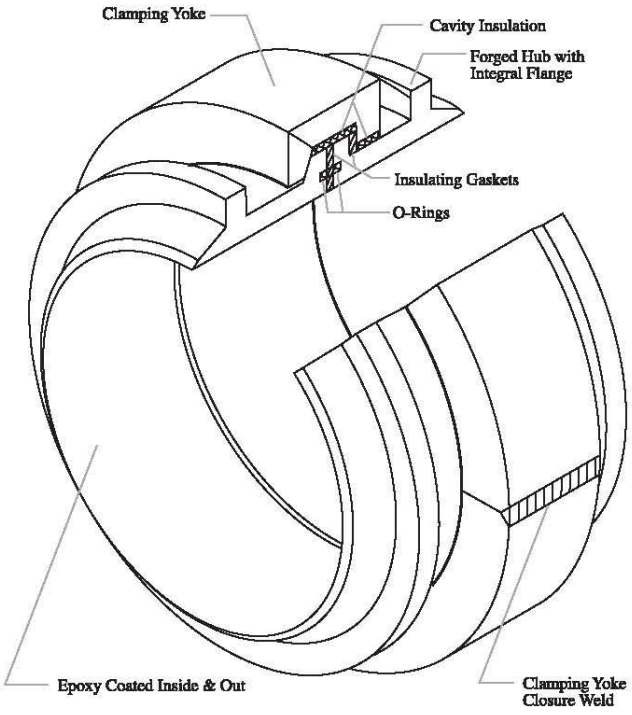
INSULATED JOINTS

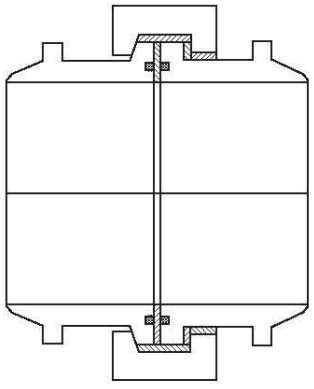
Monolithic Joints
for Electrically
Isolating
Pipelines

SYPRIS®
TECHNOLOGIES
Tube Turns Products

INSULATED JOINTS

TUBE TURNS INSULATED JOINTS are a pre-fabricated, non-separable, union used to isolate specific sections of pipelines to prevent corrosion caused by stray electrical currents or interference from other pipelines and power transmission cables.





MATERIALS OF CONSTRUCTION
The "W" type Insulated Joint has three basic metallic components; two hubs and a yoke. Two groove welds in the yoke lock the Insulated Joint in an integral unit.

STANDARD MATERIALS:
ASTM A694/ASME SA105 or SA 106 Gr.C (Minimum Yield 52,000 psi)

HIGH YIELD MATERIALS AVAILABLE UPON REQUEST:
ASTM A707

ELASTOMER O-RINGS:
Viton O-rings are standard in each Insulated Joint. Other O-ring compounds are available upon request.

INSULATED GASKET MATERIAL:
Epoxy base/glass fiber reinforced high strength laminate.

COATING:
Epoxy Base Paint.
Coal Tar Epoxy available upon request.

ADVANTAGES OF TUBE TURNS DESIGN

COMPACT
Tube Turns Insulated Joints are designed to produce a relatively compact overall length without the use of expensive pipe pups. The heat from normal welding will not affect the mechanical or electrical integrity of Tube Turns Insulated Joints.

BOLTLESS
The "W" series Insulated Joint is designed to satisfy customers that require a boltless construction for ease of final wrapping and coating after final installation of the pipeline.

FULL SCALE IN-HOUSE TESTING
Tube Turns is fully qualified to provide Magnetic Particle, Ultrasonic, and Liquid Penetrant examination in-house along with the required NDE test reports to meet customer requirements.

SINGLE PIECE CONSTRUCTION
The Tube Turns Insulated Joint is of Monolithic construction designed specifically with regard to the pipeline requirements. This design insures the precompression of the sealing gasket during assembly and enables a perfect seal to be formed against internal and external environments.

TRIPLE PROTECTION
1.) Insulated gaskets prevent metal-to-metal contact across the Insulated Joint.

2.) All internal cavities of the Insulated Joints are filled with a special dielectric compound to provide an additional electrical barrier.

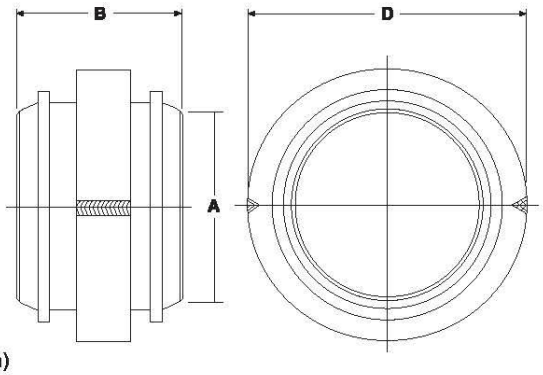
3.) Each metal component is individually coated with two coats of epoxy paint.

JOINT DIMENSIONS

WELDED INSULATED JOINT DIMENSIONS

When ordering, please specify bore required. Tube Turns Insulated Joints are normally thru bored to the same ID as the matching pipe. One or both ends can be taper bored at customer request.

Joints also available in sizes not listed and for higher pressure ratings.



All dimensions are in inches (mm)

		CL 600 W			CL 900 W		
Nominal Pipe Size	**Diameter at Weld Bevel A	Overall Length B	Maximum Diameter D	Approximate Weight Lbs. (kg)	Overall Length B	Maximum Diameter D	Approximate Weight Lbs. (kg)
4 (100)	4.500 (114.3)	7.88 (200.2)	7.75 (196.9)	40 (18.1)	10.250(260.4)	8.725(221.6)	65(29.4)
6 (150)	6.625 (168.3)	10.00 (254.0)	10.50 (266.7)	70 (31.8)	12.250(311.2)	11.812(300.00)	138(62.6)
8 (200)	8.625 (219.1)	11.13 (282.7)	13.25 (336.6)	150 (68.0)	13.750(349.3)	14.625(371.5)	235(107.0)
10 (250)	10.750 (273.1)	13.00 (330.2)	16.25 (412.8)	250 (113.4)	16.750(425.5)	17.375(441.3)	366(166.3)
12 (300)	12.750 (323.9)	13.88 (352.6)	19.00 (482.6)	350 (158.8)	17.250(438.2)	20.062(509.6)	533(242.2)
14 (350)	14.000 (355.6)	14.63 (371.6)	20.69 (525.5)	425 (192.8)	19.250(489.0)	21.688(550.9)	671(305.1)
16 (400)	16.000 (406.4)	15.88 (403.4)	23.00 (584.2)	525 (238.1)	21.500(546.1)	24.688(627.1)	963(437.9)
18 (450)	18.000 (457.2)	16.63 (422.4)	25.69 (652.5)	675 (306.2)	23.250(590.6)	27.375(695.3)	1276(579.8)
20 (500)	20.000 (508.0)	17.75 (450.9)	27.75 (704.9)	850 (385.6)	24.500(622.3)	30.125(765.2)	1634(742.6)
22 (550)	22.000 (558.8)	19.13 (485.9)	31.00 (787.4)	1150 (521.6)	26.500(673.1)	32.750(831.9)	2060(936.3)
24 (600)	24.000 (609.6)	20.50 (520.7)	34.00 (863.6)	1450 (657.7)	29.500(749.3)	35.750(908.1)	2689(1222.2)
26 (650)	26.000 (660.4)	21.88 (555.8)	36.00 (914.4)	1675 (759.8)	31.250(793.8)	38.500(977.9)	3183(1446.7)
28 (700)	28.000 (711.2)	23.13 (587.5)	38.38 (974.9)	2000 (907.2)	33.000(838.2)	41.125(1044.6)	3835(1743.4)
30 (750)	30.000 (762.0)	24.13 (612.9)	41.25 (1047.8)	2425 (1100.0)	35.000(889.0)	44.125(1120.8)	4682(2128.3)
32 (800)	32.000 (812.8)	26.25 (666.8)	43.75 (1111.3)	2900 (1315.4)	36.500(927.1)	46.750(1187.5)	5438(2471.7)
34 (850)	34.000 (863.6)	27.38 (695.5)	46.56 (1182.6)	3450 (1564.9)	38.250(971.6)	49.500(1257.3)	6435(2925.0)
36 (900)	36.000 (914.4)	28.63 (727.2)	49.75 (1263.7)	3700 (1678.3)	41.000(1041.4)	52.938(1344.6)	7910(3595.6)
38 (950)	38.000 (965.2)	28.13 (714.5)	52.75 (1339.9)	4650 (2109.2)	42.750(1085.9)	55.688(1414.5)	9095(4134.2)
40 (1000)	40.000 (1016.0)	29.25 (743.0)	55.50 (1409.7)	5325 (2415.4)	44.500(1130.3)	58.375(1482.7)	10443(4746.7)
42 (1050)	42.000 (1066.8)	30.00 (762.0)	57.88 (1470.2)	6000 (2721.6)	43.750(1111.3)	61.125(1552.6)	11476(5216.5)

** Diameters shown are based on matching pipe with yield strength of 52,000 psi or less. When matching higher yield strength pipe, diameter at weld bevel can be increased to meet piping code requirements such as ASME B31.8 Figure I5 or higher yield materials can be used.

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QUALITY CONTROL

QUALITY ASSURANCE

Each joint manufactured by Tube Turns is completely factory assembled and Hydrostatically tested to 2225 psi or 3350 psi before shipment. In addition, each joint is electrically tested to verify its insulating capability. For acceptance, the joint must show a minimum electrical resistance of 25 megohms when tested at 1000 VDC.

Clamping yoke closure welds are ultrasonically examined to insure weld soundness. Each Insulated Joint is hydrotested to test the integrity of the pressure sealing system while in special test fixtures. The end force load, due to the internal pressure, is transferred to the Insulated Joint by the integral rings located near the welding end of each hub.

When specified, the following can be furnished for each joint:

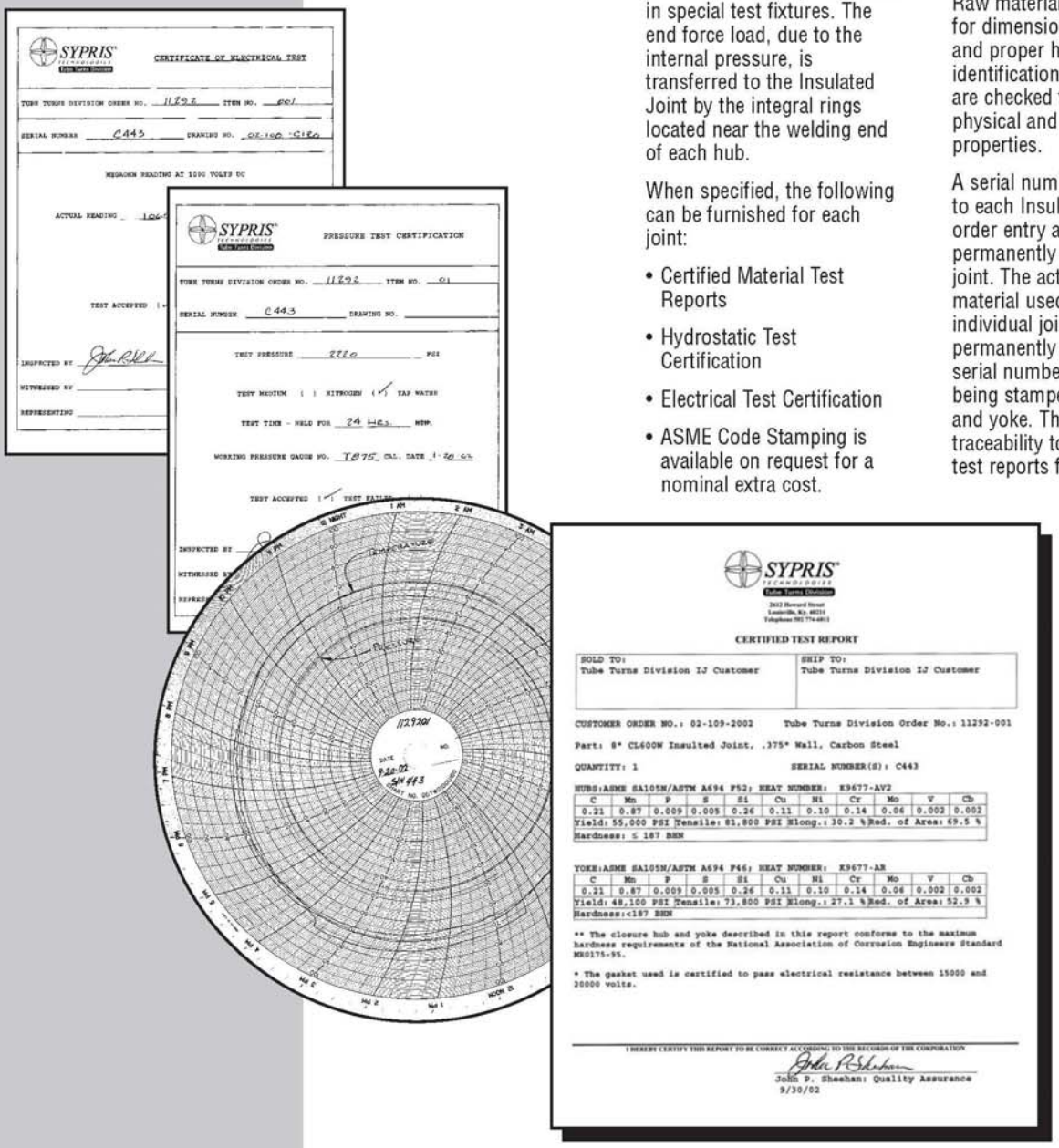
- Certified Material Test Reports
- Hydrostatic Test Certification
- Electrical Test Certification
- ASME Code Stamping is available on request for a nominal extra cost.

Tube Turns Quality Control System meets the requirements of the American Society of Mechanical Engineering Boiler and Pressure Vessel Code, Section VIII, Division 1, Appendix 10 which is audited by an Authorized Inspection Agency.

The system covers Order Analysis, Drawing Control, Procurement Control, Receiving of Materials, Process Control, Welding, Nondestructive Examination and Inspection.

Raw materials are inspected for dimensional acceptability and proper heat code identification. Mill test reports are checked to insure proper physical and chemical properties.

A serial number is assigned to each Insulated Joint at order entry and is permanently stamped on the joint. The actual heats of material used for the individual joint are permanently recorded for this serial number in addition to being stamped on the hub and yoke. This provides traceability to the material test reports for every joint.



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CERTIFICATE OF ELECTRICAL TEST

TUBE TURNS DIVISION ORDER NO. 11292 ITEM NO. 001

SERIAL NUMBER C443 DRAWING NO. 02-100-C180

MEGAOHM READING AT 1000 VOLTS DC

ACTUAL READING 106+

TEST ACCEPTED

INSPECTED BY

WITNESSED BY

REPRESENTING

SYPRIS TECHNOLOGIES
Tube Turns Division

PRESSURE TEST CERTIFICATION

TUBE TURNS DIVISION ORDER NO. 11292 ITEM NO. 01

SERIAL NUMBER C443 DRAWING NO.

TEST PRESSURE 2220 PSI

TEST MEDIUM ( ) NITROGEN (✓) TAP WATER

TEST TIME - HELD FOR 24 HRS. MIN.

WORKING PRESSURE GAUGE NO. T875 CAL. DATE 1-20-02

TEST ACCEPTED (✓) TEST FAILED

INSPECTED BY

WITNESSED BY

REPRESENTING

11292-01
NO.
DATE 9-20-02
SER # C443
CHART NO. 2017-1000-0

SYPRIS TECHNOLOGIES
Tube Turns Division
2602 Howard Street
Louisville, Ky. 40211
Telephone (502) 774-4811

CERTIFIED TEST REPORT

SOLD TO:	SHIP TO:
Tube Turns Division IJ Customer	Tube Turns Division IJ Customer

CUSTOMER ORDER NO.: 02-109-2002 Tube Turns Division Order No.: 11292-001

Part: 8" CL600W Insulted Joint, .375" Wall, Carbon Steel

QUANTITY: 1 SERIAL NUMBER(S): C443

HUBS:ASME SA105N/ASTM A694 F52; HEAT NUMBER: K9677-AV2

C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Cb
0.21	0.87	0.009	0.005	0.26	0.11	0.10	0.14	0.06	0.002	0.002

Yield: 55,000 PSI Tensile: 81,800 PSI Elong.: 30.2 % Red. of Area: 69.5 %

Hardness: ≤ 187 BHN

YOKE:ASME SA105N/ASTM A694 F46; HEAT NUMBER: K9677-AR

C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Cb
0.21	0.87	0.009	0.005	0.26	0.11	0.10	0.14	0.06	0.002	0.002

Yield: 48,100 PSI Tensile: 73,800 PSI Elong.: 27.1 % Red. of Area: 52.9 %

Hardness: <187 BHN

** The closure hub and yoke described in this report conforms to the maximum hardness requirements of the National Association of Corrosion Engineers Standard MR0175-95.

* The gasket used is certified to pass electrical resistance between 15000 and 20000 volts.

I HEREBY CERTIFY THIS REPORT TO BE CORRECT ACCORDING TO THE RECORDS OF THE CORPORATION

John P. Sheehan: Quality Assurance
9/30/02

PROTOTYPE TESTING

PRESSURE FATIGUE TESTING

Two Class 600 Insulated Joints – a 6" and a 24" – were subjected to a Hydraulic Pressure Fatigue test of 25 rapid pressure cycles from zero to 2230 psi and back to zero without any sign of leakage.

In a later test, a 24" Class 600 Insulated Joint was subjected to 2199 rapid pressure cycles from zero to at minimum 2300 psi and back to zero. At the completion of this test, the same Insulated Joint was hydrostatically tested at 3340 psi for 15 minutes. There was no evidence of leakage during either test.

TORSION TEST

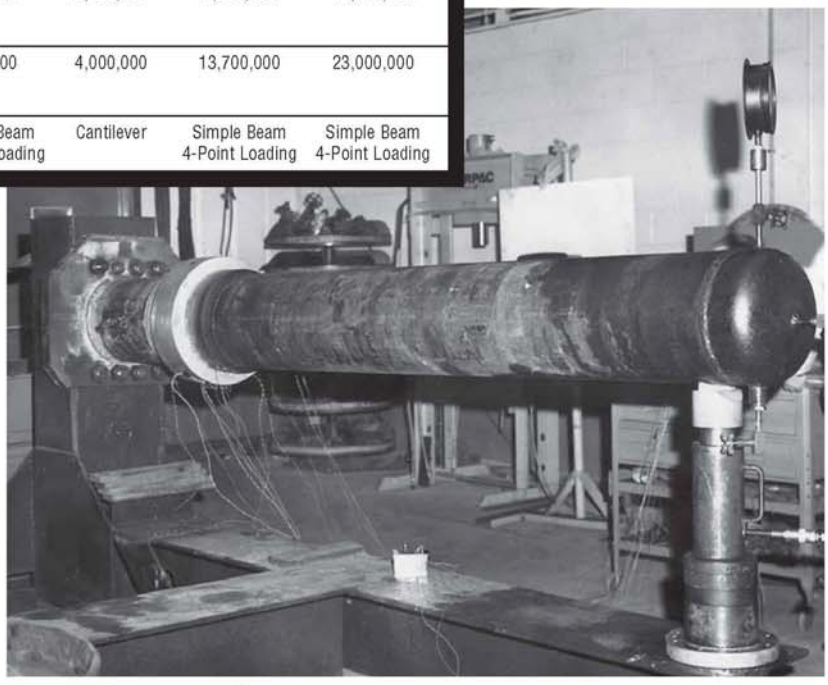
The 6" joint was successfully exposed to a torsional moment sufficient to produce a stress in the attached pipe of approximately 10% of the minimum yield strength (X65) of the attached pipe.

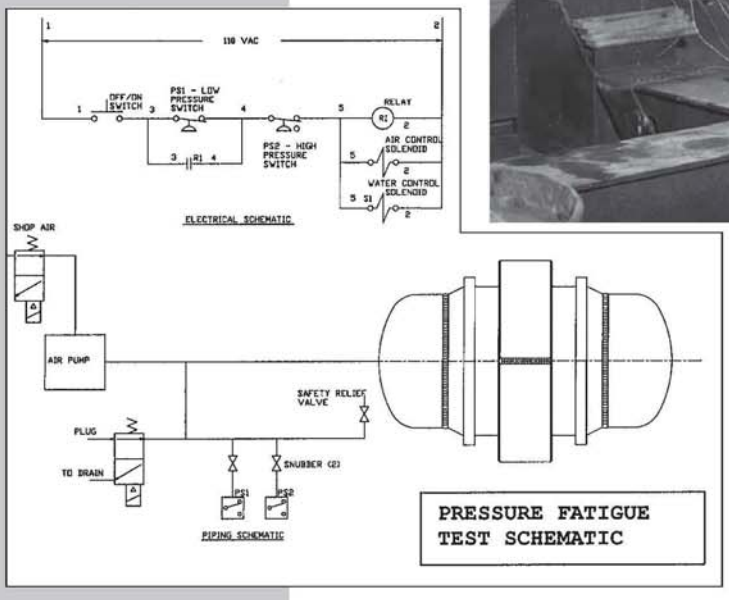
BENDING TESTS

Tube Turns Insulated Joints in 4", 6", 16", 24", and 30" sizes were welded into piping assemblies and subjected to externally applied bending loads while under full rated internal pressure. The results of this successful prototype testing are shown in the table below.

RESULTS OF PROTOTYPE TESTING PROGRAM

Size of Joints, Inches	4.5	6.62	16	24	30
Matching Pipe Thickness, Inches	.237	.280	.375	.500	.718
Electrical Resistance Measures at 1000VDC	>2000mΩ	>2000mΩ	>2000mΩ	>2000mΩ	>2000mΩ
Maximum Required Test Pressure per ANSI/ASME B16.5, psi	2225	2225	2225	2225	2225
Maximum Applied Test Pressure, psi (No Failure)	5000	5000	3945	3340	3000
Maximum Permissible Bending Moment, in lbs. per ASME B31,8, Para. 833.3 for X65 matching pipe	150,700	397,800	3,290,100	9,945,000	22,136,400
Actual Bending Moment, in lbs. applied to Insulated Joint while holding 1480 psi internal pressure without failure	180,000	517,700	4,000,000	13,700,000	23,000,000
Type of Loading in Bending	Cantilever	Simple Beam 4-Point Loading	Cantilever	Simple Beam 4-Point Loading	Simple Beam 4-Point Loading





PRESSURE FATIGUE TEST SCHEMATIC

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SUGGESTED SPECIFICATION

1.0 SCOPE

This specification applies to the purchase of butt-welding Insulated Joints used for electrical isolation and cathodic protection of pipelines. The Insulated Joints shall be as manufactured by Tube Turns and shall have an ANSI Class rating of either 600 or 900 at 100° F.

2.0 CODES AND STANDARDS

ANSI/ASME B31.8 Gas Transmission and Distribution Piping Systems.

ANSI/ASME B31.4 Liquid Petroleum Transportation Piping Systems.

ASME SECTION IX Qualification Standards for Welding and Brazing Procedures.

ASTM - Applicable Material Standards.

3.0 MATERIALS

Hubs & Yokes - ASTM A105, A106 or A694 with 52,000 psi Minimum Yield Strength.
O-Ring Gaskets - Non-conductive Viton per Mil-R-83248 Type I.
Insulating Gaskets - Epoxy Base/Glass Fiber Reinforced capable of meeting a minimum electrical strength of 15,000 Volts.

4.0 DESIGN

The Insulated Joints shall be designed to sustain an internal pressure of 1480 psi or 2220 psi in addition to an externally applied bending load which will produce a maximum bending strength of 72% of the minimum yield strength of the attached pipe.

5.0 TESTING

Each Insulated Joint shall be Hydrostatically pressure tested to 2225 psi or 3350 psi for a minimum of 15 minutes. Each Insulated joint shall be subjected to and pass an electrical resistance test of 25 megohms minimum at 1000 VDC.

6.0 WELDING

All Welders and Welding Procedures used in the fabrication of the Insulated Joints shall be qualified in accordance with ASME Section IX.

7.0 CLEAR BORE

The Insulated Joints shall have a smooth, clear bore suitable for the uninterrupted passage of Pigs, Spheres and On-line inspection tools (Intelligent Pigs).

8.0 WELD END PREPARATION

Internal diameter to match that of the attached pipe and the weld end shall be beveled to an angle of 30°, +5°/-0°, 1/16" Land.

9.0 MARKING

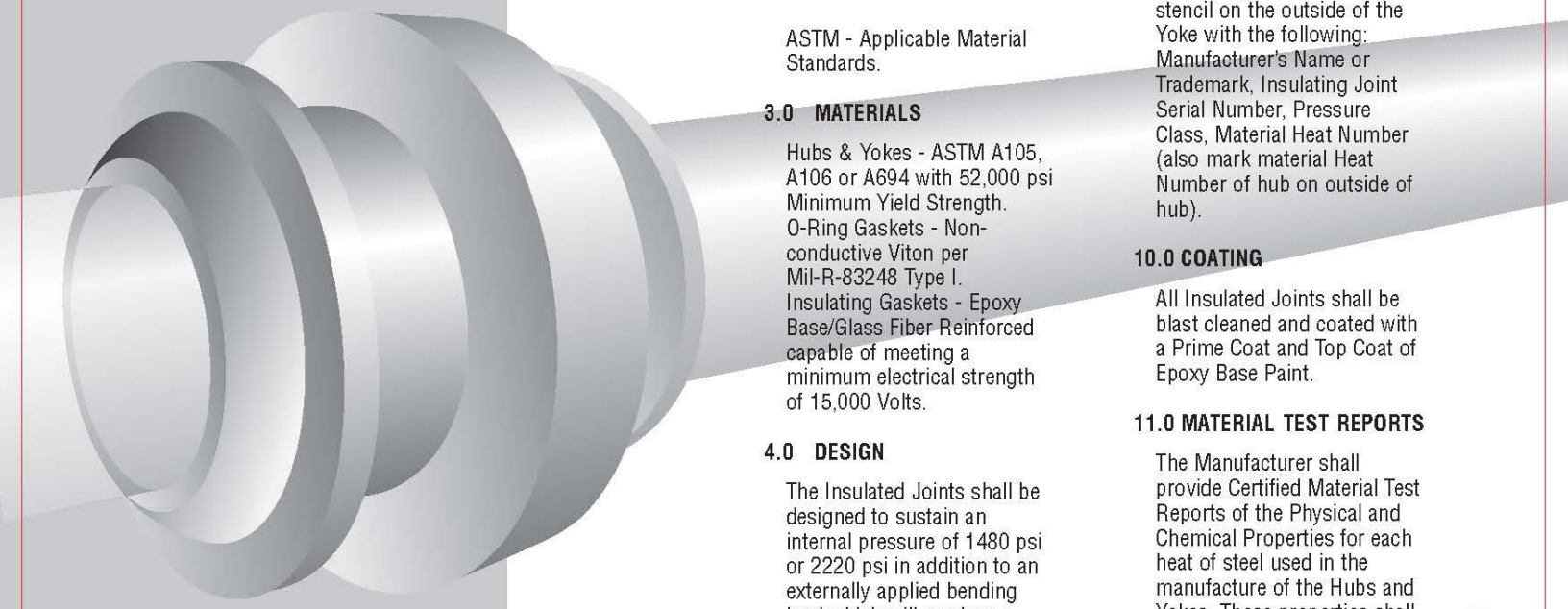
Each Insulated Joint shall be marked by low stress steel stencil on the outside of the Yoke with the following: Manufacturer's Name or Trademark, Insulating Joint Serial Number, Pressure Class, Material Heat Number (also mark material Heat Number of hub on outside of hub).

10.0 COATING

All Insulated Joints shall be blast cleaned and coated with a Prime Coat and Top Coat of Epoxy Base Paint.

11.0 MATERIAL TEST REPORTS

The Manufacturer shall provide Certified Material Test Reports of the Physical and Chemical Properties for each heat of steel used in the manufacture of the Hubs and Yokes. These properties shall conform to the applicable ASTM Specification.



GENERAL INFORMATION

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

1. Tube Turns Insulated Joints are completely assembled and sealed at the factory and are not to be disassembled for installation.

2. Install by butt-welding each end of the factory assembled joint to attaching pipe or fitting.

3. No additional heat sink is normally required. A thorough investigation of welding procedures indicates that the heat from normal welding will not adversely affect the mechanical or electrical integrity of the joint if properly installed.

4. Each joint is coated with a non-conducting epoxy paint. This coating should remain to help insure the insulating capability of the joint.

5. The Insulating Joint is factory tested for electrical resistance prior to shipment. If the original coating is removed or if an additional coating is to be applied, it is the responsibility of the user to assure that the joint remains non-conducting.

CAUTION:

As received, this item should operate as an insulating joint. If during installation any conducting path is created, it will cease to operate as an insulating joint.

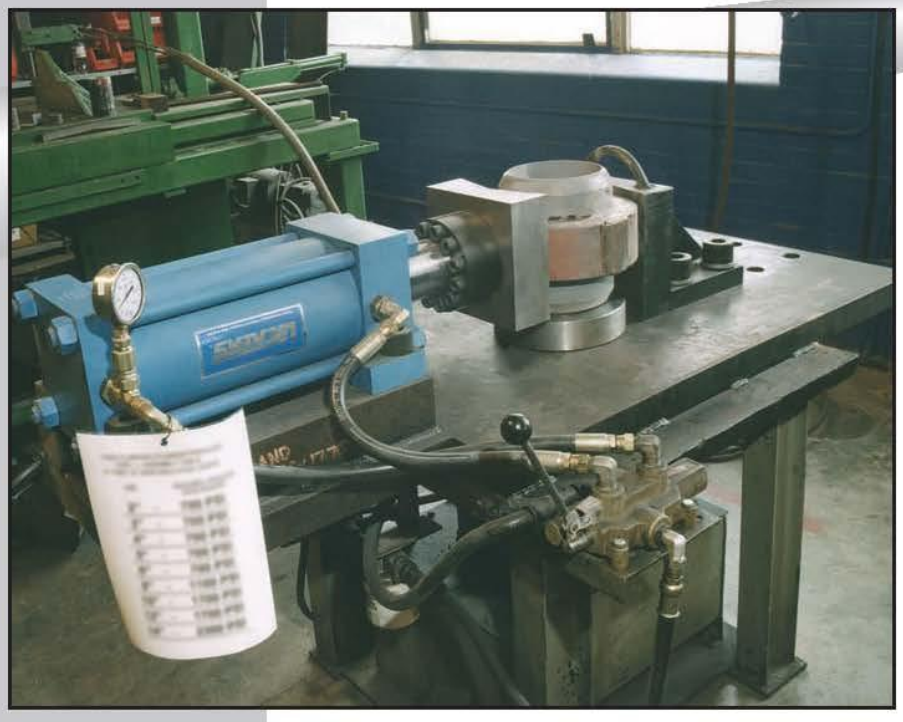
1. **Do Not:** Remove original coating with solvent or abrasion. This may damage the insulating gaskets or create a residue that is conductive.

2. **Do Not:** Coat across the joint with paints or other materials that are not proven non-conductors. (Primers such as Zinc oxide are particularly harmful.)

3. **Do Not:** Coat with Hygroscopic materials that will absorb moisture and create a conduction path between terminals or across the joint.

4. **Do Not:** Weld on joint if welding equipment is grounded on opposite side of joint.

5. **Do Not:** Attempt to disassemble the joint at any time, since this will destroy its electrical integrity and may impair its mechanical strength.



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Tube Turns Products

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SYPRIS® TECHNOLOGIES

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