

PROTECTO 401™ CERAMIC EPOXY LINED DUCTILE IRON FITTINGS**Product Information Sheet**

SIGMA's PROTECTO 401 Lined Ductile Iron Fittings with 40 mils dry film thickness provide excellent protection and the strength required to carry out the job in tough sewer pipe applications. PROTECTO 401 has been successfully used in thousands of sanitary sewer applications and has been proven with both laboratory testing and two decades of actual sewer service on all sizes of ductile Iron pipe and fittings.

PROTECTO 401 Ceramic Epoxy Lining was designed specifically for protection of ductile iron for sanitary sewer service by providing reliability similar to cement mortar lining in drinking water service but having the excellent chemical resistance of epoxy for septic sewer service.

PROTECTO 401 has been tested and withstood:

- **Salt Spray Testing**

Two years with no undercutting on a scribed ductile iron panel when measured using ASTM B 117 and when rated using ASTM D 714 evaluating degrees of blistering.

- **20% Sulfuric Acid**

Two years with no effect when rated using ASTM D 714 evaluating degree of blistering.

- **25% Sodium Hydroxide Immersion**

At 140°F two years with no effect when rated using ASTM D 714 evaluating degree of blistering.

- **Distilled Water Immersion**

At 160°F two years with no effect when rated using ASTM D 714 evaluating degree of blistering.

- **Abrasion Resistance**

Less than .075mm (3 mils) loss after one million cycles on a plus 22.5° to minus 22.5° sliding aggregate slurry abrasion tester using a sharp natural siliceous gravel with a particle size between 2mm and 10 mm.

STANDARD SPECIFICATION FOR LINING DUCTILE IRON FITTINGS FOR SEWER SERVICE**I. Condition of ductile iron prior to surface preparation**

All ductile iron pipe fittings shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. Because removal of old linings may not be possible, the intent of this specification is that the entire interior of the ductile iron fittings shall not have been lined with any substance prior to the application of the specified lining material.

Benefits:

Ceramic epoxy lining offers excellent resistance to abrasion, mechanical damage and chemical attack. In pipelines conveying slurries or septic sewage this coating can provide a robust effective protection enhancing the longevity of performance.

Ceramic Epoxy Coating Provides:

- High abrasion resistance
- Flexible film characteristics
- High corrosion resistance
- High dielectric strength
- Low permeability
- Class 1 fire and smoke rating
- Machinable film
- Acceptable for food contact

II. Lining material

The standard of quality is Protecto 401™ Ceramic Epoxy. The material shall be an amine cured novolac epoxy containing at least 20% by volume of ceramic quartz pigment. Any request for substitution must be accompanied by a successful history of lining fittings for sewer service, a test report verifying the following properties, and a certification of the test results.

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 fitting:

- ASTM B-117 Salt Spray (scribed panel) - Results to equal 0.0 undercutting after two weeks.
- 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 after undercutting 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 Acidithiobacillus Bacteria 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

III. Application

Applicator

The lining shall be applied by a certified firm with a successful history of applying linings to the interior of ductile iron 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.



**Ceramic Epoxy Lined Ductile Iron
Fittings**



Quality – Service – Commitment – Delivered.

Lining

After surface preparation and within 12 hours of surface preparation, the interior of the fitting 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 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.

IV. Inspection and certification

Inspection

All ductile iron 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 fittings shall be tested for pinholes with a non-destructive 2,500 volt test. Any defects found shall be repaired prior to shipment. Each 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 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.

V. Handling

Lined fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the fittings for lifting, positioning, or laying. The fitting shall not be dropped or unloaded by rolling. Care should be taken not to let the fitting strike sharp objects while swinging or being off loaded.