. The unrestrained beam rating shall be equal to the unrestrained assembly rating.

Restrained Assembly Rating (Hr)		**2**			**3**			**4**	
Unrestrained Beam Rating (Hr)		**1**	**1-1/2**	**2**	**1-1/2**	**2**	**3**	**2**	**3**
Steel Size	**W/D**	**Thickness (In.)**							
W6x16	0.67	0.103	0.103	0.143	0.275	0.275	NR	NR	NR
W8x21	0.67	0.103	0.103	0.143	0.275	0.275	NR	NR	NR
W18x35	0.67	0.103	0.103	0.143	0.275	0.275	NR	NR	NR
W6x20	0.68	0.102	0.102	0.143	0.273	0.273	NR	NR	NR
W12x30	0.69	0.101	0.101	0.143	0.270	0.270	NR	NR	NR
W8x24	0.7	0.100	0.100	0.143	0.268	0.268	NR	NR	NR
W10x26	0.7	0.100	0.100	0.143	0.268	0.268	NR	NR	NR
W16x36	0.7	0.100	0.100	0.143	0.268	0.268	NR	NR	NR
W14x34	0.72	0.098	0.098	0.143	0.263	0.263	NR	NR	NR
W21x44	0.74	0.097	0.097	0.143	0.259	0.259	NR	NR	NR
W18x40	0.76	0.095	0.095	0.143	0.256	0.256	NR	NR	NR
W16x40	0.77	0.094	0.094	0.143	0.253	0.253	NR	NR	NR
W5x19	0.78	0.094	0.094	0.143	0.253	0.253	NR	NR	NR
W10x33	0.79	0.093	0.093	0.143	0.250	0.250	NR	NR	NR
W8x31	0.8	0.092	0.092	0.143	0.248	0.248	NR	NR	NR
W12x35	0.8	0.092	0.092	0.143	0.247	0.247	NR	NR	NR
W8x28	0.81	0.092	0.092	0.143	0.246	0.246	0.279	0.302	0.302
W10x30	0.81	0.092	0.092	0.143	0.246	0.246	0.279	0.302	0.302
W14x38	0.81	0.092	0.092	0.143	0.246	0.246	0.279	0.302	0.302
W24x55	0.83	0.09	0.090	0.143	0.243	0.243	0.274	0.296	0.296
W6x25	0.84	0.09	0.090	0.143	0.241	0.241	0.272	0.293	0.293
W21x50	0.84	0.09	0.090	0.143	0.241	0.241	0.272	0.293	0.293
W12x40	0.86	0.088	0.089	0.143	0.237	0.237	0.268	0.288	0.288

W14x43	0.87	0.088	0.089	0.143	0.236	0.236	0.266	0.285	0.285
W16x45	0.87	0.088	0.089	0.143	0.236	0.236	0.266	0.285	0.285
W18x46	0.87	0.088	0.089	0.143	0.236	0.236	0.266	0.285	0.285
W18x50	0.88	0.087	0.089	0.143	0.235	0.235	0.264	0.282	0.282
W8x35	0.9	0.086	0.089	0.143	0.231	0.231	0.261	0.277	0.277
W10x39	0.92	0.084	0.089	0.143	0.227	0.227	0.257	0.271	0.271
W24x62	0.93	0.084	0.088	0.143	0.226	0.226	0.255	0.269	0.269
W24x68	0.94	0.084	0.087	0.143	0.225	0.225	0.253	0.267	0.267
W21x57	0.95	0.083	0.086	0.143	0.223	0.223	0.252	0.264	0.264
W21x62	0.95	0.083	0.086	0.143	0.222	0.222	0.252	0.264	0.264
W14x48	0.96	0.082	0.085	0.143	0.221	0.221	0.250	0.262	0.262
W16x50	0.96	0.082	0.085	0.143	0.221	0.221	0.250	0.262	0.262
W18x55	0.96	0.082	0.085	0.143	0.221	0.221	0.250	0.262	0.262
W12x45	0.97	0.082	0.085	0.143	0.220	0.220	0.248	0.259	0.259
W10x49	1.01	0.079	0.081	0.143	0.214	0.214	0.241	0.250	0.250
W12x53	1.01	0.079	0.081	0.143	0.214	0.214	0.241	0.250	0.250
W8x40	1.02	0.079	0.081	0.143	0.213	0.213	0.240	0.248	0.248
W27x84	1.03	0.078	0.080	0.143	0.211	0.211	0.238	0.246	0.246
W18x60	1.04	0.078	0.079	0.143	0.210	0.210	0.237	0.244	0.244
W21x68	1.04	0.078	0.079	0.143	0.210	0.210	0.237	0.244	0.244
W24x76	1.04	0.078	0.079	0.143	0.210	0.210	0.237	0.244	0.244
W10x45	1.05	0.077	0.078	0.143	0.208	0.208	0.235	0.242	0.242
W14x53	1.05	0.077	0.078	0.143	0.208	0.208	0.235	0.242	0.242
W12x50	1.07	0.076	0.077	0.143	0.206	0.206	0.232	0.238	0.238
W16x57	1.08	0.076	0.076	0.143	0.204	0.204	0.231	0.236	0.236
W16x67	1.08	0.076	0.076	0.143	0.204	0.204	0.231	0.236	0.236
W14x61	1.09	0.075	0.076	0.143	0.203	0.203	0.229	0.234	0.234
W12x58	1.1	0.075	0.075	0.143	0.202	0.202	0.228	0.232	0.232
W10x54	1.11	0.074	0.075	0.143	0.201	0.201	0.226	0.231	0.231
W12x65	1.11	0.074	0.074	0.143	0.200	0.200	0.226	0.231	0.231
W21x73	1.11	0.074	0.074	0.143	0.200	0.200	0.226	0.231	0.231

W18x65	1.12	0.074	0.074	0.143	0.199	0.199	0.225	0.229	0.229
W18x76	1.12	0.074	0.074	0.143	0.199	0.199	0.225	0.229	0.229
W30x99	1.12	0.074	0.074	0.143	0.199	0.199	0.225	0.229	0.229
W24x84	1.14	0.073	0.073	0.143	0.196	0.196	0.222	0.225	0.225
W27x94	1.15	0.073	0.073	0.143	0.196	0.196	0.221	0.223	0.223
W8x48	1.2	0.07	0.070	0.143	0.189	0.189	0.214	0.215	0.215
W14x68	1.21	0.07	0.070	0.143	0.189	0.189	0.213	0.214	0.214
W30x108	1.21	0.07	0.070	0.143	0.189	0.189	0.213	0.214	0.214
W33x118	1.21	0.07	0.070	0.143	0.189	0.189	0.213	0.214	0.214
W18x71	1.22	0.07	0.070	0.143	0.188	0.188	0.212	0.212	0.212
W10x60	1.23	0.069	0.069	0.143	0.187	0.187	0.211	0.210	0.211
W12x72	1.23	0.069	0.069	0.143	0.187	0.187	0.211	0.210	0.211
W24x104	1.23	0.069	0.069	0.143	0.187	0.187	0.211	0.210	0.211
W16x77	1.24	0.069	0.069	0.143	0.186	0.186	0.209	0.209	0.209
W27x102	1.24	0.069	0.069	0.143	0.186	0.186	0.209	0.209	0.209
W18x86	1.26	0.068	0.068	0.143	0.184	0.184	0.207	0.206	0.207
W21x83	1.26	0.068	0.068	0.143	0.184	0.184	0.207	0.206	0.207
W24x94	1.27	0.067	0.067	0.143	0.182	0.182	0.206	0.205	0.206
W14x90	1.29	0.067	0.067	0.143	0.180	0.180	0.203	0.202	0.203
W36x135	1.29	0.067	0.067	0.143	0.180	0.180	0.203	0.202	0.203
W21x101	1.3	0.066	0.066	0.143	0.180	0.180	0.202	0.200	0.202
W30x116	1.3	0.066	0.066	0.143	0.180	0.180	0.202	0.200	0.202
W14x74	1.31	0.066	0.066	0.143	0.179	0.179	0.201	0.199	0.201
W33x130	1.32	0.066	0.066	0.143	0.177	0.177	0.200	0.198	0.200
W12x79	1.34	0.065	0.065	0.143	0.176	0.176	0.198	0.195	0.198
W10x68	1.38	0.064	0.064	0.143	0.172	0.172	0.194	0.190	0.194
W24x117	1.38	0.064	0.064	0.143	0.172	0.172	0.194	0.190	0.194
W27x114	1.38	0.063	0.063	0.143	0.172	0.172	0.194	0.190	0.194
W30x124	1.38	0.063	0.063	0.143	0.171	0.171	0.194	0.190	0.194
W21x93	1.4	0.063	0.063	0.143	0.170	0.170	0.192	0.187	0.192
W18x97	1.41	0.062	0.062	0.143	0.169	0.169	0.191	0.186	0.191

W14x99	1.42	0.062	0.062	0.143	0.169	0.169	0.190	0.185	0.190
W16x89	1.42	0.062	0.062	0.143	0.169	0.169	0.190	0.185	0.190
W21x111	1.42	0.062	0.062	0.143	0.168	0.168	0.190	0.185	0.190
W8x58	1.43	0.062	0.062	0.142	0.167	0.167	0.189	0.184	0.189
W33x141	1.43	0.062	0.062	0.142	0.167	0.167	0.189	0.184	0.189
W36x150	1.43	0.062	0.062	0.142	0.167	0.167	0.189	0.184	0.189
W14x82	1.44	0.061	0.061	0.141	0.166	0.166	0.188	0.183	0.188
W12x87	1.46	0.061	0.061	0.139	0.164	0.164	0.186	0.180	0.186
W30x132	1.47	0.061	0.061	0.138	0.164	0.164	0.185	0.179	0.185
W36x160	1.52	0.059	0.059	0.134	0.160	0.160	0.180	0.174	0.180
W18x106	1.53	0.059	0.059	0.133	0.159	0.159	0.179	0.173	0.179
W24x131	1.53	0.059	0.059	0.133	0.159	0.159	0.179	0.173	0.179
W33x152	1.53	0.059	0.059	0.133	0.159	0.159	0.179	0.173	0.179
W10x77	1.55	0.058	0.058	0.132	0.158	0.158	0.177	0.171	0.177
W14x109	1.55	0.058	0.058	0.132	0.158	0.158	0.177	0.171	0.177
W21x122	1.55	0.058	0.058	0.132	0.158	0.158	0.177	0.171	0.177
W27x146	1.55	0.058	0.058	0.131	0.158	0.158	0.177	0.171	0.177
W16x100	1.58	0.057	0.057	0.129	0.155	0.155	0.175	0.168	0.175
W12x96	1.61	0.056	0.056	0.127	0.153	0.153	0.172	0.165	0.172
W36x170	1.61	0.056	0.056	0.127	0.153	0.153	0.172	0.165	0.172
W8x67	1.63	0.056	0.056	0.125	0.151	0.151	0.171	0.163	0.171
W21x132	1.67	0.055	0.055	0.122	0.149	0.149	0.167	0.159	0.167
W30x173	1.67	0.055	0.055	0.122	0.149	0.149	0.167	0.159	0.167
W14x120	1.69	0.054	0.054	0.121	0.147	0.147	0.167	0.158	0.167
W24x146	1.7	0.054	0.054	0.121	0.147	0.147	0.167	0.157	0.167
W27x161	1.7	0.054	0.054	0.121	0.147	0.147	0.167	0.157	0.167
W18x119	1.71	0.054	0.054	0.120	0.146	0.146	0.167	0.156	0.167
W36x182	1.71	0.054	0.054	0.119	0.146	0.146	0.167	0.156	0.167
W10x88	1.75	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x106	1.76	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W33x201	1.8	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167

W36x194	1.82	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W30x191	1.84	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x132	1.85	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W21x147	1.85	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W24x162	1.87	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W27x178	1.87	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W36x230	1.95	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W10x100	1.96	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W33x221	1.96	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W36x210	1.96	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x145	1.97	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x120	1.98	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W30x211	2.02	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W36x245	2.07	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W33x241	2.13	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x159	2.14	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W10x112	2.17	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W36x260	2.19	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x136	2.21	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W36x280	2.35	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x176	2.36	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x152	2.45	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W36x300	2.50	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x193	2.57	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x170	2.71	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x211	2.78	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x190	2.99	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x233	3.04	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x210	3.26	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x257	3.32	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x230	3.53	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167

W14x283	3.62	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x252	3.82	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x311	3.93	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x279	4.16	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x342	4.27	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x305	4.48	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x370	4.57	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W12x336	4.85	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x398	4.87	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x426	5.15	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x455	5.45	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x500	5.89	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x550	6.37	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x605	6.89	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x665	7.43	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167
W14x730	7.99	0.046	0.046	0.053	0.064	0.064	0.167	0.130	0.167

NR - Not Rated

CARBOLINE CO — — Type Thermo-Sorb 263. Investigated for Interior Condition Space Purpose and Interior General Purpose. (See Item 11)

8. **Spray-Applied Fire Resistive Materials* —** Applied to steel floor units (Item 3) by, mixing with water and spraying to steel surfaces which must be clean and free of dirt, loose scale and oil. Min avg and min ind density of 15/14 pcf respectively for the Type 15 and 15-High Yield, 22/18 pcf, respectively for the Type 22, 40/37 pcf respectively for the Type 40, 28/25 pcf respectively for the Type 239, 4.5/42 respectively for the 240 High Yield, and 55/50 respectively for the Type 241. For method of density determination, refer to Design Information Section. May be used only in general floor areas without concrete penetrations with all fluted steel floor units or blends consisting of one or more fluted units to one 24 in. wide max cellular unit, 1-1/2 or 3 in. deep, with cells spaced approx 6 and 8 in. respectively. Use of steel studs with discs (Item 10) is required on all cellular units with flat plate on the bottom, optional on other steel surfaces.
The following thickness of material is required on the steel floor units for the various Restrained and Unrestrained Assembly Ratings:

Restrained Assembly Rating Hr.**	Unrestrained Assembly Rating Hr.***	Min Thk of Spray Applied Fire Resistive Mtl (In.)*		

		Crests	Valley	Flat Plate
1 and 2	1	3/8	3/8	3/8
2	1-1/2 or 2	3/8	3/8	3/8
3	1-1/2 or 2	11/16	1/2	1/2
4	2 or 3[a]	1-1/2	1-1/8	NR
4	2 or 3[b]	1-7/16	13/16	NR

*Where metal lath (Item 9) is required thickness of material shall be measured to the face of the lath.

** Min thickness of 1/2 in. is required in crests of 1-1/2 in. deep fluted units for a 2 Hr. Restrained Assembly Rating.

*** Unrestrained Beam Rating (See Item 7) shall be equal to the Unrestrained Assembly Rating.

a) Floor constructed of lightweight concrete only.

b) Floor constructed of normal weight concrete only.

CARBOLINE CO — Types 15, 15-High Yield, 22, 40, 239, 240-High Yield, 241

CARBOLINE (INDIA) PVT LTD — Types 15, 15-High Yield, 22, 40, 239, 240-High Yield, 241

STONCOR MIDDLE EAST L L C — Types 15, 15-High Yield, 22, 40, 239, 240-High Yield, 241

STONCOR SOUTH CONE S A — Types 15, 15-High Yield, 22, 40, 239, 240-High Yield, 241

9. **Metal Lath (not shown) —** Where Types 40, 239, 240 High-Yield and 241 are applied to steel deck, fluted or cellular, 3/8 in. metal ribbed lath weighing 3.4 lb/yd be secured to the underside of the steel deck (ribs upward) with S-12 by 3/8 in. long panhead, self-tapping steel screws spaced 12 in. OC in all directions. Steel screws shall be fitted with 1/2 in. diameter steel washers. Adjacent pieces of lath shall be overlapped 1 in. minimum. Entire surface of deck shall be lathed.

10. **Steel Studs With Discs —** For use with Types 15, 15-High Yield and 22, studs consist of No. 12 SWG steel wire welded to 1-3/16 in. diameter No. 28 MSG galvanized steel disc. The ends of the studs opposite the disc shall be welded to the cellular floor units. The spacing of the rows shall not exceed 22 in. Spacing between studs along the rows shall not exceed 24 in. The total number of studs shall average not less than one stud per 236 sq. in. of cellular floor units.

11. **Top Coat —** Not required for Interior Conditioned space purpose. For Interior General Purpose Type Carboguard 1340 or Rustbond Penetrating Sealer intermediate coat applied over the base coat at 0.002 in. thickness and Type Carbothane 133HB top-coat, Type Carbocrylic 3359 top-coat or Type Carbothane 133VOC top-coat or Carbothane 133MC top-coat applied over the intermediate coat at 0.003 in. thickness

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2019-01-22

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

FIRE-RESISTANCE DESIGN

Assembly Usage Disclaimer

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. N645

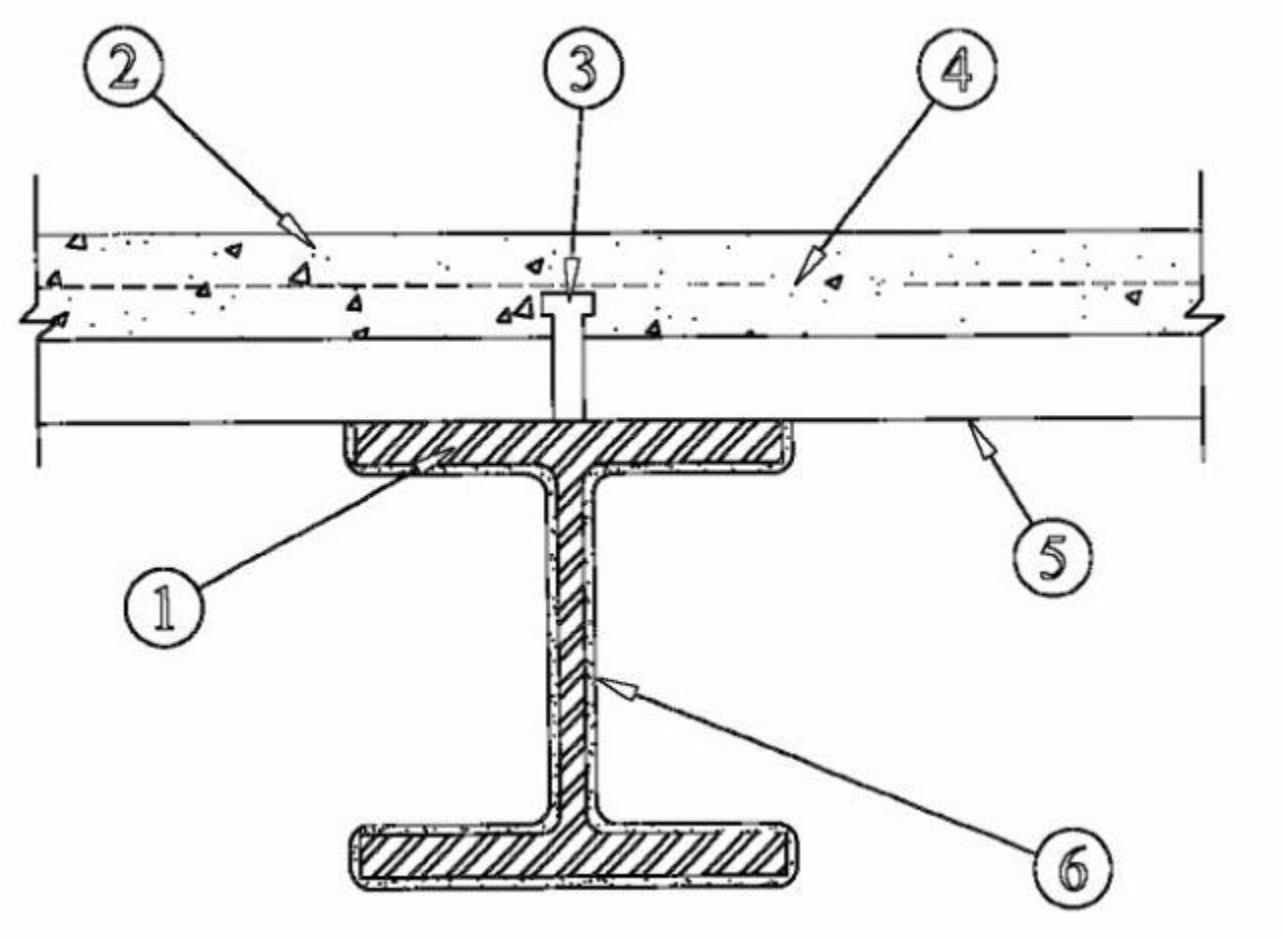
August 18, 2017

Restrained Beam Ratings — 1, 1-1/2, 2, 3 and 4 Hr (See Item 6)

Unrestrained Beam Ratings — 1, 1-1/2, 2 and 3 Hr (See Item 6)

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Steel Beam —** Wide flange steel beams with the minimum sizes shown in the tables below. Beams shall be free of dirt, loose scale and oil. Beams shall be primed with 0.003 in. dry film thickness of modified alkyd, epoxy, organic zinc or inorganic zinc based primer.

2. **Normal Weight or lightweight Concrete —** Compressive strength 3000 psi. For normal weight concrete either carbonate or siliceous aggregate may be used. Unit weight 148 lbs/cu ft for normal weight concrete and 110 lbs/cu ft for lightweight concrete.

3. **Shear Connector—(Optional) —** Studs, 3/4 in. diam headed type or equivalent per AISC specifications welded to the top flange of beam through the steel floor units.

4. **Welded Wire Fabric —** 6x6-10/10 SWG.

5. **Steel Floor and Form Units —** 1-1/2, 2 or 3 in. deep fluted, cellular or corrugated units welded to beam. Fluted units shall be used with the 3 hour unrestrained and 4 hour restrained ratings.

6. **Mastic and Intumescent Coating* —** Coating spray, brush or trowel applied directly from containers to desired thickness. See table below for appropriate final dry thickness. Flutes above beam to be completely filled with mineral wool insulation having a minimum density of 6 lbs/cu ft or the top flange of the beam shall be protected with the same thickness of coating as required on the beam.

UNRESTRAINED BEAM RATINGS

STEEL SIZE	W/D	1 HR	1-1/2 HR	2 HR	3 HR

W6x16	0.67	0.053	0.089	0.143	NR
W8x21	0.67	0.053	0.089	0.143	NR
W18x35	0.67	0.053	0.089	0.143	NR
W6x20	0.68	0.053	0.089	0.143	NR
W12x30	0.69	0.053	0.089	0.143	NR
W8x24	0.7	0.053	0.089	0.143	NR
W10x26	0.7	0.053	0.089	0.143	NR
W16x36	0.7	0.053	0.089	0.143	NR
W14x34	0.72	0.053	0.089	0.143	NR
W21x44	0.74	0.053	0.089	0.143	NR
W18x40	0.76	0.053	0.089	0.143	NR
W16x40	0.77	0.053	0.089	0.143	NR
W5x19	0.78	0.053	0.089	0.143	NR
W10x33	0.79	0.053	0.089	0.143	NR
W8x31	0.8	0.053	0.089	0.143	NR
W12x35	0.8	0.053	0.089	0.143	NR
W8x28	0.81	0.053	0.089	0.143	0.279
W10x30	0.81	0.053	0.089	0.143	0.279
W14x38	0.81	0.053	0.089	0.143	0.279
W24x55	0.83	0.053	0.089	0.143	0.274
W6x25	0.84	0.053	0.089	0.143	0.272
W21x50	0.84	0.053	0.089	0.143	0.272
W12x40	0.86	0.053	0.089	0.143	0.268
W14x43	0.87	0.053	0.089	0.143	0.266
W16x45	0.87	0.053	0.089	0.143	0.266
W18x46	0.87	0.053	0.089	0.143	0.266
W18x50	0.88	0.053	0.089	0.143	0.264
W8x35	0.9	0.053	0.089	0.143	0.261
W10x39	0.92	0.053	0.089	0.143	0.257
W24x62	0.93	0.053	0.088	0.143	0.255
W24x68	0.94	0.053	0.087	0.143	0.253

W21x57	0.95	0.053	0.086	0.143	0.252
W21x62	0.95	0.053	0.086	0.143	0.252
W14x48	0.96	0.053	0.085	0.143	0.250
W16x50	0.96	0.053	0.085	0.143	0.250
W18x55	0.96	0.053	0.085	0.143	0.250
W12x45	0.97	0.053	0.085	0.143	0.248
W10x49	1.01	0.053	0.081	0.143	0.241
W12x53	1.01	0.053	0.081	0.143	0.241
W8x40	1.02	0.053	0.081	0.143	0.240
W27x84	1.03	0.053	0.08	0.143	0.238
W18x60	1.04	0.053	0.079	0.143	0.237
W21x68	1.04	0.053	0.079	0.143	0.237
W24x76	1.04	0.053	0.079	0.143	0.237
W10x45	1.05	0.053	0.078	0.143	0.235
W14x53	1.05	0.053	0.078	0.143	0.235
W12x50	1.07	0.053	0.077	0.143	0.232
W16x57	1.08	0.053	0.076	0.143	0.231
W16x67	1.08	0.053	0.076	0.143	0.231
W14x61	1.09	0.053	0.076	0.143	0.229
W12x58	1.1	0.053	0.075	0.143	0.228
W10x54	1.11	0.053	0.075	0.143	0.226
W12x65	1.11	0.053	0.074	0.143	0.226
W21x73	1.11	0.053	0.074	0.143	0.226
W18x65	1.12	0.053	0.074	0.143	0.225
W18x76	1.12	0.053	0.074	0.143	0.225
W30x99	1.12	0.053	0.074	0.143	0.225
W24x84	1.14	0.053	0.072	0.143	0.222
W27x94	1.15	0.053	0.072	0.143	0.221
W8x48	1.2	0.053	0.069	0.143	0.214
W14x68	1.21	0.053	0.069	0.143	0.213
W30x108	1.21	0.053	0.069	0.143	0.213

W33x118	1.21	0.053	0.069	0.143	0.213
W18x71	1.22	0.053	0.068	0.143	0.212
W10x60	1.23	0.053	0.068	0.143	0.211
W12x72	1.23	0.053	0.068	0.143	0.211
W24x104	1.23	0.053	0.067	0.143	0.211
W16x77	1.24	0.053	0.067	0.143	0.209
W27x102	1.24	0.053	0.067	0.143	0.209
W18x86	1.26	0.053	0.066	0.143	0.207
W21x83	1.26	0.053	0.066	0.143	0.207
W24x94	1.27	0.053	0.065	0.143	0.206
W14x90	1.29	0.053	0.064	0.143	0.203
W36x135	1.29	0.053	0.064	0.143	0.203
W21x101	1.3	0.053	0.064	0.143	0.202
W30x116	1.3	0.053	0.064	0.143	0.202
W14x74	1.31	0.053	0.064	0.143	0.201
W33x130	1.32	0.053	0.063	0.143	0.200
W12x79	1.34	0.053	0.062	0.143	0.198
W10x68	1.38	0.053	0.061	0.143	0.194
W24x117	1.38	0.053	0.061	0.143	0.194
W27x114	1.38	0.053	0.06	0.143	0.194
W30x124	1.38	0.053	0.06	0.143	0.194
W21x93	1.4	0.053	0.06	0.143	0.192
W18x97	1.41	0.053	0.059	0.143	0.191
W14x99	1.42	0.053	0.059	0.143	0.190
W16x89	1.42	0.053	0.059	0.143	0.190
W21x111	1.42	0.053	0.059	0.143	0.190
W8x58	1.43	0.053	0.058	0.142	0.189
W33x141	1.43	0.053	0.058	0.142	0.189
W36x150	1.43	0.053	0.058	0.142	0.189
W14x82	1.44	0.053	0.058	0.141	0.188
W12x87	1.46	0.053	0.057	0.139	0.186

W30x132	1.47	0.053	0.057	0.138	0.185
W36x160	1.52	0.053	0.055	0.134	0.180
W18x106	1.53	0.053	0.055	0.133	0.179
W24x131	1.53	0.053	0.055	0.133	0.179
W33x152	1.53	0.053	0.055	0.133	0.179
W10x77	1.55	0.053	0.054	0.132	0.177
W14x109	1.55	0.053	0.054	0.132	0.177
W21x122	1.55	0.053	0.054	0.132	0.177
W27x146	1.56	0.053	0.054	0.131	0.177
W16x100	1.58	0.053	0.053	0.129	0.175
W12x96	1.61	0.053	0.053	0.127	0.172
W36x170	1.61	0.053	0.053	0.127	0.172
W8x67	1.63	0.053	0.053	0.125	0.171
W21x132	1.67	0.053	0.053	0.122	0.167
W30x173	1.67	0.053	0.053	0.122	0.167
W14x120	1.69	0.053	0.053	0.121	0.167
W24x146	1.7	0.053	0.053	0.121	0.167
W27x161	1.7	0.053	0.053	0.121	0.167
W18x119	1.71	0.053	0.053	0.120	0.167
W36x182	1.71	0.053	0.053	0.119	0.167
W10x88	1.75	0.046	0.046	0.053	0.167
W12x106	1.76	0.046	0.046	0.053	0.167
W33x201	1.8	0.046	0.046	0.053	0.167
W36x194	1.82	0.046	0.046	0.053	0.167
W30x191	1.84	0.046	0.046	0.053	0.167
W14x132	1.85	0.046	0.046	0.053	0.167
W21x147	1.85	0.046	0.046	0.053	0.167
W24x162	1.87	0.046	0.046	0.053	0.167
W27x178	1.87	0.046	0.046	0.053	0.167
W36x230	1.95	0.046	0.046	0.053	0.167
W10x100	1.96	0.046	0.046	0.053	0.167

W33x221	1.96	0.046	0.046	0.053	0.167
W36x210	1.96	0.046	0.046	0.053	0.167
W14x145	1.97	0.046	0.046	0.053	0.167
W12x120	1.98	0.046	0.046	0.053	0.167
W30x211	2.02	0.046	0.046	0.053	0.167
W36x245	2.07	0.046	0.046	0.053	0.167
W33x241	2.13	0.046	0.046	0.053	0.167
W14x159	2.14	0.046	0.046	0.053	0.167
W10x112	2.17	0.046	0.046	0.053	0.167
W36x260	2.19	0.046	0.046	0.053	0.167
W12x136	2.21	0.046	0.046	0.053	0.167
W36x280	2.35	0.046	0.046	0.053	0.167
W14x176	2.36	0.046	0.046	0.053	0.167
W12x152	2.45	0.046	0.046	0.053	0.167
W36x300	2.50	0.046	0.046	0.053	0.167
W14x193	2.57	0.046	0.046	0.053	0.167
W12x170	2.71	0.046	0.046	0.053	0.167
W14x211	2.78	0.046	0.046	0.053	0.167
W12x190	2.99	0.046	0.046	0.053	0.167
W14x233	3.04	0.046	0.046	0.053	0.167
W12x210	3.26	0.046	0.046	0.053	0.167
W14x257	3.32	0.046	0.046	0.053	0.167
W12x230	3.53	0.046	0.046	0.053	0.167
W14x283	3.62	0.046	0.046	0.053	0.167
W12x252	3.82	0.046	0.046	0.053	0.167
W14x311	3.93	0.046	0.046	0.053	0.167
W12x279	4.16	0.046	0.046	0.053	0.167
W14x342	4.27	0.046	0.046	0.053	0.167
W12x305	4.48	0.046	0.046	0.053	0.167
W14x370	4.57	0.046	0.046	0.053	0.167
W12x336	4.85	0.046	0.046	0.053	0.167

W14x398	4.87	0.046	0.046	0.053	0.167
W14x426	5.15	0.046	0.046	0.053	0.167
W14x455	5.45	0.046	0.046	0.053	0.167
W14x500	5.89	0.046	0.046	0.053	0.167
W14x550	6.37	0.046	0.046	0.053	0.167
W14x605	6.89	0.046	0.046	0.053	0.167
W14x665	7.43	0.046	0.046	0.053	0.167
W14x730	7.99	0.046	0.046	0.053	0.167

RESTRAINED BEAM RATINGS

STEEL SIZE	W/D	1 HR	1-1/2 HR	2 HR	3 HR	4 HR
W6x16	0.67	0.053	0.053	0.103	0.275	NR
W8x21	0.67	0.053	0.053	0.103	0.275	NR
W18x35	0.67	0.053	0.053	0.103	0.275	NR
W6x20	0.68	0.053	0.053	0.102	0.273	NR
W12x30	0.69	0.053	0.053	0.101	0.270	NR
W8x24	0.7	0.053	0.053	0.100	0.268	NR
W10x26	0.7	0.053	0.053	0.100	0.268	NR
W16x36	0.7	0.053	0.053	0.100	0.268	NR
W14x34	0.72	0.053	0.053	0.098	0.263	NR
W21x44	0.74	0.053	0.053	0.097	0.259	NR
W18x40	0.76	0.053	0.053	0.095	0.256	NR
W16x40	0.77	0.053	0.053	0.094	0.253	NR
W5x19	0.78	0.053	0.053	0.094	0.253	NR
W10x33	0.79	0.053	0.053	0.093	0.250	NR
W8x31	0.8	0.053	0.053	0.092	0.248	NR
W12x35	0.8	0.053	0.053	0.092	0.247	NR
W8x28	0.81	0.053	0.053	0.092	0.246	0.302
W10x30	0.81	0.053	0.053	0.092	0.246	0.302
W14x38	0.81	0.053	0.053	0.092	0.246	0.302
W24x55	0.83	0.053	0.053	0.090	0.243	0.296

W6x25	0.84	0.053	0.053	0.090	0.241	0.293
W21x50	0.84	0.053	0.053	0.090	0.241	0.293
W12x40	0.86	0.053	0.053	0.088	0.237	0.288
W14x43	0.87	0.053	0.053	0.088	0.236	0.285
W16x45	0.87	0.053	0.053	0.088	0.236	0.285
W18x46	0.87	0.053	0.053	0.088	0.236	0.285
W18x50	0.88	0.053	0.053	0.087	0.235	0.282
W8x35	0.9	0.053	0.053	0.086	0.231	0.277
W10x39	0.92	0.053	0.053	0.084	0.227	0.271
W24x62	0.93	0.053	0.053	0.084	0.226	0.269
W24x68	0.94	0.053	0.053	0.084	0.225	0.267
W21x57	0.95	0.053	0.053	0.083	0.223	0.264
W21x62	0.95	0.053	0.053	0.083	0.222	0.264
W14x48	0.96	0.053	0.053	0.082	0.221	0.262
W16x50	0.96	0.053	0.053	0.082	0.221	0.262
W18x55	0.96	0.053	0.053	0.082	0.221	0.262
W12x45	0.97	0.053	0.053	0.082	0.220	0.259
W10x49	1.01	0.053	0.053	0.079	0.214	0.250
W12x53	1.01	0.053	0.053	0.079	0.214	0.250
W8x40	1.02	0.053	0.053	0.079	0.213	0.248
W27x84	1.03	0.053	0.053	0.078	0.211	0.246
W18x60	1.04	0.053	0.053	0.078	0.210	0.244
W21x68	1.04	0.053	0.053	0.078	0.210	0.244
W24x76	1.04	0.053	0.053	0.078	0.210	0.244
W10x45	1.05	0.053	0.053	0.077	0.208	0.242
W14x53	1.05	0.053	0.053	0.077	0.208	0.242
W12x50	1.07	0.053	0.053	0.076	0.206	0.238
W16x57	1.08	0.053	0.053	0.076	0.204	0.236
W16x67	1.08	0.053	0.053	0.076	0.204	0.236
W14x61	1.09	0.053	0.053	0.075	0.203	0.234
W12x58	1.1	0.053	0.053	0.075	0.202	0.232

W10x54	1.11	0.053	0.053	0.074	0.201	0.231
W12x65	1.11	0.053	0.053	0.074	0.200	0.231
W21x73	1.11	0.053	0.053	0.074	0.200	0.231
W18x65	1.12	0.053	0.053	0.074	0.199	0.229
W18x76	1.12	0.053	0.053	0.074	0.199	0.229
W30x99	1.12	0.053	0.053	0.074	0.199	0.229
W24x84	1.14	0.053	0.053	0.073	0.196	0.225
W27x94	1.15	0.053	0.053	0.073	0.196	0.223
W8x48	1.2	0.053	0.053	0.070	0.189	0.215
W14x68	1.21	0.053	0.053	0.070	0.189	0.214
W30x108	1.21	0.053	0.053	0.070	0.189	0.214
W33x118	1.21	0.053	0.053	0.070	0.189	0.214
W18x71	1.22	0.053	0.053	0.070	0.188	0.212
W10x60	1.23	0.053	0.053	0.069	0.187	0.210
W12x72	1.23	0.053	0.053	0.069	0.187	0.210
W24x104	1.23	0.053	0.053	0.069	0.187	0.210
W16x77	1.24	0.053	0.053	0.069	0.186	0.209
W27x102	1.24	0.053	0.053	0.069	0.186	0.209
W18x86	1.26	0.053	0.053	0.068	0.184	0.206
W21x83	1.26	0.053	0.053	0.068	0.184	0.206
W24x94	1.27	0.053	0.053	0.067	0.182	0.205
W14x90	1.29	0.053	0.053	0.067	0.180	0.202
W36x135	1.29	0.053	0.053	0.067	0.180	0.202
W21x101	1.3	0.053	0.053	0.066	0.180	0.200
W30x116	1.3	0.053	0.053	0.066	0.180	0.200
W14x74	1.31	0.053	0.053	0.066	0.179	0.199
W33x130	1.32	0.053	0.053	0.066	0.177	0.198
W12x79	1.34	0.053	0.053	0.065	0.176	0.195
W10x68	1.38	0.053	0.053	0.064	0.172	0.190
W24x117	1.38	0.053	0.053	0.064	0.172	0.190
W27x114	1.38	0.053	0.053	0.063	0.172	0.190

W30x124	1.38	0.053	0.053	0.063	0.171	0.190
W21x93	1.4	0.053	0.053	0.063	0.170	0.187
W18x97	1.41	0.053	0.053	0.062	0.169	0.186
W14x99	1.42	0.053	0.053	0.062	0.169	0.185
W16x89	1.42	0.053	0.053	0.062	0.169	0.185
W21x111	1.42	0.053	0.053	0.062	0.168	0.185
W8x58	1.43	0.053	0.053	0.062	0.167	0.184
W33x141	1.43	0.053	0.053	0.062	0.167	0.184
W36x150	1.43	0.053	0.053	0.062	0.167	0.184
W14x82	1.44	0.053	0.053	0.061	0.166	0.183
W12x87	1.46	0.053	0.053	0.061	0.164	0.180
W30x132	1.47	0.053	0.053	0.061	0.164	0.179
W36x160	1.52	0.053	0.053	0.059	0.160	0.174
W18x106	1.53	0.053	0.053	0.059	0.159	0.173
W24x131	1.53	0.053	0.053	0.059	0.159	0.173
W33x152	1.53	0.053	0.053	0.059	0.159	0.173
W10x77	1.55	0.053	0.053	0.058	0.158	0.171
W14x109	1.55	0.053	0.053	0.058	0.158	0.171
W21x122	1.55	0.053	0.053	0.058	0.158	0.171
W27x146	1.55	0.053	0.053	0.058	0.158	0.171
W16x100	1.58	0.053	0.053	0.057	0.155	0.168
W12x96	1.61	0.053	0.053	0.056	0.153	0.165
W36x170	1.61	0.053	0.053	0.056	0.153	0.165
W8x67	1.63	0.053	0.053	0.056	0.151	0.163
W21x132	1.67	0.053	0.053	0.055	0.149	0.159
W30x173	1.67	0.053	0.053	0.055	0.149	0.159
W14x120	1.69	0.053	0.053	0.054	0.147	0.158
W24x146	1.7	0.053	0.053	0.054	0.147	0.157
W27x161	1.7	0.053	0.053	0.054	0.147	0.157
W18x119	1.71	0.053	0.053	0.054	0.146	0.156
W36x182	1.71	0.053	0.053	0.054	0.146	0.156

W10x88	1.75	0.046	0.046	0.046	0.064	0.130
W12x106	1.76	0.046	0.046	0.046	0.064	0.130
W33x201	1.8	0.046	0.046	0.046	0.064	0.130
W36x194	1.82	0.046	0.046	0.046	0.064	0.130
W30x191	1.84	0.046	0.046	0.046	0.064	0.130
W14x132	1.85	0.046	0.046	0.046	0.064	0.130
W21x147	1.85	0.046	0.046	0.046	0.064	0.130
W24x162	1.87	0.046	0.046	0.046	0.064	0.130
W27x178	1.87	0.046	0.046	0.046	0.064	0.130
W36x230	1.95	0.046	0.046	0.046	0.064	0.130
W10x100	1.96	0.046	0.046	0.046	0.064	0.130
W33x221	1.96	0.046	0.046	0.046	0.064	0.130
W36x210	1.96	0.046	0.046	0.046	0.064	0.130
W14x145	1.97	0.046	0.046	0.046	0.064	0.130
W12x120	1.98	0.046	0.046	0.046	0.064	0.130
W30x211	2.02	0.046	0.046	0.046	0.064	0.130
W36x245	2.07	0.046	0.046	0.046	0.064	0.130
W33x241	2.13	0.046	0.046	0.046	0.064	0.130
W14x159	2.14	0.046	0.046	0.046	0.064	0.130
W10x112	2.17	0.046	0.046	0.046	0.064	0.130
W36x260	2.19	0.046	0.046	0.046	0.064	0.130
W12x136	2.21	0.046	0.046	0.046	0.064	0.130
W36x280	2.35	0.046	0.046	0.046	0.064	0.130
W14x176	2.36	0.046	0.046	0.046	0.064	0.130
W12x152	2.45	0.046	0.046	0.046	0.064	0.130
W36x300	2.50	0.046	0.046	0.046	0.064	0.130
W14x193	2.57	0.046	0.046	0.046	0.064	0.130
W12x170	2.71	0.046	0.046	0.046	0.064	0.130
W14x211	2.78	0.046	0.046	0.046	0.064	0.130
W12x190	2.99	0.046	0.046	0.046	0.064	0.130
W14x233	3.04	0.046	0.046	0.046	0.064	0.130

W12x210	3.26	0.046	0.046	0.046	0.064	0.130
W14x257	3.32	0.046	0.046	0.046	0.064	0.130
W12x230	3.53	0.046	0.046	0.046	0.064	0.130
W14x283	3.62	0.046	0.046	0.046	0.064	0.130
W12x252	3.82	0.046	0.046	0.046	0.064	0.130
W14x311	3.93	0.046	0.046	0.046	0.064	0.130
W12x279	4.16	0.046	0.046	0.046	0.064	0.130
W14x342	4.27	0.046	0.046	0.046	0.064	0.130
W12x305	4.48	0.046	0.046	0.046	0.064	0.130
W14x370	4.57	0.046	0.046	0.046	0.064	0.130
W12x336	4.85	0.046	0.046	0.046	0.064	0.130
W14x398	4.87	0.046	0.046	0.046	0.064	0.130
W14x426	5.15	0.046	0.046	0.046	0.064	0.130
W14x455	5.45	0.046	0.046	0.046	0.064	0.130
W14x500	5.89	0.046	0.046	0.046	0.064	0.130
W14x550	6.37	0.046	0.046	0.046	0.064	0.130
W14x605	6.89	0.046	0.046	0.046	0.064	0.130
W14x665	7.43	0.046	0.046	0.046	0.064	0.130
W14x730	7.99	0.046	0.046	0.046	0.064	0.130

NR - Not Rated

CARBOLINE CO — Type Thermo-Sorb 263. Investigated for Interior Conditioned Space Purpose and Interior General Purpose. (See Item 7)

7. **Top Coat —** For Interior General Purpose Type Carboguard 1340 or Type Rustbond Penetrating Sealer FC intermediate coat applied over the base coat at 0.002 in. thickness and Type Carbothane 133HB top-coat, Type Carbocrylic 3359 top-coat or Type Carbothane 133VOC or Carbothane 133MC top-coat applied over the intermediate coat at 0.003 in. thickness.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2017-08-18

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

TEST REPORT

REPORT NUMBER: 103084896SAT-002A
ORIGINAL ISSUE DATE: August 15, 2017
REVISED DATE:

EVALUATION CENTER
Intertek Testing Services NA Inc.
16015 Shady Falls Road
Elmendorf, TX 78112

RENDERED TO

Carboline Co.
350 Hanley Industrial Court
Saint Louis, MO 63144

Report of Testing "Thermo-Sorb 263" for compliance with the applicable requirements of the following criteria: ASTM E84-16 TEST FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS (UL 723, UBC 8-1, NFPA 255)

ABSTRACT

Specimen I. D. "Thermo-Sorb 263"

Test Standard: ASTM E84-16 TEST FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS (UL 723, UBC 8-1, NFPA 255)

Test Date: August 7, 2017

Client: Carboline Co.

Test Results:

FLAME SPREAD INDEX	**5**
SMOKE DEVELOPED INDEX	**75**

Joseph Martinez
Technician III

Reviewed and approved:

Servando Romo
Project Engineer

Intertek

I. INTRODUCTION

This report describes the results of the ASTM E84-16 TEST FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS a method for determining the comparative surface burning behavior of building materials. This test is applicable to exposed surfaces, such as ceilings or walls, provided that the material or assembly of materials, by its own structural quality or the manner in which it is tested and intended for use, is capable of supporting itself in position or being supported during the test period.

The purpose of the method is to determine the relative burning behavior of the material by observing the flame spread along the specimen. Flame spread and smoke density developed are reported, however, there is not necessarily a relationship between these two measurements.

"The use of supporting materials on the underside of the test specimen may lower the flame spread index from that which might be obtained if the specimen could be tested without such support... This method may not be appropriate for obtaining comparative surface burning behavior of some cellular plastic materials... Testing of materials that melt, drip, or delaminate to such a degree that the continuity of the flame front is destroyed, results in low flame spread indices that do not relate directly to indices obtained by testing materials that remain in place."

This test method is also published under the following designations:

NFPA 255
UL 723
UBC 8-1

This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

II. PURPOSE

The ASTM E84 (25 foot tunnel) test method is intended to compare the surface flame spread and smoke developed measurements to those obtained from tests of mineral fiber cement board and select grade red oak flooring. The test specimen surface (18 inches wide and 24 feet long) is exposed to a flaming fire exposure during the 10 minute test duration, while flame spread over its surface and density of the resulting smoke are measured and recorded. Test results are presented as the computed comparisons to the standard calibration materials.

The furnace is considered under calibration when a 10 minute test of red oak decking will pass flame out the end of the tunnel in five minutes, 30 seconds, plus or minus 15 seconds. The fiber cement board which complies with Annex A3 of the ASTM E 84 standard forms the zero point for both flame spread and smoke developed indexes, while the red oak flooring smoke developed index is set as 100.

III. TEST PROCEDURE

The tests were conducted in accordance with the procedures outlined in the ASTM E84. The specimens are placed directly on the tunnel ledges. As required by the standard, one or more layers of 0.25 inch thick reinforced concrete board are placed on top of the test sample between the sample and the tunnel lid. After the test, the samples are removed from the tunnel, examined and disposed of.

Building Code Classification:
According to the 2015 International Building Code Section 803.1.1, interior and ceiling finish materials are classified based on the results from the ASTM E 84 Flame Spread Index and Smoke Developed Index values.

The 2015 International Building Code classifications are listed below. The National Fire Protection Association publication *NFPA 101 Life Safety Code* also uses the same classification system when tests are conducted per NFPA 253 (ASTM E 84).

Class A: Flame Spread Index 0-25; Smoke-Developed Index 0-450

Class B: Flame Spread Index 26-75; Smoke-Developed Index 0-450

Class C: Flame Spread Index 76-200; Smoke-Developed Index 0-450

IV. REVISION SUMMARY

DATE	SUMMARY
August 15, 2017	Original

V. DESCRIPTION OF TEST SPECIMENS

Date Received:	6/16/2017
Date placed in the conditioning room:	6/16/2017
Conditioning (73°F & 50% R.H.):	52 days
Specimen Width (in):	24
Specimen Length (ft):	24
Specimen Thickness (in):	0.3
Total Specimen Weight (lbs):	90

Specimen Description:
The specimen was described by the client as "Intumescent coating".

The 24 ft. long test specimen consisted of three 8 ft. long coated cement boards.

The product was received by our personnel in good condition and given an identification number of SAT1706161337-001.

Mounting Method:
The specimen was self-supporting. The coated side was exposed towards the flames.

VI. TEST RESULTS & OBSERVATIONS

The test results, computed on the basis of observed flame front advance and electronic smoke density measurements are presented in the following table.

Test Specimen	Flame Spread Index	Smoke Developed Index
"Thermo-Sorb 263"	5	75

The data sheets are included in Appendix A. These sheets are actual print-outs of the computerized data system which monitors the tunnel furnace, and contain all calibration and specimen data needed to calculate the test results.

VII. OBSERVATIONS

During the test, the specimen was observed to behave in the following manner.

Time (min:sec)	Observations
0:00	The test burners were turned on.
1:15	The coating began to blister.
1:46	Steady ignition was observed.
5:30	Charred chunks of coating began to fall.
10:00	The test burners were shut off.

After the test, the specimen was observed to be damaged as follows:

Distance (FEET)	Damage Descriptions
0 – 5	The coating was observed to have a thick layer of intumescent char.
5 – 7	The coating was observed to have a thin layer of intumescent char.
7 – 16	The coating was observed to be heavily discolored and blistered.
16 – 24	The coating was observed to be heavily discolored.

APPENDIX A
ASTM E84
DATA SHEETS

TEST RESULTS

FLAMESPREAD INDEX: 5

SMOKE DEVELOPED INDEX: 75

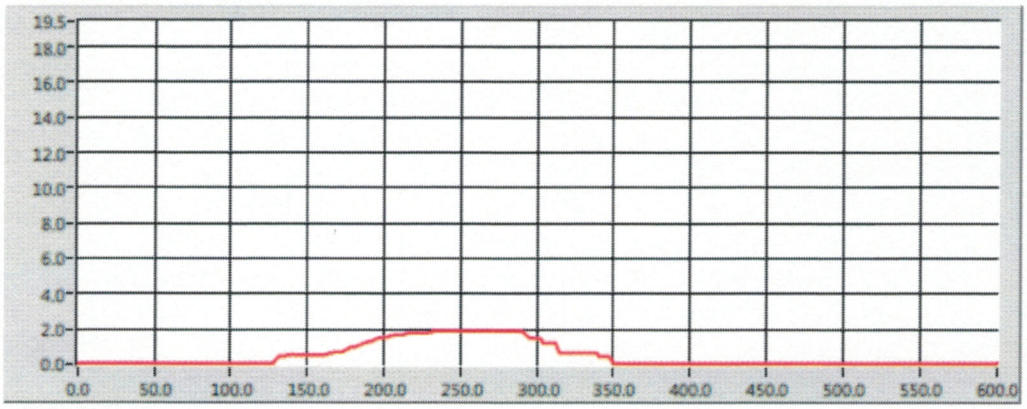
SPECIMEN DATA . . .

Time to Ignition (sec):	106
Time to Max FS (sec):	233
Maximum FS (feet):	1.9
Time to 980 F (sec):	Never Reached
Time to End of Tunnel (sec):	Never Reached
Max Temperature (F):	546
Time to Max Temperature (sec):	589
Total Fuel Burned (cubic feet):	43.84
FS*Time Area (ft*min):	13.2
Smoke Area (%A*min):	52.7
Unrounded FSI:	6.8

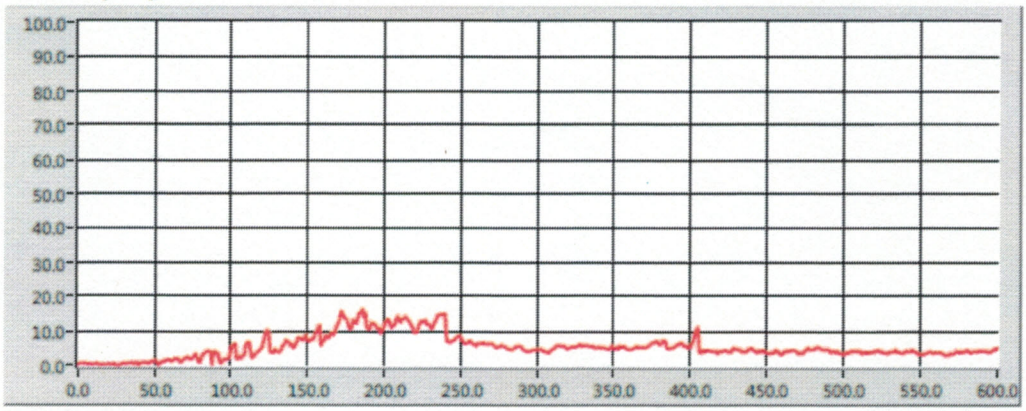
CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec):	45.0
Red Oak Smoke Area (%A*min):	70.0

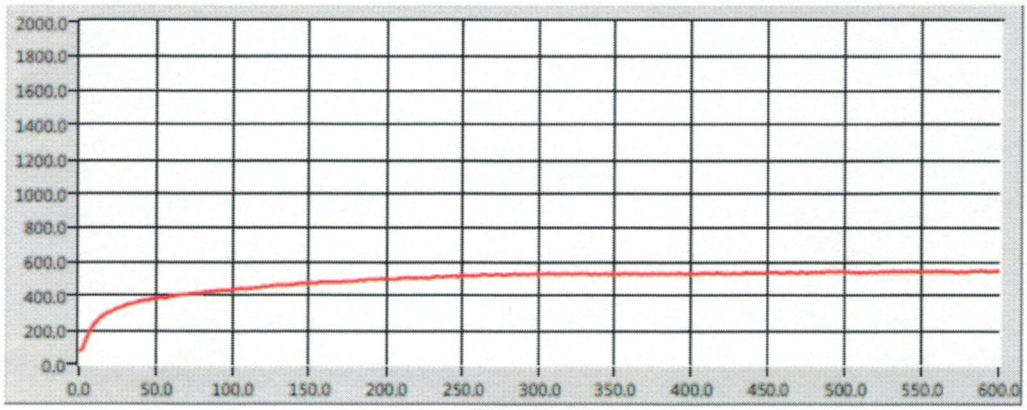
FLAME SPREAD (ft)



Smoke (%A)



Temperature (℉)



Time (sec)

600

Founded 1929 St. Louis Testing Laboratories INCORPORATED

2810 Clark Avenue • St. Louis, MO 63103-2574 • (314) 531-8080 • FAX (314) 531-8085

Chemical, Metallurgical, Mechanical, Nondestructive, Environmental Testing, Analyses and Field Service.

CARBOLINE COMPANY - R&D
350 Hanley Industrial Ct.
St. Louis, MO 63144

Attention: ***Brooke Grau***

May 17, 2017
Lab No. 17F-0913
P.O. No. 01693T BEV

(Corrected Report 6/2/17, 6/12/17)

WITNESSING SURFACE HARDNESS SHORE D

SUBJECT: WITNESSING CARBOLINE TEST PROJECT 06193T

SPECIFICATION: ASTM D2240

WITNESSED BY: L. Wesemann

IDENTIFICATION: TEST #4, CARBOLINE TEST PROJECT 06193T, SURFACE HARNDESS SHORE D FOR THERMO-SORB 263.

INSPECTION DATE: May 15, 2017

TEST #4

Panel ID	Coating System	DFT (mils)	Hardness Readings (5 readings)	Average Hardness
2	Thermo-Sorb 263	149 (258 mils)	65,62,63,63,62	63

JKB/dmm

Juergen K. Bloch, Manager
Nondestructive Testing Department
St. Louis Testing Laboratories, Inc.

Founded 1929 St. Louis Testing Laboratories INCORPORATED

2810 Clark Avenue • St. Louis, MO 63103-2574 • (314) 531-8080 • FAX (314) 531-8085

Chemical, Metallurgical, Mechanical, Nondestructive, Environmental Testing, Analyses and Field Service.

CARBOLINE COMPANY - R&D
350 Hanley Industrial Ct.
St. Louis, MO 63144

Attention: ***Brooke Grau***

May 17, 2017
Lab No. 17F-0913
P.O. No. 01693T BEV

(Corrected Report 6/2/17, 6/12/17)

WITNESSING IMPACT RESISTANCE

SUBJECT:	WITNESSING CARBOLINE TEST PROJECT 06193T
SPECIFICATION:	ASTM 2794
WITNESSED BY:	L. Wesemann
IDENTIFICATION:	TEST #3, CARBOLINE TEST PROJECT 06193T, IMPACT RESISTANCE OF THERMO-SORB 263, 6 PANELS USED IN TESTING.
INSPECTION DATE:	May 15, 2017

See page 7 thru 10 for results

Founded 1929 St. Louis Testing Laboratories INCORPORATED

CARBOLINE COMPANY - R&D
350 Hanley Industrial Ct.
St. Louis, MO 63144

Attention: ***Brooke Grau***

May 17, 2017
Lab No. 17F-0913
P.O. No. 01693T BEV

(Corrected Report 6/2/17, 6/12/17)

TEST #3

WITNESSING IMPACT RESISTANCE (CONTINUED)

Panel ID	System	Inch/lbs	Direct Impact		Indirect Impact	
			Pass	Fail	Pass	Fail
1	Thermo-Sorb 263	40"	✓			
		42"	✓			
		44"	✓			
		46"	✓			
		45"	✓			
		50"	✓			
3		50"	✓			
		52"	✓			
		54"	✓			
1		56"	✓			
		58"	✓			
3		60"		X		
		58"	✓			
		58"	✓			
		58"	✓			
		58"	✓			
		60"	✓			
		60"	✓			
1		60"	✓			
		60"	✓			

Founded 1929 St. Louis Testing Laboratories INCORPORATED

CARBOLINE COMPANY - R&D
350 Hanley Industrial Ct.
St. Louis, MO 63144

Attention: ***Brooke Grau***

May 17, 2017
Lab No. 17F-0913
P.O. No. 01693T BEV

(Corrected Report 6/2/17, 6/12/17)

TEST #3

WITNESSING IMPACT RESISTANCE (CONTINUED)

Panel ID	System	Inch/lbs	Direct Impact		Indirect Impact	
			Pass	Fail	Pass	Fail
1	Thermo-Sorb 263	62"	✓			
2		64"	✓			
		66"	✓			
		68"	✓			
		70"	✓			
		72"		X		
		72"	✓			
		72"	✓			
		72"	✓			
4		72"	✓			
		76"	✓			
		80"	✓			
		84"	✓			
		88"		X		
		84"	✓			
		86"		X		
5		84"		X		

Founded 1929 St. Louis Testing Laboratories INCORPORATED

CARBOLINE COMPANY - R&D
350 Hanley Industrial Ct.
St. Louis, MO 63144

Attention: ***Brooke Grau***

May 17, 2017
Lab No. 17F-0913
P.O. No. 01693T BEV

(Corrected Report 6/2/17, 6/12/17)

TEST #3

WITNESSING IMPACT RESISTANCE (CONTINUED)

Panel ID	System	Inch/lbs	Direct Impact		Indirect Impact	
			Pass	Fail	Pass	Fail
5	Thermo-Sorb 263	76"		X		
		70"		X		
		64"		X		
		60"		X		
		48"		X		
		40"	✓			
		44"	✓			
		46"		X		
		44"		X		
		44"	✓			
6		44"	✓			
		40"	✓			
		40"	✓			
		40"	✓			

Founded 1929 St. Louis Testing Laboratories INCORPORATED

CARBOLINE COMPANY - R&D
350 Hanley Industrial Ct.
St. Louis, MO 63144

Attention: ***Brooke Grau***

May 17, 2017
Lab No. 17F-0913
P.O. No. 01693T BEV

(Corrected Report 6/2/17, 6/12/17)

TEST #3

WITNESSING IMPACT RESISTANCE (CONTINUED)

Panel ID	System	Inch/lbs	Direct Impact		Indirect Impact	
			Pass	Fail	Pass	Fail
6	Thermo-Sorb 263	40"	✓			
		40"	✓			

JKB/dmm

Juergen K. Bloch, Manager
Nondestructive Testing Department
St. Louis Testing Laboratories, Inc.

Founded 1929 St. Louis Testing Laboratories INCORPORATED

2810 Clark Avenue • St. Louis, MO 63103-2574 • (314) 531-8080 • FAX (314) 531-8085

Chemical, Metallurgical, Mechanical, Nondestructive, Environmental Testing, Analyses and Field Service.

CARBOLINE COMPANY - R&D
350 Hanley Industrial Ct.
St. Louis, MO 63144

Attention: ***Brooke Grau***

May 17, 2017
Lab No. 17F-0913
P.O. No. 01693T BEV

(Corrected Report 6/2/17, 6/12/17)

WITNESSING TABER ABRASION

SUBJECT: WITNESSING CARBOLINE TEST PROJECT 06193T

TEST METHOD: ASTM D4060

WHEEL: CS-17

WITNESSED BY: L. Wesemann

IDENTIFICATION: TEST #1, CARBOLINE TEST PROJECT 06193T, TABER ABRASION, OF THERMO-SORB 263

INSPECTION DATE: May 15, 2017

TEST #1

Coating	Panel ID	Initial Weight	1000 Cycles (grams)	Weight Loss (milligrams)
Thermo-sorb 263	1	116.6412	116.3424	298
	2	117.6589	117.3588	300
			Average:	299

JKB/dmm

Juergen K. Bloch, Manager
Nondestructive Testing Department
St. Louis Testing Laboratories, Inc.

COMPLIANCE TESTED by berkeley analytical

VOC Emission Test Certificate

Product Name: Thermo-Sorb® 263

Product Sample Information	
Company:	Carboline
Company Website:	www.carboline.com
Product Type:	Floor Coatings or Adhesives
Date Produced:	7/27/2017

Certificate Information	
Certificate No:	170831-02
Certified By:	Raja S. Tannous, Laboratory Director
Date:	August 31, 2017

Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017 (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	≤ 0.5 mg/m^3
Private Office	≤½ Chronic REL	YES	≤9.0 µg/m^3	YES	≤ 0.5 mg/m^3

Product Coverage[5]: 115m2 @1mil

1. Exposure scenarios & product quantities for classroom & office are defined in Tables 4-2 – 4-5 (CDPH Std. Mtd. V1.2-2017)
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 V1.2 (partial list)

- USGBC LEED Version 4, BD&C, ID&C
- The WELL Building Standard
- ANSI/GBI 01, Green Building Assessment Protocol

Narrative: Carboline selected a sample representative of its Thermo-Sorb 263 fire resistive coating product and submitted it on 8/1/2017 for testing. Berkeley Analytical measured and evaluated the emissions of VOCs from this sample following CDPH/EHLB/Standard Method V1.2-2017. The results of the test are presented in Berkeley Analytical report, 904-003-02A-Aug3117.

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.

INTERNATIONAL LIVING FUTURE INSTITUTE℠

Declare℠

Thermo-Sorb 263
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; 2-Propenoic acid, 2-ethylhexyl ester, polymer with ethenylmethylbenzene; Carbonic acid, dimethyl ester; Titanium dioxide; 1,3-Propanediol, 2,2-bis(hydroxymethyl)-; Alkanes, C18-28, chloro; Melamine; Toluene; Aromatic 100 (Aromatic naphtha, type 1); Zinc borate; Acetic acid, 1,1-dimethylethyl ester; Cumene; Methanol

Living Building Challenge Criteria: Compliant

I-13 Red List:

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

% Disclosed: 100% at 100ppm
VOC Content: 149 g/L

I-10 Interior Performance: CDPH Standard Method v1.2-2017
I-14 Responsible Sourcing: Not Applicable

CRB-0013
EXP. 01 JUN 2024
Original Issue Date: 2019