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ICC-ES Report

PMG-1057

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Valid: 02/15 to 02/16

DIVISION: 22 00 00—PLUMBING
SECTION: 22 11 16—DOMESTIC WATER PIPING

REPORT HOLDER:

CURAFLO IP LLC

4035 E. OASIS STREET
MESA, AZ 85215

EVALUATION SUBJECT:

CURAFLO ENGINEERED FLOW LINING SYSTEMS®



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ICC-ES PMG Listing**PMG-1057**

Effective Date: February 2015

This listing is subject to re-examination in one year.

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CSI: DIVISION: 22 00 00—PLUMBING
Section: 22 11 16—Domestic Water Piping

Product certification system:

The ICC-ES product certification system includes testing samples taken from the market or supplier's stock, or a combination of both, to verify compliance with applicable codes and standards. The system also involves factory inspections, and assessment and surveillance of the supplier's quality system.

Product: CuraFlo Engineered Flow Lining Systems®—Uses epoxy to coat the interior of existing, cleaned galvanized steel pipe or copper rigid tube pressurized potable water supply systems

Listee: CuraFlo IP LLC
4035 E. Oasis St.
Mesa, Arizona 85215

Compliance with the following codes:

2015, 2012 and 2009 *International Plumbing Code*® (IPC)
2015, 2012 and 2009 *International Residential Code*® (IRC)
2012 and 2009 *Uniform Plumbing Code*® (UPC)*

**Uniform Plumbing Code*® is a copyrighted publication of the International Association of Plumbing and Mechanical Officials.

Compliance with the following standards:

ASTM F2831-2012, Standard Practice for Internal Non Structural Epoxy Barrier Coating Material Used In Rehabilitation of Metallic Pressurized Piping Systems
ASTM D4541-2009e1, Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers
ICC-ES LC1008-2009, Listing Criteria for Internal Epoxy Barrier Pipe Coating Material for Water Supply Systems
IAPMO IGC189-2008, Internal Pipe Epoxy Barrier Coating Material for Application in Pressurized (Closed) Water Piping Systems
NSF/ANSI 61-2014, Drinking Water System Components – Health Effects
ANSI/AWWA C210-2008, Liquid-Epoxy Coating System for the Interior and Exterior of Steel Water Pipe Lines

Identification:

CuraPoxy: Each container bears a label marked Part A or Part B, with the manufacturer's name, the NSF 61 designation and the ICC-ES PMG listing mark. The label also has the batch number printed on it.

CuraPoxy LS: Each container bears a label marked Part A or Part B, with the manufacturer's name, the NSF 61 designation and the ICC-ES PMG listing mark. The label also has the batch number printed on it.

Coated Piping or Rigid Tubing: At a maximum distance of 20 feet (6096 mm) along exposed coated pipe or tube, and at each fixture connection, a label is attached indicating the manufacturer's name, NSF-PW, the words "This pipe has been lined with a CuraFlo[®] epoxy" and the ICC-ES PMG listing mark. The label includes a warning against using flame or heat when repairing any part of the piping system, and that any additions or alterations to the epoxy-lined piping system must be performed using mechanical fittings.

Installation:

CuraPoxy and CuraPoxy LS must be applied by authorized applicators trained by CuraFlo IP LLC. Existing piping or rigid tubes must be in good condition, with any cracks or leaks or visible signs of corrosion repaired. The following steps comprise the installation sequence:

1. The existing piping system is partially disassembled into separate sections, with flexible tube, valves and gasket connections removed.
2. Each section is air-dried and sandblasted clean in accordance with the manufacturer's published instructions. The cleaned surface, when viewed without magnification, must be in a shiny metal state and free of all visible oil, grease, dirt, mill scale, rust and previously applied coatings. Evenly dispersed, very light shadows, streaks and discolorations caused by stains of mill scale, rust and old coatings are permitted to remain on no more than 33 percent of the surface. Slight residues of rust and old coatings are permitted to be left in the craters of pits, if the original surface is pitted. Upon completion, this level of cleaning must be visually verified and recorded by the applicator.
3. Each section is then pressure-tested with air to 100 psi (689.5 kPa), to verify that the pipe has no holes, cracks or leaks.
4. Using proprietary measuring and application equipment provided by CuraFlo IP LLC, CuraPoxy epoxy is applied in one end of a pipe or tube section and forced by air pressure through the section.
5. After curing in accordance with the manufacturer's instructions, the CuraFlo applicator then reassembles the piping system and hydrostatically pressure tests to 120 psi (827 kPa) in the presence of the code official or the official's designated representative.
6. In the presence of the code official or designated representative, the CuraFlo applicator then conducts a flow test to verify the minimum flow rate to each fixture in accordance with Table 604.3 of the IPC.
7. Design: See Tables 1–4 for flow rates and pressure drop based on an average coating thickness of 0.010 inch (0.254 mm).

Models: CuraPoxy and CuraPoxy LS are proprietary, two-part, mechanically mixed epoxy materials that are pneumatically applied to the interior of cleaned rigid-galvanized pipe or copper tube used to convey pressurized potable water. CuraPoxy and CuraPoxy LS are composed of a two-component epoxy (Part A and Part B) which meets the requirements of NSF 61, Section 5. The CuraFlo Engineered Flow Lining System is recognized for application on either galvanized steel pipe or copper tube from 1/2 inch to 4 inches (12.7 to 102 mm) in diameter. The installed minimum thickness of the coating must be 0.010 inch (0.254 mm) on all sizes, but the coating is certified for thicknesses up to 0.04 inch (1.0 mm). The CuraFlo Engineered Flow Lining System is not for application on gasket connections, valves or on flexible pressure pipe.

Conditions of Listing:

The CuraFlo Engineered Flow Lining System must be installed in accordance with this listing and the manufacturer's published installation instructions. In the event of a conflict, the instructions in this listing govern. In addition:

1. The existing piping system must be fabricated from rigid copper tubing or galvanized steel pipe materials in accordance with the applicable code.
2. All leaks must be repaired prior to coating in such a way so as to restore the affected sections to a code-complying condition.
3. The CuraPoxy and CuraPoxy LS used in the CuraFlo Engineered Flow Lining System are manufactured in Broken Arrow, Oklahoma, under a quality control program with annual surveillance inspections by ICC-ES.

TABLE 1—WATER PRESSURE LOSS IN 1/2-INCH TYPE M COPPER PIPE

flow rate, gals/min	pipe interior: uncoated pipe ID, in.: 0.569 C factor: 125		pipe interior: coated with 10 mils of CuraPoxy ID, in.: 0.549 C factor: 150		pressure saved because of coating, psi / 100 ft pipe
	Velocity, feet/sec	uncoated pipe friction loss, h _f psi / 100 ft pipe	Velocity, feet/sec	coated pipe friction loss, h _f psi / 100 ft pipe	
1	1.26	0.93	1.36	0.79	0.14
2	2.52	3.35	2.71	2.85	0.50
3	3.79	7.1	4.07	6.0	1.1
4	5.05	12	5.42	10	1.8
5	6.31	18	6.78	16	3
6	7.57	26	8.13	22	4
7	8.83	34	9.49	29	5
8	10.1	44	10.8	37	7
9	11.4	54	12.2	46	8
10	12.6	66	13.6	56	10
11	13.9	79	14.9	67	12
12	15.1	92	16.3	78	14
13	16.4	107	17.6	91	16
14	17.7	123	19.0	104	18
15	18.9	139	20.3	118	21
16	20.2	157	21.7	133	24
17	21.4	176	23.0	149	26
18	22.7	195	24.4	166	29



TABLE 2—WATER PRESSURE LOSS IN 3/4-INCH TYPE M COPPER PIPE

flow rate, gals/min	pipe interior: uncoated pipe ID, in.: 0.811 C factor: 125		pipe interior: coated with 10 mils of CuraPoxy ID, in.: 0.791 C factor: 150		pressure saved because of coating, psi / 100 ft pipe
	Velocity, feet/sec	uncoated pipe friction loss, h _f psi / 100 ft pipe	Velocity, feet/sec	coated pipe friction loss, h _f psi / 100 ft pipe	
1	0.62	0.17	0.65	0.13	0.03
2	1.24	0.60	1.31	0.48	0.12
3	1.86	1.3	1.96	1.0	0.2
4	2.48	2.2	2.61	1.7	0.4
5	3.11	3.3	3.26	2.6	0.6
6	3.73	4.6	3.92	3.7	0.9
7	4.35	6.1	4.57	4.9	1.2
8	4.97	7.8	5.22	6.3	1.5
9	5.59	10	5.88	7.8	1.9
10	6.21	12	6.53	9.4	2.3
11	6.83	14	7.18	11	2.7
12	7.45	16	7.83	13	3.2
13	8.07	19	8.49	15	3.7
14	8.70	22	9.14	18	4.2
15	9.32	25	9.79	20	④ 4.8
16	9.94	28	10.4	23	5.4
17	10.6	31	11.1	25	6.1
18	11.2	35	11.8	28	6.7
19	11.8	38	12.4	31	7.5
20	12.4	42	13.1	34	8.2
21	13.0	46	13.7	37	9.0
22	13.7	50	14.4	41	10
23	14.3	55	15.0	44	11
24	14.9	59	15.7	48	11
25	15.5	64	16.3	51	12
26	16.1	69	17.0	55	13
27	16.8	74	17.6	59	14
28	17.4	79	18.3	63	15
29	18.0	84	18.9	68	16
30	18.6	89	19.6	72	17
31	19.3	95	20.2	77	18
32	19.9	101	20.9	81	20
33	20.5	107	21.5	86	21

TABLE 3—WATER PRESSURE LOSS IN 1/2 SCHEDULE 40

flow rate, gals/min	pipe interior: uncoated pipe ID, in.: 0.622 C factor: 120		pipe interior: coated with 10 mils of CuraPoxy ID, in.: 0.602 C factor: 150		pressure saved because of coating, psi / 100 ft pipe
	Velocity, feet/sec	uncoated pipe friction loss, h_f psi / 100 ft pipe	Velocity, feet/sec	coated pipe friction loss, h_f psi / 100 ft pipe	
1	1.06	0.65	1.13	0.50	0.15
2	2.11	2.34	2.25	1.82	0.52
3	3.17	5.0	3.38	3.8	1.1
4	4.22	8.4	4.51	6.6	1.9
5	5.28	13	5.64	10	3
6	6.34	18	6.76	14	4
7	7.39	24	7.89	18	5
8	8.4	30	9.0	24	7
9	9.5	38	10.1	29	8
10	10.6	46	11.3	36	10
11	11.6	55	12.4	43	12
12	12.7	64	13.5	50	14
13	13.7	75	14.7	58	17
14	14.8	86	15.8	67	19
15	15.8	97	16.9	76	(R) 22
16	16.9	110	18.0	85	25
17	17.9	123	19.2	95	28
18	19.0	137	20.3	106	31

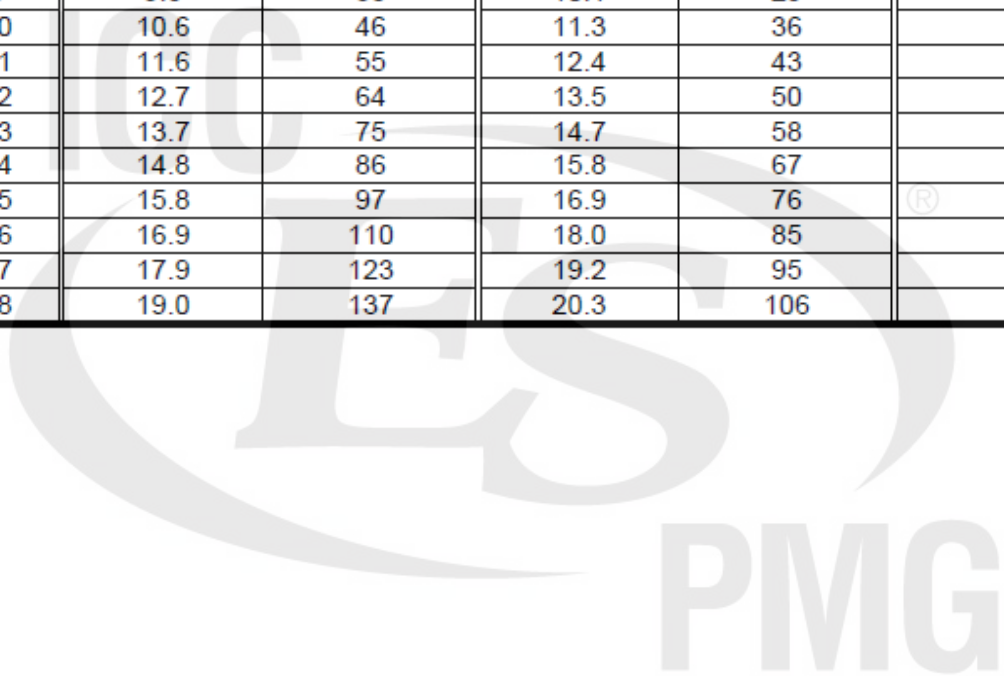


TABLE 4—WATER PRESSURE LOSS IN 3/4 INCH SCHEDULE 40 CARBON STEEL PIPE

flow rate, gals/min	pipe interior: uncoated pipe ID, in.: 0.824 C factor: 120		pipe interior: coated with 10 mils of CuraPoxy ID, in.: 0.804 C factor: 150		pressure saved because of coating, psi / 100 ft pipe
	Velocity, feet/sec	uncoated pipe friction loss, h _f psi / 100 ft pipe	Velocity, feet/sec	coated pipe friction loss, h _f psi / 100 ft pipe	
1	0.60	0.17	0.63	0.12	0.04
2	1.20	0.60	1.26	0.44	0.15
3	1.80	1.3	1.90	0.9	0.3
4	2.41	2.1	2.53	1.6	0.5
5	3.01	3.2	3.16	2.4	0.8
6	3.61	4.5	3.79	3.4	1.2
7	4.21	6.0	4.42	4.5	1.5
8	4.81	7.7	5.06	5.8	2.0
9	5.41	10	5.69	7.2	2.4
10	6.02	12	6.32	8.7	3.0
11	6.62	14	6.95	10	3.5
12	7.22	16	7.58	12	4.2
13	7.82	19	8.22	14	4.8
14	8.42	22	8.85	16	5.5
15	9.02	25	9.48	18	6.3
16	9.63	28	10.1	21	7.1
17	10.2	31	10.7	23	7.9
18	10.8	35	11.4	26	9
19	11.4	38	12.0	29	10
20	12.0	42	12.6	31	11
21	12.6	46	13.3	34	12
22	13.2	50	13.9	38	13
23	13.8	55	14.5	41	14
24	14.4	59	15.2	44	15
25	15.0	64	15.8	48	16
26	15.6	69	16.4	51	17
27	16.2	73	17.1	55	19
28	16.8	79	17.7	59	20
29	17.4	84	18.3	63	21
30	18.0	89	19.0	67	23
31	18.7	95	19.6	71	24
32	19.3	101	20.2	75	26
33	19.9	107	20.9	79	27