PLAINTIFF'S EXHIBIT
CT-437

TECHNICAL CHANGE ORDER

CertainTeed

CertainTeed Corporation
Pipe and Plastics Group

APPLICABLE TO:
A/C Standard Product Specification
Spec. #10A

DATE OF ISSUE:	T.C.O. NO.:	PAGE NO.:
APR 23 1979	4	1

DESCRIPTION:
Fluid-Tite A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150 and 200

Purpose:

To correct the Epoxy Lined Pressure spec:

1) I.D. lining thickness was changed from 40 mils minimum to 40 mils nominal.

2) Lined Coupling FT-B design B_2 dimensions corrected.

Effective Date:

Date of issue.

Disposition of Superseded Pages:

Destroy pages 1, 2, and 7 of Spec. 10A all dated March 13, 1978 in your A/C Standard Product Specification Book. Replace with the pages attached.

CTD015398

PREPARED BY:	APPROVED BY:	R & D	MFG.	SALES	I.E.	OTHERS

TECHNICAL SPECIFICATIONS

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SPECIFICATIONS CLASSIFICATION: A/C Standard Product Specification		
T.C.O. REF. NO.	SPECIFICATION NO:	PAGE NO.:
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SUPERSEDES: March 13, 1978		DATE OF ISSUE: APR 23 1979

DESCRIPTION:

FLUID-TITE A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150 and 200

General

These specifications show the requirements for an epoxy resin lining for application to A/C Pressure Pipe. Epoxy lined pipe is primarily intended for use where unusual acidic conditions arise due to the hydrogen sulfide cycle and for the transporting of corrosive industrial wastes containing dilute acid, alkali, or salts. Lined pipe shall not be used for transporting potable water or other materials for human consumption. The lining shall be Type 40. Type 40 has a 40 mil nominal lining thickness. A/C epoxy lined pressure products described in this specification are:

Pipe and couplings
Coupling Adaptor to Steel (CAS) - special only.
Coupling Reducer, Size to Size - special only.
Pipe Adaptor, Class to Class - special only.

Composition

The lining is composed of a solvent free epoxy resin, curing agent, fillers and coloring matter.

The composition of the A/C pressure pipe shall be found in the General Standards Manual.

Conformance

The epoxy lining shall conform to the standards set forth in ASTM Specification C-541, latest issue.

The A/C pressure pipe shall meet the requirements of P&PG Standard Product Specification Nos. 1 and 3A.

Physical Requirements

Lining

Thickness - The thickness of the lining shall be 40 mils nominal (0.040") as determined by ASTM Specification C-541.

Adhesion - The lining shall have a permanent bond to the pipe wall. The strength of the bond shall be determined by ASTM Specification C-541.

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SPECIFICATIONS CLASSIFICATION: A/C Standard Product Specification		
T.C.O. REF. NO. 4	SPECIFICATION NO: 10A	PAGE NO.: 2
SUPERSEDES: March 13, 1978	DATE OF ISSUE: APR 23 1979	

DESCRIPTION:

FLUID-TITE A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150 and 200

Abrasion - The lining shall resist the action of mechanical pipe cleaning devices and shall show no gouges, cracks, or other defects which expose the A/C or otherwise impair the lining serviceability.

Pipe

Physical requirements of pipe, couplings, and accessories used for lining shall be those of P&PG Standard Product Specification Nos. 1 and 3A.

Chemical Requirements

Lining

The lining, when tested, shall meet the chemical requirements as required by ASTM Specification C-541.

Pipe

The pipe shall meet the chemical requirements of P&PG Standard Product Specification Nos. 1 and 3A.

General Requirements

Pipe

Lengths - Standard and random lengths shall be those as shown in P&PG Standard Product Specification Nos. 1 and 3A. Half lengths, quarter lengths and fully machined will only be supplied on customer request.

Dimensions

Unlined - The unlined dimensions shall be those as shown in P&PG Standard Product Specification Nos. 1 and 3A.

Lined

Type 40 - Nominal 40 mils (.040")

Machined Ends - Nominal 20 mils (.020")
Minimum 12 mils (.012")
Maximum 23 mils (.023")

CTD015400

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SPECIFICATIONS CLASSIFICATION: A/C Standard Product Specification		
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DESCRIPTION:

FLUID-TITE A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150 and 200

Couplings

Couplings for lining shall be machined according to the dimensions shown in Table B.

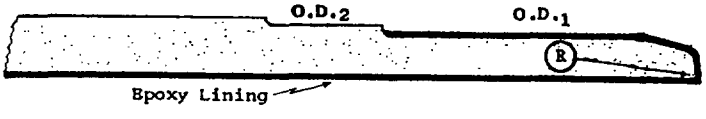
Special Preparation for Epoxy Coating

Pipe and pipe fittings shall be sanded, brushed, and vacuumed on the I.D. and $O.D._1$ surfaces. I.D. corners at the ends shall be sanded or filed to remove sharp corners where epoxy will build up.

Couplings and fittings shall be clean. The inside corner between B_2 and the groove shall be broken 1/16" to 1/8".

Note: Plants manufacturing pipe or fittings to be shipped to Hillsboro plant for epoxy coating shall break edges as described above.

M.B.O.



Lined $O.D._1$ = Std. Unlined M.B.O. + 2(0.020" Lining $^{+0.003"}_{-0.008"}$)

(R) = Break corners before coating

CTD015401

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SPECIFICATIONS CLASSIFICATION: A/C Standard Product Specification		
T.C.O. REF. NO. 3	SPECIFICATION NO: 10A	PAGE NO.: 4
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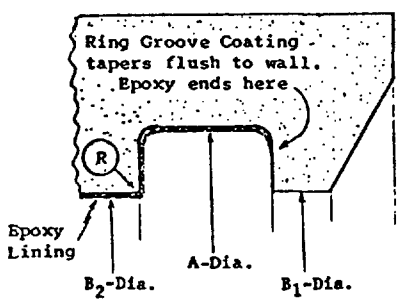
DESCRIPTION:

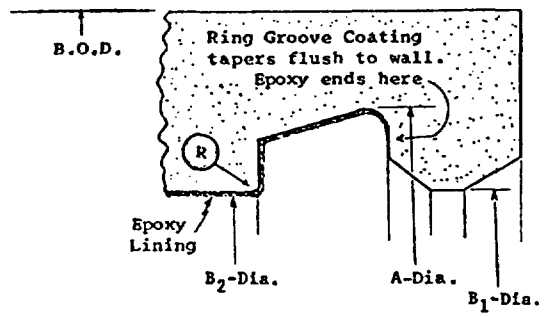
FLUID-TITE A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150, and 200

COUPLING

ALL CG SIZES



4" FT-B ONLY



(R) = Break corners before coating 1/16"min. 1/8"max.

	4" thru 16"	18" thru 24"
A" Dia. = Unlined Nominal	+0.000" -0.040"	+0.000" -0.046
B" Dia. = Unlined Nominal	Not Lined	Not Lined
C" Dia. = Unlined Nominal	+0.000" -0.046	+0.000" -0.046

CTD015402

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DATE OF ISSUE: MAR 13 1978

DESCRIPTION:

FLUID-TITE A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150 and 200

Table A

Lined O.D.

	Pipe Size	Minimum	Nominal	Maximum
CG Design				
Class 100	4	4.65	4.68	4.71
	6	6.92	6.95	6.98
	8	9.12	9.15	9.18
	10	11.25	11.28	11.31
	12	13.45	13.48	13.51
	14	15.08	15.11	15.14
	16	17.16	17.19	17.22
	18	19.90	19.94	19.98
	20	22.12	22.16	22.20
	24	26.50	26.52	26.56
Class 150	4	4.82	4.85	4.88
	6	6.92	6.95	6.98
	8	9.12	9.15	9.18
	10	11.67	11.70	11.73
	12	13.93	13.96	13.99
	14	16.23	16.26	16.29
	16	18.47	18.50	18.53
	18	20.94	20.98	21.02
	20	23.28	23.32	23.36
	24	27.96	28.00	28.04
Class 200	4	4.82	4.85	4.88
	6	6.92	6.95	6.98
	8	9.12	9.15	9.18
	10	11.67	11.70	11.73
	12	13.93	13.96	13.99
	14	16.23	16.26	16.29
	16	18.47	18.50	18.53
FT-B Design				
Class 100	4	4.65	4.68	4.71
Class 150	4	4.82	4.85	4.88
Class 200	4	4.82	4.85	4.88

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CertainTeed Corporation Pipe and Plastics Group	T.C.O. REF. NO.: 3	SPECIFICATION NO: 10A	PAGE NO.: 6
	SUPERSEDES: February 13, 1973		DATE OF ISSUE: MAR 13 1978

DESCRIPTION: FLUID-TITE A/C Epoxy Lined Pressure Pipe and Couplings Class 100, 150 and 200

Table B

Unlined Couplings

CG Design

Class 100	A"	B_1"	B_2"	B.O.D" +.08" -.00"	G"
4	5.46	4.93	4.82	6.25	.95
6	7.71	7.20	7.09	8.40	.95
8	9.91	9.40	9.29	10.80	.95
10	12.04	11.53	11.42	13.30	.95
12	14.24	13.73	13.62	15.55	.95
14	16.01	15.39	15.26	17.60	1.03
16	18.09	17.47	17.34	19.80	1.03
18	20.84	20.22	20.09	22.60	1.03
20	23.06	22.44	22.31	25.30	1.03
24	27.42	26.80	26.67	30.00	1.03
Class 150					
4	5.61	5.10	4.99	6.66	.95
6	7.71	7.20	7.09	8.76	.95
8	9.91	9.40	9.29	11.32	.95
10	12.46	11.95	11.84	14.36	.95
12	14.72	14.21	14.10	17.00	.95
14	17.16	16.54	16.41	19.80	1.03
16	19.40	18.78	18.65	22.28	1.03
18	21.88	21.26	21.13	24.91	1.03
20	24.22	23.60	23.47	27.55	1.03
24	28.90	28.28	28.15	33.02	1.03
Class 200					
4	5.61	5.10	4.99	6.88	.95
6	7.71	7.20	7.09	9.35	.95
8	9.91	9.40	9.29	12.00	.95
10	12.46	11.95	11.84	15.15	.95
12	14.72	14.21	14.10	17.90	.95
14	17.16	16.54	16.41	20.50	1.03
16	19.40	18.78	18.65	23.20	1.03

FT-B Design

Class 100					
4	5.63	4.79	4.82	6.25	.73
Class 150					
4	5.80	4.96	4.99	6.66	.73
Class 200					
4	5.80	4.96	4.99	6.88	.73

Tolerances: A", B_1", and B_2" - 4" to 16" ±.025"
18" to 24" ±.040"
G" CG Design 4" to 24" +.030" -.010"
FT-B Design 4" +.020" -.010"

CTD015404

All other dimensions same as A/C Standard Product Specification No. 1 or 3A.

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SPECIFICATIONS CLASSIFICATION: A/C Standard Product Specification

T.C.O. REF. NO.	SPECIFICATION NO:	PAGE NO.:
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SUPERSEDES: March 13, 1978

DATE OF ISSUE: APR 23 1979

DESCRIPTION:

Fluid-Tite A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150 and 200

Table C

Lined Couplings

CG Design

	A"			$B"_2$		
Class 100	Min.	Nom.	Max.	Min.	Nom.	Max.
4	5.40	5.42	5.46	4.76	4.79	4.83
6	7.65	7.67	7.71	7.02	7.05	7.09
8	9.85	9.87	9.91	9.23	9.25	9.29
10	11.98	12.00	12.04	11.35	11.38	11.42
12	14.18	14.20	14.24	13.55	13.58	13.62
14	15.95	15.97	16.01	15.20	15.22	15.26
16	18.03	18.05	18.09	17.28	17.30	17.34
18	20.76	20.80	20.86	20.01	20.05	20.11
20	22.98	23.02	23.08	22.23	22.27	22.33
24	27.34	27.38	27.44	26.59	26.63	26.69
Class 150						
4	5.55	5.57	5.61	4.93	4.96	5.00
6	7.65	7.67	7.71	7.02	7.05	7.09
8	9.85	9.87	9.91	9.23	9.25	9.29
10	12.40	12.42	12.46	11.78	11.80	11.84
12	14.64	14.66	14.72	14.04	14.06	14.10
14	17.10	17.12	17.16	16.35	16.37	16.41
16	19.34	19.36	19.40	18.59	18.61	18.65
18	21.80	21.84	21.90	21.05	21.09	21.15
20	24.14	24.18	24.24	23.39	23.43	23.49
24	28.82	28.86	28.92	28.07	28.11	28.17
Class 200						
4	5.55	5.57	5.61	4.93	4.96	5.00
6	7.65	7.67	7.71	7.02	7.05	7.09
8	9.85	9.87	9.91	9.23	9.25	9.29
10	12.40	12.42	12.46	11.78	11.80	11.84
12	14.64	14.66	14.72	14.04	14.06	14.10
14	17.10	17.12	17.16	16.35	16.37	16.41
16	19.34	19.36	19.40	18.59	18.61	18.65

FT-B Design

CTD015405

Class 100						
4	5.57	5.59	5.63	4.76	4.79	4.83
Class 150						
4	5.74	5.76	5.80	4.93	4.96	5.00
Class 200						
4	5.74	5.76	5.80	4.93	4.96	5.00

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DESCRIPTION: FLUID-TITE A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150 and 200

Table C (Continued)

"G" Dimension

G dimensions same for all classes.

CG Design

G"	Min.	Nom.	Max.
4" - 12"	.92	.93	.96
14" - 24"	1.00	1.01	1.04

FT-B Design

4"	.70	.71	.74

CTD015406

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SPECIFICATIONS CLASSIFICATION: A/C Standard Product Specification		
T.C.O. REF. NO. 3	SPECIFICATION NO: 10A	PAGE NO.: 9
SUPERSEDES: February 13, 1973		DATE OF ISSUE: MAR 13 1973

DESCRIPTION: FLUID-TITE A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150 and 200

Lined Couplings

Lined couplings shall be lined with not less than 12 mils coating nor more than 23 mils. The coating on the ring grooves shall be closer to 12 mils than 23 mils.

A/C Accessory Fittings

Coupling adaptor to steel, coupling reducer and pipe adaptors will be supplied on special order only. Unlined and lined dimensions of these fittings can be found in the back of this specification.

Rubber Rings

NBR (oil resistant) rings will normally be supplied with epoxy line pipe and couplings. Natural rubber rings will be supplied upon customer request.

Lubricant

Lubricant will be supplied in accordance with Standard Product Specification No. 1 or 3A.

Lining Finish

The lining and other coated surfaces shall be continuous and free of holes, runs, sags, blisters, uncoated areas, cracks, or other imperfections that would impair its protective function. Pipe ends and couplings shall not have sharp protrusions or excess coating which would interfere with proper joint sealing.

Outside surfaces of fully machined pipe shall be coated for a distance equal to one half the length of the corresponding coupling. Couplings shall be coated over the interior surfaces to the base of the outside vertical surface of the ring groove.

Pipe Straightness and Ovality

These properties are important to the lining process, as crooked or oval pipe will not coat well. Pipe conforming best to these two properties shall be selected for lining.

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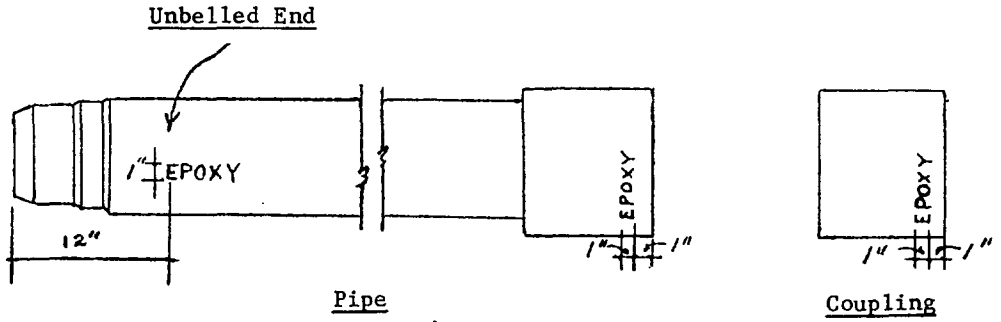
SPECIFICATIONS CLASSIFICATION: A/C Standard Product Specification		
T.C.O. REF. NO. 3	SPECIFICATION NO: 10A	PAGE NO.: 10
SUPERSEDES: February 13, 1973		DATE OF ISSUE: MAR 13 1978

DESCRIPTION:

FLUID-TITE A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150 and 200

Marking

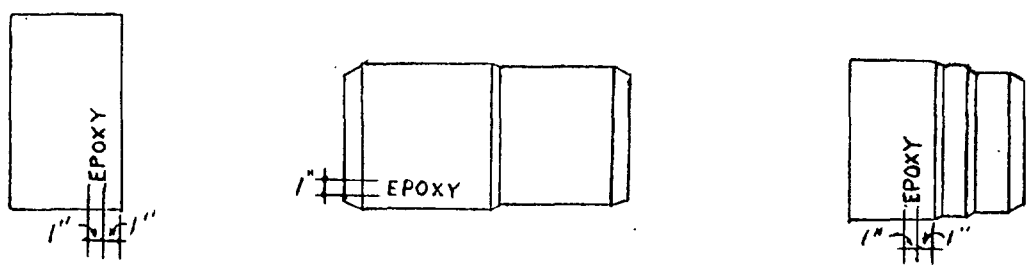
In addition to the standard markings, epoxy lined pressure pipe shall have stenciled or stamped in 1" black letters "Epoxy" approximately 12" from the unbelled end parallel to the pipe axis. "Epoxy" shall be preceded and followed by a 1" black bar, i.e. - EPOXY -. Lined couplings shall be stenciled in 1" black letters "EPOXY". Marking shall be about 1" from edge of coupling and perpendicular to coupling axis. Lined fittings shall be marked similar to couplings. See examples below:



Pipe

Coupling

CTD015408



Adaptor
Fluid-Tite to Steel

Adaptor
Fluid-Tite Class to Class

Reducer
Fluid-Tite to Fluid-Tite

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SPECIFICATIONS CLASSIFICATION: A/C Standard Product Specification

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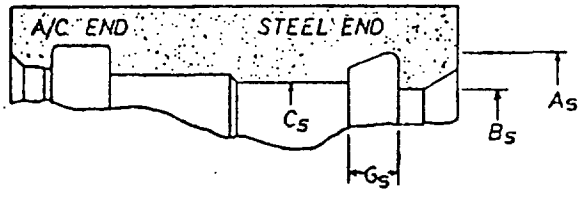
DESCRIPTION:

FLUID-TITE A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150 and 200

Coupling Adaptor To Steel (CAS)

Unlined Dimensions

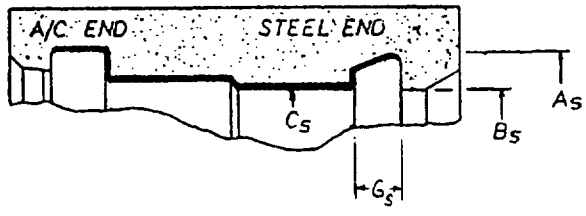


Refer to A/C Standard Product Spec 1 or 3A for dimension not shown.

Size, In.	A_S" ±.025"	B_S" ±.025"	C_S" ±.025"	G_S" +.03" -.01"
4	5.58	4.56	4.69	.73
6	7.37	6.69	6.83	.66
8	9.46	8.69	8.84	.66
10	11.61	10.81	10.97	.66
12	13.61	12.81	12.98	.66

Note: The 4" A/C end is currently Fluid-Tite B design.

Lined Dimensions



Size, In.	A_S" Min.	A_S" Nom.	A_S" Max.	C_S" Min.	C_S" Nom.	C_S" Max.	G_S" Min.	G_S" Nom.	G_S" Max.
4	5.52	5.54	5.58	4.63	4.66	4.70	.70	.71	.74
6	7.31	7.33	5.37	6.77	6.80	6.84	.63	.64	.67
8	9.40	9.42	9.46	8.78	8.81	8.85	.63	.64	.67
10	11.55	11.57	11.61	10.91	10.94	10.98	.63	.64	.67
12	13.55	13.57	13.61	12.92	12.95	12.99	.63	.64	.67

CTD015409

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SPECIFICATIONS CLASSIFICATION: A/C Standard Product Specification		
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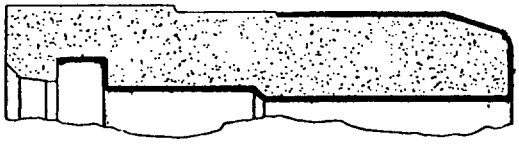
SUPERSEDES:		DATE OF ISSUE: MAR 13 1978

DESCRIPTION:

FLUID-TITE A/C Epoxy Lined Pressure Pipe and Couplings
Class 100, 150 and 200

Coupling Reducer

Fluid-Tite to Fluid-Tite

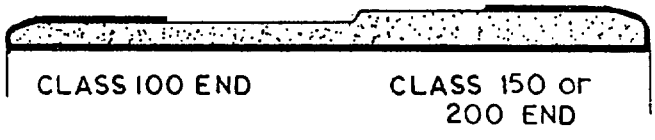


To manufacture refer to A/C Standard Product Spec 1 or 3A. Unlined and lined dimensions of the appropriate pipe and coupling sizes and classes are given in this specification.

Note: 6" to 4" reducer currently has the Fluid-Tite B design 4" coupling end.

Pipe Adaptor (PAD-5)

Class 100 Fluid-Tite to Class 150/200 Fluid-Tite



Machined O.D. surfaces of this PAD shall be coated for a distance equal to one half the length of the corresponding coupling.

To manufacture refer to A/C Standard Product Spec 1 or 3A. Unlined and lined dimensions of the appropriate pipe size and class are given in this specification.

CTD015410

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