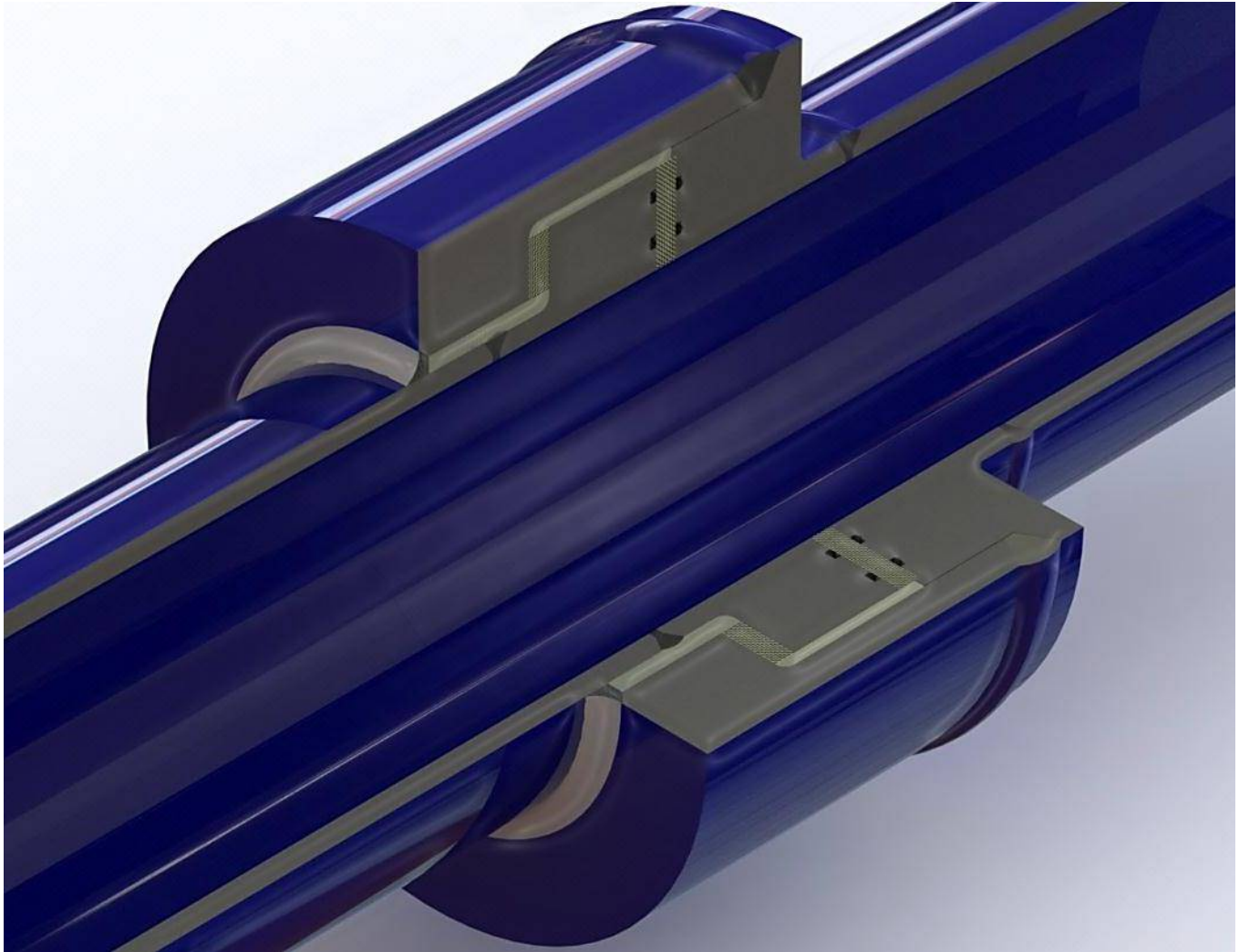


ELECTROSTOP™

MONOLITHIC ISOLATION JOINT



GPT QUALITY POLICY

We are committed to total quality customer satisfaction by:

- Driving continuous improvement in everything we do
 - Exceeding our customer's expectations
 - Providing highest quality products
 - Delivering on time

1.0 PRODUCT OVERVIEW

1.1 PURPOSE

1.1.1 This purpose of this document is to describe the various parts of the manufacturing process for ElectroStop™ Monolithic Isolation Joints.

1.2 SCOPE

1.2.1 This document covers the design, material and manufacturing standards for all NPS 2 - 24 ElectroStop™ Monolithic Isolation Joints manufactured at the GPT, Houston facility.

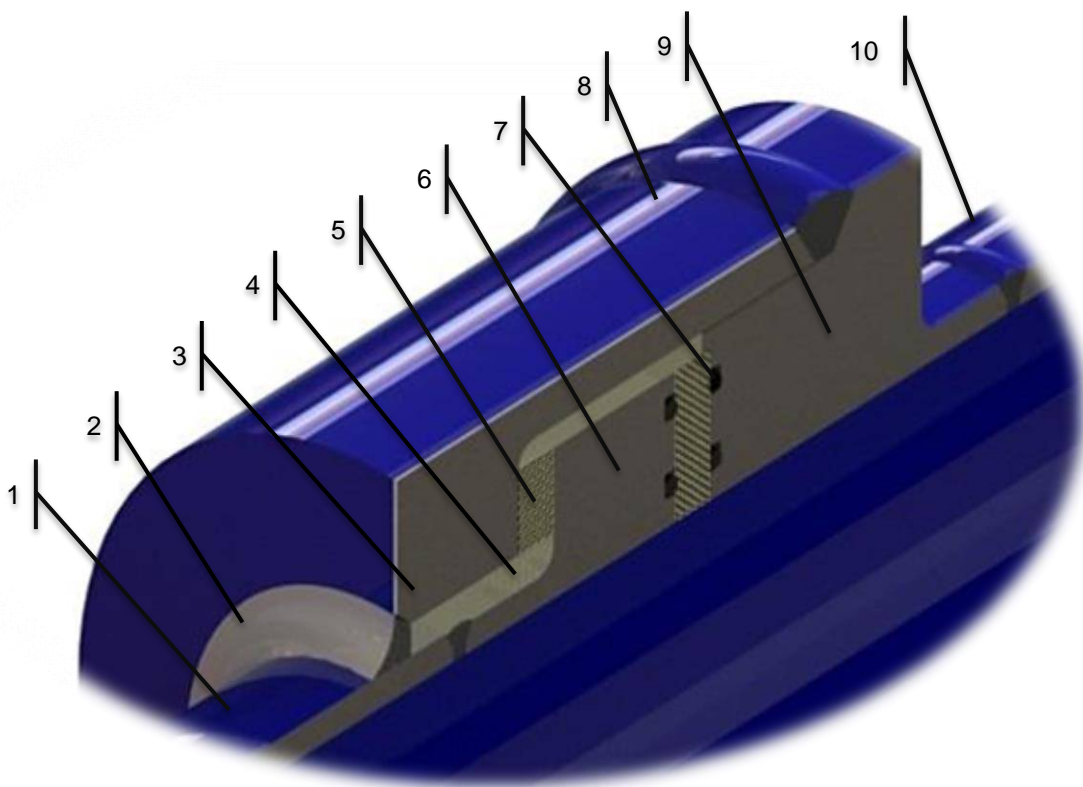
1.3 DEFINITIONS

- **ASTM** - American Society for Testing Material
- **ANSI** - American National Standards Institute
- **API** - American Petroleum Institute
- **ASME** - American Society of Mechanical Engineers
- **Cathodic Protection** - A technique used to control the corrosion of a metal surface by making it the cathode of an electrochemical cell.
- **Dielectric Fitting** - A fitting having insulating parts or material that prohibits flow of electric current.
- **Dielectric Strength** - The maximum electrical field strength a non-conducting material can withstand without breaking down.
- **Forged Steel Fittings** - Solid pieces of steel are forced into fitting shapes under very high temperature and pressure and then machined into final form
- **Galvanic Action** - When two dissimilar metals are immersed in the same electrolytic solution and connected electrically there is an interchange of atoms carrying an electric charge between them. The anode metal with the higher electrode potential corrodes with the cathode protected.
- **ISO 9000** - A series of five standards for developing a total quality management system. Developed by the International Organization for Standardization.
- **ID** - Inside diameter - the diameter of a pipe measured from the inside edges.
- **Insulation Resistance** - The resistance to current leakage through the insulation materials.
- **Monolithic** - consisting of or constituting a single unit.
- **NPS** - Nominal Pipe Size - a North American set of standard sizes for pipes used for high or low pressures and temperatures. Pipe size is specified with two non-dimensional numbers: a nominal pipe size (NPS) for diameter based on inches, and a schedule (Sched. or Sch.) for wall thickness.
- **OD** - Outside Diameter - the diameter of a pipe measured from the outside edges.
- **SMLS** - Seamless pipe
- **SPEC** - Specification
- **STD** - Standard
- **Schedule** - Numbers assigned to different wall thicknesses of pipe (e.g.40, 80, 160)
- **Seamless Pipe** - Pipe or tube formed by piercing a billet of steel and then rolling.

- **Specified Minimum Yield Strength (SMYS)** - the specified minimum yield strength for steel pipe manufactured in accordance with a listed specification. It is an indication of the minimum stress a pipe may experience that will cause plastic (permanent) deformation.
- **Thermosetting** - A process in which a prepolymer in a soft solid or viscous state changes irreversibly into an infusible, insoluble polymer network by curing.
- **Wall Thickness** - The thickness of the pipe wall.

1.4 GENERAL DESCRIPTION

1.4.1 ElectroStop™ Monolithic Isolation Joints are used for electrical sectioning and improving cathodic protection systems against corrosion of gas, water and petroleum pipelines. The ElectroStop™ eliminates short circuits, field assembly and is less expensive than a jointed flange with isolation gaskets. A high insulation resistance is assured by three features: a) insulation gasket that prevents metal-to-metal contact across the joint, b) internal cavities filled with a high dielectric strength compound, and c) internal and external surfaces coated with non-conductive epoxy paint.



1. PIPE PUP A
2. RTV SEALANT
3. COLLAR
4. DIELECTRIC EPOXY RESIN
5. INSULATION RING
6. FLANGE A
7. O-RINGS
8. EPOXY COATING
9. FLANGE B
10. PIPE PUP B



Product Specification & Data
ElectroStop™
Monolithic Isolation Joints

SD-ElectroStop-01-Rev.0

Rev. 00

Page 4 of 6

Date Approved: 4/31/2014

1.5 DESIGN & MANUFACTURING REQUIREMENTS

1.5.1 Monolithic isolation fittings shall be boltless and completely factory assembled in accordance with the appropriate requirements of ASTM, API, DIN and BS codes. All welds shall be butt weld construction. The dielectric isolation material shall be a thermosetting fiberglass epoxy material. Sealing shall be by two static O-ring seals housed machined grooves, fully protected from cavitation in full compliance with ASME design codes. Interior and exterior coating shall be a two part epoxy with a thickness of 16 to 24 mils to within 2" of each end. Testing shall be Electrical (@5kv, 25 Mohm), Hydraulic (@ 1.5 x O.P.) and Weld (Ultrasonic/Magnetic Particle).

1.6 MATERIAL SPECIFICATIONS

1.6.1 Pipe, Casting and Forging Specs

Part	Material	Specification Standard	Specification	Size Range	Type	Grade	SMYS (PSI)	Min. Tensile Strength (PSI)
Pipe	Carbon Steel	ASTM	A106 - This specification covers carbon steel pipe for high-temperature service.	NPS 2 - 4	SMLS	B	35,000	60,000
Pipe	Carbon Steel	API	API 5LX - This specification covers High test line pipe.	NPS 6-24	PSL 1 SMLS	X52	52,200	66,700
Pipe	Carbon Steel	API	API 5LX - This specification covers High test line pipe.	NPS 6-24	PSL 2 SMLS	X52	52,200 - 76,900	66,700 - 110,200
Castings	Carbon Steel	ASTM	A216 - This specification covers carbon steel castings for Valves, flanges, fittings, or other pressure-containing parts for high-temperature service and of quality suitable for assembly with	NPS 2 - 4		WCB	36,000	70,000 - 95,000
Forgings	Carbon Steel	ASTM	A105 - This specification covers standards for forged carbon steel piping components, that is, flanges, fittings, Valves, and similar parts, for	NPS 6-24		A105	36,000	70,000
Forgings	Carbon Steel	ASTM	A694 - This specification covers forged or rolled steel pipe flanges, forged fittings, valves, and parts	NPS 6-24		F52	52,000	66,000

1.6.2 Isolation Gaskets - The dielectric insulation material shall be of glass reinforced epoxy conforming to ASTM D709 Class IV.

1.6.3 O-rings – A 70 durometer Nitrile inner o-ring seal and a 75 durometer Viton outer o-ring seal is the GPT standard. Other material may be selected upon customer request and shall be conforming to an ASTM D2000 classification or equivalent material.

O-Ring Material Selection		
ASTM D1418 Designation	Elastomer	Brief Summary
NBR	Buna-N (Nitrile)	Nitrile has good mechanical properties and high wear resistance relative to other elastomers. Unless they are specially compounded, nitrile is not resistant to weathering, sunlight and ozone.
SBR, BR	Butadiene, Styrene Butadiene	SBR is similar to natural rubber. SBR is mostly used in tires and seals for non-mineral oil based applications.
IIR	Butyl	Butyl has a very low permeability rate making it a great seal under vacuum. Butyl also has good electrical, shock dampening properties.

CR	Chloroprene (Neoprene®)	Neoprene® exhibits good oil, ozone, weather, aging, refrigeration and chemical resistance. It also has good mechanical properties over a wide temperature range.
EPM, EPDM	Ethylene Propylene	Ethylene Propylene Copolymer has excellent resistance to phosphate ester fluids (Skydrol), brake fluids (glycol base), steam, weather, and ozone.
FKM	Fluorocarbon (Viton®)	Responds very well with resistance to ozone, high temperatures, oxygen, mineral oil, synthetic hydraulic fluids, fuels, aromatics and many organic solvents and chemicals. The universal O-ring.
FSI, FVMQ	Fluorosilicone	Has excellent resistance to petroleum oils and fuels. Fluorosilicone has limited strength and abrasion resistance so it is generally recommended for static applications only.
HNBR	Hydrogenated Nitrile	HNBR has excellent abrasion, compression set, tensile, and tear properties. Unlike standard nitriles, HNBR resists ozone, sunlight, and other atmospheric environments.
NR / IR	Natural Rubber / Isoprene	Natural Rubber / Isoprene has excellent dynamic properties. However, it does not do well with petroleum oils, sunlight and ozone.
ACM	Polyacrylate	Polyacrylate is used in applications such as transmissions or anything where there is petroleum oils and high temperature. Highly resistant to ozone and weathering.
Si, VMQ, MQ, MQ, PVMQ	Silicone	Silicon exhibits great temperature range capabilities. Silicones also has good resistance to ozone, weather and is also a good insulator. However, it has low tensile, tear and wear resistance.

1.6.4 Epoxy Fill – 90-3001 is a low viscosity, unfilled epoxy potting and encapsulating system which forms a bubble free glass like finish when cured. This is a 100% solids resin system that does not contain any solvents. Its low viscosity aids in filling voids and air pockets. In addition, there is no filler settling with this system.

1.6.4.1 TYPICAL SPECIFICATIONS

Color	Clear
Mix ratio, by volume	1:1
Mix ratio, by weight	100:83
Mix viscosity, @ 25C, cps	1,000
Pot life, 100 gram mass, @ 25C	20 minutes
Specific gravity, @ 25C	1.12
Hardness, Shore D	55-60
Tensile strength, psi	5,700
Thermal conductivity, btu.in/hr.ft ² .F	3.0
Thermal expansion coefficient per C	50x10 ⁻⁶
Operating temperature C	-50 to +150
Dielectric strength, volts/mil	558
Dielectric constant, 60 Hz	4.7
Dissipation factor, 60 Hz	.034
Volume resistivity, ohm-cm	5.0x10 ¹⁵

- 1.6.5 **RTV Sealant** – A 100 percent silicone RTV rubber, neutral-cure sealant, Dow Corning 832 Multi-Surface Adhesive Sealant is non-corrosive and provides superior unprimed adhesion, forming a flexible and long-lasting seal.
- 1.6.6 **Epoxy Coating** - The internal and external coating shall be a fusion-bonded epoxy resin. The coating shall be applied, per manufacturer recommendations, the full length of each steel pipe pup except for a 2” cut-back on both ends for welding.