

NILES STEEL TANK ULTONIUM II GLASS LINING SPECIFICATION

Purpose:

Complete and total coverage of the enamel coating applied to a steel substrate is the ultimate goal in glass lining. Properly coated steel shall be a silica based ceramic material which when cured will be smooth, durable and will increase the life expectancy of the part in service. Ultonium II glass lining will prevent the build-up of latex and Polymer residue. Application of Ultonium II is done to properly prepared steel substrates using industry standards and tested according to ASTM and SSPC standards.

Niles Steel Tanks offers Ultonium II, a premium glass lining for steel pipe and fittings for service in Latex and Polymer industries. Applications allowing process temperatures to 350 degrees F. Ultonium II glass is Cobalt blue, formulated with special bonding agents to be amenable to both steel and ductile iron, developing a strong chemical bond between the glass and substrate during the fusing operation. Ultonium II is a single-coat system achieving a finished thickness of 12 mils nominal, and is inspected both visually and by spark test to ensure that the glass is free of pin holes crazing and scaling that would substantially expose the metal surface.

REQUIREMENTS:

The Ultonium II chemical bond shall be sufficient to permit a strain in the metal of .001 in. sq. (the yield point of carbon steel) without damage to the glass.

Ultonium II will be applied to all wetted surface areas. The Ultonium II will subsequently be fired in a specially designed furnace at a maturing temperature in excess of 1500 degrees F. for the appropriate time to achieve a smooth vitreous lining, with a proper molecular bond.

PREPREATION:

The pipe and fittings are inspected and marked in accordance to ASME specifications for incoming material inspection procedures.

All surfaces that are to be glass coated require the same basic preparation. After the part is inspected for any protrusions from excessive weld build-up, abnormalities in the steel or casting residue are all checked and ground flush and repaired if necessary. The part is then annealed at temperatures between 1540 and 1620 F to remove any chemical residue or manufacturing oils. After cooling, the part is moved to sandblasting. Sandblasting pipe and fittings is done using a 360 degree nozzle. It is very important to properly sandblast the steel surface so there is enough "profile" for the glass lining to adhere. Failure to properly sandblast to a clean white metal finish could result in spalling or fracturing of the glass lining.

Niles Steel Tank uses an automatic sifting system built into the blast cabinet to insure that the proper steel shot grit size is being used. Waste material, particles too small or too big, is filtered to containers where it is removed from the system and disposed of. Particles that are properly sized will continue back to the blasting reservoir.



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PREPERATION Cont'd

The steel surface profile, produced by sandblasting is examined on a bi-weekly basis and compared to a benchmark profile. Adjustments are made to the velocity and amount of material being used if an adjustment is necessary. Since the surface of the steel is now exposed, oxidation begins at once. It is important that all sandblasted parts are moved to the glassing area and coated as soon after the sandblasting as possible. Parts that sit too long are returned to the blast cabinet for additional blasting and touch-up. Precautions must be made to avoid moisture, oils, handling or other containments that can create a barrier between the glass and substrate after the parts are blasted. Any contamination on the steel substrate could result in "glass eyes", voids, or other defects in the glass and are caused when the foreign material begins to out gas under the glass

APPLICATION:

An automatic sprayer then applies between 20 mils and 24 mils of Ultonium II glass enamel and is dried in a curing oven at 400° until all moisture is removed. The dried frit will have a minimum finish thickness of 20 mils. Parts are then fired at 1500° until frit has liquefied and bonded to the steel subtrate. After cooling, the pipe and fittings are inspected for visual defects and each part has a minimum of 12 mils of finished Ultonium II glass enamel.

If the part requires multiple coats of glass, the non-glassed surfaces must be returned to the blast cabinet to remove scale build up between firings. Failure to properly prepare and remove the scale build up will result in contamination in the furnace where small particles become airborne and could potentially create defects if landed on the enamel surface.

INSPECTION:

To properly test for holidays and pinholes, a spark tester is used in accordance to ASTM, NACE and SSPC guidelines. Low voltage and wet sponge, non-destructive detection is used for testing pipe and fittings.

(In some industries, a total destructive test is required and voltage is set to above 12,000 volts. The purpose of the destructive test is to completely remove any glass in a void revealing the steel substrate.)

WARPAGE:

During firing and after removal from the furnace, all piping will be supported to minimize the effects of warpage/ deflection. As support does not control the expansion/ contraction of the metal, the following parameters apply to the finished product. Applying a plum line from the pipe O.D. @ the back of the flange on each end, the maximum deflection from plum will be as follows:

Pipe from 1'0" to 9'11" – 1/4"

Pipe from 10'0" to 13'11" – 5/16"

Ultonium II will have a hardness of at least 400 on the Knoop Scale or 5.5+ on the Mohs Scale, and a density of approximately 3.0 grams / cubic centimeter, as measured by ASTM designation D-792.

Flanging of pipe and fittings will be accomplished by ASME certified welders, and will conform to ASME accepted welding procedures. Connections will be std. 150 lb. slip-on or weld neck flanges, or machined stub ends, with 150 lb. class forged steel split back-up flanges.



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CAUSES FOR REJECTION ARISING FROM FABRICATION:

- A) Flanges not perpendicular
- B) Bolt holes not aligned
- C) Fractures in welds
- D) Non sealing joints
- E) Damaged glass as a result of fabrication

CARE IN HANDLING GLASS LINED STEEL PIPE & FITTINGS:

- A) Never lift by inserting solid device (i.e. tow motor fork) into barrel of item
- B) Never support entire weight of pipe or fittings on a single flange during Installation
- C) CRT-NA gaskets should be used with any glass lined pipe or fittings with glass applied to the flange faces, and should be loosened and re-torqued after a 24 hour heat cycle, to assure proper seating.
- D) Bolts must always be tightened in diametric opposition. When using CRT-NA gaskets, always conform to the following torque values (ft. lbs.):
 - 1 1/2" = 20 – 30#
 - 2", 3" & 4" = 30 – 50#
 - 6" & 8" = 50 – 90#
 - 10" & 12" = 75 – 125#
- E) Never hammer joints into place
- F) In storage, never support the item directly on the glass of a flange face
- G) In process, glass lined pipe should be supported by cradles or slings with at least 1 per every 6' of horizontal run. Vertical runs of pipe should be equipped with the appropriate base expansion joints, and intermediate stabilizers, especially on sections in excess of 10'. Anchoring pipe properly at each side of an expansion joint system permits adjustment, and allows for the isolation of vibration.

TESTING:

Niles Ultonium II is rigidly tested under the following ASTM testing guidelines:

W-H-196 Test = 7.0 – 8.0 mg/in²

This test consists of exposing the enamel to a boiling (212 F) 4/10% solution of sodium Bicarbonate for (8) eight, (18) eighteen-hour cycles. Maximum weight loss after eight cycles is not to exceed 15 mg/in².

PEI T-21 Spot Acid Test

This test is used to determine enamel resistance to acids. The test area is examined for visible effects on the enamel and is graded from Class AA (no sign of etching) to Class D (etched surface). NST's Ultonium II records Class A performance, equating to excellent chemical resistance.

Impact resistance

The impact resistance test is used to determine the adhesive qualities of enamel to the substrate. The enamel is graded on the fractured glass's ability to maintain its adherence in the impact area (an actual indication of the chemical bond). With Class 1 being the worst to Class 5 the best, Class 3 is considered acceptable. NST's Ultonium II outstanding strength performance consistently falls between the upper Class 4 and middle Class 5 range.



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