INFRASTEEL™

PERMANENT CULVERT REHABILITATION SYSTEMS

AUGUST 2020

TECHNICAL DATA

www.infrasteel.com | www.precisionpipe.com

PRECISION PIPE & PRODUCTS, INC.

A cut above the rest.

Sectional Properties

Specified Thickness	Area of Section	Moment of Inertia	Section Modulus	Radius of Gyration
T	*A*	*i*	*S*	*r*
(in.)	(in.²/ft)	(in.⁴/in)	(in.³/ft)	(in.)
0.375	4.500	0.053	0.2813	0.1084
0.500	6.000	0.125	0.5001	0.1445
0.625	7.500	0.244	0.7814	0.1806
0.750	9.000	0.422	1.1252	0.2168
0.875	10.500	0.670	1.5316	0.2529
1.000	12.000	1.000	2.0040	0.2890

Surface Roughness

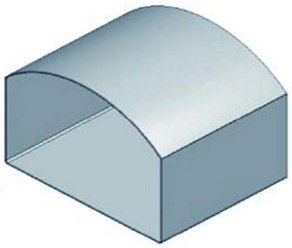
Mannings's Coefficient	0.012

InfraSteel 242 Physical Properties

Tensile Strength	58,000 psi min.
Yield Strength	36,000 psi min.

InfraSteel 242 Chemical Properties

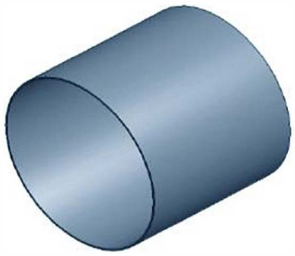
Carbon	.26 max.
Manganese	1.65 max.
Phosphorus	.04 max.
Sulfur	.05 max.
Copper	.20 min.



MAXBOXX CULVERT LINER

ARCH PIPE LINER

ELLIPTICAL PIPE LINER



ROUND PIPE LINER

Weathering Properties

The presence of Copper	. 20% minimum, improves corrosion resistance by a factor of 2.

SPECIFICATION:

INFRASTEEL 242 (dtd 4-1-20)

Standard for arc welded copper bearing corrosion resistant straight seam steel pipe (Round, Arch, Elliptical, and Special Shapes)

1) Scope

This specification covers arc welded straight seam steel pipe with .20 minimum copper for improved corrosion resistance for use in culvert rehab under roadways. The pipe may be round, elliptical, arch shaped or other special section as specified by the purchaser. Unless otherwise specified below the requirements of this specification apply to both round pipe sections and the non round pipe sections.

2) Ordering Information

Orders for this material should contain the following information.

2.1 Quantity

2.2 Size: outside diameter, specified wall if greater than shown in section 4 of this specification, and any other dimensions required for special sections. Wall thickness and structural design is the responsibility of the purchaser.

2.3 Length of pipes being ordered

2.4 Ends square cut and/or beveled ends

2.5 All material is to be domestic or domestic with mmu.

The purchaser is to specify if the material is to be domestic or domestic with mmu.

2.51 **DOMESTIC**: The pipe must be made from steel plates that were produced in the USA, and the pipe must be manufactured in the USA.

2.52 **DOMESTIC WITH mmu**: Purchaser is to specify if the domestic material used is to be "melted and manufactured in the USA" with back up papers from the steel plate mill showing that the material was "melted and manufactured in USA". The pipe must be manufactured in USA.

2.6 Tensile testing: The purchaser is to specify if he wants mechanical test samples taken from each heat number used, or from one random plate taken from each 100 ft. of each size on the order.

2.7 The purchaser is to specify if ASTM A-36 Grade B is to be used.

3) Manufacture

All pipe shall be made from new unused steel plates.
All pipe shall be straight seam pipe.
Straight seams welded after rolling must be automatic DSAW welds.
Midwelds done after rolling may be done by automatic or semi-automatic DSAW, FCAW, or GMAW welding. Splices done before rolling, and repair welds may be done by automatic, semi-automatic or manual DSAW, FCAW, or GMAW welding.

4) Specified Wall Thickness

The wall thickness and structural design is the responsibility of the purchaser. The purchaser shall specify the wall thickness required for his project as required by his design calculations, applicable specifications and pipe size. The minimum thicknesses below are based on the pipe manufacture; a thicker wall thickness shall be specified by the purchaser if needed to meet his requirements.

Round Pipe:
The minimum specified wall to be used for round pipe made to this specification shall be .500 nominal wall, and the wall thickness at any one point shall not be more than 12.5% under the specified nominal wall thickness.
(ie. Min wall = .875 x specified wall thickness)

Elliptical Pipe, Arch Pipe, and other non round pipe sections:
The minimum specified wall thickness to be used for these sections shall be .500", and the wall thickness at any point shall not be thinner than .015" under the specified wall thickness. (ie Min wall = specified wall thickness minus .015")

5) Chemical Composition

Each heat number of steel used for this product shall be tested for chemistry and shall conform to the following:

Carbon:	.26 max
Manganese:	1.65 max (see note below)
Phosphorus:	.04 max
Sulfur:	.05 max
Copper:	.20 min

Note: For each reduction of .01% carbon below the specified maximum concentration of carbon given above, an increase of .05% over the specified maximum concentration of manganese given above is permissible up to a maximum of 2.00% manganese.

6) Tensile Requirements for the Steel

Tensile strength:	58000 psi min.
Yield strength:	36000 psi min.

Each heat number used shall be tested for tensile and yield strength, and the results must meet the tensile and yield requirements above.

At the option of the purchaser, the Tensile test may be done on only one random sample taken from each 100 ft. of each pipe size on each purchase order and must meet the above tensile and yield requirements.

7) Test Report Requirements

A Pipe Material Test Report shall be furnished by the pipe mill producing the pipe.
The Pipe MTR shall provide the chemical test results of each heat number used in each pipe for the elements listed in section 5 above. Chemical test results must conform to section 5 of this specification.

The Pipe MTR shall also provide tensile and yield properties for each heat number used in each pipe; or if the purchaser specifies random sampling for tensile testing in accordance with section 2.6 of this specification, the Pipe MTR will show random tensile test results as required by section 2.6 of this specification. The tensile test results shall conform to section 6 of this specification.
All pipe must be manufactured in the USA.
All pipe must be made from steel plates that were produced in the USA, and the Pipe Material Test Report shall certify that pipe was made from domestic steel.

If MMU pipe is specified by the purchaser, all plates used shall be "melted and manufactured in the USA", and the Pipe Material Test Report will list all of the heat numbers or plate id numbers used for each pipe and will certify that pipe was "melted and manufactured in USA". Back up papers from the plate mill will be supplied to show that the plate was "melted and manufactured in the USA".

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8) Pipe Dimensional Tolerances

8.1 **Length**: The length of each pipe shall be within +-1/2" of the specified ordered length.

8.2 **Circumference:** The outside circumference at any point in the length of the pipe shall be within 1% of the nominal circumference or within +-1/2", whichever is less.

8.3 **Straightness:** The maximum allowable straightness deviation in any 10 ft length shall be 1/8".
For lengths over 10 ft the maximum deviation of the entire length may be equal to [1/8" x (total length in ft/10 ft)].

8.4 **Roundness** (for round pipe sections): The difference between the major and minor outside diameters at each end of each pipe shall not exceed 1/4" for diameters up to and including 48" OD and 1/2" for diameters greater than 48" OD.

8.5 **Wall Thickness:**
Round Pipe: For round pipe sections the minimum wall thickness at any point shall be not less than 12.5% of the specified wall thickness.
Elliptical, Arch Pipe, and other non round sections: For Elliptical, Arch Pipe, and other non round sections, the minimum wall thickness at any point shall not be less than .015" below the specified wall thickness.

9) Ends

Pipe ends shall be square cut or shall have a 30 degree bevel on OD or ID as specified by purchaser.

- When lining up the joints for welding, the critical alignment points are the longitudinal weld seams, and the 2 tangents points in the bottom where the flatter bottom radius transitions to the tighter haunch radius. The bracing inside of the liner should be used only as a visual tool to aid in alignment; think of aligning the crosshairs of a scope when setting the pieces into position.
- To aid with alignment, Ears or Tabs should be welded on the top of the end of one piece, so it can be hung on the piece it is being aligned with.
- Porta Power tools, wedges and modified C clamps should be used by the welders for manipulating the steel to make the ends of each section match prior to welding. Begin by tack welding the pipe every 6 inches once it is aligned. The welders should start welding at the invert, and then work upwards to the 12:00 position. The top radius is typically the best place to adjust any slack in the steel.
- The cross bracing should be removed during the manipulation of the ends for welding. This allows the liner to flex slightly and the walls to fit up flush. Replace 1 set of cross bracing at each joint area during the grouting process
- Grout Ports should be added every 10' at 12:00, 3:00, and 9:00. As grout is being pumped into the downstream end the grout will fill up the annular space moving up hill. As the grout moves uphill the next grout port will be used as a vent or window, to determine the position of the grout, and should be plugged when grout reaches it. Grout ports should be used as needed and can be added anywhere that grout is needed to fill voids. Grout pressure should not exceed 3.5 psi at point of injection.
- Tapered or conical lead sections are available. This allows liner section to be forced through sections of the host structure that have movable obstructions. Tracks or rails may be welded to the bottom of the host pipe to reduce the resistance and force required to slip the liner through the host.
- Arched liner with a flat bottom is more prone to float when grout is being pumped than pipe with a radius on the bottom. If necessary, spacers may be added to keep the liner from floating, prior to grouting, by cutting a hole in the top of the piece, and welding in a steel spacer that runs from the top of the liner to the ID of the host pipe structure. Grouting should be done in 2 or more stages.
- Liners are assembled and welded together by two methods: Method 1 is fitting the liner sections together outside of the host, and then slipping the liner into the host. Method 2 is loading each liner section inside the host, and fitting the joints from the ID. The installer is required to advise InfraSteel of the lining method chosen, and specify the end bevel configuration of the liner.

Limited Warranty:
Infrasteel is manufactured for each specific purchase and is warranted only to the extent that it is proven to be defective in material or workmanship prior to installation. Damage due to installation or grouting is not warranted. If the product is deemed defective the purchaser should provide immediate written notice of the defect and provide an opportunity for inspection by an Infrasteel representative. The InfraSteel product will be repaired on site, repaired at the plant, or replaced at Infrasteel's discretion, to the satisfaction of the purchaser.