List of Thermal Protection Systems Excepted from Test Verification

The Pipeline and Hazardous Materials Safety Administration (PHMSA) issues this thermal protection system list to revise and update information on the current list, in coordination with the Federal Railroad Administration (FRA) and in accordance with the requirements of § 179.18(c). The thermal protection systems included on the list are compliant and are acceptable for use, without further test verification, on U.S. Department of Transportation (DOT) specification tank cars. The material characteristics and the information necessary to apply any of the systems on this list to DOT specification rail tank cars is available in the PHMSA Records Center, Pipeline and Hazardous Materials Safety Administration, East Building, 1200 New Jersey Avenue, SE, Washington, DC 20590-0001 or via an e-mail request to barbara.alston.ctr@dot.gov.

The three previous lists of thermal protection systems excepted from test verification were published in the *Federal Register* on June 5, 2018 (Notice No. 2017-11; 83 FR 26144), May 13, 1993 (58 FR 28436) and January 31, 1986 (51 FR 4063). The current list identifies thermal protection systems by their 1993 system application number, with the 1986 system application number shown in parentheses, if applicable. Per the 2018 notice, we will manage updates and additions to the list using the PHMSA website, rather than the *Federal Register*, moving forward. The approved systems that have been revised by DOT since 2018 are: Unifrax I LLC, Tonawanda, NY; Nutec Inc., Charlotte, NC; and Morgan Advanced Materials, Augusta, GA.

FOR FURTHER INFORMATION CONTACT:

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The current list of thermal protection systems is as follows:

1. Unifrax I LLC, Tonawanda, New York (formerly listed as Carborundum Company, Niagara Falls, New York)

FyreWrap Tank Car Blanket (Formerly listed as Fiberfrax)

- *System Application 01 (6):* Apply 1.651 cm (0.65 inches) minimum thickness FyreWrap thermal protection (density ≥72.1 kg/m^3 (4.5 lbs/ft^3), then an 11-gauge steel jacket.
- *System Application 02 (22):* (<288 °C) Apply 1.27 cm (0.5 inch) minimum thickness FyreWrap thermal protection (density ≥72.1 kg/m^3 (4.5 lbs/ft^3)), compressed no less than 0.635 cm (0.25 inch) with froth-in-place rigid urethane foam, then an 11-gauge steel jacket. The total thickness of the FyreWrap thermal

protection and the urethane foam combination must be at least 5.08 cm (2.0 inches).

- *System Application 03 (23):* (<288 °C) Apply 2.54 cm (1.0 inch) minimum thickness FyreWrap thermal protection (density ≥72.1 kg/m^3 (4.5 lbs/ft^3)), compressed no less than 1.372 cm (0.54 inches) with froth-in-place rigid urethane foam, then an 11-gauge steel jacket. The total thickness of the FyreWrap thermal protection and the urethane foam combination must be at least 5.08 cm (2.0 inches).
- *System Application 04 (24):* (<288 °C) Apply 1.27 cm (0.5 inch) minimum thickness FyreWrap thermal protection (density ≥68.9 kg/m^3 (4.3 lbs/ft^3)), then apply 10.16 cm (4.0 inches) minimum thickness glass fiber insulation compressed to 8.89 cm (3.5 inches), and then an 11-gauge steel jacket.
- *System Application 05 (29):* Apply 1.27 cm (0.50 inch) minimum thickness FyreWrap thermal protection (density ≥72.1 kg/m^3 (4.5 lbs/ft^3)), then an 11-gauge steel jacket.
- *System Application 06:* Persons may use this system provided the tank car is constructed from at least 1.905 cm (0.75 inch) carbon steel plate. Apply 1.27 cm (0.50 inch) minimum thickness FyreWrap thermal protection and the glass fiber insulation combination must be at least 8.89 cm (3.5 inches).

2. Courtaulds Aerospace, Incorporated, Des Plaines, Illinois

Thermal Shield Coating

System Application 01 (4): Apply 0.002 cm (7/10-mil) primer (a 2:1 ratio by volume of 513-003 base component and 9110x350 activator component). Next, apply 0.597 cm (235 mils) of Thermal Shield Coating (a nominal 5:1 ratio by volume of 821x359 base component and 9110x407 activator component) to the primed surface, then 0.005 cm (2 mils) of topcoat (a 2:1 ratio by volume of 821x317 base component and 9110x376 activator component).

3. Fibrex, Incorporated, Aurora, Illinois

A. Tank Wrap Insulation

System Application 01 (8): Apply 3.81 cm (1.5 inches) minimum thickness Tank Wrap Insulation (density ≥96.1 kg/m^3 (6 lbs/ft^3)), compressed to 2.54 cm (1.0 inch), then an 11-gauge steel jacket.

B. Tank Car Insulation

System Application 01 (25): (<288 °C) Apply 3.81 cm (1.5 inches) minimum thickness Tank Car Insulation (density ≥96.1 kg/m^3 (6 lbs/ft^3)), and 7.62 cm (3.0 inches) minimum thickness glass fiber insulation compressed to 6.35 cm (2.5 inches), then an 11-gauge steel jacket.

4. Holmes, Insulation Limited, Ontario, Canada

HILBLOK 1212

System Application 01 (7): Apply 2.54 cm (1.0 inch) minimum thickness of HILBLOK 1212 (density ≥200.2 kg/m^3 (12.5 lbs/ft^3)), then an 11-gauge steel jacket.

5. Nutec Inc., Charlotte, North Carolina (formerly listed as Nutec Fibratec SA de CV of Mexico)

½-Inch Thick Ceramic Fire Blanket

- *System Application 01:* Apply 12.7 mm (0.50 inches) minimum thickness ½-inch thick MaxShield Tank Car Blanket manufactured by Nutec Inc. Charlotte, North Carolina with an average mass density equal to or greater than 74.6 kg/m^3 (4.66 lb/ft^3), and then apply a 3.18 mm thick (11-gauge) steel jacket.
- *System Application 02*: Apply 12.7 mm (0.50 inches) minimum thickness MaxShield Tank Car Blanket with an average mass density equal to or greater than 74.6 kg/m3 (4.66 lb/ft3) and then apply 101.6 mm (4.0 inches) minimum thickness of glass fiber insulation. The insulation components are compressed to 101.6 mm (4.0 inches) and then apply a 3.18 mm thick (11-gauge) steel jacket.

6. Jotun Paints, Inc., Belle Chasse, Louisiana

Jotachar JF750 Intumescent Paint

System Application 01: Apply 5.0 mm (0.20 inches) minimum thickness Jotachar JF750 Intumescent Paint manufactured by Jotun Paints, Inc. The coating is a proprietary mixture of two products, Jotachar JF750 Comp A and Jotachar JF750 Comp B that is applied in two coats for a nominal thickness of 5.0 mm (0.20 inches).

7. Premier Refractories, Erwin, Tennessee

Cer-Wool FP Blanket

System Application 01: (<288°C) Apply 1.17 cm (0.46 inches) minimum thickness Cer-Wool FP Blanket (weight per unit area ≥1.04 kg/m² (0.21 llbs/ft²)), then apply 10.16 cm (4.0 inches) minimum thickness fiber insulation (density ≥11.1 kg/m³) compressed to 8.89 cm (3.5 inches), and then an 11-gauge steel jacket.

8. Rock Wool Manufacturing, Leeds, Alabama

Delta Board

System Application 01 (1): Apply 2.54 cm (1.0 inch) minimum thickness of Delta Board (density ≥192.2 kg/m^3 (12 lbs/ft^3)), then an 11-gauge steel jacket.

9. Textron Specialty Materials, Lowell, Massachusetts

Chartek 59

- *System Application 01 (3):* Apply 0.008 cm (3 mils) of primer (Military Standard MIL-P-5219B), then apply a 2.54 cm (1.0 inch) hexagonal, 22-gauge, wire mesh to the primed surface. Next, apply 0.457 cm (180 mils) Chartek 59 thermal

protection, then 0.008 cm (3 mils) of AMERCOAT 383 (Brea, California) to the cured surface.

- *System Application 02 (18):* (<288 °C) Apply 5.08 cm (2.0 inches) minimum thickness polyurethane foam then an 11-gauge steel jacket, then apply 0.005 cm (2 mils) minimum of primer (Military Standard MIL-P-52192B, Mobile 13-R-56, or equivalent) to the clean surface. Next, apply 0.53 cm (210 mils) minimum thickness of Chartek 59 thermal protection to the cured surface.
- *System Application 03 (19):* (<288 °C) Apply 5.08 cm (2.0 inches) minimum thickness glass fiber then an 11-gauge steel jacket, then apply 0.005 cm (2 mils) minimum of primer (Military Standard MIL-P-52192B, Mobile 13-R-56, or equivalent) to the clean surface. Next, apply 0.46 cm (180 mils) minimum thickness of Chartek 59 thermal protection to the cured surface.
- *System Application 04 (21):* (<288 °C) Apply 5.08 cm (2.0 inches) minimum thickness polyurethane foam then an 11-gauge steel jacket, then apply 0.005 cm (2 mils) minimum of primer (Military Standard MIL-P-52192B, Mobile 13-R-56, or equivalent) to the clean surface. Next, apply 0.46 cm (180 mils) minimum thickness of Chartek 59 thermal protection to the cured surface.
- *System Application 05 (30):* (<288 °C) Apply 0.008 cm (3 mils) of primer (Military Standard MIL-P- 52192B) to the clean surface. The use of a primer is optional when facilities complete the surface preparation and coating operations within six hours and the atmosphere has a dew point above 3 °C (37.4 °F). When desired, applicators may place a 2.54 cm (1.0 inch) hexagonal 22-gauge wire mesh to the primed surface. Next, apply 0.457 cm (180 mils) of Chartek 59

thermal protection to the cured surface, then apply 0.008 cm (3 mils) of an AMERCOAT 383 topcoat (Brea, California) to the Chartek 59 thermal protection to the cured surface.

- *System Application 06 (31):* (<288 °C) Apply 5.08 cm (2.0 inches) minimum thickness polyurethane foam then an 11-gauge steel jacket, then apply 0.005 cm (2 mils) minimum of primer (Military Standard MIL-P-52192B, Mobile 13-R-56, or equivalent) to the clean surface. When desired, applicators may place a 2.54 cm (1.0 inch) hexagonal 22-gauge wire mesh to the primed surface. Next, apply 0.46 cm (180 mils) minimum thickness of Chartek 59 thermal protection to the cured surface.
- *System Application 07 (34):* (<288 °C) Apply 5.08 cm (2.0 inches) minimum thickness glass fiber insulation then an 11-gauge steel jacket, then apply 0.005 cm (2 mils) minimum of a polyamide epoxy primer (Military Standard MIL-P-52192B, Mobile 13-R-56, or equivalent) to the clean surface. When desired, applicators may place a 2.54 cm (1.0 inch) hexagonal 22-gauge wire mesh to the primed surface. Next, apply 0.46 cm (180 mils) minimum thickness of Chartek 59 thermal protection to the cured surface.
- *System Application 08:* Apply 0.008 cm (3 mils) of primary (Military Standard MIL-P-5219B), then apply a 2.54 cm (1.0 inch) hexagonal, 22-gauge, wire mesh to the primed surface. Next, apply 0.46 cm (180 mils) Chartek 59 thermal protection, then apply 0.008 cm (3 mils) of AMERCOAT (Brea, California) to the Chartek 59 thermal protection to the cured surface.

10. Morgan Advanced Materials, Augusta, Georgia (formerly listed as Thermal Ceramics, Augusta, Georgia)

A. Kaowool Tank Car Blanket

- *System Application 01 (5):* Apply 2.54 cm (1.0 inch) minimum thickness of Kaowool Tank Car Blanket (density ≥32.7 kg/m^3 (2.04 lbs/ft^3)), then an 11-gauge steel jacket.
- *System Application 02 (10):* Apply 1.32 cm (0.52 inches) minimum thickness of Kaowool Tank Car Blanket (density ≥76.9 kg/m^3 (4.8 lbs/ft^3)), then an 11-gauge steel jacket.
- *System Application 03 (32):* (<288 °C) Apply 2.54 cm (1.0 inch) minimum thickness of Kaowool Tank Car Blanket (density ≥72.1 kg/m^3 (4.5 lbs/ft^3)), then apply 10.16 cm (4.0 inches) of glass fiber insulation compressed to 7.62 cm (3.0 inches), then an 11-gauge steel jacket.
- *System Application 04 (33):* (<288 °C) Apply 1.321 cm (0.52 inches) minimum thickness of Kaowool Tank Car Blanket (density ≥76.9 kg/m^3 (4.8 lbs/ft^3)), then apply 10.16 cm (4.0 inches) of glass fiber insulation compressed to 8.89 cm (3.5 inches), then an 11-gauge steel jacket.
- *System Application 05 (35):* (<288 °C) Apply 2.54 cm (1.0 inch) minimum thickness of Kaowool Tank Car Blanket (density ≥72.1 kg/m^3 (4.5 lbs/ft^3)), then apply 10.16 cm (4.0 inches) of glass fiber insulation compressed to 7.62 cm (3.0 inches), then an 11-gauge steel jacket.
- *System Application 06 (36):* (<288 °C) Apply 1.321 cm (0.52 inches) minimum thickness of Kaowool Tank Car Blanket (density ≥76.9 kg/m^3 (4.8 lbs/ft^3)), then

apply 10.16 cm (4.0 inches) of glass fiber insulation compressed to 8.89 cm (3.5 inches), and then an 11-gauge steel jacket.

- *System Application 07:* Apply 2.54 cm (1.0 inch) minimum thickness of Kaowool Tank Car Blanket (density ≥64.1 kg/m^3 (4 lbs/ft^3)), then an 11-gauge steel jacket having an annular space of 1.016 cm (0.4 inches) between the thermal protection and the steel jacket.

B. Cerablanket Tank Car Blanket (formerly listed as Cerawool Tank Car Blanket)

- *System Application 01 (9):* Apply 1.524 cm (0.6 inch) minimum thickness of Cerablanket Tank Car Blanket (density ≥64.1 kg/m^3 (4 lbs/ft^3)), then an 11-gauge steel jacket having an annular space of 1.016 cm (0.4 inches) between the thermal protection and the jacket.
- *System Application 02:* Apply 2.54 cm (1.0 inch) minimum thickness of Cerablanket Tank Car Blanket (density ≥54.9 kg/m^3 (3.43 lbs/ft^3)), and 5.08 cm (2.0 inches) minimum thickness polyurethane foam, then an 11-gauge steel jacket.

C. Superwool Plus Tank Car Blanket (formerly listed as Superwool Plus Insulation Tank Car Blanket)

- *System Application 01: (<288° C)* Apply 12.7 mm (0.50 inches) minimum thickness Superwool Plus Tank Car Blanket with an average mass density ≥60.2 kg/m^3 (3.76 lbs/ft^3), then apply 101.6 mm (4.0 inches) minimum thickness of glass fiber insulation with density ≥12.0 kg/m^3 (0.75 lbs/ft^3). The insulation

components are compressed to 101.6 mm (4.0 inches), and then apply a 3.18 mm thick (11-gauge) steel jacket.

- *System Application 02: (<288°C)* Apply 12.7 mm (0.50 inches) minimum thickness Superwool Plus Tank Car Blanket with an average mass density equal to or greater than of 60.2 kg/m^3 (3.76 lbs/ft^3), and then apply a 3.18 mm thick (11-gauge) steel jacket over the insulation.

D. Pyroscat FP Tank Car Blanket

• System Application 01: (<288°C) Apply 1.17 cm (0.46 inches) minimum thickness Pyroscat FP Tank Car Blanket (weight per unit area ≥1.04 kg/m2 (0.21 lbs/ft2)), then apply 10.16 cm (4.0 inches) minimum thickness fiber insulation (density ≥11.1 kg/m3) compressed to 8.89 cm (3.5 inches), and then an 11-gauge steel jacket.

11. Thermal Sciences, Incorporated, St. Louis, Missouri

A. Thermo-lag 330-1 Subliming Material System

- *System Application 01 (2):* Apply 0.005 cm (2 mils) of Thermo-lag Primer 351, 0.127 cm (5 mils) Thermo-lag 351-EX176 Primer, or 0.02 cm (8 mils) of PLASITE 7156 Primer, then apply 0.419 cm (165 mils) of Thermo-lag 330-1 Subliming Compound. Next, apply 0.013 cm (5 mils) of Thermo-lag Topcoat 350. Thermo-lag 330-CA cure accelerator may be added to the above components.
- *System Application 02:* Apply 0.020 cm (8 mils) of Wisconsin Protective Coatings' Plasite 7156 (Green Bay, Wisconsin), then apply 0.419 cm (165 mils)

of Thermo-lag 330-1 Subliming Compound. Next, apply 0.013 cm (5 mils) of Thermolag Topcoat 350.

B. Thermo-lag 330-3 Subliming Material System

- *System Application 01 (12):* Apply 5.08 cm (2.0 inches) minimum thickness of glass fiber then an 11-gauge steel jacket, then apply 0.010 cm (4 mils) minimum thickness of Thermo-lag Primer 351-3 primer to the tank jacket. Next, apply 0.32 cm (125 mils) minimum thickness of Thermo-lag 330-3 Subliming Compound, and then apply 0.013 cm (5 mils) of Thermo-lag Topcoat 350-3.
- *System Application 02 (13):* Apply 5.08 cm (2.0 inches) minimum thickness of polyurethane, then an 11-gauge steel jacket, then apply 0.010 cm (4 mils) minimum thickness of Thermo-lag Primer 351-3 primer to the tank jacket, and then apply 0.32 cm (125 mils) minimum thickness of Thermo-lag 330-3 Subliming Compound. Next, apply 0.013 cm (5 mils) of Thermo-lag Topcoat 350-3.
- *System Application 03 (14):* Apply 5.08 cm (2.0 inches) minimum thickness of glass fiber then an 11-gauge steel jacket, then apply 0.010 cm (4 mils) minimum thickness of Thermo-lag Primer 351-3 primer to the exterior tank jacket, and then apply 0.34 cm (135 mils) minimum thickness of Thermo-lag 330-3 Subliming Compound. Next, apply 0.013 cm (5 mils) of Thermo-lag Topcoat 350-3.
- *System Application 04 (16):* (<288 °C) Apply 5.08 cm (2.0 inches) minimum thickness of glass fiber then an 11-gauge steel jacket, then apply 0.010 cm (4 mils) minimum film thickness of Thermo-lag Primer 351-3 primer to the tank

jacket, and then apply 0.48 cm (188 mils) minimum thickness of Thermo-lag 330-3 Subliming Compound. Next, apply 0.013 cm (5 mils) of Thermo-lag Topcoat 350-3.

- *System Application 05 (17):* (<288 °C) Apply 5.08 cm (2.0 inches) minimum thickness of polyurethane then an 11-gauge steel jacket, then apply 0.010 cm (4 mils) minimum thickness of Thermo-lag Primer 351-3 primer to the tank jacket. Next, apply 0.48 cm (188 mils) minimum thickness of Thermo-lag 330-3 Subliming Compound. Next, apply 0.013 cm (5 mils) of Thermo-lag Topcoat 350-3.

C. Thermo-lag 330-3 Subliming Material System

- *System Application 01 (15):* Apply 5.08 cm (2.0 inches) minimum thickness of polyurethane foam then an 11-gauge steel jacket, then apply 0.010 cm (4 mils) minimum thickness of Thermo-lag Primer 351-3 to the tank jacket, and then apply 0.343 cm (135 mils) minimum thickness of Thermo-lag 330-30 Subliming Compound. Next, apply 0.013 cm (5 mils) of Thermo-lag Topcoat 350-3.
- *System Application 02 (27):* Apply 5.08 cm (2.0 inches) minimum thickness of glass fiber then an 11-gauge steel jacket, then apply 0.010 cm (4 mils) minimum thickness of Thermo-lag Primer 351-3 primer to the tank jacket, and then apply 0.46 cm (180 mils) minimum thickness of Thermo-lag 330-30 Subliming Compound. Next, apply 0.013 cm (5 mils) of Thermo-lag Topcoat 350-3.
- *System Application 03 (28):* Apply 2.54 cm (1.0 inch) minimum thickness of polyurethane foam then an 11-gauge steel jacket, then apply 0.010 cm (4 mils)

minimum thickness of Thermo-lag Primer 351-3 to the tank jacket, and then apply 0.457 cm (180 mils) minimum thickness of Thermo-lag 330-30 Subliming Compound. Next, apply 0.013 cm (5 mils) of Thermo-lag Topcoat 350-3.

D. Thermo-Lag 440 Subliming Material System

System Application 01: Apply 0.013 cm (5 mils) of Thermo-lag 351-176 Primer to the tank surface, then apply 0.419 cm (165 mils) of Thermo-lag 440 Subliming Material to the surface. Next, apply 0.005 cm (2 mils) of Thermo-lag 350-31 Topcoat.

12. United States Gypsum Company, Chicago, Illinois

A. Thermafiber Tank Car Fire Proofing

- *System Application 01 (11):* Apply 2.54 cm (1.0 inch) minimum thickness of Thermafiber Tank Car Fire proofing (density ≥112.1 kg/m^3 (7 lbs/ft^3)), then an 11-gauge steel jacket.
- *System Application 02 (20)*: (<288 °C) Apply 2.54 cm (1.0 inch) minimum thickness of Thermafiber Tank Car Fire proofing (density >112.1 kg/m^3 (7 lbs/ft^3)), with a foil scrim polyethylene facing, then apply 10.16 cm (4.0 inches) of glass fiber compressed to 7.62 cm (3.0 inches), and then an 11-gauge steel jacket.
- *System Application 03 (26):* (<288 °C) Apply 2.54 cm (1.0 inch) minimum thickness of Thermafiber Tank Car Fire proofing (density >112.1 kg/m^3 (7 lbs/ft^3)), with a foil scrim polyethylene facing, then apply 2.54 cm (1.0 inch)

minimum thickness polyurethane facing followed by 2.54 cm (1.0 inch) minimum thickness polyurethane foam, and then an 11-gauge steel jacket.

- *System Application 04:* (<288 °C) Apply 2.54 cm (1.0 inch) minimum thickness of Thermafiber Tank Car Fire proofing (density ≥112.1 kg/m^3 (7 lbs/ft^3)), then apply 8.89 cm (3.5 inches) glass fiber insulation compressed to 7.62 cm (3.0 inches) and then an 11-gauge steel jacket.

B. Inswool HP

System Application 01: (<288 °C) Apply 3.81 cm (1.5 inch) minimum thickness of INSWOOL HP ceramic fiber blanket (density <80.1 kg/m^3 (5 lbs/ft^3)), then an 11-gauge steel jacket.