

# **EL PASO LINE 2000 CONVERSION**

**Test Section Number 10** 

Sta. 24635+ to Sta. 25522+

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8 August 2002

NTSB INCIDENT #PLD21FR003 EPNG LINE 2000-0006643 The purpose of this report is to summarize the results from Test Section #10 of the Line 2000 Conversion Project for EL Paso Natural Gas. This section was primarily comprised of 30" O.D. x 0.281" W.T. x Grade X-70. The section is located in Pinal County, Arizona, and begins at Station# 24635+ and ends at Station# 25522+ for a total length of 88 694 ft.

The test began at 4:00 pm on 7 August 02, and ended at 12:00 am on 8 August 02. The initial test pressure at the test-site was 1280 psi and after the full eight hours the final test pressure was 1273 psi. The ambient temperature at the test-site was a maximum of 101°F at the beginning of the test and decreased to a minimum of 84°F at the end of the test. The test-site pipe temperature at the beginning of the test was 93°F and increased to a maximum of 94°F at the end of the test pressure at the highest point in the test section was 1221 psi yielding 93.1% SMYS. The maximum test pressure at the lowest point was 1289 psi yielding 98.3% SMYS. The test pressure was maintained throughout the duration of the test and was subsequently accepted as valid.



# **EL PASO LINE 2000 CONVERSION**

**Test Section Number 10A** 

Sta. 25521+ to Sta. 25694+

5 August 2002

NTSB INCIDENT #PLD21FR003 EPNG LINE 2000-0006664 Milbar Hydro-Test, Inc. 651 Aero Drive Shreveport LA 71107-6943

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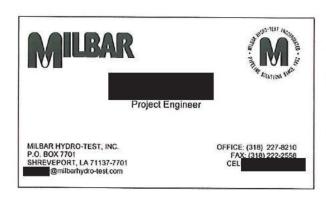




# Facsimile transmittal

To:		Fax:			
Company:	El Paso Natural Gas	Date	Decem	ber 18, 2002	
From:		Pages:	2, Incl	uding this one.	
Re:	Test summary revision	-test section 10A			
Urgent	□ For Review	Please Comment		Please Reply	Please Recycle
•	• •	۰		•	

Notes: This is the revision you and I discussed this morning. Please look it over and let me know if any changes need to be made.



This is a confidential message, intended solely for the person to whom it is addressed. If you receive this message in error, please forward it to the correct person, or mail it back to us. Thank you. The purpose of this report is to summarize the results from Test Section #10A of the Line 2000 Conversion Project for EL Paso Natural Gas. This section was primarily comprised of 30" O.D. x 0.438" W.T. x Grade X-70. The section is located in Pinal County, Arizona, and begins at Station# 25521+ and ends at Station# 25694+ for a total length of 17 314 ft.

The test began at 1:00 pm on 5 August 02, and ended at 9:00 pm on 5 August 02. The initial test pressure at the test-site was 2033 psi and after the full eight hours the final test pressure was 2033 psi. However, both pressure recorders, test-site and far end, indicate a pressure loss that the test-site dead weights did not register. This most likely was caused by not filling the oil reserve in the dead weight's canister causing the weights to reach a maximum and then maintain that value. According to the test-site pressure chart, the minimum test pressure at the highest point in the test section was 2005 psi yielding 98.1% SMYS. The maximum test pressure at the lowest point was 2044 psi yielding 100% SMYS. The ambient temperature at the test-site was 101°F at the beginning of the test and increased to a maximum of 106°F before decreasing to 81°F at the end of the test. The test-site pipe temperature at the beginning of the test was 92°F and increased to a maximum of 94°F at the end of the test. The test was maintained throughout the duration of the time period and was subsequently accepted as valid.

The purpose of this report is to summarize the results from Test Section #10A of the Line 2000 Conversion Project for EL Paso Natural Gas. This section was primarily comprised of 30" O.D. x 0.438" W.T. x Grade X-70. The section is located in Pinal County, Arizona and begins at Station# 25521+ and ends at Station# 25694+ for a total length of 17 314 ft.

The test began at 1:00 pm on 5 August 02, and ended at 9:00 pm on 5 August 02. The initial test pressure at the test-site was 2033 psi and after the full eight hours the final test pressure was 2033 psi. The ambient temperature at the test-site was 101°F at the beginning of the test and increased to a maximum of 106°F before decreasing to 81°F at the end of the test. The test-site pipe temperature at the beginning of the test was 92°F and increased to a maximum of 94°F at the end of the test. The minimum test pressure at the highest point in the test section was 2033 psi yielding 99.5% SMYS. The maximum test pressure at the lowest point was 2044 psi yielding 100% SMYS. The test-site pressure chart was adjusted at 12:50 pm to represent a more accurate depiction of the pressure at the test-site. The test-site. The test-site and throughout the duration of the test and was subsequently accepted as valid.



## **EL PASO LINE 2000 CONVERSION**

**Test Section Number 12** 

Sta. 27262+ to Sta. 27525+4

22 September 2002

The purpose of this report is to summarize the results from Test Section #12 of the Line 2000 Conversion Project for EL Paso Natural Gas. This section was primarily comprised of 30" O.D. x 0.281" W.T. x Grade X-70. The section is located in Pinal County, Arizona, and begins at Station# 27262+

The test began at 3:30 pm on 22 September 02, and ended at 11:30 pm on 22 September 02. The initial test pressure at the test-site was 1342 psi and after the full eight hours the final test pressure was 1333 psi. The ambient temperature at the test-site was 96°F at the beginning of the test and decreased to a minimum of 75°F at the end of the test. The test-site pipe temperature at the beginning of the test was 92°F and increased to a maximum of 95°F at the end of the test. The minimum test pressure at the highest point in the test section was 1183 psi yielding 90.2% SMYS. The maximum test pressure at the lowest point was 1342 psi yielding 102.4% SMYS. The test pressure was maintained throughout the duration of the test and was subsequently accepted as valid.



# **EL PASO LINE 2000 CONVERSION**

**Test Section Number 13** 

Sta. 27525+ to Sta. 27839+:

22 September 2002

The purpose of this report is to summarize the results from Test Section #13 of the Line 2000 Conversion Project for EL Paso Natural Gas. This section was primarily comprised of 30" O.D. x 0.281" W.T. x Grade X-70. The section is located in Pinal County, Arizona, and begins at Station# 27525+

The test began at 9:30 am on 22 September 02, and ended at 5:30 pm on 22 September 02. The initial test pressure at the test-site was 1360 psi and after the full eight hours the final test pressure was 1356 psi. The ambient temperature at the test-site was 86°F at the beginning of the test and increased to a maximum of 99°F before decreasing to 97°F at the end of the test. The test-site pipe temperature at the beginning of the test was 82°F and increased to a maximum of 84°F at the end of the test. The minimum test pressure at the highest point in the test section was 1185 psi yielding 90.4% SMYS. The maximum test pressure at the lowest point was 1360 psi yielding 103.7% SMYS. The test pressure was maintained throughout the duration of the test and was subsequently accepted as valid.



## **EL PASO LINE 2000 CONVERSION**

Test Section Number 14 Sta. 27839-**100** to Sta. 27980+

22 September 2002

The purpose of this report is to summarize the results from Test Section #14 of the Line 2000 Conversion Project for EL Paso Natural Gas. This section was primarily comprised of 30" O.D. x 0.281" W.T. x Grade X-70. The section is located in Pinal County, Arizona, and begins at Station# 27839+ and ends at Station# 27980+ for a total length of 14 067 ft.

The test began at 12:15 am on 22 September 02, and ended at 8:15 am on 22 September 02. The initial test pressure at the test-site was 1193 psi and after the full eight hours the final test pressure was 1184 psi. The ambient temperature at the test-site was 73°F at the beginning of the test and increased to a maximum of 84°F at the end of the test. The test-site pipe temperature at the beginning of the test. The test-site pipe temperature at the end of the test. The minimum test pressure at the highest point in the test section was 1184 psi yielding 90.3% SMYS. The maximum test pressure at the lowest point was 1300 psi yielding 99.2% SMYS. The test pressure was maintained throughout the duration of the test and was subsequently accepted as valid.



# EL PASO LINE 2000 CONVERSION

**Test Section Number 15** 

Sta. 27980+ to Sta. 28104+

21 September 2002

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The purpose of this report is to summarize the results from Test Section #15 of the Line 2000 Conversion Project for EL Paso Natural Gas. This section was primarily comprised of 30" O.D. x 0.281" W.T. x Grade X-70. The section is located in Pinal County, Arizona, and begins at Station# 27980+ and ends at Station# 28104+ for a total length of 12 428 ft.

The test began at 11:00 am on 21 September 02, and ended at 7:00 pm on 21 September 02. The initial test pressure at the test-site was 1314 psi and after the full eight hours the final test pressure was 1314 psi. The ambient temperature at the test-site was 84°F at the beginning of the test and increased to a maximum of 90°F before decreasing to 84°F at the end of the test. The test-site pipe temperature at the beginning of the test was 87°F and increased to a maximum of 89°F before decreasing to 88°F at the end of the test. The test-site pipe temperature at the beginning the test was 87°F and increased to a maximum of 89°F before decreasing to 88°F at the end of the test. The minimum test pressure at the highest point in the test section was 1189 psi yielding 90.7% SMYS. The maximum test pressure at the lowest point was 1314 psi yielding 100.2% SMYS. The test pressure was maintained throughout the duration of the test and was subsequently accepted as valid.

	DR-17, Attachment 7 Page 1 of 15	
ž	12/10/2002 13:15 PAGE 01	
	FAX	
	Page #1 of 14	
	To:	
	From:	
	Ref.: Hydrostatic Test #1-2 for Tom Mix Comp. Sta.	
	Sent To FAX #	
	Date Sent: 10/07/03	

Sir;

This is the second of two Hydrostatic tests for the launcher/receiver here at Tom Mix Compressor Station. The tie-in on Line 2000 is set for this Wednesday Oct. 8<sup>th</sup>.

Please E-mail acceptance to:



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(M.P. or S	S.S.):	State:	Co	unty/Parish:	Locatio		Design	970	MAOP	944
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Location	Station	Elevation (feet)	Max. psig	@ Max.	Min. peig.	@ Min.	Varianc psig.	P	sig.	@Target
Location EGIN	Station 0+00	Elevation (feet) 0	Max. psig. 1,600	69.0%	Min. <b>psig.</b> 1,505	@ Min. 64.9%	Varianc paig. 95	P	.552	@Target 66.9%
Location EGIN 11GH ELEVATION	Station 0+00 0+00	Elevation (feet) 0	Max. psig. 1,600 1,600	69.0% 69.0%	Min. psig. 1,505 1,505	@ Min. 64.9% 64.9%	Varianc paig. 95 95		.552 .552	@Target 66.9% 66.9%
Location EGIN IGH ELEVATION OW ELEVATION	Station 0+00 0+00 0+00	Elevation (feet) 0 0 0	Max. psig. 1,600 1,600 1,600	69.0% 69.0% 69.0% 69.0%	Min. psig. 1,505 1,505 1,505	@ Min. 64.9% 64.9% 64.9%	Variand paig. 95 95 95		251g. ,552 ,552 ,552	@Target 86.9% 66.9% 66.9%
Location EGIN HIGH ELEVATION OW ELEVATION ND	Station           0+00           0+00           0+00           0+00           0+00           0+00	Elevation (feet) 0 0 0	Max. psig 1,600 1,600 1,600 1,600	(2 Max. 69.0% 69.0% 69.0% 69.0%	Min. psig. 1,505 1,505 1,505 1,505	@ Min. 64.9% 64.9% 64.9%	Variand paig. 95 95 95 95 95		251g. ,552 ,552 ,552 ,552	@Target 86.9% 66.9% 66.9% 66.9%
Location EGIN HIGH ELEVATION OW ELEVATION END Dead Weight Location (Test Point	Station           0+00           0+00           0+00           0+00           0+00           0+00	Elevation (feet) 0 0 0	Max. psig. 1,600 1,600 1,600	69.0% 69.0% 69.0% 69.0%	Min. psig. 1,505 1,505 1,505	@ Min. 64.9% 64.9% 64.9%	Variand paig. 95 95 95		251g. ,552 ,552 ,552	@Target 86.9% 66.9% 66.9%
Location DEGIN HIGH ELEVATION OW ELEVATION END Dead Weight Location (Test Point REMARKS:	Station           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00	Elevation (feet) 0 0 0 0 0	Max. pekg 1,600 1,600 1,600 1,600 1,600 1,608	(2 Max. 59.0% 69.0% 69.0% 69.0%	Min. psig. 1,505 1,505 1,505 1,505 1,505 1,505	@ Min. 64.9% 64.9% 64.9% 64.9% 64.9%	Variano paig. 95 95 95 95 95 95		251g. ,552 ,552 ,552 ,552	@Target 86.9% 66.9% 66.9% 66.9%
Location DEGIN HIGH ELEVATION OW ELEVATION END Dead Weight Location (Test Point REMARKS:	Station           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00	Elevation (feet) 0 0 0 0 0	Max. pekg 1,600 1,600 1,600 1,600 1,600 1,608	(2 Max. 59.0% 69.0% 69.0% 69.0%	Min. psig. 1,505 1,505 1,505 1,505 1,505 1,505	@ Min. 64.9% 64.9% 64.9% 64.9% 64.9%	Variano paig. 95 95 95 95 95 95		251g. ,552 ,552 ,552 ,552	@Target 86.9% 66.9% 66.9% 66.9%
Location DEGIN HIGH ELEVATION OW ELEVATION END Dead Weight Location (Test Point REMARKS:	Station           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00	Elevation (feet) 0 0 0 0 0	Max. pekg 1,600 1,600 1,600 1,600 1,600 1,608	(2 Max. 59.0% 69.0% 69.0% 69.0%	Min. psig. 1,505 1,505 1,505 1,505 1,505 1,505	@ Min. 64.9% 64.9% 64.9% 64.9% 64.9%	Variano paig. 95 95 95 95 95 95		251g. ,552 ,552 ,552 ,552	@Target 86.9% 66.9% 66.9% 66.9%
Location EGIN HIGH ELEVATION OW ELEVATION END Dead Weight Location (Test Point	Station           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00	Elevation (feet) 0 0 0 0 0	Max. pekg 1,600 1,600 1,600 1,600 1,600 1,608	(2 Max. 59.0% 69.0% 69.0% 69.0%	Min. psig. 1,505 1,505 1,505 1,505 1,505 1,505	@ Min. 64.9% 64.9% 64.9% 64.9% 64.9%	Variano paig. 95 95 95 95 95 95		251g. ,552 ,552 ,552 ,552	@Target 86.9% 66.9% 66.9% 66.9%
Location DEGIN HIGH ELEVATION OW ELEVATION END Dead Weight Location (Test Point REMARKS:	Station           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00	Elevation (feet) 0 0 0 0 0	Max. pekg 1,600 1,600 1,600 1,600 1,600 1,608	(2 Max. 59.0% 69.0% 69.0% 69.0%	Min. psig. 1,505 1,505 1,505 1,505 1,505 1,505	@ Min. 64.9% 64.9% 64.9% 64.9% 64.9%	Variano paig. 95 95 95 95 95 95		251g. ,552 ,552 ,552 ,552	@Target 86.9% 66.9% 66.9% 66.9%
Location DEGIN HIGH ELEVATION OW ELEVATION END Dead Weight Location (Test Point REMARKS:	Station           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00	Elevation (feet) 0 0 0 0 0	Max. pekg 1,600 1,600 1,600 1,600 1,600 1,608	(2 Max. 59.0% 69.0% 69.0% 69.0%	Min. psig. 1,505 1,505 1,505 1,505 1,505 1,505	@ Min. 64.9% 64.9% 64.9% 64.9% 64.9%	Variano paig. 95 95 95 95 95 95		251g. ,552 ,552 ,552 ,552	@Target 86.9% 66.9% 66.9% 66.9%
Location EGIN IGH ELEVATION OW ELEVATION ND Dead Weight Location (Test Point REMARKS:	Station           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00	Elevation (feet) 0 0 0 0 0 0 discharge piping including fin	Minx. peig 1,600 1,600 1,600 1,600 1,600 1,600 fan leads, p	(2) Max. 69.0% 69.0% 69.0% 69.0% 69.0%	Min. peig. 1,505 1,505 1,505 1,505 1,505 1,504 nchar piping p	@ Min. 64.9% 64.9% 64.9% 64.9% 64.9%	Varianc psig. 95 95 95 95 95 95 95	P 1 1 1 1 1 1 1	231g. .552 .552 .552 .552 .552 .552 .552 .5	@Target 86.9% 66.9% 66.9% 66.9%
Location DEGIN HIGH ELEVATION OW ELEVATION END Dead Weight Location (Test Point REMARKS:	Station           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00           0+00	Elevation (feet) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max. pelg 1,600 1,600 1,600 1,600 1,600 1,600 1,600 fan leads, p	(2 Max. 59.0% 69.0% 69.0% 69.0%	Min. peig. 1,505 1,505 1,505 1,505 1,505 1,504 nchar piping p	(0) Min.     (64.9%     (64.	Variance psig. 95 95 95 95 95 95 95 95 95 95		231g. .552 .552 .552 .552 .552 .552 .552 .5	(2) Target 86.9% 56.9% 66.9% 66.9% 64.9%
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Location IEGIN IIGH ELEVATION OW ELEVATION NO Dead Weight Location (Test Point IEMARKS: est consist of all station suction ply PRE-TEST SPECIFIED	Station 0+00 0+00 0+00 0+00 0+00 0+00 0+00 0+	Elevation (feet) 0 0 0 0 0 discharge piping including fin fest Performed by (Sign	Minx. peig 1,600 1	(2) Max. 69.0% 69.0% 69.0% 69.0% 69.0%	Min. peig. 1,505 1,505 1,505 1,505 1,505 1,504 ncher piping p	© Min. 64.9% 64.9% 64.9% 64.9% 64.9% 64.9% Kower gas, fuel	Variance psig. 95 95 95 95 95 95 95 95 95 95	Ine piping.	29 g. .552 .552 .552 .552 .552 .552 .652 	(2) Targat 86.9% 56.9% 66.9% 66.9% 64.9%
Location EGIN IGH ELEVATION OW ELEVATION ND ead Weight Location (Test Point EMARKS: est consist of all station suction ply PRE-TEST SPECIFIED Inginator (Signature)	Station 0+00 0+00 0+00 0+00 0+00 0+00 0+00 0+	Elevation (feet) 0 0 0 0 0 discharge piping including fin fischarge piping including fin Test Performed by (Sig	Minx. peig 1,600 1	(2) Max. 69.0% 69.0% 69.0% 69.0% 69.0%	Min. psig. 1,505 1,505 1,505 1,505 1,504 ncher piping p	© Min. 64.9% 64.9% 64.9% 64.9% 64.9% 64.9% Kower gas, fuel	Varianc psig. 95 95 95 95 95 95 95 95 95 95 95 95 95	Ine piping.	29 g. .552 .552 .552 .552 .552 .552 .652 	©Target 86.9% 66.9% 66.9% 66.9% 64.9% 64.9%
Location EGIN IGH ELEVATION OW ELEVATION NO ead Weight Location (Test Point EKARKS: est consist of all station suction ply PRE-TEST SPECIFIED Inginator (Signature)	Station 0+00 0+00 0+00 0+00 0+00 0+00 0+00 0+	Elevation (feet) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Minx. peig 1,800 1,800 1,800 1,800 1,800 1,800 1,800 fan leads, ; ERFORMED nature):	22 Max.     69.0%	Min. psig. 1,505 1,505 1,505 1,505 1,504 ncher piping p	© Min. 64.9% 64.9% 64.9% 64.9% 64.9% 64.9% Kower gas, fuel	Variance paig. 95 95 95 95 95 95 95 95 95 95 95 95 95	Ine piping.	29 g. .552 .552 .552 .552 .552 .552 .652 	©Target 86.9% 66.9% 66.9% 66.9% 64.9% 64.9%

12/10/2002 13:16

	Final									Page 2 of	4	
in	aso		Т	EST DESIG	N INFORMA	TION		Deto:		Select Rout	ng:	
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m Number	P = calculated	ated D = Outside dia. ( = Well Thick.   S = SMYS		S = SMYS			End		Calculated Stress Levels			
SIN NUMBER	Design Pres. (psig)	(inches)	(inches)	(pti)	F × Design Factor	Begin Station	Station	Bevation	@ Select, Design Pres.	s Level (% SMYS)	may last say	
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2	3855	2.375	0.218	42,000	0.50		a		12.6	19.5	20.8	
3	2739	4.500	0.237	52,000	0.50			1	17.7	27.5	29.2	
4	2198	6.625	0.280	52,000	0.50				22.1	34.2	36.4	
5	1941	8.625	0.322	52,000	0.50				25.0	38.8	41.2	
6	1426	10.750	D.365	42,000	0.50			1	34.0	52.8	56.1	
7	1235	12,750	D.375	42,000	0.50	1			39.3	60.9	64.8	
8	1167	30,000	0.500	70,000	0.50				41.6	64.5	68.6	
9	1157	34.000	0.582	70,000	0.50				41.9	65.0	69.1	
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Rev. 03/03)-Final							Page 3 of 4
4			Т	ESTLOG		Test Date:	Select Routing:
elpas	0						Select Northing:
	Project	Nama:		- Broinstin	AFE Number	10-06-03	1
	Tom Mix L2000	M.P. 5304		074		Facility Name	
A.			60.0.	den er		Tosh Mix Compr	essor Station
and the second second	tual Installation L		5304	End	530+	Den 1 That # 1	- 2
Measured pressure	Time	Ambient	Test Medium	Ground Temp (F*)	Remarks (see instr	Actions on page 1)	
(psig)	AM PM	Temp. (F*)	Temp. (F")	(If Applicable)		·····	
253 PSE	6,22m	61.5	1 23		Beggal 1	2 DAN PIACE 20	
738 951	7:00 AM	101.1	23			134	
153 PI	8:00 Am	70.0	89.0			reck for the links	- Working on Erres
0. 051	12:45 Am	8.5.0	KB.D			ick for unterworking	g - 'ompty pipes
D PSI	12:00	\$2.3	94.5		Begin P	No for Leak @ 34 F	Acoste
STOD ISI	12:25 PM	87.5	91.5	1	Sha For 1	enk check	······
STOP BT	18:36 10	\$6.7	91.5		Berin	Nestone illing	
1085 PSI	12:35 Pm	\$1.2	90,0		5500	FOR LEAKS (Kerk	
OHI PSI	12:45 Pm	88.6	90.0		Took	PRESSURE CONN TO REPLACE	alua and Bunches dis
OPSI	1:10 Pm	84.9	90.0		Jegit Pk	casadeta	ping an among an are
320 151	1125 FM	87.1	910			/	
455 P37 455 P52	1:40 Pm	86.2	7/.0		Stop tox		
1075 AST	2:00 PM	86.2	91.0		Begin p	Resshering	
1º 75/51	2:05 PM	86.8	91.0			Essaleing 1	
1530 PSI	2:15 P.m	85.9	51.0		Stop Pier	mp - I chark Tok	kals.
1535 PSI	2145 fm.	84.8	91.5		Basin to	t	ROAS.
1535 PST	JIN AM	85.9	91.5	1.10		est - sun just came the	und elast
1537 PSI	3:05 1.m	85.9	91.5		Kunning to	of -sur warming up pipe	- Alandi
1541 PSI	3:15 R.M.	85.0	91.5		Running to	st - Bled att press has to	vold Level RACS.
1543 PST	3:25 Pm.	83.9	92		PALAG TE	ct- sun in tout of ch	The said a Cloude & Ved f
545 PSI 546 PSI	3:35 P.W. 3:45 P.M.	83.0	92		Kumine 1	est - Wind picking up - sun in	+ ant of clouds (sloud)
546 PSI	4:00 P.M.	83.0	92		Channy D	at - windy - cloudy	and the second
STG PSI	4:15 1-1.	81.5	91.5		Kunning To	st - Joudy overeast - win	9
545 PSI	4:30 P.M.	80.8	905		Suplationing	arest - same type of weat	there - winey + clindy
543PSI	4145 1-12 .1	80.1	90.5		SHN baby J a	Louds - cloudy overcast	
541 PSI	5.00 Rm.	80.1	900	[	NO SHAS-OI	oudy-thundering	
538 PSI	SISP.M.	79.4	900		Very cloud.	-windy -+ thundering	
536 PSI	5:30 Pm	79.0	89.0		Temp: gottin	a caper-slight winds-shill	Comple
533 PSI	5:45 p.m.	78.7	68.0		Sungoing d	100 N - getting coole & - cloud	Ly overcast
53095Z	6:00 P.m.	78.3	85.0		gettine day	K-Cool-winty -olor collas	down
537 152	6:10 Pm.	77.9	88.0	the second second	Kais & one	ssure to stad on line.	D.K.
532 PSL	6:30 Pm.	77.2	87.5	i	Nightfall - TA	mp. cooling off pipe -light w!	AA.5
570 PST 539 PST	6:40 FM	71.2	87.5		Terup, 0000	no down -weed to haise	DESS LA P
SJRPSI	6:45 Pm .	77.2	57.5		KRIDER FEL	esture to hold test on	line-getting cool temp
534 P5I	7:00 P.M.	76.7	87.5		Cool Night	test dains Anad	
Isdi PST	8:00 fm	75.6	80.0		Icmp d.R.e	sping cool next pige to	stading att-
150167	105 Pm	75.6	32.		P.c.Stoward R	HI TARYERAL	1~J.
1042 054	SIDPMI	75.(	83.5		Ressured VP	- ISA With Brist	pikela, d-E to Pump 1/1 brit

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	Tom Mix L2000	t Name:		Project 1.D. / /	AFE Number	Facility Na	ne or Number	
		A REAL PROPERTY OF A REAL PROPER		074	509	Tom Mbx Compressor Station		
	tual Installation I			End		Tes+#1-2		
(psig)	TIMO AM PM	Temp. (F*)	Test Medium Temp. (F*)	Ground Tamp (F*) (If Applicable)	Remarks (see instruct	ons on page 1)		
1537 856	\$30 PM	75.1	82.	(III P P P P P P P P P P P P P P P P P P	Pricework Don.	at the 1 as Parken	<del>1: · · · · · · · · · · · · · · · · · · ·</del>	
1530 Pst	9:00 m.	74.8	81		PRESSURE AND!	the Gould Post Chalter	s RETAPSI Probe To Apt	
1527155	915Pm.	74.0	13.7	ALC: NOT	TEND Prese 9	Totally detailed East 19	al Recard Partin Act	
1523151	9:301M.	74.0			And TOMP P	est shelt	ACTAPOS FRAT 10 105	
1523155	9:30Pm.	74. 0.	88		PRESSURL Due	Anna Statula		
1520rs	9:45 PM.	74.1	Y6.5	A PRODUCTION OF THE PARTY OF	ITESSUM UM	TITLA CATENCET		
154015	Lidopm.	74.2	86.5		ML MINEY DACK I	ATO 154 A POSSUME Hall	IN & Sarking from Runp VIBNATE	
155157	10:00Pm	74.2	865		Pressure drepping	Sland Test STILL OK	y pay in the station	
135201	10:30 Pm.	73.6	83		Pr655466 411	dropping Stouls TESt of		
15 70 PUT	11:00 Pm. 11:15 Pm	73.6	83		F-ESSY-6 Prov	aspont Sloud, Test the militan Slight coold	real	
Saure	11.15 [ [ ]	12.3	82.5		TESt COMI	Plet. / De Present	Aret	
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From         ES 2647         To:         AZ         PINAL COUNTY         Designation           Project Description:         InsalL VEW LINE 2000 BURGE MAIN LINE VALVE 39 1/2 WITH 30" FULL OPENING BLOCK VALVE WITH BLOWOFFS. BYPASS AND SHAFER OPERATOR LOCATION IS SECTION 2, T-6 A GROUND DISTURBANCE OF LESS THAN 5 ACRES IS REQUIRED. PROJECT IS UNFORSEEN AND IS REQUIRED TO COMPLY WITH DOT 192. 179, LINE VALVE SPACING, MAX 20 MILES BETWEEN VALVES IN CLASS 1 LOCATIONS.           BETWEEN VALVE ASSEMBLY WAS TESTED HERE IN EL PASO STATION# 3 BY AN EL PASO EMPLOYEE WILLIE Q. GARCIA.         REPLACEMENT         REFERENCE DRAWINGS ATTACHED POST-INSTALLATION TEST           POST.INSTALLATION TEST         FABRICATION         NEW CONSTRUCTION [2]         REPLACEMENT         REFERENCE DRAWINGS ATTACHED POST-INSTALLATION TEST           POST.INSTALLATION TEST         PRE-INSTALLATION TEST         Test Design Griteria         Test Section - Reference Data Test Medium         Wair Minimum and maximum pressure of test (max. Test Pressure (Pipi)         % PIPE SMYS Section Langth         % Houre ( Max. Elevation Change         0 Gol Max. Elevation Change         0 FL Section Fill Velue           VariwFlange ANSI Class Rating NA         Max. Test Pressure (Pipi)         % PIPE SMYS Min.         % SMYS         Variance         1 2         3 Back         2         3 Back         2         3 Back         2         3 Back         2         3 Back         1 2         3 Back         2         3 Back         1 2         3 Back		and the second se								Page 1 of 4	
AHR         CIG         EPHO Z         TGP         SNG I         Test Number:         1         of         1           MSTALL VALVE 59-1/2 2000 LINE         Project ID/ / AFE Number         Project ID/ / AFE Number         Test Number:         1         of         1         Statistice         Class Location         1         Statistice         Class Location         1         Statistice         Class Location         1         Statistice         Design         844         MAOP         7           Project Description:         MAR OF UNICED VALUE 59 1/2 WITH 30" FULL OREWING BLOCK VALVE WITH BLOWDERS BY/PAISS AND SHAFER OREMATIC INCALLES SECTION 2. TA         NAX NAV UNICES INCASS I CONTROL CONTROL ON CO	1		TEST	SPECIFIC	ATIONS				Selec	t Routing:	
Project large:         Project ID: / APE Number         Facility Name of Number           Installation Location         MP or 55.1:         State:         CountyParian:         Dias Location         1         Diasignation         Diasignation </th <th>elpaso</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>26-9</th> <th>Sep-2003</th> <th></th> <th>1</th>	elpaso						26-9	Sep-2003		1	
INSTALL VALUE 28-1/2 2000 LINE         D86005         CASA GRANDE LETTS           From:         ES 2471         To:         AZ         Privat_COUNTY         Class Location         1         Sector Bit         Designation         Designation         1         Sector Bit         Designation         Designation         1         Sector Bit         Designation	ANR		NG 🗹	TGP	SNG		Test N	umber: 1	of 1		
Installation Location (M.P. or S.):     State:     CountyParish:     Class Location (M.P. or S.):     State:     CountyParish:     Class Location (Designation     State:     State: <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>r</td>										r	
Image: MP, or S. S.):         State:         CountyPariati:         Distinguistion         1         Design and the pressure         State           roget Description:         NSALL Rev Units 2000 BURCH MAINLEN VALVE 39 1/2 WITH 30° FULL OPENING BLOCK VALVE WITH BLOWOPFS. BYPASS AND SHAFER OPERATOR LOCATION IS SECTION 2, 1-6         GROUND DISTURD VALVE STATE AS ARE SERVICES THAN AS ARE SERVICES TO AN AS A CAULES.           REGULARD DISTURDED VALVES IN CLASS TARK 3 ARE SERVICES TO AN AS A CAULES THAN AS A CAUSE STATION# 3 BY AN EL PASO EMPLOYEE WILLIE 0, GARCIA.         COMPLY WITH BOT 192. T76, LINE VALVE SPACING, MAX 20 MILES FUEL PRESSURE (FUEL PRESSURE FUEL PRESSURE FUEL PRESSURE (FUEL PRESSURE FUEL PRESSURE FUEL PRESSURE FUEL PRESSURE (FUEL PRESSURE FUEL PRESSURE FUEL PRESSURE FUEL PRESSURE (FUEL PRESSURE (FU			INE		0860				RANDE L6775	1	
From     ES 2647     To:     AZ     PINAL COUNTY     Designation     Pressure       Project Description:     Implementation:     Implemen			State	Co	untv/Parish:			1 101233/007/007/00 111111	944 M4	OP 94	
NSALL NEW LINE 2000 BURED MANULINE VALVE 39 1/2 WITH 30° FULL OPENING BLOCK VALVE WITH BLOWOFRS SPYASS AND SHARER OPERATOR LOCATION IS SECTION 2. T.G. SCOUND DSTURBACE OF LESS TAMS 56 ACRES IN REQUIRED PROJECT IS UNFORSED AND DISREQUIRED TO COMPLY WITH DOT 192.179, LINE VALVE SPACING, MAX 20 MILES ETWEEN VALVES IN CLASS 1 LOCATIONS.  INS VALVE SASSEMBLY WAS TESTED HERE IN EL PASO STATION # 3 BY AN EL PASO EMPLOYEE WILLIE G. GARCIA.  LEAK ONLY TEST STRENOTH TEST FABRICATION IN # 3 BY AN EL PASO EMPLOYEE WILLIE G. GARCIA.  LEAK ONLY TEST PRENETH TEST FABRICATION IN # 3 BY AN EL PASO EMPLOYEE WILLIE G. GARCIA.  LEAK ONLY TEST PRENETH TEST FABRICATION IN # 3 BY AN EL PASO EMPLOYEE WILLIE G. GARCIA.  LEAK ONLY TEST PRENETH TEST FABRICATION IN # STATUS FABRICATION REPLACEMENT REFERENCE DRAWINGS ATTACHED  POST-INSTALLATION TEST PRENETH TEST FEBRING TION # 3 BY AN EL PASO EMPLOYEE WILLIE G. GARCIA.  LEAK ONLY TEST PRENETH TEST PRENETH TEST FEBRING TION # 3 BY AN EL PASO EMPLOYEE WILLIE G. GARCIA.  LEAK ONLY TEST PRENETH TEST PRENETH TEST FEBRING TION # 3 BY AN EL PASO EMPLOYEE WILLIE G. GARCIA.  LEAK ONLY TEST PRENETH TEST PRENETH FEBRING TION # 3 BY AN EL PASO EMPLOYEE WILL BY TEST PRENETH TION TEST PRENETH TION TEST PRENETH CALCULATION TEST PRENETH TO TEST PRENETH TION TEST PRENETH TO A TEST PRENETH CALCULATION TEST PRENETH TION TEST PRENETH TION TEST PRENETH TO A TEST PRENETH CALCULATION WILL BE TEST PRENETH TO A TEST PRENETH CALCULATION WILL BE TEST PRENETH TO A TEST PRENETH TO A TEST PRENETH TO A TEST PRENETH TO A TEST PRENETH TEST PRENTEMANT THE TEST PRENETH TEST PRENETHER TO TEST PRENETHER TO TEST PRENETHER TO TEST PRENETHER TO TEST PRENETHED						Designatio	n i .	a Contract Contract Strength			
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LEAK ONLY TEST       STRENGTH TEST       FABRICATION       NEW CONSTRUCTION       REPLACEMENT       RETEST       REFERENCE DRAWINGS ATTACHED         POST-INSTALLATION TEST       PRE-INSTALLATION TEST       Test Design Criteria       Test Section - Reference Data         Minimum Component Characteristics       Test Design Criteria       Test Section - Reference Data         Minimum Component Characteristics       Input minimum and maximum pressure of test       Test Medium       Waler         SMYS       60.000       Pressure (psig)       % PIPE SMYS       Section FL Uotume       0         alver/Flange ANSI Class Rating       Max. Test Pressure (PiPe)       1800.0       900%       Section FL Uotume       0       Gal         Max. Test Pressure (PiPe)       1800.0       900%       Section FL Uotume       0       Gal         Max. Test Pressure (PiPe)       1800.0       900%       100       1,550       92.         Location       Station       Elevation       Max.       % SMYS       Min.       % SMYS       Variance       Target       % SI         Biel LEVATION       0+00       0       1,800       95.0%       1,800       90.0%       100       1,350       92.         Diff LEEVATION       0+00       0       1,800       95.0%	ETWEEN VALVES IN CLASS 1 LOCA	TIONS.									
LEAK ONLY TEST       STRENGTH TEST       FABRICATION       NEW CONSTRUCTION       REPLACEMENT       RETEST       REFERENCE DRAWINGS ATTACHED         POST-INSTALLATION TEST       PRE-INSTALLATION TEST       Test Design Criteria       Test Section - Reference Data         Minimum Component Characteristics       Test Design Criteria       Test Section - Reference Data         Minimum Component Characteristics       Input minimum and maximum pressure of test       Test Medium       Waler         SMYS       60.000       Pressure (psig)       % PIPE SMYS       Section FL Uotume       0         alver/Flange ANSI Class Rating       Max. Test Pressure (PiPe)       1800.0       900%       Section FL Uotume       0       Gal         Max. Test Pressure (PiPe)       1800.0       900%       Section FL Uotume       0       Gal         Max. Test Pressure (PiPe)       1800.0       900%       100       1,550       92.         Location       Station       Elevation       Max.       % SMYS       Min.       % SMYS       Variance       Target       % SI         Biel LEVATION       0+00       0       1,800       95.0%       1,800       90.0%       100       1,350       92.         Diff LEEVATION       0+00       0       1,800       95.0%	HIS VALVE ASSEMBLY WAS TESTED	HERE IN EL PASO STA	TION# 3 BY AN EL PA	ASO EMPLOYE	EWILLEO GAR	AIC		CARDING TO DESCRIPTION			
POST-INSTALLATION TEST       PRE-INSTALLATION TEST       Test Design Criteria         Minimum Component Characteristics       Test Design Criteria       Test Pressure Calculations         Input minimum and maximum pressure of test       Input minimum and maximum %SMYS of test       Test Medium       Water         Wait Tickness       05.00       Input minimum and maximum %SMYS of test       Section Length       0       Pressure (pig)       % PIPE SMYS         NA       Max. Test Pressure (Valves and Fitings)       NA       NA       NA       NA       Max. Elevation change       0       Pi         Section Length       0       Pressure (pig)       % PIPE SMYS       Max. Elevation change       0       Pi         Max. Test Pressure (Valves and Fitings)       NA       NA       NA       NA       Max. Elevation change       0       Pi         Section Length       0       1800.0       90.0%       100       1,550       92.         Coll       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Cell Levation       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Cell Levation       0+00       0       1	IN THE TOOL HOLI WAS IEDIEL	TENE IN LE PAGO STA		CO LINFLOIE	E TILLIL G. GARG	<b>2</b> 03.					
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POST-INSTALLATION TEST       PRE-INSTALLATION TEST       Test Design Criteria         Minimum Component Characteristics       Test Pressure Calculations       Test Pressure Calculations         Ippe Information       Input minimum and maximum pressure of test       Test Design Criteria         Wat Thekness 0.500       Input minimum and maximum pressure of test       Test Duration 8         Station Equations       Pressure (psig)       % PIPE SMYS         NA       Max. Test Pressure (Ppp)       1900.0       96.0%         Max. Test Pressure (Valves and Fitings)       N/A       N/A         Min.       1800.0       90.0%         Idet Freesure (Ppp)       1900.0       95.0%         Max. Test Pressure (Valves and Fitings)       N/A       N/A         Min.       1800.0       90.0%         Icot Into       Station       (feet)       psig.       @ Max.         Icot Into       0+00       0       1,900       95.0%       1.800       90.0%       100       1.850       92.         ND       0+00       0       1,900       95.0%       1.800       90.0%       100       1.850       92.         ND       0+00       0       1,900       95.0%       1.800       90.0%       100											
POST-INSTALLATION TEST       PRE-INSTALLATION TEST       Test Design Criteria         Minimum Component Characteristics       Test Pressure Calculations       Test Pressure Calculations         Ippe Information       Input minimum and maximum pressure of test       Test Design Criteria         Wat Thekness 0.500       Input minimum and maximum pressure of test       Test Duration 8         Station Equations       Pressure (psig)       % PIPE SMYS         NA       Max. Test Pressure (Ppp)       1900.0       96.0%         Max. Test Pressure (Valves and Fitings)       N/A       N/A         Min.       1800.0       90.0%         Idet Freesure (Ppp)       1900.0       95.0%         Max. Test Pressure (Valves and Fitings)       N/A       N/A         Min.       1800.0       90.0%         Icot Into       Station       (feet)       psig.       @ Max.         Icot Into       0+00       0       1,900       95.0%       1.800       90.0%       100       1.850       92.         ND       0+00       0       1,900       95.0%       1.800       90.0%       100       1.850       92.         ND       0+00       0       1,900       95.0%       1.800       90.0%       100				W CONSTRUC			RETEST		E DRAWINGS	ATTACHED	
Test Design Criteria         Test Pressure Calculations           Iminum Component Characteristics         Test Pressure Calculations           Ipp Information         Test Pressure Calculations         Test Pressure Calculations           Ipp Information         Input minimum and maximum ressure of test         Test Duration         8         Hours (no.           Wall Thickness         0.00         95.0%         Max         Test Pressure (Pipe)         1000         95.0%         Max         Section Length         0         FL           Max Test Pressure (Pipe)         190.0         95.0%         Max         Test Pressure (Pipe)         100.0         90.0%         Section Length         0         FL           Max Test Pressure (Valves and Fittings)         N/A         N/A         N/A         N/A         N/A         N/A         Min.         Section Length         0         FL         Section Length         0 <td></td> <td></td> <td></td> <td>CONSTRUC</td> <td>NON EL REP</td> <td></td> <td>REIESI</td> <td>L REPERENC</td> <td>DRAWINGS</td> <td>ATTACHEDL</td>				CONSTRUC	NON EL REP		REIESI	L REPERENC	DRAWINGS	ATTACHEDL	
Minimum Component Characteristics       Test Pressure Calculations         ippe Information       input: minimum and maximum pressure of test       input: minimum and maximum messure of test         ippe ANSI Class Rating       input: minimum and maximum %SMYS of test       Section Length       0         SMYS       60:000       max. Test Pressure (Pipe)       1900.0       95.0%         Max. Test Pressure (Pipe)       1900.0       95.0%       Max. Elevation Change       0         Rater Pressure (Pipe)       1900.0       95.0%       Max. Elevation Change       0       Ft.         Station Elevation       Max. Test Pressure (Pipe)       1900.0       95.0%       Max.       Pressure (Pipe)       Section Fill Volume       0       Galack         est Pressures       Max. Test Pressure (Pipe)       1900.0       95.0%       Min.       % SMYS       Variance       Target       % SI         Location       Station       (feet)       psig.       @ Max.       psig.       @ Min.       psig.       Pipe.       Pipe.<	POST-INSTALLATION TEST									1000	
Test Medium Water         OD		Test D	esign Criteria				1000	Test Section	- Reference D	ata	
Test Medium Water         OD	Minimum Component Characteristi	CS	Test Pres	sure Calculati	ons						
O.D.       30         Wail Thickness       0.500         Strick ress       0.500         alve/Flange ANSI Class Rating N/A       Input minimum and maximum %SMYS of test       Test Duration       8       Hous (Gal         Max. Test Pressure (Pipe)       1900.0       95.0%       N/A       N/A       N/A         Max. Test Pressure (Valves and Fittings)       N/A       N/A       N/A       N/A       N/A         est Pressures       Max. Test Pressure (Valves and Fittings)       N/A       N/A       N/A       N/A         Location       Station       (feet)       psig.       @ Max.       psig.       @ Min.       Mission       Mission </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Test Medium</td> <td>Water</td> <td></td>								Test Medium	Water		
Wall Thickness       550 SMYS       0500 000         Yalve/Flange ANSI Class Rating N/A       Input minimum and maximum %SMYS of test       Section Ength       0       Ft.         Max. Test Pressure (Pipe)       1960.0       95.0%       N/A       N/A       N/A         Max. Test Pressure (Pipe)       1960.0       95.0%       Section Ength       0       Ft.         Station Equations:       1       2       3         Max. Test Pressure (Pipe)       1960.0       95.0%       Section Ength       0       Ft.         Station Equations:       1       2       3         Max. Test Pressure (Pipe)       1800.0       90.0%       Section Ength       Ahead		Linnut min	imum and maximum	receive of tect		1	1.00		A COMPANY OF THE REPORT OF THE REPORT OF	Hours (mi	
SMYS       60,000       Pressure (pipe)       Pressure (pipe)       % PIPE SMYS       Section Fill Volume       0       Gal         Max. Test Pressure (Valves and Fittings)       1%/A       N/A						1. (d. 5.)			Construction of the construction		
Pressure (psig)         % PIPE SMYS           Max         Test Pressure (Pipe)         1900.0         95.0%           Max         Test Pressure (Pipe)         1900.0         95.0%           Min         Max         Test Pressure (Pipe)         1900.0         95.0%           Min         Elevation Change         0         Pressure           Location         Station         Elevation         Max         % SMYS         Min.         % SMYS         Variance         Target         % SI           Cocation         Station         (feet)         psig.         @ Min.         Msin.         Msin.         Msin.		Input min	nimum and maximum %	6SMYS of test		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	1.		100		
Max         Test Pressure (Pipe)         1900 0         95.0%         Station Equations:         1         2         3           iest Pressures         Max. Test Pressure (Valves and Fittings)         N/A         N/A         N/A         N/A         And	SMYS 60,000					1 - Cho	Sec	tion Fill Volume	0	Gal	
Max         Max         Test Pressure (Views and Fittings)         1900         95.0%         Station Equations:         1         2         3           inin         Max         Test Pressure (Valves and Fittings)         N/A         N/A         N/A         And				Press	ure (psig) % P	IPE SMYS	Max. El	evation Change	0	Ft.	
N/A       Max. Test Pressure (Valves and Fittings)       N/A       N/A       N/A       N/A         Min.       Min.       18C0.0       90.0%       Ahead       Ahead <t< td=""><td>/alve/Flange ANSI Class Rating</td><td>Max. Test Press</td><td>ure (Pipe)</td><td></td><td></td><td>95.0%</td><td></td><td></td><td>1 2</td><td>3</td></t<>	/alve/Flange ANSI Class Rating	Max. Test Press	ure (Pipe)			95.0%			1 2	3	
Min.         1800.0         90.0%         Ahead           Image: Section Sectin Section Section Sectin Section Section Sectin Sect				171 C		CONCERNMENT OF CONCERNMENT OF CONCERNMENT	- and a set				
Test Pressures         Elevation         Max.         % SMYS         Min.         % SMYS         Variance         Target         % SI           Location         Station         (feet)         psig.         @ Max.         psig.         @ Min.         psig.         @ Min.         psig.         @ Min.         psig.         @ Target         % SI           BEGIN         0+00         0         1,900         95.0%         1,800         90.0%         100         1,850         92.           OW ELEVATION         0+00         0         1,900         95.0%         1,800         90.0%         100         1,850         92.           OW ELEVATION         0+00         0         1,900         95.0%         1,800         90.0%         100         1,850         92.           Dead Weight Location (Test Point)         0+00         0         1,900         95.0%         1,800         90.0%         100         1,850         92.           REMARKS:         I         IECORDER SERIAL# 5144-DS         DEADWEIGHT SERIAL# 7683         IHE FABRICATION WILL BE HYDROSTATICALLY TESTED IN THE SHOP. IT IS NOT PRACTICAL TO TEST THE FABRICATION AFTER INSTALLATION IN THE MAINLINE BECAUSE         IHE ADDITION OF THIS VALVE IS BEING EXPEDITED TO MEET DOT COMPLIANCE REQUIREMENTS FOR VALVE SPACING AND TAKE ADVANTGE OF A PLANNED OUT			( and a start at the start g			the second se	1	CONTRACTOR OF THE OWNER			
Image: Second Station       Elevation       Max.       % SMYS       Min.       % SMYS       Variance       Target       % SM         Location       Station       (feet)       psig.       psig.       @ Min.       psig.       psig.       @ Min.       psig.       psig.       @ Min.       psig.       <						00.070	a second s	Allead	PERSONAL DESCRIPTION		
Image: Second Station       Elevation       Max.       % SMYS       Min.       % SMYS       Variance       Target       % SM         Location       Station       (feet)       psig.       psig.       @ Min.       psig.       psig.       @ Min.       psig.       psig.       @ Min.       psig.       <								Contraction .			
Location       Station       (feet)       psig.       @ Max.       psig.       @ Min.       psig.       psig.       @ Ta         EGIN       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         IGH ELEVATION       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         OW ELEVATION       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         ND       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         ead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         ead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         EADRICATION WILL BE HYDROSTATICALLY TESTED IN THE SHOP. IT IS NOT PRACTICAL TO TEST THE FABRICATION AFTER INSTALLATION IN THE MAINLINE BECAUSE       HIS IS AN EXISTING, IN-SERVICE LINE       POST-TEST REVIEWED BY:       TEST PERFORMED / ACCEPTED BY:       POST-TEST REVIEWED BY:       Image: Compliance (signature)       Date: <t< th=""><th>N/A</th><th></th><th></th><th>1</th><th></th><th></th><th></th><th></th><th></th><th></th></t<>	N/A			1							
EGIN         0+00         0         1,900         95.0%         1,800         90.0%         100         1,850         92.           IGH ELEVATION         0+00         0         1,900         95.0%         1,800         90.0%         100         1,850         92.           OW ELEVATION         0+00         0         1,900         95.0%         1,800         90.0%         100         1,850         92.           OW ELEVATION         0+00         0         1,900         95.0%         1,800         90.0%         100         1,850         92.           ead Weight Location (Test Point)         0+00         0         1,900         95.0%         1,800         90.0%         100         1,850         92.           ead Weight Location (Test Point)         0+00         0         1,900         95.0%         1,800         90.0%         100         1,850         92.           ECOREDER SERIAL# 5144-DS         DEADWEIGHT SERIAL# 7683         HE         FABRICATION WILL BE HYDROSTATICALLY TESTED IN THE SHOP. IT IS NOT PRACTICAL TO TEST THE FABRICATION AFTER INSTALLATION IN THE MAINLINE BECAUSE           PSTREAM ON THE LINE.         IEADDITION OF THIS VALVE IS BEING EXPEDITED TO MEET DOT COMPLIANCE REQUIREMENTS FOR VALVE SPACING AND TAKE ADVANTGE OF A PLANNED OUTAGE           PSTREAM ON THE L	N/A		Elevation			Min	% SMYS	Variance	Target	(	
IIGH ELEVATION       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         OW ELEVATION       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         IND       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         IND       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Dead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Need Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         VEEDATION WILL BE HYDROSTATICALLY TESTED IN THE SHOP. IT IS NOT PRACTICAL TO TEST THE FABRICATION AFTER INSTALLATION IN THE MAINLINE BECAUSE       HIS IS AN EXISTING, IN-SERVICE LINE       HE ADDITION OF THIS VALVE IS BEING EXPEDITED TO MEET DOT COMPLIANCE REQUIREMENTS FOR VALVE SPACING AND TAKE ADVANTGE OF A PLANNED OUTAGE         IPSTREAM ON THE LINE.       Test Performed <i>by</i> (Signature): , ,	N/A	Min.		Max.	% SMYS						
OW ELEVATION       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         ND       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Dead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Dead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         VEEMARKS:       Image: Compliance (Signature)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         VEEMARKS:       Image: Compliance (Signature)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         VEEMARKS:       Image: Compliance (Signature)       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         VEECOREDER SERIAL# 5144-DS       DEADWEIGHT SERIAL# 7683       Image: Compliance (Signature)       100       1,850       92.       100       1,850       100       1,850       100       1,85	N/A  Test Pressures  Location	Min. Station	(feet)	Max. psig.	% SMYS @ Max.	psig.	@ Min.	psig.	psig.	@Targ	
ND       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Dead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Dead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Dead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Dead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Dead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         Dead Weight Location (Test Point)       Deade       Its is an Existing (its contraction of the point)       1,800       90.0%       100       1,850       92.         HE FABRICATION WILL BE HYDROSTATICALLY TESTED IN THE SHOP. IT is NOT PRACTICAL TO TEST THE FABRICATION AFTER INSTALLATION IN THE MAINLINE BECAUSE       HE ADDITION OF THIS VALVE IS BEING EXPEDITED TO MEET DOT COMPLIANCE REQUIREMENTS FOR VALVE SPACING AND TAKE ADVANTGE OF A PLANNED OUTAGE	N/A  Test Pressures  Location  EGIN	Min. Station 0+00	(feet) 0	Max. psig. 1,900	% SMYS @ Max. 95.0%	<b>psig.</b> 1,800	@ Min. 90.0%	psig. 100	psig. 1,850	@Targ 92.5%	
Dead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         IEMARKS:       IECOREDER SERIAL# 5144-DS       DEADWEIGHT SERIAL# 7683         HE FABRICATION WILL BE HYDROSTATICALLY TESTED IN THE SHOP. IT IS NOT PRACTICAL TO TEST THE FABRICATION AFTER INSTALLATION IN THE MAINLINE BECAUSE         HIS IS AN EXISTING, IN-SERVICE LINE         HE ADDITION OF THIS VALVE IS BEING EXPEDITED TO MEET DOT COMPLIANCE REQUIREMENTS FOR VALVE SPACING AND TAKE ADVANTGE OF A PLANNED OUTAGE         IPSTREAM ON THE LINE.         PRE-TEST SPECIFIED / REVIEWED BY:         Test Performed by (Signature)         Date:       Test Performed by (Signature):         Place:       Optimizer (Signature)         Date:       Witnessee of Assepted by Et haso Representation.         Witnessee of Assepted by Et haso Representation.       Pate:         Actual MAOP	N/A	Min. Station 0+00 0+00	(feet) 0 0	Max. psig. 1,900 1,900	% SMYS @ Max. 95.0% 95.0%	psig. 1,800 1,800	@ Min. 90.0% 90.0%	psig. 100 100	psig. 1,850 1,850	@Targ 92.5% 92.5%	
Dead Weight Location (Test Point)       0+00       0       1,900       95.0%       1,800       90.0%       100       1,850       92.         IEMARKS:	N/A	Min. Station 0+00 0+00 0+00 0+00	(feet) 0 0	Max. psig. 1,900 1,900 1,900	% SMYS @ Max. 95.0% 95.0%	psig. 1,800 1,800	@ Min. 90.0% 90.0%	psig. 100 100	psig. 1,850 1,850	@Targ 92.5% 92.5%	
REMARKS:       Image: Compliance (Signature)       Date:       Operations (Signature)       Date:       Date:       Operations (Signature)       Date:       Operations (Sign	N/A	Min. Station 0+00 0+00 0+00 0+00	(feet) 0 0 0	Max. psig. 1,900 1,900 1,900	% SMYS @ Max. 95.0% 95.0% 95.0%	psig. 1,800 1,800 1,800	@ Min. 90.0% 90.0% 90.0%	psig. 100 100 100	psig. 1,850 1,850 1,850	@Targ 92.5% 92.5% 92.5%	
RECOREDER SERIAL# 5144-DS       DEADWEIGHT SERIAL# 7683         THE FABRICATION WILL BE HYDROSTATICALLY TESTED IN THE SHOP. IT IS NOT PRACTICAL TO TEST THE FABRICATION AFTER INSTALLATION IN THE MAINLINE BECAUSE         THIS IS AN EXISTING, IN-SERVICE LINE         THE ADDITION OF THIS VALVE IS BEING EXPEDITED TO MEET DOT COMPLIANCE REQUIREMENTS FOR VALVE SPACING AND TAKE ADVANTGE OF A PLANNED OUTAGE         IPSTREAM ON THE LINE.         PRE-TEST SPECIFIED / REVIEWED BY:         TEST PERFORMED / ACCEPTED BY:         OPST-TEST REVIEWED BY:         Date:         Option of the applicable (Signature)         Date:         Option of the applicable (Signature)         Date:         Option of the applicable (Signature)         Date:         Option of the second of th	N/A  Test Pressures  Location  BEGIN  HIGH ELEVATION  OW ELEVATION  SND	Min. Station 0+00 0+00 0+00 0+00 0+00	(feet) 0 0 0 0	Max. psig. 1,900 1,900 1,900 1,900	% SMYS @ Max. 95.0% 95.0% 95.0% 95.0%	psig. 1,800 1,800 1,800 1,800 1,800	@ Min. 90.0% 90.0% 90.0% 90.0%	psig. 100 100 100 100 100	psig. 1,850 1,850 1,850 1,850 1,850	@Targ 92.5% 92.5% 92.5% 92.5% 92.5%	
HE FABRICATION WILL BE HYDROSTATICALLY TESTED IN THE SHOP. IT IS NOT PRACTICAL TO TEST THE FABRICATION AFTER INSTALLATION IN THE MAINLINE BECAUSE         HIS IS AN EXISTING, IN-SERVICE LINE         HIS IS AN EXISTING, IN-SERVICE LINE         HE ADDITION OF THIS VALVE IS BEING EXPEDITED TO MEET DOT COMPLIANCE REQUIREMENTS FOR VALVE SPACING AND TAKE ADVANTGE OF A PLANNED OUTAGE         IPSTREAM ON THE LINE.         PRE-TEST SPECIFIED / REVIEWED BY:         TEST PERFORMED / ACCEPTED BY:         POST-TEST REVIEWED BY:         Originator (Signature)         Date:         Compliance (Signature)         Date:         Compliance (Signature)         Date:         Outer Contractor or for Employaei:         Outer:         Outer:       Oute	N/A  Test Pressures  Location  EGIN  IGH ELEVATION  OW ELEVATION  ND  Dead Weight Location (Test Point)	Min. Station 0+00 0+00 0+00 0+00 0+00	(feet) 0 0 0 0	Max. psig. 1,900 1,900 1,900 1,900	% SMYS @ Max. 95.0% 95.0% 95.0% 95.0%	psig. 1,800 1,800 1,800 1,800 1,800	@ Min. 90.0% 90.0% 90.0% 90.0%	psig. 100 100 100 100 100	psig. 1,850 1,850 1,850 1,850 1,850	@Targ 92.5% 92.5% 92.5% 92.5% 92.5%	
HIS IS AN EXISTING, IN-SERVICE LINE         THE ADDITION OF THIS VALVE IS BEING EXPEDITED TO MEET DOT COMPLIANCE REQUIREMENTS FOR VALVE SPACING AND TAKE ADVANTGE OF A PLANNED OUTAGE         PRE-TEST SPECIFIED / REVIEWED BY:         TEST PERFORMED / ACCEPTED BY:       POST-TEST REVIEWED BY:         Originator (Signature)       Date:       Compliance (signature): , , , , , , , , , , , , , , , , , , ,	N/A  Test Pressures  Location  EGIN  HIGH ELEVATION  OW ELEVATION  ND  Dead Weight Location (Test Point)  REMARKS:	Min. Station 0+00 0+00 0+00 0+00 0+00 0+00	(feet) 0 0 0 0 0	Max. psig. 1,900 1,900 1,900 1,900	% SMYS @ Max. 95.0% 95.0% 95.0% 95.0%	psig. 1,800 1,800 1,800 1,800 1,800	@ Min. 90.0% 90.0% 90.0% 90.0%	psig. 100 100 100 100 100	psig. 1,850 1,850 1,850 1,850 1,850	@Targ 92.5% 92.5% 92.5% 92.5% 92.5%	
THE ADDITION OF THIS VALVE IS BEING EXPEDITED TO MEET DOT COMPLIANCE REQUIREMENTS FOR VALVE SPACING AND TAKE ADVANTGE OF A PLANNED OUTAGE         PRE-TEST SPECIFIED / REVIEWED BY:       POST-TEST REVIEWED BY:         TEST PERFORMED / ACCEPTED BY:       POST-TEST REVIEWED BY:         Date:       Compliance (signature):       POST-TEST REVIEWED BY:         Option:       POST-TEST REVIEWED BY:       Date:         Option:       Compliance (signature)       Date:         Option:       POST-TEST REVIEWED BY:         Option:       Compliance (signature)       Date:         Option:       Compliance (signature)       Date: <td colsp<="" td=""><td>N/A  Test Pressures  Location  EGIN  IGH ELEVATION  OW ELEVATION  ND  EAd Weight Location (Test Point)  EEMARKS:  EECOREDER SERIAL# 5144-DS DEA</td><td>Min. Station 0+00 0+00 0+00 0+00 0+00 0+00 DWEIGHT SERIAL# 7683</td><td>(feet) 0 0 0 0 0 3</td><td>Max. psig. 1,900 1,900 1,900 1,900 1,900 1,900</td><td>% SMYS @ Max. 95.0% 95.0% 95.0% 95.0% 95.0%</td><td>psig. 1,800 1,800 1,800 1,800 1,800</td><td>@ Min. 90.0% 90.0% 90.0% 90.0% 90.0%</td><td>psig. 100 100 100 100 100 100</td><td>psig. 1,850 1,850 1,850 1,850 1,850 1,850</td><td>@Targ 92.59 92.59 92.59 92.59 92.59</td></td>	<td>N/A  Test Pressures  Location  EGIN  IGH ELEVATION  OW ELEVATION  ND  EAd Weight Location (Test Point)  EEMARKS:  EECOREDER SERIAL# 5144-DS DEA</td> <td>Min. Station 0+00 0+00 0+00 0+00 0+00 0+00 DWEIGHT SERIAL# 7683</td> <td>(feet) 0 0 0 0 0 3</td> <td>Max. psig. 1,900 1,900 1,900 1,900 1,900 1,900</td> <td>% SMYS @ Max. 95.0% 95.0% 95.0% 95.0% 95.0%</td> <td>psig. 1,800 1,800 1,800 1,800 1,800</td> <td>@ Min. 90.0% 90.0% 90.0% 90.0% 90.0%</td> <td>psig. 100 100 100 100 100 100</td> <td>psig. 1,850 1,850 1,850 1,850 1,850 1,850</td> <td>@Targ 92.59 92.59 92.59 92.59 92.59</td>	N/A  Test Pressures  Location  EGIN  IGH ELEVATION  OW ELEVATION  ND  EAd Weight Location (Test Point)  EEMARKS:  EECOREDER SERIAL# 5144-DS DEA	Min. Station 0+00 0+00 0+00 0+00 0+00 0+00 DWEIGHT SERIAL# 7683	(feet) 0 0 0 0 0 3	Max. psig. 1,900 1,900 1,900 1,900 1,900 1,900	% SMYS @ Max. 95.0% 95.0% 95.0% 95.0% 95.0%	psig. 1,800 1,800 1,800 1,800 1,800	@ Min. 90.0% 90.0% 90.0% 90.0% 90.0%	psig. 100 100 100 100 100 100	psig. 1,850 1,850 1,850 1,850 1,850 1,850	@Targ 92.59 92.59 92.59 92.59 92.59
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IPSTREAM ON THE LINE.         PRE-TEST SPECIFIED / REVIEWED BY:       POST-TEST REVIEWED BY:         Originator (Signature)       Date:       Test Performed by (Signature): , , , , , , , , , , , , , , , , , , ,	N/A	Min. Station 0+00 0+00 0+00 0+00 0+00 0+00 DWEIGHT SERIAL# 7683 TATICALLY TESTED IN T	(feet) 0 0 0 0 0 3	Max. psig. 1,900 1,900 1,900 1,900 1,900 1,900	% SMYS @ Max. 95.0% 95.0% 95.0% 95.0% 95.0%	psig. 1,800 1,800 1,800 1,800 1,800	@ Min. 90.0% 90.0% 90.0% 90.0% 90.0%	psig. 100 100 100 100 100 100	psig. 1,850 1,850 1,850 1,850 1,850 1,850	@Targ 92.59 92.59 92.59 92.59 92.59	
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Designed Reviewed if applicable (Signature)     Date:     Company Name (for Contractor or for Employee):     9/2 7/63     Engineering or Operations (Signature)     Date:       Compliance (Signature)     Date:     Witnesses a Accepted by ETLaso Representative:     Pate:     Actual MAOP	N/A  Test Pressures  Location  EGIN  GOW ELEVATION  OW ELEVATION  Dead Weight Location (Test Point)  REMARKS:  RECOREDER SERIAL# 5144-DS DEA  HE FABRICATION WILL BE HYDROS'  HIS IS AN EXISTING, IN-SERVICE LIN  HE ADDITION OF THIS VALVE IS BEI  JPSTREAM ON THE LINE.	Min. Station 0+00 0+00 0+00 0+00 0+00 DWEIGHT SERIAL# 7683 TATICALLY TESTED IN T IE NG EXPEDITED TO MEE	(feet) 0 0 0 0 3 HE SHOP. IT IS NOT	Max. psig. 1,900 1,900 1,900 1,900 1,900 PRACTICAL TO REQUIREMEN	% SMYS           @ Max.           95.0%	psig. 1,800 1,800 1,800 1,800 1,800 1,800 ICATION AFTER	@ Min. 90.0% 90.0% 90.0% 90.0% 90.0%	psig.           100	psig. 1,850 1,850 1,850 1,850 1,850 LINE BECAUSI ED OUTAGE	@Targ 92.5% 92.5% 92.5% 92.5% 92.5%	
Designed Reviewed if applicable (Signature)       Date: <b>Operations (Signature) Date: Operations (Signature) Date: Date:</b>	N/A  Test Pressures  Location  EGIN  GOW ELEVATION  OW ELEVATION  Dead Weight Location (Test Point)  REMARKS:  RECOREDER SERIAL# 5144-DS DEA  HE FABRICATION WILL BE HYDROS'  HIS IS AN EXISTING, IN-SERVICE LIN  HE ADDITION OF THIS VALVE IS BEI  JPSTREAM ON THE LINE.	Min. Station 0+00 0+00 0+00 0+00 0+00 0+00 DWEIGHT SERIAL# 7683 TATICALLY TESTED IN T IE NG EXPEDITED TO MEE EVIEWED BY:	(feet) 0 0 0 3 "HE SHOP. IT IS NOT T DOT COMPLIANCE	Max. psig. 1,900 1,900 1,900 1,900 1,900 PRACTICAL TO REQUIREMEN	% SMYS           @ Max.           95.0%	psig. 1,800 1,800 1,800 1,800 1,800 1,800 ICATION AFTER	@ Min. 90.0% 90.0% 90.0% 90.0% 90.0%	psig.           100	psig. 1,850 1,850 1,850 1,850 1,850 LINE BECAUSI ED OUTAGE	@Targ 92.5% 92.5% 92.5% 92.5% 92.5%	
Designed Reviewed if applicable (Signature)       Date:       Company Name (for Contractor or for Employee):       /Date:       Engineering or Operations (Signature)       Date:         Compliance (Signature)       Date:       Witnessee a Accepted by En aso Representative.       Ø 12 7/03       Actual MAOP	N/A	Min. Station 0+00 0+00 0+00 0+00 0+00 0+00 DWEIGHT SERIAL# 7683 TATICALLY TESTED IN T IE NG EXPEDITED TO MEE EVIEWED BY:	(feet) 0 0 0 3 "HE SHOP. IT IS NOT T DOT COMPLIANCE	Max. psig. 1,900 1,900 1,900 1,900 1,900 PRACTICAL TO REQUIREMEN	% SMYS           @ Max.           95.0%	psig. 1,800 1,	@ Min. 90.0% 90.0% 90.0% 90.0% 90.0%	psig.           100	psig. 1,850 1,850 1,850 1,850 1,850 LINE BECAUSI ED OUTAGE	@Targ 92.5% 92.5% 92.5% 92.5% 92.5%	
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Compliance (Signature) Date: Witnesses a necesses by Erraso representative: Øate: Actual MAOP	N/A	Min. Station 0+00 0+00 0+00 0+00 0+00 DWEIGHT SERIAL# 7683 TATICALLY TESTED IN T IE NG EXPEDITED TO MEE SVIEWED BY: Date:	(feet) 0 0 0 0 3 THE SHOP. IT IS NOT T DOT COMPLIANCE TES Test Performed by (S	Max. psig. 1,900 1,900 1,900 1,900 1,900 1,900 PRACTICAL TO REQUIREMEN T PERFORMED Signature):	% SMYS @ Max. 95.0% 95.0% 95.0% 95.0% 95.0% O TEST THE FABR ITS FOR VALVE S 0 / ACCEPTED BY	psig. 1,800 1,800 1,800 1,800 1,800 EXATION AFTER PACING AND TA Date: 27/63 Date;	@ Min. 90.0% 90.0% 90.0% 90.0% 1NSTALLAT KE ADVANT	psig.           100           100           100           100           100           100           100           100           100           100           100           100           100           100           100           100           ION IN THE MAIN           GE OF A PLANNE           POST-TEST           (signature)	psig.           1,850 </td <td>@Targ 92.5% 92.5% 92.5% 92.5% 92.5% 92.5%</td>	@Targ 92.5% 92.5% 92.5% 92.5% 92.5% 92.5%	
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	INSTAL	Project Name: L VALVE 39-1/2	2000 LINE		Project I.D.	AFE Number 6328	Facility Name or Number CASA GRANDE L6775					
_	INSTAL					0320				Calculated Stress Levels		
em Number	P = calculated	D = Outside dia.	t = Wall Thick.	S = SMYS	F = Design	Begin	End			Stress Level (% SMYS)		
omnumbor	Design Pres.(psig)	(inches)	(inches)	(psi)	Factor	Station	Station	Elevation	@ Select.Design Pres.	@ min. test pres	@ max. test pr	
1	1022	30.000	0.438	70,000	0.50	sraight pipe			46.2	88.1	93.0	
2	1000	30.000	0.500	60,000	0.50	tees			47.2	90.0	95.0	
3	1875	16.000	0.500	60,000	0.50	reducing tee			25.2	48.0	50.7	
4	1188	10.750	0.365	35,000	0.50	sraight tee			39.7	75.7	79.9	
5	4764	1.315	0.179	35,000	0.50	sraight pipe			9.9	18.9	19.9	
6	6125	0.840	0.147	35,000	0.50	nipple			7.7	14.7	15.5	
7	1260	30.000	0.375	70,000	0.72	transition piece	(0/s fab. Assy		53.9	102.9	108.6	
8												
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REMARKS:												

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### Request

Additional information on 4 leaks near MP 484 during 2002 hydrotest – documentation shows these were caused by manufacturing defects. Does KM know what type of manufacturing defects (hard spots, seam issues, etc.)?

### Response

The four pressure test failures requested were in Test Section 11 during the 2002 conversion of service (details of the conversion tests are noted in DR-11B\_Conversion of service listing\_CONF).

Pressure	Test Failure tab	le
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Date	Segment	Location	Cause
8/6/2002	CASA GRANDE TO TOM MIX	MP 487 Station	Manufacturing
8/12/2002	CASA GRANDE TO TOM MIX	MP 493 Station	Manufacturing
8/23/2002	CASA GRANDE TO TOM MIX	MP 496 Station	Manufacturing
9/2/2002	CASA GRANDE TO TOM MIX	MP 498 Station	Manufacturing

Note: the stationing has been updated in this table to match the original metallurgical report to allow for easy comparison.

A metallurgical analysis of these four failures was completed on April 17, 2003 and is attached (DR-101\_Att01\_TSIMS 5-2003-0510 Line 2000 Hydrotest 4-03\_CONF.pdf). Excerpts from the conclusion are:

- All four of the hydrotest failures initiated at sites of original manufacturing defects in the forms of part-wall defects, narrow laminations, center-line segregation, and inclusion clusters within the pipe body. One of the sites also demonstrated external corrosion damage with approximately 59% wall loss.
- Visual inspection indicated that the lamination defects observed were less than one-inch wide. Ultrasonic inspection was unable to confirm any additional dimensional aspects of these defects other than near mid-wall positioning.
- Although certain aspects of the microstructural state of Bergrohr pipe steel have presented problems with the original manufacturing defects noted, the benefit of the finegrained microstructural state is manifested in the propensity of this material for a higher fracture toughness response.
- The chemical and mechanical test results for Line 2000 pipe material meet or exceed the minimum requirements stipulated in API5L for Grade X70.
- Fracture mechanics modeling formulated conservative stress intensity factors (KI) for the defect condition at MP 496.9 and confirmed that the rupture initiated at the lamination defect progressing in a radial direction toward the OD surface of the pipe. (*Note: This was the location with external corrosion found*)
- Since the hydrotests exposed the original manufacturing defect conditions, and recognizing that all remaining defects should be sub-critical in size, additional work on this line is not anticipated at this time.

3/10/2022

## Response to NTSB Request from Kinder Morgan Request: DR-101

As related to the external corrosion found at hydrotest failure at MP 496, the in-line inspection for this piggable segment occurred in December 2002 after the pressure testing was completed. So the external corrosion threat was addressed through the pressure test and the in-line inspection.



## Metallurgy Laboratory

Ph: (915)587-3784 FAX: (915)587-3714

TO: Distribution

DATE: April 17, 2003

FROM:

SUBJECT: Line 2000 Hydrotest Ruptures

INTRODUCTION

Hydrotesting Line 2000 during the months of August and September produced four ruptures at MPs 487.5, 493.1, 496.9, and 498.6. All of the ruptured pipe sections were submitted to the Metallurgy Lab for analysis. Although operational background information on this line is unavailable, the pipe is nominally a 30 inch OD, 0.303 inch wall thickness, X70, manufactured by Bergrohr.

#### CONCLUSIONS AND RECOMMENDATIONS

- All four of the hydrotest failures initiated at sites of original manufacturing defects in the forms of part-wall defects, narrow laminations, center-line segregation, and inclusion clusters within the pipe body. One of the sites also demonstrated external corrosion damage with approximately 59% wall loss.
- Hydrotest failures caused by manufacturing defects on this line trace back to as early as 1986, as referenced in a metallurgical report prepared by J. P. Kenny & Partners for the All-American Line Company. One of these failures was within two miles of the rupture experienced at MP 487.5.
- Visual inspection indicated that the lamination defects observed were less than one-inch wide. Ultrasonic inspection was unable to confirm any additional dimensional aspects of these defects other than near mid-wall positioning.
- Although certain aspects of the microstructural state of Bergrohr pipe steel have presented problems with the original manufacturing defects noted, the benefit of the finegrained microstructural state is manifested in the propensity of this material for a higher fracture toughness response.
- The chemical and mechanical test results for Line 2000 pipe material meet or exceed the minimum requirements stipulated in API5L for Grade X70.
- Fracture mechanics modeling formulated conservative stress intensity factors (K<sub>I</sub>) for the defect condition at MP 496.9 and confirmed that the rupture initiated at the lamination defect progressing in a radial direction toward the OD surface of the pipe.

- RSTRENG analysis showed that the external corrosion damage observed at MP 496.9 had reduced the safe maximum operating pressure to 917 psig and projected a burst pressure of 1273 psig. The actual rupture pressure was slightly higher at 1303 psi.
- Since the hydrotests exposed the original manufacturing defect conditions, and recognizing that all remaining defects should be sub-critical in size, additional work on this line is not anticipated at this time.
- Due to the extent of OD corrosion observed at the MP 496.9 location, historical documentation of the CP history and related information should be examined for all piping downstream of former heating stations. The coating at this site may have been particularly effective in shielding the pipe, since it consisted of an inner tape coating, a polyurethane foam insulation layer, plus a heavy tape outer layer, possibly Polyken 956-30.

### LABORATORY PROCEDURE

As-received and close-up photographs were taken of each of the ruptures submitted for analysis. NDE inspection utilizing ultrasonics was performed to determine the extent of the apparent lamination defects intersecting all of the rupture surfaces and to evaluate the extent of wall loss due to OD corrosion. Representative pipe sections from each rupture were torch cut from the general initiation site and submitted to the Lab for metallographic preparation and microhardness testing. Additional pipe material was removed from the hydrotest rupture at MP 496.9 and submitted to METL (Phoenix) for chemical and mechanical property assessment. Fracture mechanics modeling was also performed.

### DISCUSSION

Table I summarizes some of the basic information assigned to each of the four hydrotest ruptures.

### Table I. Summary Data on the Hydrotest Ruptures

MP	Engr. Station	Wall Thickness, inches	Rupture Pressure, psi	Date	Time
487.5		0.299	1290	8/6/02	1:27am
493.1		0.297	1293	8/12/02	3:39pm
496.9		0.297	1303	8/23/02	3:10pm
498.6		0.303	1294	9/02/02	1:20pm

All four ruptures are primarily oriented axially with a significant portion of the rupture planes demonstrating shear fracture conditions. Photograph 1, showing the rupture at MP 493.1, is generally represent of the macroscopic fracture evidence observed at each of the other rupture sites. The predominance of the shear fracture zones confirms high fracture toughness of the pipe material, while the axial portions of the rupture interfaces signify coincidentally the presence of the rupture initiation sites in association with at least two conditional states: 1). The presence of pre-existing (original manufacturing) defects and 2). Corrosion enhanced wall thickness reduction. Details of the axial portions of each of these ruptures are shown in Photographs 2-6. The rupture at MP 487.5 is revealed in Photographs 2 and 3, which document a pre-existing defect condition in the form of an unbounded interface or part-wall defect and at least some portion of a lamination (see arrow locations in Photographs 2 and 3). The defect conditions representative of the MP 493.1 rupture are revealed in Photograph 4.

which have promoted internal separations. These defect conditions were sufficiently narrow to evade ultrasonic detection along the rupture interface.

Photograph 5 shows a portion of the rupture interface for MP 496.9, which reveals significant wall loss (58.8%) due to external corrosion damage. The external coating system used on this portion of the piping was a multi-layer tape system with urethane foam insulation. Small lamination defects can also be observed in Photograph 5.

The rupture at MP 498.6 is shown in Photograph 6. The scalloped contour of this rupture interface is due to a lamination, which was approximately 0.7 inches wide. Since the dimensions of this lamination were measurable, fracture mechanics was utilized for this defect condition.

Transverse metallographic sections were prepared for three of the four failures, with each intersecting the approximate hydrotest rupture origins. Photographs 7 and 8 provide details of the general microstructural features representative of pipe comprising this Bergrohr production. The pipe material represents fine-grained steel, generally banded and alternating in very thin layers of ferrite (light) and carbides (dark). Fibering of small inclusion clusters in linear arrays was also observed. The ASTM grain size equivalent for the ferritic grains is 10+, which serves to optimize strength and fracture toughness (see mechanical test results). The sectioning on the rupture at MP 487.5 documents the size and distribution of the inclusion clusters found intersecting this portion of the rupture interface. Photographs 9-11 show the inclusions in close proximity to the rupture interface. Since the original slabs that were rolled into plate as a precursor for pipe manufacturing were continuously cast, some portion of the inclusions are probably representative of center-line segregation. However, the general microstructural state is the same that was shown in Photographs 7 and 8.

The remaining transverse metallographic section is shown in Photograph 12. As shown in this photograph, the corrosion is in the form of overlapping pits with some demonstration of preferential microstructural corrosion. This rupture site was the only site which demonstrated significant corrosion damage. UT wall thickness readings were performed from the ID-side of the pipe along an axial distance of six-feet adjacent to the rupture. The maximum pit depth was 0.055 inches, while the average pit depth was less at 0.034 inches. RSTRENG analysis for the B31G (Case 3) criterion demonstrated that the safe maximum pressure for this line would have been 917 psig.

Nondestructive testing utilizing ultrasonic instrumentation indicated that the internal separations were extremely narrow and virtually undetectable, which is typical for inclusion chains and accompanying center-line segregation. However, the rupture at MP 498.6 exposed the entire width of a lamination that measured approximately 0.7 inches.

The tensile test results provided by METL (Phoenix) substantiated the API5L X70 Grade for this pipe with a 0.2% offset (per ASTM A370) and 0.5% gage length intercept (per API5L) yield strength in excess of 77,000 psi in the circumferential orientation. The tensile strength averaged 98,500 psi with 21% elongation.

Figure 1 portrays the Charpy V-Notch test results for test temperatures up to 212°F. These results satisfy the API5L Supplementary Requirement 5 (SR5) for minimum shear area, while the absorbed energy values at 32°F averaged 75 ft-lb for a full size equivalent sample size. The chemical analysis results are listed under Table II.

Averaged CVN Test Results (for full-size equivalent samples)

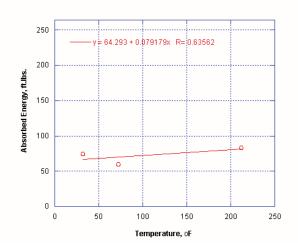


Figure 1. CVN test results for Line 2000 pipe material.

Using the fracture mechanics approach used in the hydrotest failure investigation on this same line at MP 945.1 (report dated June 13, 2002), a circumferential lamination of width (2a) is used to model the pipe defect and its influence on rupture behavior during hydrotesting (see Figure 2). The membrane stress represents the hoop stress and the parameters,  $G_m$  and  $G_b$ , can be computed based on the flaw size width (2a), pipe radius (R), and pipe wall thickness (t). Utilizing the actual hydrotest rupture pressure of 1294 psi for MP 498.6, K<sub>1</sub>, and the stress intensity factor for the outer and inner membrane surfaces can be calculated. Although the boundary conditions for plane strain conditions are not satisfied for these pipe dimensions, conservative predictions of the critical stress intensity factor can be determined. For this case, K<sub>1</sub> for the inner pipe surface was 58.8 ksi (in.)<sup>1/2</sup>, while the outer pipe surface was 75.6 ksi (in.)<sup>1/2</sup>. The difference in stress intensity magnitude suggests that the rupture initiated in the outer membrane first along the lamination interface and progressed to the inner membrane as the longitudinal interface grew radially and axially.

In a metallurgical report prepared by J. P. Kenny & Partners for the All-American Line Company, dated June 1986 and entitled "Metallurgical Report on Field Hydrotest Failures in Bergrohr/Herne Line Pipe," two hydrotest failures were investigated from MPs 485.25 and 471.9. The J. P. Kenny report actually contained a metallurgical analysis by the original plate manufacturer, Peine-Salzgitter, based on their production records and analysis of the hydrotest failures submitted. The rupture pressures for both of these locations were 1129 psi (86%SMYS) and 1179 psi (89.9% SMYS), respectively. Peine-Salzgitter formulated that the first failure was due to an original manufacturer defect referred to as a part-wall defect and the latter due to a high volume fraction of Al<sub>2</sub>O<sub>3</sub> and CaO inclusions. The chemical analysis quoted for the aforementioned pipe sections is listed in Table II.

Table II. Chemical analysis results for the pipe at MP 496.9 compared to two former hydrotest failure sites referenced in the Kenny report (weight percentages)

MP	C	Mn	Р	S	Si	Cu	Ni	Cr	V	Nb	AL
496.9	0.09	1.60	0.012	0.001	0.43	0.01	0.09	0.04	0.05	0.06	0.030
*485.2	0.10	1.49	0.015	0.003	0.46	0.02	0.02	0.02	0.06	0.03	0.036
*471.9	0.08	1.49	0.014	0.005	0.43	0.1	0.06	0.02	0.06	0.03	0.032
API5I X70 (max )	0 23	1 60	0.030	0.030							

\*Information provided in the Kenny Report

These chemistries appear well designed and appropriate for the X70 Grade. Although the Peine-Salzgitter ultrasonic slab inspection reports did not reveal any problems with the steel prior to plate rolling in the case of the first failure, the second failure indicated that ultrasonic inspection did pick up minor readings of "chain-like inclusions." The source of these inclusion defects was hypothesized to be due to a build-up of de-oxidation products in the continuously cast steel slab tundish, which for some unknown reason dropped into the slab caster and rolled out in the plate product. Peine-Salzgitter admitted that the cause for both hydrotest failures was their original manufacturing defects.

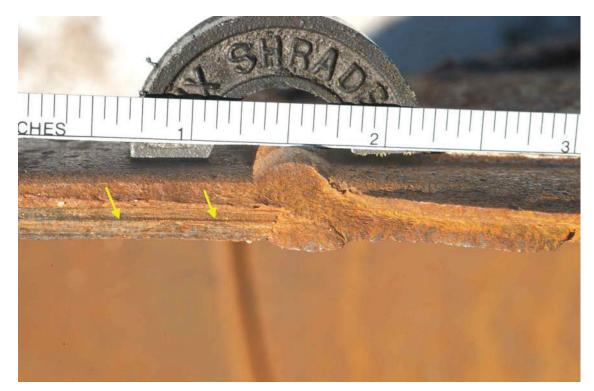
With the impact samples returned from METL, one of the samples was chosen at random and examined using the SEM/EDS system. All of the impact samples demonstrated high proportions of shear fracture evidence as well as mid-span delaminations. In order to understand the fracture characteristics of this pipe steel and the relevance of the fibering or inclusion clusters observed in the microstructural state, a SEM study of one of the fractured impact samples located numerous residual inclusions. One of the inclusions observed is referenced in Photograph 13, which was confirmed by EDS to be mostly a particle composed of calcium sulfide. Since CaO or burnt lime is added during steel production operations to aid in desulfurization, residual CaS dispersed within the steel indicates that the slag-off process was not fully effective. The linear morphology of these inclusion particles is further illustrated in Photograph 13 by noting the two "tracks" of former sites of inclusion particles. The balance of the fracture evidence confirms dimple rupture and shear fracture predominance.

DISTRIBUTION

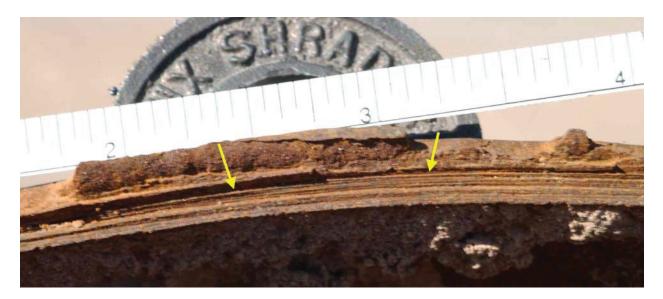




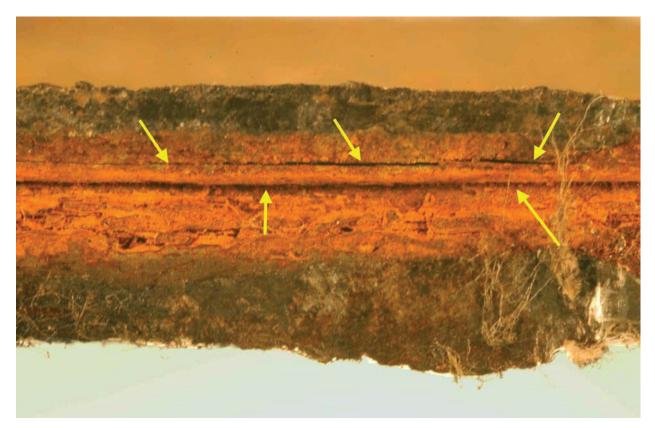
Photograph 1. Representative documentation of the hydrotest rupture at MP 493.1.



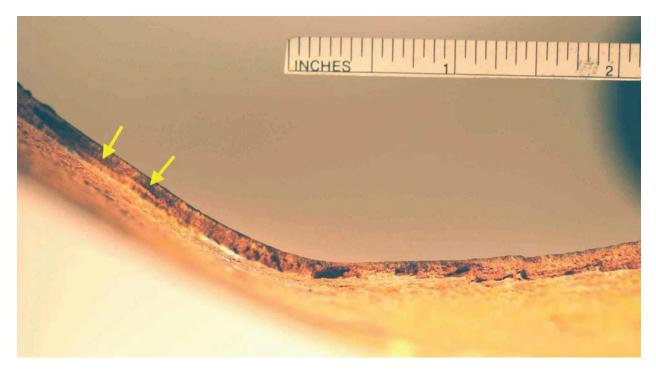
Photograph 2. A portion of the hydrotest rupture surface at MP 487.5 showing the part-wall defect (arrows).



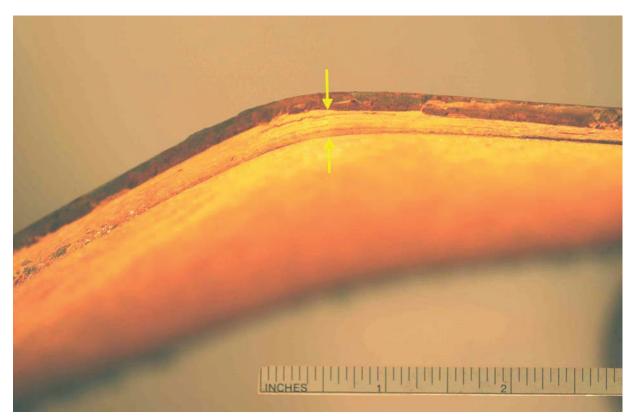
Photograph 3. Another portion of the hydrotest rupture surface at MP 487.5 showing more of the part-wall defect (arrows).



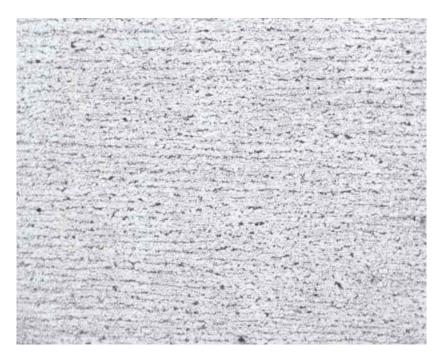
Photograph 4. A portion of the rupture surface at MP 493.1 showing the intersection of two laminations. Approximately 6X.



Photograph 5. A portion of the rupture surface at MP 496.9 showing significant wall loss due to external corrosion and a shallow lamination (see arrows).



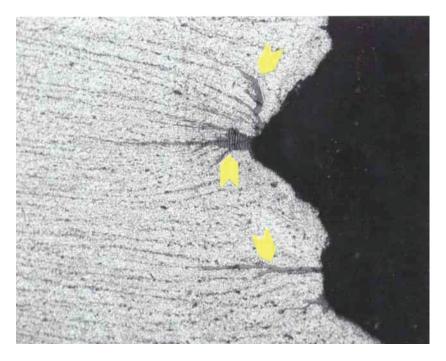
Photograph 6. A portion of the rupture surface at MP 498.6 showing exposure of the contained lamination (arrows).



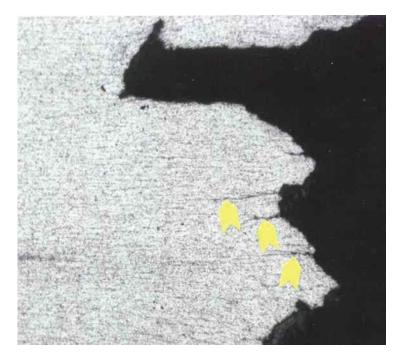
Photograph 7. Representative microstructural features of the pipe steel at MP 487.5 with finegrained, banded ferrite and pearlite. 100X. Nital reagent.



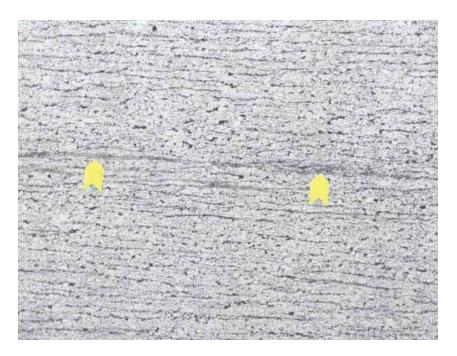
Photograph 8. A close-up of the microstructural features of the pipe steel with alternating layers of ferrite (light) and pearlite (dark). 800X. Nital reagent.



Photograph 9. Representative microstructural features of the pipe steel along the rupture interface at MP 487.5 showing the inclusion enrichment (arrows). 100X. Nital reagent.



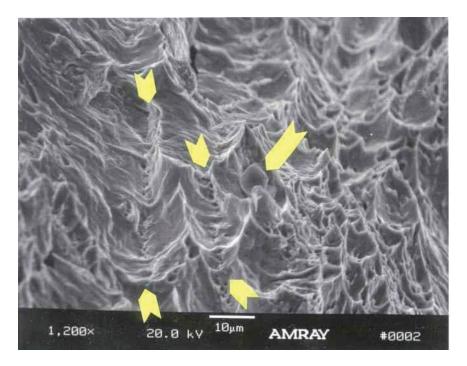
Photograph 10. More general view of the microstructural features of the pipe steel along the rupture interface at MP 487.5 showing the inclusion enrichment (arrows). 50X. Nital reagent.



Photograph 11. Representative microstructural features of the pipe steel along the rupture interface at MP 487.5 showing some minor inclusion clusters (arrows). 100X. Nital reagent.



Photograph 12. Representative microstructural features of the pipe steel at MP 496.9 OD surface corrosion in the form overlapping pits. 100X. Nital reagent.



Photograph 13. SEM fractograph showing a CaS particle (large arrow), two linear arrays of former inclusion sites (see smaller arrows), and shear fracture evidence. 1200X.

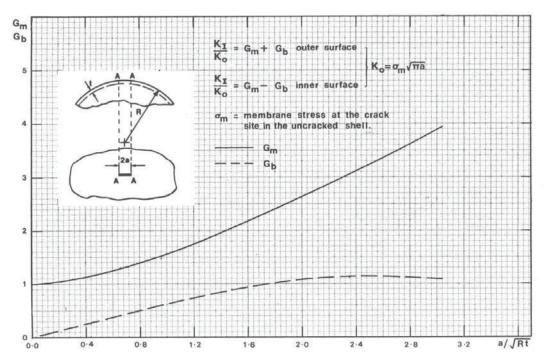


Figure 2. The stress intensity relationship for a crack in a spherical shell subjected to a uniform membrane stress. Ref: D. P. Rooke and D. J. Cartwright, <u>Compendium of Stress Intensity</u> <u>Factors</u>, Hillingdon Press, Uxbridge, 1974, p. 328.