NANOCHAR®

epoxy-based intumescent fire protection - for rail applications

Suitable for protection of steel, aluminum or composites from cellulosic and hydrocarbon fires.
NanoChar® is intended to protect structural steel, vessels, piping and wiring in a hydrocarbon pool and/or jet fire to extend the functional integrity for a specified period of time.

IAG
INTUMESCENTS ASSOCIATES GROUP

15406 Crescent Oaks Ct.
Houston, Texas 77068
Phone 281-323-5322
Fax 281-631-9292
www.iagtx.com

NANOCHAR®

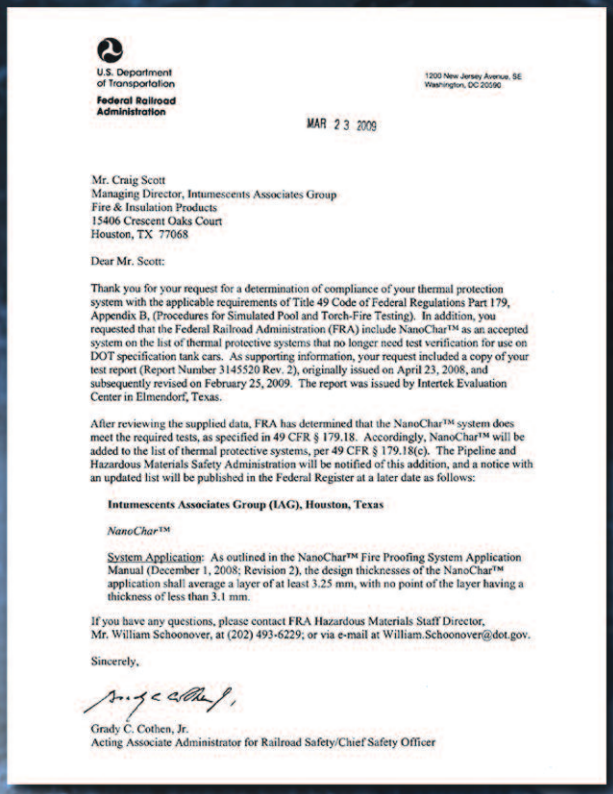
epoxy-based intumescent fire protection - for rail applications

Suitable for protection of steel, aluminum or composites from cellulosic and hydrocarbon fires.

NanoChar® is not limited to, but is intended to protect structural steel, vessels, piping and wiring in a hydrocarbon pool and/or jet fire to extend their functional integrity for a specified period of time.

Petrochemical Plants and Offshore Oil & Gas Operations

- Structural Steel Columns and Beams
- Divisions and Decks
- Vessels
- Piping and Valves
- Wiring and Actuators



U.S. Department of Transportation
Federal Railroad Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

MAR 23 2009

Mr. Craig Scott
Managing Director, Intumescents Associates Group
Fire & Insulation Products
15406 Crescent Oaks Court
Houston, TX 77068

Dear Mr. Scott:

Thank you for your request for a determination of compliance of your thermal protection system with the applicable requirements of Title 49 Code of Federal Regulations Part 179, Appendix B, (Procedures for Simulated Pool and Torch-Fire Testing). In addition, you requested that the Federal Railroad Administration (FRA) include NanoChar™ as an accepted system on the list of thermal protective systems that no longer need test verification for use on DOT specification tank cars. As supporting information, your request included a copy of your test report (Report Number 3145520 Rev. 2), originally issued on April 23, 2008, and subsequently revised on February 25, 2009. The report was issued by Intertek Evaluation Center in Elmendorf, Texas.

After reviewing the supplied data, FRA has determined that the NanoChar™ system does meet the required tests, as specified in 49 CFR § 179.18. Accordingly, NanoChar™ will be added to the list of thermal protective systems, per 49 CFR § 179.18(c). The Pipeline and Hazardous Materials Safety Administration will be notified of this addition, and a notice with an updated list will be published in the Federal Register at a later date as follows:

Intumescents Associates Group (IAG), Houston, Texas

NanoChar™

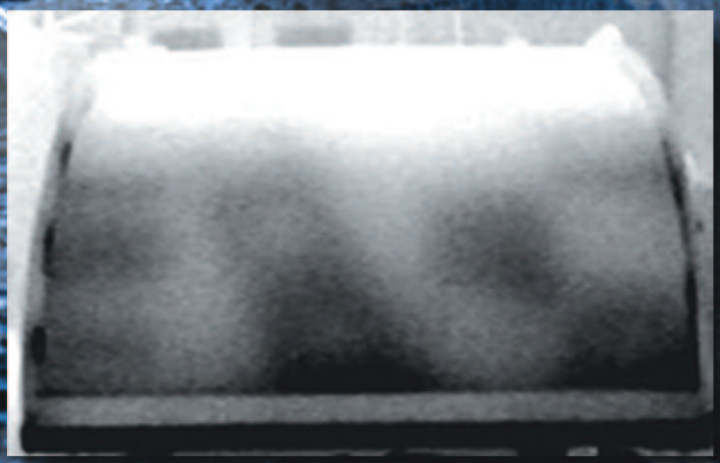
System Application: As outlined in the NanoChar™ Fire Proofing System Application Manual (December 1, 2008; Revision 2), the design thicknesses of the NanoChar™ application shall average a layer of at least 3.25 mm, with no point of the layer having a thickness of less than 3.1 mm.

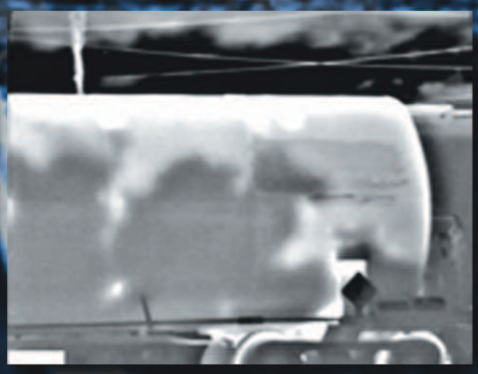
If you have any questions, please contact FRA Hazardous Materials Staff Director, Mr. William Schoonover, at (202) 493-6229; or via e-mail at William.Schoonover@dot.gov.

Sincerely,

Grady C. Cothen, Jr.
Acting Associate Administrator for Railroad Safety/Chief Safety Officer

RAIL CAR INSULATION FAILURES (IR)





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NanoChar® is now Federal Rail Administration (FRA) 49CFR & 179.18 approved for use as a fire protection barrier applied at 3.25mm, and can offer advantages in the following areas for rail car protection:

Reduced Application Time

NanoChar® is a fire protection and corrosion protection system. NanoChar® can be hand applied, but is typically spray applied using airless single or plural component spray units manufactured by Sprayquip. The required 3.25 mm of NanoChar® can be applied in one coat with 2-3 passes. As NanoChar® is a corrosion system as well, it can be applied direct to metal (DTM) eliminating the need for a primer coat. As NanoChar® is typically a sprayed application, it is ideal for coating / protecting complex shapes easily accommodating various attachments to the primary substrate. NanoChar® cure times are dependent on ambient temperatures. At 70°F touch cure is in 4-6 hours and to handle 24 hours. Cure rates can easily be adjusted to suit constructability issues.

NanoChar® is a 100% volume solids material. No solvents are used during the spray applications.

Weight Reduction

NanoChar® applied at the required 3.25 mm, equates to a material weight of only 0.80 pounds per square foot of surface area, reducing up to 8-10% of the weight of the typical rail car.

Reduction In Dimension

For fire protection certification, NanoChar® is only adding a total of 6.50 mm to the diameters of the vessel. If thermal insulation is also required, this can be accommodated by design, however testing may be required by the FRA. This feature may offer designers for the next generation rail cars to take advantage of reduced weight and overall diameter to increase the cargo loads.

Durability / Repairability

NanoChar® is a two component 100% solids epoxy intumescent fire resistant material with a typical Shore D hardness of 72, and a compressive strength of ≥2,500 psi, making the material extremely resistant to impact damage. Bond strength to the substrate is greater than 900 psi per ASTM 1002 lap shear testing, meaning any damage due to impact will remain localized and easily repaired via hand application. Rail maintenance and repair centers should find the reinstatement of fire protection using NanoChar® a valued solution.

Property	Test Method	Value
Liquid Density		
Part A	ASTM D1475	≤1.23 g/cc, 10.3 Lb/gal
Part B	ASTM D1475	≤1.14 g/cc, 9.5 Lb/gal
Liquid Mixed Density	ASTM D1475	≥1.20 g/cc, 10.0 Lb/gal
Typical Sprayed Density	ASTM D1475	≥1.10 g/cc
Moisture Absorption	Immersion in water	
	@RT for 31 days - uncoated	2.6 wt % weight gain
Flame Spread	ASTM E 84	25
Smoke Generation	ASTM E 84	90
Hardness	Shore D	≥72
Chemical Resistance	Resistant to many common	
	Acids, Bases, and Solvents	
Tensile Strength	ASTM D638	≥1800 psi
Tensile Modulus	ASTM D638	≥200 K psi
Compression Strength	ASTM D695	≥2500 psi
Lap Shear Strength	ASTM D1002	≥1400 psi
Flexible Strength	ASTM D790	≥2800 psi
Flexural Modulus	ASTM D790	≥210 K psi
Notched IZOD Impact Strength	ASTM D256	0.63 J/cm
Smoke & Toxicity Index	IMO FTP code Annex.1, pt 2	Toxicity Pass Smoke Primary Deck/floor Pass
Torch & Hose Stream	NFPA 58	120 Min.
Federal Rail Administration (FRA)	49CFR & 179.18	3.25mm

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