

San Francisco International Airport Builds for the Future with Corrosion Protected Pipe and Fittings

In 2005, the FAA mandated compliance with the Federal Runway Safety Act (RSA) which necessitated airfield reconfigurations at some airports. For San Francisco International Airport (SFO), one of the nation's busiest airports, this posed a unique problem for the airport's utility infrastructure. Constrained by Highway 101 to the west, and the San Francisco Bay to the east, SFO faced numerous challenges in order to comply with the new safety requirements. In particular, airport engineers had to realign existing, and install new, potable water, sanitary sewer, industrial wastewater, gravity, and pressurized storm pipelines as well as construct a new drainage pump station and outfall pipelines.



Project Details and Project Summary

- Project Name: San Francisco Airport Runway Safety Area Program
- Location and Timing: San Francisco, CA; August 2012
- Pipe Size and Length: 151 total fittings and spools ranging from 4-inch to 30-inch
- Lining: 40mil Tnemec® 431 Ceramic Epoxy Lining
- Coating: 24mil Americoat® 385/78HB Coal Tar Epoxy

During the design phase, the pressurized storm water pipe specification called for Fusible PVC™ pipe which provided a restrained system. All fittings were to be epoxy coated and cement mortar lined per AWWA C210 and C104, respectively. The pressurized industrial wastewater pipe was also specified Fusible PVC™ pipe. The engineering specification also required all fittings, including elbows, reducers and tee's, to be epoxy coated and cement mortar lined per the same AWWA C210 and C104 minimum requirements. While the original design of the pressurized industrial wastewater line called for cement lining, it was recommended that the lining design could be improved to provide more abrasion and chemical resistance. An addendum was issued that specified a ceramic, 100% solids epoxy, such as Protecto® 401 or "equivalent", for the ductile iron fittings.

Once Protecto® 401 or "equivalent" was specified as a lining material, data which supported the equivalence or even superiority of another 100% solids epoxy, Tnemec® Series 431, was presented to SFO's engineering staff. Tnemec® Series 431 exhibits better abrasion resistance, as well as other improved mechanical properties. Additionally, as with Protecto® 401, the Tnemec epoxy is chemically resistant to solutions commonly found in a variety of wastewater streams.

Test or Characteristic	Tnemec 431 Epoxy <i>Lining & Coating</i>	Protecto 401 Novolac Epoxy <i>Lining</i>
Abrasion Resistance <i>ASTM D4060</i>	76 mg loss	340 mg loss ¹
Tensile Strength²	3,400 psi	250-300 psi
Adhesion to Ductile <i>ASTM D4541</i>	>1,131 psi	1000 psi
Adhesion to Steel	1,769 psi	Not tested
Impact Resistance³	160 in-lbs on DI	72 in-lbs
Cathodic Disbondment	0.0	0.17mm circle

1. Data from Tnemec
2. ASTM D2370, ASTM D412
3. ASTM G14, ASTM D2794

After review, the engineering team at SFO determined that Tnemec® Series 431 was equivalent to Protecto® 401 and thus accepted it as an equivalent lining material for the industrial wastewater line.

The coating system ultimately chosen for the ductile iron fittings was PPG's Americoat® 385/78HB Coal Tar Epoxy at 24 mils, which provides cost-effective fitting adhesion and a high level of protection from the environment.

The pipe and fittings distributor sent 151 ductile iron pieces ranging from 4-inch to 30-inch for lining and coating to Mobile Pipe. Mobile Pipe, known for expert application of high quality coatings and linings, was able to apply both the coal tar epoxy coating and the ceramic epoxy lining in a timely and cost-effective manner.

Oxidized fittings staged for blasting



Primed fittings ready for exterior epoxy



Finished fittings lined with Tnemec® 431 (green) and Americoat® 385/78HB coal tar epoxy coating



Fusible PVC™ pipe with coated and lined ductile iron fittings at the project site

