

LIBERTY COATING COMPANY

MANUFACTURING PROCEDURE FOR PRITEC POLYETHYLENE COATING

DOCUMENT NO: MP-05

REVISION – 0

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REVIEWED BY:

Q.C. DEPARTMENT:

DATE:

APPROVED BY:

VICE PRESIDENT & COO:

DATE:

1.0 Scope and General

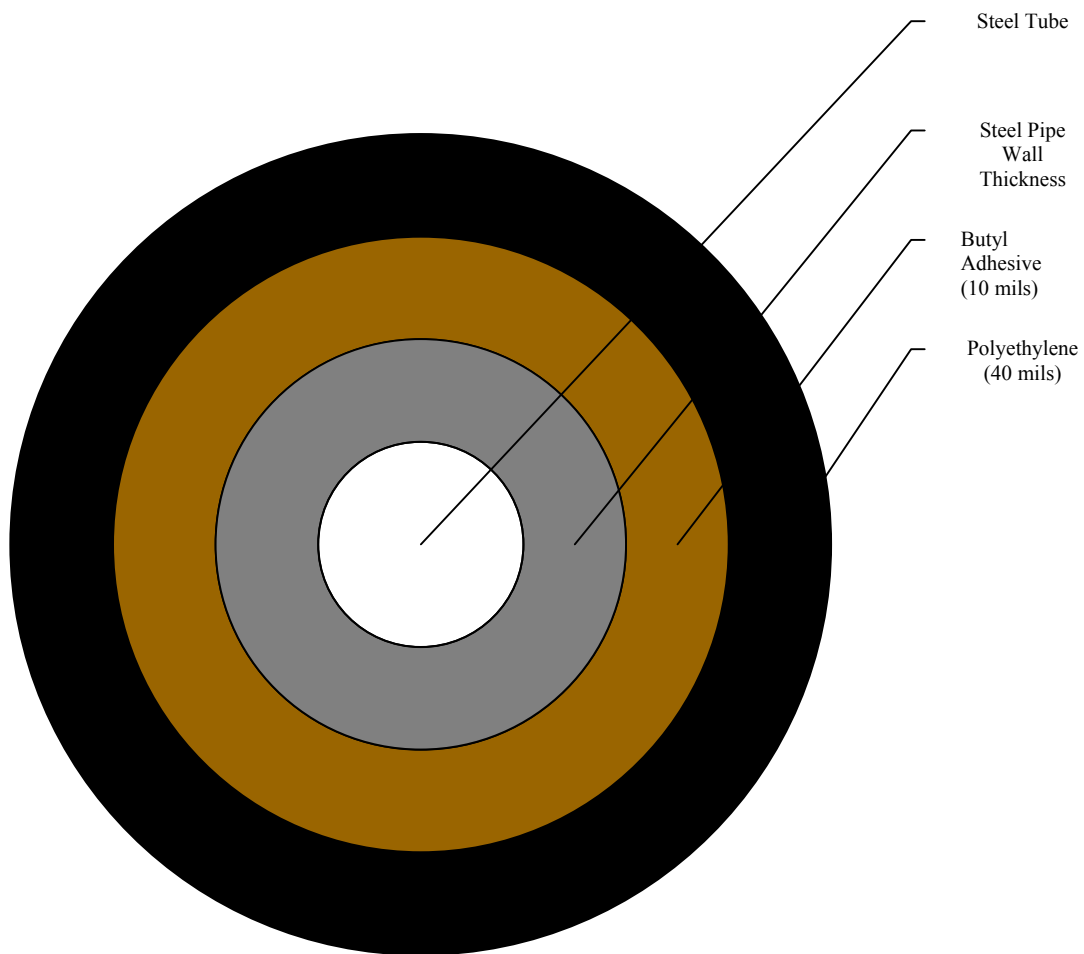
This MP covers the specifications of Pritec Polyethylene coating of pipe.

2.0 Materials (See Appendix No. 1)

Adhesive: Butyl

Polyethylene: High density polyethylene resin either blended with color concentrate or pre-compounded.

3.0 Coating System



4.0 Manufacturing Procedure Specification

PROCESS	PROCEDURE	REMARKS
4.1 <i>Pipe Handling</i>	<ol style="list-style-type: none">(1) Bare pipe will be handled with forklifts or cranes.(2) Bare pipe will be visually inspected upon receipt for damage.	<ol style="list-style-type: none">(1) See MP-H for additional handling information.(2) This inspection is not a full body inspection but observation before unloading and during handling.(3) All pipe delivered to the applicator shall be suitable for application of protective coating. If pipe is not suitable for coating, extra treatment and charges may apply. Refer to NAPCA Bulletin #16-94-94 for further clarification.
4.2 <i>Surface Preparation</i>	<ol style="list-style-type: none">(1) Any oil, grease or other contaminants shall be removed by solvent cleaning per SSPC-SP-01.(2) The pipe shall be preheated to at least 5°F (2.8°C) above the dew point prior to blasting. Temperature shall be checked using a surface probe thermometer.(3) The blasting shall be performed by an up style blast machine utilizing two (2) wheels.(4) The blasted pipe surface is visually inspected for steel surface imperfections. Imperfections which could be a detriment to the coating shall be removed by filing or grinding.(5) Blast cleaned pipe shall be coated within 4 hours or before "rust" bloom.	<ol style="list-style-type: none">(1) The degree of cleanliness shall meet a commercial blast as described in SSPC-SP-6 or NACE 3.(2) The surface profile shall be 1.5 to 4.0 mils (38 to 101 microns) as measured by replica tape once per hour.

PROCESS	PROCEDURE	REMARKS
4.3	<i>Surface Cleaning</i>	(1) The external surface will be cleaned using an air knife.
4.4	<i>Masking of Pipe Ends</i>	(1) Each pipe end shall be masked with tape, cap or other material prior to butyl application. (2) Pipe with raised weld seams that have not been ground even with the pipe surface shall be covered with a seam tape before coating application.
4.5	<i>Butyl Adhesive Coating</i>	(1) The butyl adhesive shall be spirally extruded in multiple layers to form a bonded coating. minimum overlap is ¼ inch (6 mm). (2) The adhesive temperature at application shall be between 280°F (137°C) to 340°F (171°C). temperature shall be checked using infrared pyrometer. (3) A silicone rubber coated pressure roller shall be used to minimize air entrapment
		(1) Masking width will be approximately 2 inches (± 1 inch) [(51 mm) (± 25 mm)] per end. (1) Film thickness of a minimum of 8 mils (203 microns). (2) Sheet temperature shall be recorded once per hour.

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| 4.6 | <i>Polyethylene Coating</i> | <ul style="list-style-type: none"> (1) The top coat shall be spirally extruded onto the adhesive coating in multiple layers to form a seamless bonded coating. Minimum overlap is ½ inch (12 mm). (2) The polyethylene temperature shall be between 450°F (232°C) to 575°F (302°C). Temperature shall be checked using infrared pyrometer. (3) A silicone rubber coated pressure roller shall be used to minimize air entrapment between adhesive and polyethylene layers. | <ul style="list-style-type: none"> (1) The nominal thickness shall be 40 mils (1 mm) unless otherwise specified in the plant order. (2) The acceptable minimum thickness shall be 10% less than nominal thickness. (3) Overlap width will be recorded once per hour. |
| 4.7 | <i>Water Quenching</i> | <ul style="list-style-type: none"> (1) The coated pipe will be cooled externally utilizing water spray and/or water flooding. | |
| 4.8 | <i>Holiday Detection</i> | <ul style="list-style-type: none"> (1) The coated surface of all pipes shall be 100% electrically tested for pinholes and/or damage immediately after cooling. | <ul style="list-style-type: none"> (1) Voltage of holiday detector:
Voltage = $\sqrt{t} \times 1250$
(t = coating thickness in mils) (2) Detector will have audible and visual alarm. (3) Detector voltage will be checked once per shift using volt meter. (4) Coating holidays will be recorded. |
| 4.9 | <i>Coating Repairs</i> | <ul style="list-style-type: none"> (1) Any irregularity that does not pass the quality inspection shall be repaired or over coated. (2) These irregularities can be found by the electrical inspection, thickness measurement or by visual inspection. | <ul style="list-style-type: none"> (1) Recommended repair methods are Liberty RM-001 (Tape), RM-002 (PERP) and RM-003 (Sleeve). (2) When needed repairs are excessive, the pipe may be double coated. |

PROCESS	PROCEDURE	REMARKS
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| <p>4.10 <i>Coating
Cutback</i></p> | <p>(1) The coating is cut 4 inches ($\pm \frac{1}{2}$ inch) [(102 mm) (± 12 mm)] from the pipe end by apparatus or by hand and the coating is then removed.</p> <p>(2) The masking tape is removed from pipe ends.</p> | <p>(1) Normal shrinkage will move the polyolefin cutback approximately another 2 to 6 inches (51-102 mm) after being cut.</p> |
| <p>4.11 <i>Final
Inspection</i></p> | <p>(1) The coated pipe shall be visually inspected.</p> <p>(2) Thickness shall be measured by magnetic gauge.</p> <p>(3) A Peel Test shall be performed at least twice per shift.</p> | <p>(1) See Sections 5.0.</p> <p>(2) All defects shall be repaired as outlined in Section 4.09.</p> <p>(3) Thickness gauge shall be calibrated at least twice per shift.</p> |
| <p>4.12 <i>Marking</i></p> | <p>(1) The O.D. of coating shall be stenciled or marked with the following items as a minimum.</p> <p style="margin-left: 40px;">a) Pipe Manufacturer</p> <p style="margin-left: 40px;">b) P.O. Number</p> <p style="margin-left: 40px;">c) Pipe Nominal O.D. and Wall Thickness</p> <p style="margin-left: 40px;">d) Weight per Foot</p> <p style="margin-left: 40px;">e) Coating Sequence Number</p> <p style="margin-left: 40px;">f) Liberty Logo</p> <p style="margin-left: 40px;">g) Date Coated</p> | |
| <p>4.13 <i>Pipe
Handling</i></p> | <p>(1) The coated pipe shall be handled using forklift with padded forks or with crane using lined hooks.</p> <p>(2) Coating damages caused by handling shall be repaired.</p> | <p>(1) See Section 4.09 for repair methods.</p> |
| <p>4.14 <i>Storage
And
Shipment</i></p> | <p>(1) Coated pipe will be stored on sand berms or wooden skids.</p> <p>(2) Coated pipe will be loaded out using forklift equipped with padded forks or crane using lined hooks.</p> | |

INSPECTION PROCEDURES

ITEM	FREQUENCY	PROCEDURE	ACCEPTANCE LIMIT	
5.1	Pipe Preheat Temperature	Once Per Hour	Surface Probe	Minimum 5°F (2.8°C) above the dew point
5.2	Blasted Pipe Surface	All Pipe	Visual Inspection of	File/grind defects NACE 3 / SSPC-SP-6
5.3	Blasted Pipe Anchor Pattern	Once Per Hour	Replication tape	1.5 to 40 mils (38 to 100 microns)
5.4	Butyl & Polyolefin Temperature	Once Per Hour	Infrared Pyrometer	Butyl – 280°F (137°C) to 340° (171°C) Polyolefin – 450°F (232°C) to 575°F (302°C)
5.5	Overlap Width	Once Per Hour	Tape Measure	Butyl – Not less than ¼ inch (6 mm). Polyolefin – Not less than ½ inch (12 mm)
5.6	Coating Thickness	One Pipe per Hour	(1) Magnetic gauge (2) Check 3 places on one pipe. (3) Record high/low reading once per hour.	Per Plant Order
5.7	Electrical Inspection	100% of Coating Surface	Holiday detector set at Voltage = $\sqrt{t} \times 1250$ (t=coating thickness in mils)	All defects will be repaired
5.8	Peel Test	Twice per Shift	SOP # TM-010	20 lb. Pull

6.0 Reporting

6.1 Daily Operating Report

- (1) Pipe preheat temperature.
- (2) Anchor pattern profile.
- (3) Material temperature.
- (4) Overlap width.

The above are recorded once per hour, including pipe number.

6.2 Daily Final Inspection Report

- (1) Pipe production number.
- (2) Holidays.
- (3) Total coating thickness, minimum-maximum.
- (4) Rejects.

6.3 Daily Laboratory Report

- (1) Peel Test.

Pipe number for each test will be recorded for each test.

Appendix No. 1: Typical Properties of Material

1.0 Butyl Adhesive:

Property	Test Method	Typical Value
Melt Index (190°C/2.16kg)	ASTM D1238	Max. 8.0

2.0 Polyethylene Top Coat (Raw Material) (Non-Compounded):

Property	Test Method	Typical Value
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Mechanical Properties

Tensile Strength (Break) psi (MPa).....	D 638.....	3000
Ultimate Elongation, %.....	D 638.....	500

Thermal Properties

Melt Index, g/10 minutes.....	D 1238.....	.20 - .65
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Miscellaneous Properties

Density at 73°F (23°C), g/cm ³	D 1505.....	0.939
Environmental Stress Crack Resistance 10% Igepal, F Hours (ASTM D 1693 Cond..B).....	D 1693.....	500
Durometer Hardness, Shore D.....	D 2240.....	55
Melting Point.....		248°F(120°C)
Vicat Softening Point.....	D 1525.....	240°F(116°C)
Brittleness Temperature.....	D 746.....	< -203°F (-95°C)