



## Belco Manufacturing

Date: June 16, 2003  
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Prepared by:

A handwritten signature in blue ink that reads 'Douglas A. Rozendal'.

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Senior Project Engineer

Prepared for:  
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Reviewed by:

A handwritten signature in black ink that reads 'Dale B. Edwards'.

Dale B. Edwards, P.E.  
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## ASTM D2992-01 Test Program Summary

### Request Origination

Testing Requested by Belco Manufacturing Company  
 Belco Manufacturing contact: William Schneider, Director of Research and Development

### Test Laboratory Information

Testing Performed by Bodycote Broutman, Inc from 03/04/2002 to 04/15/2003  
 Testing Supervisor: Doug Rozendal

### Material Information

Test Material: FRP Pipe made with CoRezyn 8441, with 3% antimony, resin utilizing a structure of multiple layers of 30 ends of winding glass at a 65° wind angle and a liner consisting of one layer of Nexus veil followed by two layers of 1.5 oz./ft<sup>2</sup> mat.  
 Nominal Size: 4-Inch

### Test Conditions

Test Method: ASTM D2992-01 Procedure B per ASTM D-1598-97 (Static LTHS)  
 End Closure: Free-end, Thread-On Steel  
 Test Temperature: 75°F  
 Test Environment: Interior: Water, Exterior: Air

### Test Results

Total Number of Observations: 30 total data points  
 Number of Observations meeting ASTM D2992-01: 28 data points  
 Coefficient of Correlation, r: 0.4863

### ASTM D2992-01 Hydrostatic Pressure Test Results per ASTM D1598-97

Data Pt	Stress, psi	Time, hr	Failure Mode	Data Pt	Stress, psi	Time, hr	Failure Mode
1*	20,314	138.0	Pipe End	16	25,909	0.3	Pipe Endcap
2*	20,314	303.0	Pipe Wall	17	31,311	0.3	Pipe Endcap
3	14,256	12,806.5	RWOF	18	24,266	4.0	Pipe Endcap
4	20,195	166.0	Pipe Endcap	19	17,557	4.0	Pipe Endcap
5	13,757	12,471.5	RWOF	20	15,848	4.0	Pipe Endcap
6	15,382	12,363.6	RWOF	21	18,107	4.0	Pipe Endcap
7	18,958	12,818.4	RWOF	22	18,342	2,210.3	RWOF
8	21,383	12,697.0	RWOF	23	20,876	2,159.9	RWOF
9	16,626	12,976.8	RWOF	24	16,782	1,491.3	RWOF
10	22,861	184.3	Pipe Wall	25	20,665	1,491.3	RWOF
11	17,204	12,963.3	RWOF	26	19,207	1,491.3	RWOF
12*	34,883	76.0	Pipe Wall	27	26,269	4,370.5	RWOF
13	15,184	10,669.6	RWOF	28	21,885	9,262.3	RWOF
14	18,697	10,669.6	RWOF	29	39,010	0.2	Pipe Endcap
15	17,377	10,669.6	RWOF	30	19,376	0.06	Pipe Endcap

\*=tested at Fibercast

RWOF=removed without failure

### Least Squares Regression Results per ASTM D2992-01

Static Hydrostatic Regression Value	Prediction Time Interval		
	100,000 Hours	150,000 Hours	50 Years (438,000 Hrs)
LTHS psi / (MPa)	14,190 / (97.8)	13,830 / (95.4)	12,930 / (89.2)
LCL psi / (MPa)	11,004 / (75.9)	10,530 / (72.6)	9389 / (64.7)
LPL psi / (MPa)	9,350 / (64.5)	9,002 / (62.1)	8155 / (56.2)
HDB psi / (MPa)	12,500 / (86.2)	12,500 / (86.2)	12,500 / (86.2)