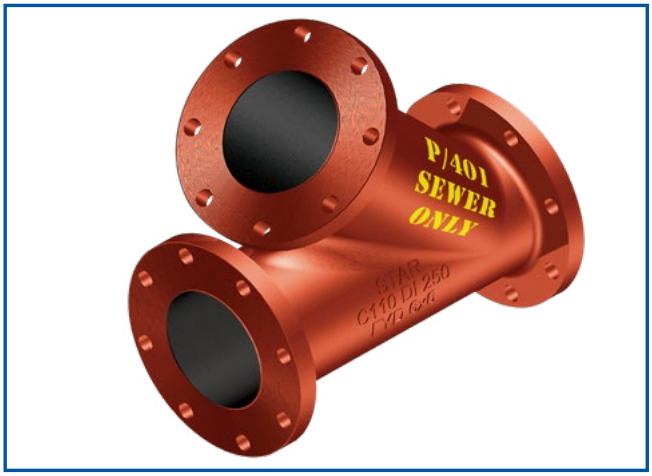
PROTECTO 401™ LINING

CERAMIC EPOXY
FOR DUCTILE IRON PIPE & FITTINGS

PRODUCT PROFILE

Protecto 401™ was created by Induron Protective Coatings.



FEATURES AND BENEFITS

- **Superior Internal Lining** for corrosion and abrasion resistance for sewer applications, resulting in an extended life of the system
- **Non-Hazardous and Safe for our Environment**, ensuring confidence in using a quality product that is safe
- **Non-Toxic Coating** (no volatile organic compounds)
- **Non-Flammable** (no solvents in its compound)
- **Exceptional Alternative** to other linings available in the market
- The application process **does NOT require OSHA regulation**
- **Re-Coatable**, Protecto 401™ joint compound shall be used for touch-up or repair in accordance with manufacturer's recommendations.

SUGGESTED SPECIFICATION FOR PROTECTO 401™ CERAMIC EXPOXY FOR DUCTILE IRON PIPE & FITTINGS

All ductile iron pipe and fittings shall be internally lined with 40 mils. of Protecto 401™, an amine cured novolac epoxy manufactured by Induron Protective Coatings.

STAR® PIPE PRODUCTS

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PROTECTO 401™ LINING

CERAMIC EPOXY FOR DUCTILE IRON PIPE &FITTINGS

LINING MATERIAL

Protecto 401™ is manufactured by Induron Protective Coatings and is an amine cured novolac epoxy, which contains, a minimum of 20% by volume of ceramic quartz pigment.

Protecto 401™ meets or exceeds the following criteria:

A. A permeability rating of 0.00 when tested according to Method A of ASTM E-96-66, Procedure A with a test duration of 30 days.

B. The following test must be run on coupons from factory lined ductile iron pipe:

* ASTM B-117 Salt Spray (scribed panel) - Results to equal 0.0 undercutting after two years.
* ASTM G-95 Cathodic Disbondment 1.5 volts@ 77°F. Results to equal no more than 0.5 mm undercutting after 30 days.
* Immersion testing rated using ASTM D-714-87.

  -20% Sulfuric acid-No effect after two years.

  -140°F 25% Sodium Hydroxide- No effect after two years.

  -160°F Distilled Water-No effect after two years.

  -120°F Tap Water (scribed panel)- 0.0 undercuttni g after two years with no effect.

* ASTM G-22 90 Standard practice for determining resistance of Synthetic Polymeric materials to bacteria. The test should determine the resistance to growth of AcidithiobacillusBacteria and should be conducted at 30 degrees centigrade for a period of 7 days on a minimum of 4 panels. The growth must be limited only to trace amounts of bacteria.

C. An abrasion resistance of no more than 3 mils (.075 mm) loss after one million cycles using European Standard EN 598: 1994 Section 7.8 Abrasion Resistance.

APPLICATION METHOD

Applicator

The lining shall be applied by a Protecto 401™ authorized applicator with a successful history of applying linings to the interior of Ductile iron Pipe and Fittings. All applicators must be independently inspected at least two times per year to insure compliance with the requirements of this specification. This inspection must be coordinated and reviewed by the manufacturer of the lining material and any deviation from the application and/or quality requirements shall be corrected by the applicator. All inspections shall be in writing and a permanent record maintained.

Surface Preparation

Prior to abrasive blasting, the entire area to receive the protective compound shall be inspected for oil, grease, etc. Any areas with oil, grease, or any substance that can be removed by solvent, shall be solvent cleaned to remove those substances. After the surface has been made free of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering oxide may be left on the surface. Any area where rust reappears before lining must be re-blasted.

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APPLICATION METHOD (CONTINUED)

Lining
After surface preparation and within 12 hours of surface preparation, the interior of the pipe shall receive 40 mils nominal dry film thickness. No lining shall take place when the substrate or ambient temperature is below 40°F. The surface also must be dry and dust free. If flange pipe or fittings are included in the project, the lining shall not be used on the face of the flange.

Coating of Bell Sockets and Spigot Ends
Due to the tolerances involved, the gasket area and spigot end up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum using Protecto 401™ Joint Compound. The Joint Compound shall be applied by brush to ensure coverage. Care should be taken that the Joint Compound is smooth without excess buildup in the gasket seat or on the spigot ends. Coating of the gasket seat and spigot ends shall be done after the application of the lining.

Number of Coats
The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. To prevent delamination between coats, no material shall be used for lining which is not indefinitely recoatable with itself without roughening of the surface.

Touch-Up and Repair
Protecto 401™ Joint Compound shall be used for touch-up or repair in accordance with manufacturer's recommendations.

INSPECTION AND CERTIFICATION

Inspection
All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC PA-2 Film Thickness Rating.

The interior lining of all pipe barrels and fittings shall be tested for pinholes with a non-destructive 2,500 volt test. Any defects found shall be repaired prior to shipment.

Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work.

Certification
The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified.

Handling
Lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and fittings for lifting, positioning, or laying. The pipe shall not be dropped or unloaded by rolling.

Care should be taken not to let the pipe strike sharp objects while swinging or being off loaded. Ductile iron pipe should never be placed on grade by use of hydraulic pressure from an excavator bucket or by banging with heavy hammers.

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