



**RCP, Inc**

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Redacted

October 24, 2011

Pacific Gas and Electric Company  
350 N. Wiget  
Walnut Creek, CA 94598  
Attention: Redacted

Test Contractor:	ARB -- 0629-53-3500 T-43B
Asset Owner:	Pacific Gas and Electric Company -- 41497361
Construction Contractor:	ARB -- 0629-53-3500 T-43B
Test Section:	PG&E T-43B , L-147, MP 1.95 - 3.4
Test Date:	October 23, 2011
Certificate Number:	RCP 61362 - T-43B , L-147, MP 1.95 - 3.4

To whom it may concern,

This letter is to certify that the hydrostatic test performed on pipe owned by Pacific Gas and Electric Company and tested by ARB met the requirements of the Code of Federal Regulations, Title 49, Part 192, Subpart J (Class 3).

The test segment was subjected to a spike pressure test of 748 psig for 30 minutes, without observed leakage or yielding of the pipe segment. The 30 minute spike test and subsequent pressure reduction with volume bleed was included and is part of the 8.32 hour test duration period.

This hydrostatic test was completed successfully. Pressure was maintained on the test facilities in excess of 8.32 continuous hours without evidence of a leak failure. Water was the test medium. At the highest elevation point in the test section, the calculated test pressure was 609 psig and the MAOP per 49 CFR Part 192, Subpart J can be as high as 406 psig. The MAOP established by this test is sufficient to qualify for Pacific Gas and Electric Company's desired MAOP of 400 psig.

Pressure decreased 61 psi during the test. 9,523.20 ounces of fluid was intentionally released from the test section. Net corrected volumetric change from beginning of the test to the end of the test is calculated to be 1,792.68 ounces, gain, which is equivalent to a 1.38 °F change in pipe temperature and larger than the anticipated error attributed to the temperature measurement instrumentation utilized.

Test pressure did not remain steady even though no leaks were observed. The volumetric gain is attributed to the inherent error associated with physically attempting to measure the average temperature of 7,541 feet of buried and 175 feet of exposed pipe from a single point on the line.

Sincerely,  
Redacted

cc. file

**RCP**

**Hydrostatic Test Certification**

Company	Pacific Gas and Electric Company	Job Number	41497361
Construction Co	ARB	Job Number	0629-53-3500 T-43B
Hydro. Test Co	ARB	Project No.	0629-53-3500 T-43B
Test Section	PG&E T-43B, L-147, MP 1.95 - 3.4		
File Name	RCP 61362 - T-43B, L-147, MP 1.95 - 3.4		

**Hydrostatic Test Pressure**

APPLICABLE CODE FOR CERTIFICATION:

Code of Federal Regulations, Title 49, Part 192, Subpart J (Class 3)

Test Date:

23-Oct-11

This is to certify that the pipeline or pipeline section(s) described below was hydrostatically pressure tested in accordance with the following procedure:

Pipeline:	PG&E T-43B, L-147, MP 1.95 - 3.4
From:	135+25
To:	60+34

Segment	Length	Diameter	Wall Thickness	Specification	100% SMYS
1	101 ft	20,000 in	0.375 in	API5L-X55, ERW-LF, Arc Weld, Steel	2,438 psi
2	31 ft	6,625 in	0.280 in	API5L-Grade B, SM, Arc Weld, Steel	2,958 psi
3	25 ft	3,500 in	0.216 in	API5L-Grade B, SM, Arc Weld, Steel	4,320 psi
4	23 ft	1,315 in	0.154 in	API5L-Grade B, SM, Arc Weld, Steel	6,198 psi
5	471 ft	20,000 in	0.313 in	API5L-X42, DSAW, Arc Weld, Steel	1,313 psi
6	1,439 ft	20,000 in	0.290 in	API5L-X42, DSAW, Arc Weld, Steel	1,050 psi
7	4,959 ft	20,000 in	0.281 in	API5L-X52, DSAW, Arc Weld, Steel	984 psi
8	134 ft	20,000 in	0.375 in	API5L-X60, DSAW, Arc Weld, Steel	1,950 psi
9	501 ft	24,000 in	0.313 in	API5L-Grade B, SM, Arc Weld, Steel	1,565 psi
10	14 ft	6,625 in	0.280 in	API5L-Grade B, SM, Arc Weld, Steel	2,958 psi
11	18 ft	20,000 in	0.750 in	API5L-X42, DSAW, Arc Weld, Steel	3,150 psi

**Initial Test Conditions**

Pressure at Test Point:	748 psig	Date/Time:	10/23/11 3:56 PM	Pipe Temperature:	80.0 °F
Ambient Temperature:	84.0 °F	Elevation @ Test Point:	16.0 ft	Restrained:	66.0 °F
Pressure @ High Point (Cal/Measure):	670 psig	Elevation @ High Point:	196.0 ft	Location:	135+25
Pressure @ Low Point (Cal/Measure):	748 psig	Elevation @ Low Point:	16.0 ft	Location:	67+09
				Location:	135+25

**Final Test Conditions**

Pressure at Test Point:	687 psig	Date/Time:	10/24/11 12:15 AM	Pipe Temperature:	77.0 °F
Ambient Temperature:	63.0 °F	Elevation @ Test Point:	16.0 ft	Restrained:	68.0 °F
Pressure @ High Point (Cal/Measure):	609 psig	Elevation @ High Point:	196.0 ft	Location:	135+25
Pressure @ Low Point (Cal/Measure):	687 psig	Elevation @ Low Point:	16.0 ft	Location:	67+09
				Location:	135+25
Total Fluid Injected:		9523.20 fluid ounces		Volume gain	
Total Fluid Withdrawn:		1,792.68 oz		0.0115%	
Net Change in Volume of the Test Section ±(+ Gain, - Loss):		gain		1.381 °F equivalent	

Test Duration:		8.32 hours	
Minimum Test Pressure:	685 psig	Maximum Allowable Operating Pressure:	609 psig
Maximum Test Pressure:	748 psig	DOT Part 192	Test Factor= 1.50
% SMYS:	71.3%	Minimum Test Pressure (Calculated/Measured):	406 psig
		Maximum	609 psig

The MAOP established by this test is sufficient to qualify for Pacific Gas and Electric Company's desired MAOP of 400 psig.

Were leaks observed?	No	Explain:
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The test segment was subjected to a spike pressure test of 748 psig for 30 minutes, without observed leakage or yielding of the pipe segment. The 30 minute spike test and subsequent pressure reduction with volume bleed was included and is part of the 8.32 hour test duration period.

No leaks were observed during the test period. The test section included 7,541 feet of buried and 175 feet of exposed pipe. Pressure lost 61 psi during the test. The buried pipe segment gained 2°F fluid temperature and the exposed pipe segment lost 3°F.

9,523.20 ounces of fluid was intentionally released from the test section. Net corrected volumetric change from beginning of the test to the end of the test is calculated to be 1,792.68 ounces, gain, which is equivalent to a 1.38 °F change in pipe temperature and larger than the anticipated error attributed to the temperature measurement instrumentation utilized.

Test pressure did not remain steady even though no leaks were observed. The volumetric gain is attributed to the inherent error associated with physically attempting to measure the average temperature of 7,541 feet of buried and 175 feet of exposed pipe from a single point on the line.

Acceptable Hydrostatic Test? **Yes**

Remarks: Lots of air was observed in the line during testing due to trapped pigs. The SS curve did not indicate yielding of the pipe. Water truck ran out of water during ramping pressure to spike at 640 psig at 2:13 pm. Continued ramping to spike pressure after water truck arrived, from 620 psig at 3:35 pm, due to erroneous readings created by injected air. Depressurization was controlled and done very slowly so as not to disturb pigs and cause rapid or irregular pressure readings.

Redacted

24-Oct-11



# Dead Weight Log Sheet

Owner Company	Pacific Gas and Electric Company	Job Number	41497361
Construction Co.	ARB	Job Number	0629-53-3500 T-43B
Testing Co.	ARB	Project No.	529-53-3500 T-43
Test Section	PG&E T-43B, L-147, MP 1.95 - 3.4		
File Name	RCP 61362 - T-43B, L-147, MP 1.95 - 3.4		

Date	23-Oct-11	Test Log						
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Log No.	Test Period		Test Pressure	Temperature °F			Remarks		
	Date	Time		Ambient	Pipe		Comment	Bleed	Inject
					Unrestrained	Restrained			
1	10/23/11	2:00 PM	510 psig	59 °F	68 °F	66 °F	Start Spike		
2	10/23/11	2:01 PM	520 psig	59 °F	68 °F	66 °F	Inject		938 oz.
3	10/23/11	2:02 PM	530 psig	86 °F	77 °F	66 °F	Inject		2,481 oz.
4	10/23/11	2:03 PM	540 psig	86 °F	77 °F	66 °F	Inject		2,879 oz.
5	10/23/11	2:04 PM	550 psig	86 °F	77 °F	66 °F	Inject		2,529 oz.
6	10/23/11	2:05 PM	560 psig	86 °F	77 °F	66 °F	Inject		2,227 oz.
7	10/23/11	2:06 PM	570 psig	86 °F	77 °F	66 °F	Inject		1,972 oz.
8	10/23/11	2:07 PM	580 psig	86 °F	77 °F	66 °F	Inject		1,933 oz.
9	10/23/11	2:08 PM	590 psig	86 °F	77 °F	66 °F	Inject		1,829 oz.
10	10/23/11	2:09 PM	600 psig	86 °F	77 °F	66 °F	Inject		1,678 oz.
11	10/23/11	2:10 PM	610 psig	86 °F	77 °F	66 °F	Inject		1,646 oz.
12	10/23/11	3:35 PM	620 psig	86 °F	77 °F	66 °F	Inject		1,591 oz.
13	10/23/11	3:36 PM	630 psig	86 °F	77 °F	66 °F	Inject		239 oz.
14	10/23/11	3:37 PM	640 psig	86 °F	77 °F	66 °F	Inject		1,312 oz.
15	10/23/11	3:38 PM	650 psig	86 °F	77 °F	66 °F	Inject		1,193 oz.
16	10/23/11	3:39 PM	660 psig	86 °F	77 °F	66 °F	Inject		1,304 oz.
17	10/23/11	3:40 PM	670 psig	86 °F	77 °F	66 °F	Inject		1,312 oz.
18	10/23/11	3:41 PM	680 psig	86 °F	77 °F	66 °F	Inject		1,344 oz.
19	10/23/11	3:42 PM	690 psig	86 °F	77 °F	66 °F	Inject		1,328 oz.
20	10/23/11	3:43 PM	700 psig	86 °F	77 °F	66 °F	Inject		1,352 oz.
21	10/23/11	3:44 PM	710 psig	86 °F	77 °F	66 °F	Inject		1,424 oz.
22	10/23/11	3:45 PM	720 psig	86 °F	77 °F	66 °F	Inject		1,320 oz.
23	10/23/11	3:46 PM	730 psig	86 °F	77 °F	66 °F	Inject		1,368 oz.
24	10/23/11	3:47 PM	740 psig	86 °F	77 °F	66 °F	Inject		1,320 oz.
25	10/23/11	3:48 PM	748 psig	86 °F	77 °F	66 °F	Inject		1,257 oz.
26	10/23/11	3:56 PM	748 psig	84 °F	80 °F	66 °F	On Test		
27	10/23/11	4:06 PM	746 psig	84 °F	80 °F	67 °F			
28	10/23/11	4:16 PM	746 psig	83 °F	80 °F	67 °F			
29	10/23/11	4:26 PM	745 psig	82 °F	80 °F	67 °F	End Spike		
30	10/23/11	4:27 PM	735 psig	82 °F	80 °F	67 °F	Bleed	1,587 oz.	
31	10/23/11	4:46 PM	725 psig	82 °F	80 °F	67 °F	Bleed	1,587 oz.	
32	10/23/11	5:05 PM	715 psig	82 °F	80 °F	67 °F	Bleed	1,587 oz.	
33	10/23/11	5:23 PM	705 psig	82 °F	80 °F	67 °F	Bleed	1,587 oz.	
34	10/23/11	5:41 PM	695 psig	82 °F	80 °F	67 °F	Bleed	1,587 oz.	
35	10/23/11	5:59 PM	685 psig	76 °F	80 °F	67 °F	Bleed	1,587 oz.	
36	10/23/11	6:00 PM	685 psig	76 °F	80 °F	67 °F			
37	10/23/11	6:15 PM	687 psig	76 °F	81 °F	67 °F			
38	10/23/11	6:30 PM	687 psig	75 °F	81 °F	67 °F			
39	10/23/11	6:45 PM	687 psig	75 °F	81 °F	67 °F			
40	10/23/11	7:00 PM	687 psig	74 °F	81 °F	68 °F			
41	10/23/11	7:15 PM	687 psig	73 °F	81 °F	68 °F			
42	10/23/11	7:30 PM	687 psig	73 °F	81 °F	68 °F			
43	10/23/11	7:45 PM	687 psig	72 °F	81 °F	68 °F			
44	10/23/11	8:00 PM	687 psig	71 °F	81 °F	68 °F			
45	10/23/11	8:15 PM	687 psig	71 °F	81 °F	68 °F			
46	10/23/11	8:30 PM	687 psig	71 °F	80 °F	68 °F			
47	10/23/11	8:45 PM	687 psig	71 °F	80 °F	68 °F			
48	10/23/11	9:00 PM	687 psig	69 °F	80 °F	68 °F			



# Dead Weight Log Sheet

Owner Company	Pacific Gas and Electric Company	Job Number	41497361
Construction Co.	ARB	Job Number	0629-53-3500 T-43B
Testing Co.	ARB	Project No.	529-53-3500 T-43B
Test Section	PG&E T-43B , L-147, MP 1.95 - 3.4		
File Name	RCP 61362 - T-43B , L-147, MP 1.95 - 3.4		

Date

23-Oct-11

## Test Log

Log No.	Test Period		Test Pressure	Temperature °F			Remarks		
	Date	Time		Ambient	Pipe		Comment	Bleed	Inject
					Unrestrained	Restrained			
49	10/23/11	9:15 PM	687 psig	68 °F	79 °F	68 °F			
50	10/23/11	9:30 PM	687 psig	68 °F	79 °F	68 °F			
51	10/23/11	9:45 PM	687 psig	67 °F	78 °F	68 °F			
52	10/23/11	10:00 PM	687 psig	67 °F	78 °F	68 °F			
53	10/23/11	10:15 PM	687 psig	66 °F	78 °F	68 °F			
54	10/23/11	10:30 PM	687 psig	66 °F	78 °F	68 °F			
55	10/23/11	10:45 PM	687 psig	65 °F	78 °F	68 °F			
56	10/23/11	11:00 PM	687 psig	65 °F	78 °F	68 °F			
57	10/23/11	11:15 PM	687 psig	65 °F	78 °F	68 °F			
58	10/23/11	11:30 PM	687 psig	64 °F	77 °F	68 °F			
59	10/23/11	11:45 PM	687 psig	64 °F	77 °F	68 °F			
60	10/24/11	12:00 AM	687 psig	63 °F	77 °F	68 °F			
61	10/24/11	12:15 AM	687 psig	63 °F	77 °F	68 °F	End of Test		

Spike Test		37,775.4 oz.
Hydrostatic Test	9,523.2 oz.	

Were leaks observed during the test period?

Exposed and buried pipe, no leaks observed.

High Test Pressure:	748 psig
Low Test Pressure:	685 psig



## Pipe Segment Volume Calculations

Company	Pacific Gas and Electric Company	Job Number	41497361
Construction Co.	ARB	Job Number	0629-53-3500 T-43B
Hydro. Test Co.	ARB	Project No.	0629-53-3500 T-43B
Test Section	PG&E T-43B, L-147, MP 1.95 - 3.4		
File Name	RCP 61362 - T-43B, L-147, MP 1.95 - 3.4		

**WATER**

Description	Segment							
	1	2	3	4	5	6	7	8
Restrained or Unrestrained?	Unrestrained	Unrestrained	Unrestrained	Restrained	Restrained	Restrained	Restrained	Restrained
Outside Diameter	20.000 in.	6.625 in.	3.500 in.	1.315 in.	20.000 in.	20.000 in.	20.000 in.	20.000 in.
Wall Thickness	0.375 in.	0.280 in.	0.216 in.	0.154 in.	0.313 in.	0.250 in.	0.281 in.	0.375 in.
Inside Diameter	19.250 in.	6.065 in.	3.068 in.	1.007 in.	19.375 in.	19.500 in.	19.438 in.	19.250 in.
Spec./Grade	API5L-X65	API5L-Grade B	API5L-Grade B	API5L-Grade B	API5L-X42	API5L-X42	API5L-Grade B	API5L-X52
Length Unrestrained	101 ft	31 ft	25 ft					
Length Restrained				23 ft	471 ft	1,439 ft	4,959 ft	134 ft
Temperature -- On Test	80 °F	80 °F	80.0 °F	66.0 °F	66.0 °F	66.0 °F	66.0 °F	66.0 °F
Temperature -- End of Test	77 °F	77 °F	77.0 °F	68.0 °F	68.0 °F	68.0 °F	68.0 °F	68.0 °F
Pressure -- On Test	748 psig	748 psig	748 psig	748 psig	748 psig	748 psig	748 psig	748 psig
Pressure -- End of Test	687 psig	687 psig	687 psig	687 psig	687 psig	687 psig	687 psig	687 psig

Unrestrained Pipe					
Vo	1,834.48 gal		Vtp1	1,837.59 gal	
	234,814 oz.			235,212 oz.	
Vo Unrestrained	1,527 gal	47 gal	10 gal		
Fwp 1	1.002290	1.002290	1.002290		
Fpp 1	1.001600	1.000675	1.000443		
Fpt 1	1.000364	1.000364	1.000364		
Fwt 1	1.002418	1.002418	1.002418		
Fpwt 1 = Fpt/Fwt	0.997951	0.997951	0.997951		
Vtp 1 = Vo(Fwp)(Fpp)(Fpwt)	1,529.82 gal	46.57 gal	9.61 gal		
Fwp 2	1.002103	1.002103	1.002103		
Fpp 2	1.001469	1.000620	1.000407		
Fpt 2	1.000309	1.000309	1.000309		
Fwt 2	1.001966	1.001966	1.001966		
Fpwt = Fpt/Fwt	0.998347	0.998347	0.998347		
Vtp = Vo(Fwp)(Fpp)(Fpwt)	1,529.94 gal	46.57 gal	9.61 gal		

Restrained Pipe					
Vo	119,201.49 gal		Vtp1	119,607.53 gal	
	15,257,791 oz.			15,309,764 oz.	
Vo Unrestrained			1 gal	7,214 gal	22,325 gal
Fwp 1			1.002290	1.002290	1.002290
Fpp 1			1.000170	1.001428	1.001791
Fpt 1			1.000073	1.000073	1.000073
Fwt 1			1.000582	1.000582	1.000582
Fpwt 1 = Fpt/Fwt			0.999491	0.999491	0.999491
Vtp 1 = Vo(Fwp)(Fpp)(Fpwt)			1 gal	7,237 gal	22,405 gal
Fwp 2			1.002103	1.002103	1.002103
Fpp 2			1.000165	1.001321	1.001654
Fpt 2			1.000097	1.000097	1.000097
Fwt 2			1.000803	1.000803	1.000803
Fpwt = Fpt/Fwt			0.999294	0.999294	0.999294
Vtp = Vo(Fwp)(Fpp)(Fpwt)			1 gal	7,233 gal	22,393 gal

Combined Pipe					
Vo	121,035.98 gal		Vtp1	121,445.12 gal	
	15,492,605 oz.			15,544,976 oz.	
					121,384.73 gal
					15,537,245 oz.



## Pipe Segment Volume Calculations

Company	Pacific Gas and Electric Company
Construction Co.	ARB
Hydro. Test Co.	ARB
Test Section	PG&E T-43B , L-147, MP 1.95 - 3.4
File Name	RCP 61362 - T-43B , L-147, MP 1.95 - 3.4

General Pipe Data							
Description	9	10	11				
Restrained or Unrestrained?	Restrained	Restrained	Unrestrained				
Outside Diameter	24.000 in.	6.625 in.	20.000 in.				
Wall Thickness	0.313 in.	0.280 in.	0.750 in.				
Inside Diameter	23.375 in.	6.065 in.	18.500 in.				
Spec./Grade	API5L-X60	API5L-Grade B	API5L-X42				
Length Unrestrained			18 ft				
Length Restrained	501 ft	14 ft					
Temperature -- On Test	66.0 °F	66.0 °F	80.0 °F				
Temperature -- End of Test	68.0 °F	68.0 °F	77.0 °F				
Pressure -- On Test	748 psig	748 psig	748 psig				
Pressure -- End of Test	687 psig	687 psig	687 psig				

Unrestrained Pipe							
Vo							
Vo Unrestrained			251 gal				
Fwp 1			1.002290				
Fpp 1			1.000769				
Fpt 1			1.000364				
Fwt 1			1.002418				
Fpwt 1 = Fpt/Fwt			0.997951				
Vtp 1 = Vo(Fwp)(Fpp)(Fpwt)			251.60 gal				
Fwp 2			1.002103				
Fpp 2			1.000706				
Fpt 2			1.000309				
Fwt 2			1.001966				
Fpwt = Fpt/Fwt			0.998347				
Vtp = Vo(Fwp)(Fpp)(Fpwt)			251.64 gal				

Restrained Pipe							
Vo							
Vo Unrestrained	11,169 gal	21 gal					
Fwp 1	1.002290	1.002290					
Fpp 1	1.001719	1.000513					
Fpt 1	1.000073	1.000073					
Fwt 1	1.000582	1.000582					
Fpwt 1 = Fpt/Fwt	0.999491	0.999491					
Vtp 1 = Vo(Fwp)(Fpp)(Fpwt)	11,208 gal	21 gal					
Fwp 2	1.002103	1.002103					
Fpp 2	1.001588	1.000480					
Fpt 2	1.000097	1.000097					
Fwt 2	1.000803	1.000803					
Fpwt = Fpt/Fwt	0.999294	0.999294					
Vtp = Vo(Fwp)(Fpp)(Fpwt)	11,202 gal	21 gal					

Combined Pipe							
Vo							
Vo							



## Pipe Segment Volume Allowance Calculations

Company	Pacific Gas and Electric Company	Job Number	41497361
Construction Co.	ARB	Job Number	0629-53-3500 T-43B
Hydro. Test Co.	ARB	Project No.	0629-53-3500 T-43B
Test Section	PG&E T-43B, L-147, MP 1.95 - 3.4		
File Name	RCP 61362 - T-43B, L-147, MP 1.95 - 3.4		
<b>WATER</b>			

General Pipe Data								
Description	Segment							
	1	2	3	4	5	6	7	8
Restrained or Unrestrained?	Unrestrained	Unrestrained	Unrestrained	Restrained	Restrained	Restrained	Restrained	Restrained
Outside Diameter	20.000 in.	6.625 in.	3.500 in.	1.315 in.	20.000 in.	20.000 in.	20.000 in.	20.000 in.
Wall Thickness	0.375 in.	0.280 in.	0.216 in.	0.154 in.	0.313 in.	0.250 in.	0.281 in.	0.375 in.
Inside Diameter	19.250 in.	6.065 in.	3.068 in.	1.007 in.	19.375 in.	19.500 in.	19.438 in.	19.250 in.
Spec./Grade	API5L-X65	API5L-Grade B	API5L-Grade B	API5L-Grade B	API5L-X42	API5L-X42	API5L-Grade B	API5L-X52
Length Unrestrained	101 ft	31 ft	25 ft					
Length Restrained				23 ft	471 ft	1,439 ft	4,959 ft	134 ft
Temperature -- On Test	78 °F	78 °F	78 °F	66 °F	66 °F	66 °F	66 °F	66 °F
Temperature -- End of Test	79 °F	79 °F	79 °F	67 °F	67 °F	67 °F	67 °F	67 °F
Pressure -- On Test	717 psig	717 psig	717 psig	717 psig	717 psig	717 psig	717 psig	717 psig
Pressure -- End of Test	717 psig	717 psig	717 psig	717 psig	717 psig	717 psig	717 psig	717 psig
Unrestrained Pipe								
Vo	1,834.48 gal		Vtp1	1,837.78 gal		Vtp2	1,837.57 gal	
	234,814 oz.			235,236 oz.			235,209 oz.	
Vo Unrestrained	1,527 gal	47 gal	10 gal					
Fwp 1	1.002195	1.002195	1.002195					
Fpp 1	1.001534	1.000647	1.000424					
Fpt 1	1.000328	1.000328	1.000328					
Fwt 1	1.002122	1.002122	1.002122					
Fpwt 1 = Fpt/Fwt	0.998209	0.998209	0.998209					
Vtp 1 = Vo(Fwp)(Fpp)(Fpwt)	1,529.96 gal	46.57 gal	9.61 gal					
Fwp 2	1.002195	1.002195	1.002195					
Fpp 2	1.001534	1.000647	1.000424					
Fpt 2	1.000346	1.000346	1.000346					
Fwt 2	1.002255	1.002255	1.002255					
Fpwt = Fpt/Fwt	0.998095	0.998095	0.998095					
Vtp = Vo(Fwp)(Fpp)(Fpwt)	1,529.79 gal	46.57 gal	9.61 gal					
Restrained Pipe								
Vo	119,201.49 gal		Vtp1	119,588.25 gal		Vtp2	119,578.32 gal	
	15,257,791 oz.			15,307,297 oz.			15,306,025 oz.	
Vo Restrained			1 gal	7,214 gal	22,325 gal	76,446 gal	2,026 gal	
Fwp 1			1.002195	1.002195	1.002195	1.002195	1.002195	1.002195
Fpp 1			1.000164	1.001370	1.001718	1.001526	1.001138	
Fpt 1			1.000073	1.000073	1.000073	1.000073	1.000073	
Fwt 1			1.000582	1.000582	1.000582	1.000582	1.000582	
Fpwt 1 = Fpt/Fwt			0.999491	0.999491	0.999491	0.999491	0.999491	
Vtp 1 = Vo(Fwp)(Fpp)(Fpwt)			1 gal	7,236 gal	22,401 gal	76,692 gal	2,032 gal	
Fwp 2			1.002195	1.002195	1.002195	1.002195	1.002195	
Fpp 2			1.000167	1.001374	1.001722	1.001530	1.001142	
Fpt 2			1.000085	1.000085	1.000085	1.000085	1.000085	
Fwt 2			1.000681	1.000681	1.000681	1.000681	1.000681	
Fpwt = Fpt/Fwt			0.999404	0.999404	0.999404	0.999404	0.999404	
Vtp = Vo(Fwp)(Fpp)(Fpwt)			1 gal	7,235 gal	22,399 gal	76,686 gal	2,031 gal	
Combined Pipe								
Vo	121,035.98 gal		Vtp1	121,426.03 gal		Vtp2	121,415.89 gal	
	15,492,605 oz.			15,542,532 oz.			15,541,234 oz.	
1 °F Change	10.14 gal		1,298.07 oz.					



## Pipe Segment Volume Allowance Calculations

Company	Pacific Gas and Electric Company						
Construction Co.	ARB						
Hydro. Test Co.	ARB						
Test Section	PG&E T-43B , L-147, MP 1.95 - 3.4						
File Name	RCP 61362 - T-43B , L-147, MP 1.95 - 3.4						
General Pipe Data							
Description	9	10	11				
Restrained or Unrestrained?	Restrained	Restrained	Unrestrained				
Outside Diameter	24.000 in.	6.625 in.	20.000 in.				
Wall Thickness	0.313 in.	0.280 in.	0.750 in.				
Inside Diameter	23.375 in.	6.065 in.	18.500 in.				
Spec./Grade	API5L-X60	API5L-Grade B	API5L-X42				
Length Unstrained			18 ft				
Length Restrained	501 ft	14 ft					
Temperature -- On Test	66 °F	66 °F	78 °F				
Temperature -- End of Test	67 °F	67 °F	79 °F				
Pressure -- On Test	717 psig	717 psig	717 psig				
Pressure -- End of Test	717 psig	717 psig	717 psig				
Unrestrained Pipe							
Vo							
Vo Unrestrained			251 gal				
Fwp 1			1.002195				
Fpp 1			1.000737				
Fpt 1			1.000328				
Fwt 1			1.002122				
Fpwt 1 = Fpt/Fwt			0.998209				
Vtp 1 = Vo(Fwp)(Fpp)(Fpwt)			251.63 gal				
Fwp 2			1.002195				
Fpp 2			1.000737				
Fpt 2			1.000346				
Fwt 2			1.002255				
Fpwt = Fpt/Fwt			0.998095				
Vtp = Vo(Fwp)(Fpp)(Fpwt)			251.60 gal				
Restrained Pipe							
Vo							
Vo Restrained	11,169 gal	21 gal					
Fwp 1	1.002195	1.002195					
Fpp 1	1.001648	1.000493					
Fpt 1	1.000073	1.000073					
Fwt 1	1.000582	1.000582					
Fpwt 1 = Fpt/Fwt	0.999491	0.999491					
Vtp 1 = Vo(Fwp)(Fpp)(Fpwt)	11,206 gal	21 gal					
Fwp 2	1.002195	1.002195					
Fpp 2	1.001652	1.000496					
Fpt 2	1.000085	1.000085					
Fwt 2	1.000681	1.000681					
Fpwt = Fpt/Fwt	0.999404	0.999404					
Vtp = Vo(Fwp)(Fpp)(Fpwt)	11,205 gal	21 gal					
Combined Pipe							
Vo							
1 °F Change							





## Hydrostatic Test Pipe Data Table

Pipe Type	Length	Restrained / Unrestrained	Outside Diameter	Wall Thickness	Specification & Grade	Pipe Yield Pressure	Material	Joint Type	Seam Type
1	101 ft	Unrestrained	20.000 in.	0.3750 in.	API5L-X65	2,438 psig	Steel	Arc Weld	ERW-LF
2	31 ft	Unrestrained	6.625 in.	0.2800 in.	API5L-Grade B	2,958 psig	Steel	Arc Weld	SM
3	25 ft	Unrestrained	3.500 in.	0.2160 in.	API5L-Grade B	4,320 psig	Steel	Arc Weld	SM
4	23 ft	Restrained	1.315 in.	0.1540 in.	API5L-Grade B	8,198 psig	Steel	Arc Weld	SM
5	471 ft	Restrained	20.000 in.	0.3125 in.	API5L-X42	1,313 psig	Steel	Arc Weld	DSAW
6	1,439 ft	Restrained	20.000 in.	0.2500 in.	API5L-X42	1,050 psig	Steel	Arc Weld	DSAW
7	4,959 ft	Restrained	20.000 in.	0.2810 in.	API5L-Grade B	984 psig	Steel	Arc Weld	SM
8	134 ft	Restrained	20.000 in.	0.3750 in.	API5L-X52	1,950 psig	Steel	Arc Weld	DSAW
9	501 ft	Restrained	24.000 in.	0.3125 in.	API5L-X60	1,563 psig	Steel	Arc Weld	DSAW
10	14 ft	Restrained	6.625 in.	0.2800 in.	API5L-Grade B	2,958 psig	Steel	Arc Weld	SM
11	18 ft	Unrestrained	20.000 in.	0.7500 in.	API5L-X42	3,150 psig	Steel	Arc Weld	DSAW

### Hydrostatic Test Project Owner & Participants

Owner Company	Pacific Gas and Electric Company	Job Number
Address	350 N. Wiget Walnut Creek, CA 94598 Attention: Redacted	41497361
Construction Company	ARB	Job Number
Address	1875 Loveridge Road Pittsburg, CA 94565 Attention: Redacted	0629-53-3500 T-43B
Hydrostatic Test Co.	ARB	Project No.
Address	1875 Loveridge Road Pittsburg, CA 94565 Attention: Redacted	0629-53-3500 T-43B
Test Section	PG&E T-43B, L-147, MP 1.95 - 3.4 From: 135+25 To: 60+34	
File Name	RCP 61362 - T-43B, L-147, MP 1.95 - 3.4	

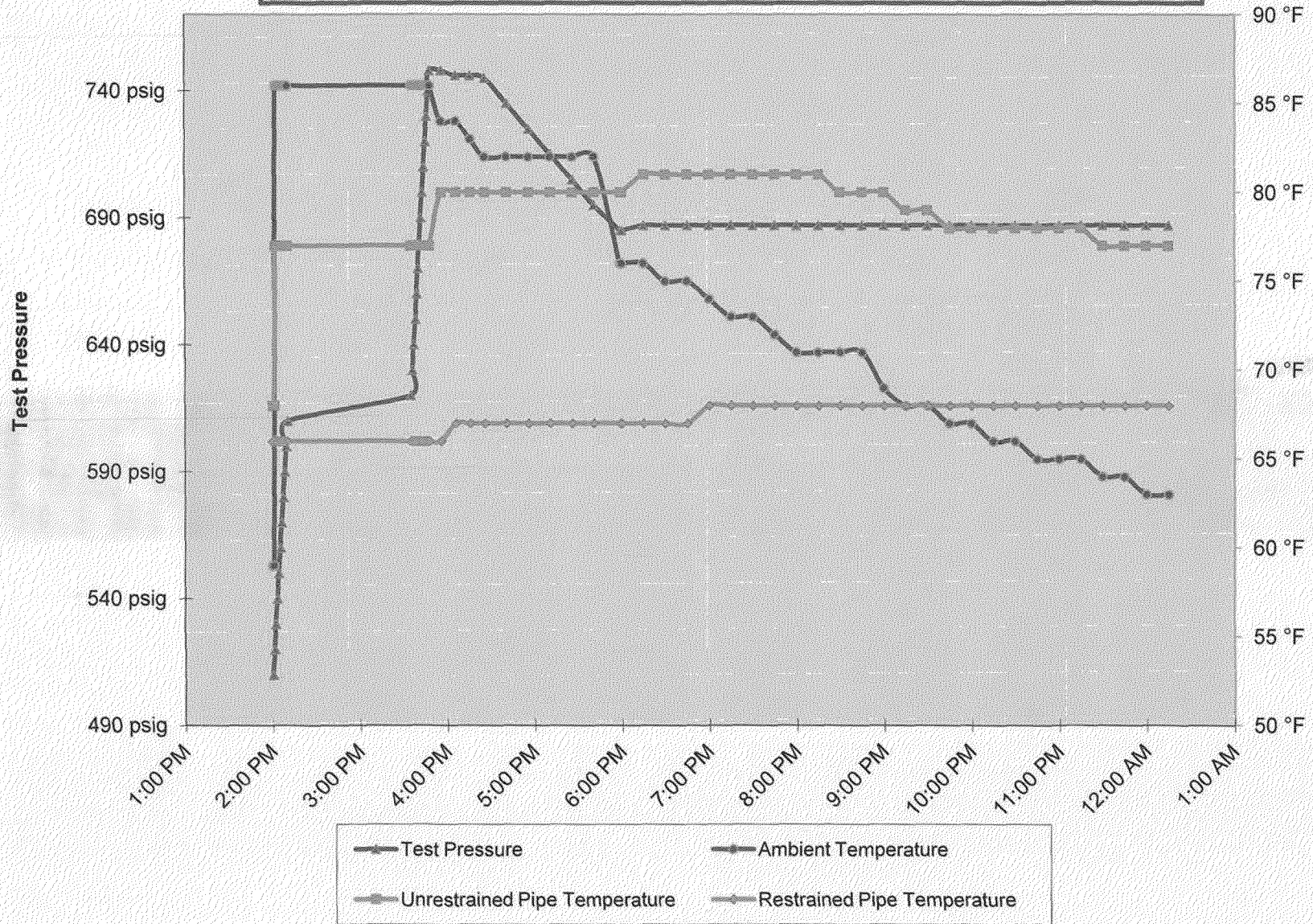
#### Part II - Test Data (TO BE PREPARED BY PERSON SUPERVISING TEST AT TIME OF TEST)

Note: Minimum test pressure and duration are not to be changed without written approval.

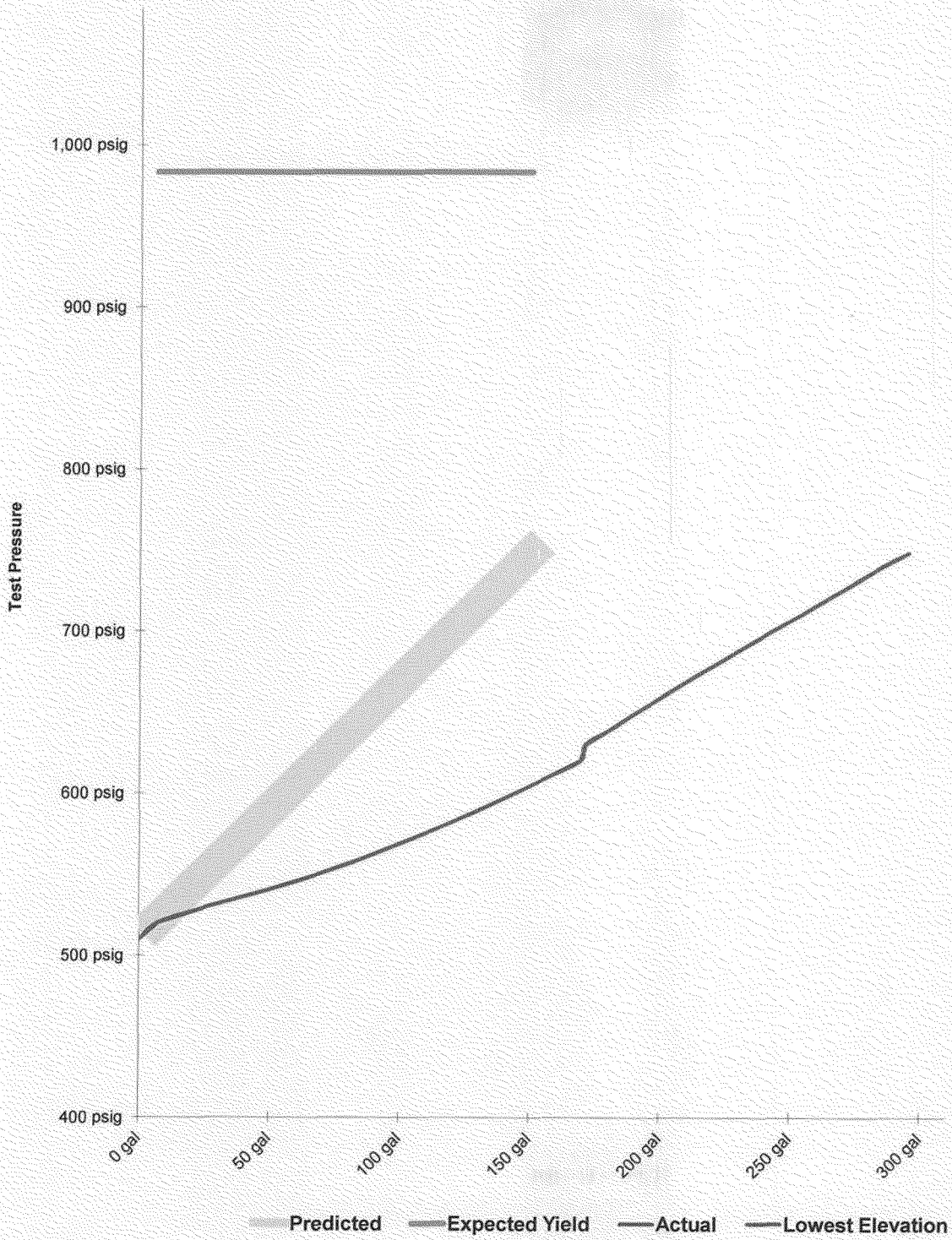
Time and Date Test Pressure Reached	10/23/11 3:56 PM	Elevation at Test Point	16 ft	Min. Required Test Press At Test Point (1)	678.00 psig	Max. Allowable Test Press at Test Point (4)	750.00 psig
Time and Date Test Ended	10/24/11 12:15 AM	Max. Elevation in Test Section	196 ft	Min. Indicated Test Pressure (2)	685.00 psig	Max. Indicated Test Pressure (5)	748.00 psig
Actual Duration of Test	8 hours 19 minutes	Min. Elevation in Test Section	16 ft	Min. Test Pressure at Max. Elevation (3)	607.00 psig	Max. Test Pressure at Min. Elevation (6)	748.00 psig

RCP

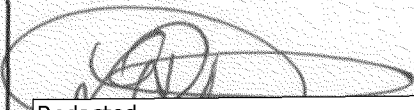
PG&E T-43B , L-147, MP 1.95 - 3.4

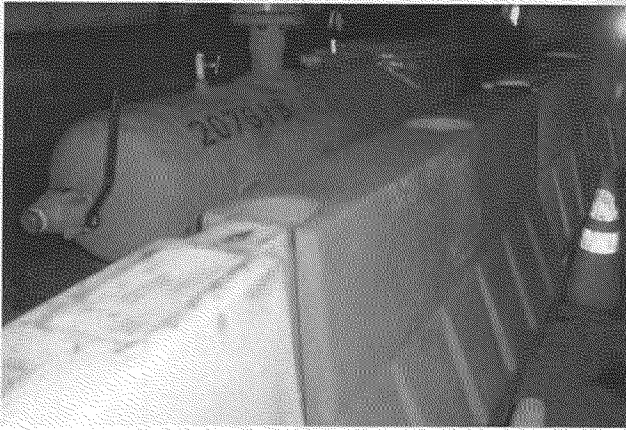


**Spike Pressure Test**  
**Stress Strain Curve -- PG&E T-43B , L-147, MP 1.95 - 3.4**

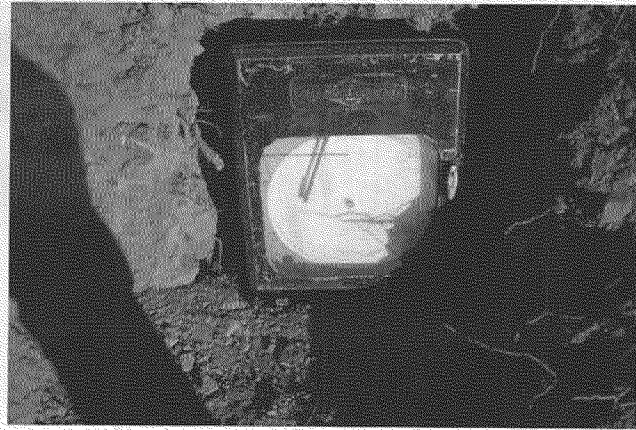




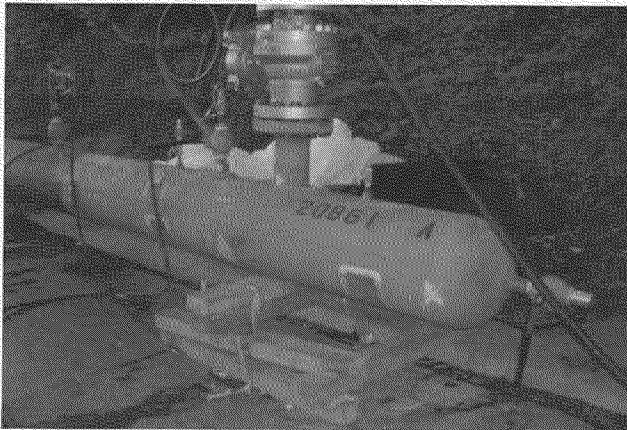
Actual Pressure Volume Plot Data			Predicted Pressure Volume Plot Data	Slope		Spike Pressure Test Stress Strain Curve -- PG&E T-43B, L-147, MP 1.95 - 3.4	
Pressure	Strokes	Gallons	Gallons	Actual	Predicted		
510 psig	0	0.00 gal		0	0.000	Pump gal per stroke	0.094 gal/stroke
520 psig	118	7.33 gal	6.30 gal	0.733	0.630	Pump Piston Diameter	1.625 in
530 psig	430	26.72 gal	12.60 gal	1.938	0.630	Pump Piston Stroke	3.50 in
540 psig	792	49.21 gal	18.91 gal	2.249	0.630	Pump Cylinders	3 ea
550 psig	1110	68.96 gal	25.21 gal	1.976	0.630	Volume check gal per stroke	0.062 gal/stroke
560 psig	1390	86.36 gal	31.51 gal	1.740	0.630	Volume Released (gallons)	12.40 gal
570 psig	1638	101.77 gal	37.82 gal	1.541	0.630	Pressure Reduced (psi)	10 psi
580 psig	1881	116.87 gal	44.12 gal	1.510	0.630	Maximum2	310 gal
590 psig	2111	131.16 gal	50.43 gal	1.429	0.630	Minimum2	0 gal
600 psig	2322	144.27 gal	56.73 gal	1.311	0.630	Maximum1	1,084 psig
610 psig	2529	157.13 gal	63.04 gal	1.286	0.631	Minimum1	400 psig
620 psig	2729	169.55 gal	69.34 gal	1.243	0.631	Gallons/Stroke Used	0.062 gal/stroke
630 psig	2759	171.42 gal	75.65 gal	0.186	0.631	Predicted Gallons/Stroke	0.032 gal/stroke
640 psig	2924	181.67 gal	81.95 gal	1.025	0.631	Pressure Increment	10 psi
650 psig	3074	190.99 gal	88.26 gal	0.932	0.631		
660 psig	3238	201.18 gal	94.57 gal	1.019	0.631	Max Pressure	748 psig
670 psig	3403	211.43 gal	100.88 gal	1.025	0.631		
680 psig	3572	221.93 gal	107.18 gal	1.050	0.631	Buried Pipe Temperature	68 °F
690 psig	3739	232.31 gal	113.49 gal	1.036	0.631		
700 psig	3909	242.87 gal	119.80 gal	1.056	0.631	Exposed Pipe Temperature	70 °F
710 psig	4088	253.99 gal	126.11 gal	1.112	0.631		
720 psig	4254	264.30 gal	132.42 gal	1.031	0.631	ASME B31.8 Appendix N-5	
730 psig	4426	274.99 gal	138.73 gal	1.069	0.631		
740 psig	4592	285.30 gal	145.04 gal	1.031	0.631	Average Actual Elastic Slope	0.733
748 psig	4750	295.12 gal	150.09 gal	1.227	0.631	Average Predicted Elastic Slope	0.631
<p>Revision 1 -- The formula calculating Established Minimum Yield Pressure B31.8 N-5(c)(2) was typed over with an incorrect pressure. The pipe was exposed to 822 psig without evidence of yielding; therefore, establishing that the pipe did not yield at 748 psig.</p> <p>The plotted stress/strain curves bend to the left indicating that the test segment contained a significant volume of free air. The curve bends to the left as free air is absorbed into the water. Typically air will be absorbed until the water saturates with air. This stabilization can be observed after 630 psig.</p> <p>The curve would bend severely to the right (the opposite direction) to indicate yielding; which, it did not.</p>						Code Prescribed Minimum Yield Slope (less 10%) B31.8 N-5 (c)(2)	1.393
						Established Minimum Yield Pressure B31.8 N-5 (c)(2)	748 psig
						Maximum Allowed Volume (After Slope Deviation) B31.8 N-5 (c)(2)	418 gal
						Volume (After Slope Deviation) B31.8 N-5 (c)(2)	0 gal
						 Redacted	



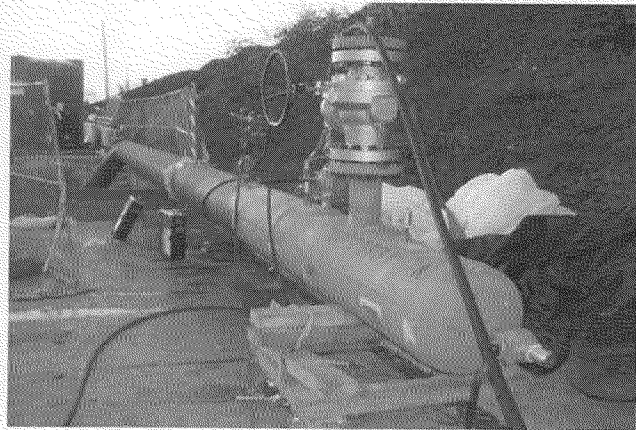
Test End



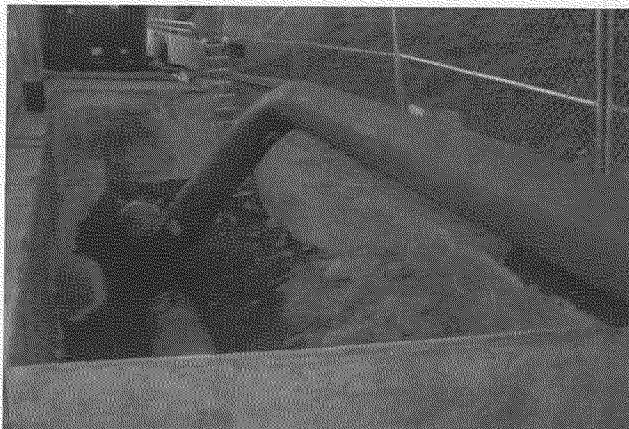
Restrained Temp Recorder Test End



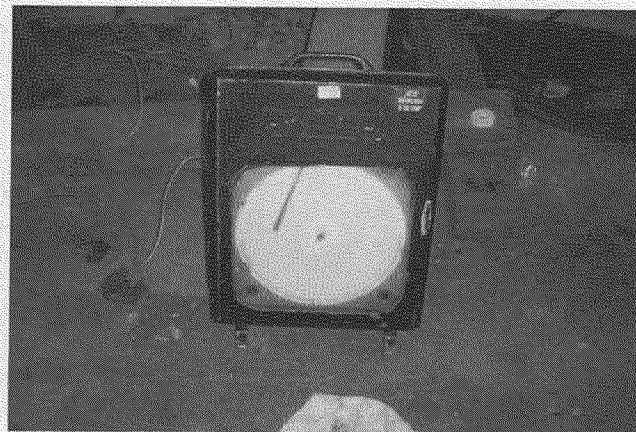
Test Head



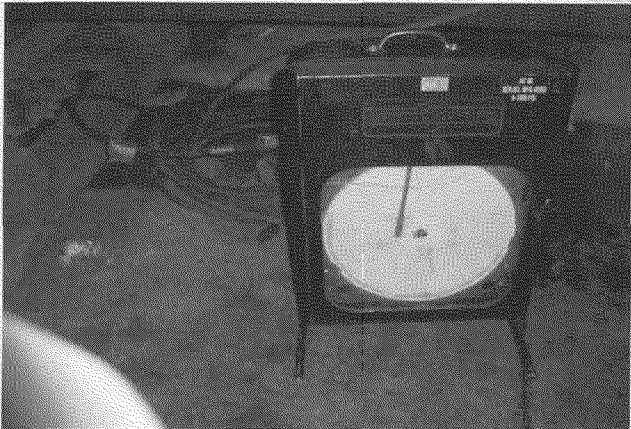
Test Header Connections



Pipe Connect



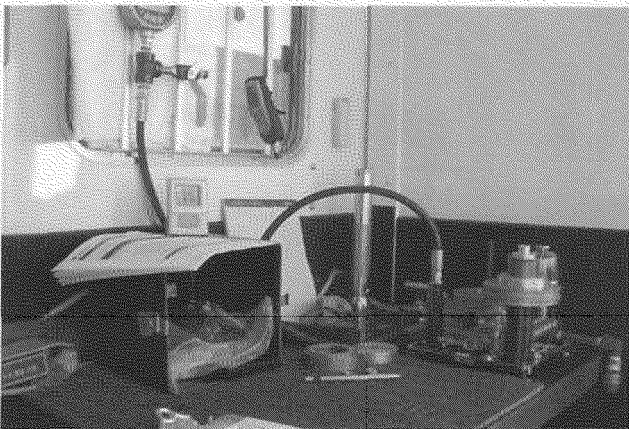
Unrestrained Temp Recorder



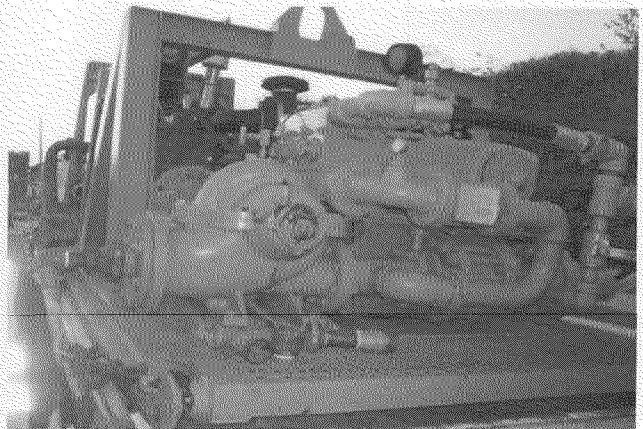
Pressure Chart Recorder



Restrained Pressure Chart Recorder  
Test Head



Dead Weight Test Equipment



Pressure Pump