ENCLOSURE 1 TO NL-13-147

IP-CALC-13-00062, R1

EVALUATION OF LEAK AT LINE 1093 IN UNIT 3 MOAT

ENTERGY NUCLEAR OPERATIONS, INC
INDIAN POINT NUCLEAR GENERATING UNIT NO. 3
DOCKET NO. 50-286

☐ ANO-1 ☐ ANO-2 ☐ GGNS ☐ IP-2 ☒ IP-3 ☐ PLP
☐ JAF ☐ PNPS ☐ RBS ☐ VY ☐ W3
☐ NP-GGNS-3 ☐ NP-RBS-3

CALCULATION COVER PAGE	(1) **EC #** 47540	(2) **Page 1 of** 7

(3) Design Basis Calc. ☐ YES ☒ NO | (4) ☒ CALCULATION ☐ EC Markup

(5) **Calculation No: IP-CALC-13-00062**	(6) **Revision: 1**
(7) **Title: Evaluation of Leak at Line 1093 in Unit 3 Moat**	(8) **Editorial** ☐ YES ☒ NO
(9) **System(s): SW**	(10) **Review Org (Department): Civil/Structural**

(11) **Safety Class:**	(12) **Component/Equipment/Structure Type/Number:**	
☒ **Safety / Quality Related** ☐ **Augmented Quality Program** ☐ **Non-Safety Related**	**Line 1093**	
(13) **Document Type: CALC**		
(14) **Keywords (Description/Topical Codes):** **SW**		

REVIEWS

(15) Name/Signature/Date	(16) Name/Signature/Date	(17) Name/Signature/Date
Kai Lo 10-30-2013 [signature]	G. Bhalla 10-30-2013 [signature] 10/30/2013	R. Drake [signature] 10/31/13
Responsible Engineer	☒ **Design Verifier** ☒ **Reviewer** ☐ Comments Attached	**Supervisor/Approval** ☐ Comments Attached

CALCULATION REFERENCE SHEET	*CALCULATION NO: IP-CALC-13-00062* REVISION: 1

I. EC Markups Incorporated (N/A to NP calculations)
1.
2.
3.
4.
5.

II. Relationships:	Sht	Rev	Input Doc	Output Doc	Impact Y/N	Tracking No.
1.			☐	☐		
2.			☐	☐		
3.			☐	☐		
4.			☐	☐		
5.			☐	☐		

III. CROSS REFERENCES:

1. ENN-DC-185, "Through-Wall Leaks in ASME Section XI Class 3 Moderate Energy Piping Systems"
2. EN-CS-S-008-MULTI Rev. 0, "Pipe Wall Thinning Structural Evaluation"
3. ASME Code Case N513-3
4. USAS B31.1, Power Piping Code, 1967 & 1973
5. ASME B & PV Code, Section XI, 2001 edition
6. CR-IP3-2013-04174
7. CR-IP3-2013-04416
8. UT report **IP3-UT-13-058**
9. VT report IP3-VT-13-021

IV. SOFTWARE USED:

Title:________ Version/Release:________ Disk/CD No.______

V. DISK/CDS INCLUDED:

Title:________ Version/Release________ Disk/CD No.______

VI. OTHER CHANGES:

Revision	Record of Revision
0	Initial issue.
1	Revised cover page 1, through 5 based on VT report IP3-VT-13-021. Revised Attachment A, page 4 and 5.

LIST OF EFFECTIVE PAGES

Calculation Number: IP-CALC-13-00062 Revision Number: 1

PAGE	REV.	PAGE	REV.	PAGE	REV.
All	0				
1 to 5	1				
6, 7	1				
Att. A p.1 to 3	0				
Att. A p.4, 5	1				
Att B p. 1 to 7	0				
Att B p. 8, 9	1				

Topic **Page No.**

Total number of pages: 23 pages

6.0 Calculation Section

6.1 Background

On October 3, a through wall weeping leak was identified and later determined not to be an active leak on the 10"-1093 pipe in the Unit 3 moat in the transformer yard. An area was identified of missing metal of the pipe wall thickness approximately equals to ¾" x 3". The degraded pipe location is in the ISI code boundary.(See CR-IP3-2013-04174). There are two other areas approximately 20 feet away that show evidence of external corrosion. Structural operability evaluation is needed.
On October 29, after the removal of the support and coating on the pipe to facilitate the installation of a temporary repair clamp (EC-47124), the portion of the defect that is close to the bottom of pipe became more accessible. The length of the defect along the circumferential direction was found to be 8.25" (IP3-VT-13-021) instead of 4.75" (IP3-UT-13-058).

6.2 Purpose

The purpose of this calculation is twofold:

1. To determine the allowable through wall flaw length per ASME CC N-513-3. If the actual flaw including the leak is less than the allowable flaw length, then the pipe will be structurally adequate and operable.
2. To determine the minimum required pipe wall thickness per EN-CS-S-008-MULTI for the two areas that show external corrosion.

6.3 Method of analysis

1. The pipe is typically buried but is temporary supported every 8 feet. The pipe's bending stress is based on the 8 feet pipe span. The equivalent static method using the peak seismic acceleration from the ground response spectra is used in the determination of the pipe stress.

2. The pipe wall thickness around the 2" by 8.5" defect is based on 0.319", 87.5% of the nominal pipe wall thickness basing on the UT and VT report. The lowest of the five UT readings is 0.378" and visually the pipe surface around the defective area is in good, un-corroded condition.

3. For the through wall indication location, the allowable flaw length in the circumferential and axial direction are determined per CC-N513-3.

4. The minimum pipe wall thickness is determined based on EN-CS-S-008-MULTI. The lowest UT thickness from the two externally corroded locations is compared to the minimum required pipe wall thickness and the remaining service life is determined.

6.4 Assumption

1. For the through wall indication location (area#3), the adjusted wall thickness is the average value of the five UT readings around the defective area (2.5" by 4.75"), namely 0.382". The calculation conservatively uses 0.319". This value is judged to be conservative for the good, non-corroded metal surface around the newly found, lengthened defect area identified in the IP3-VT-13-00021.
2. For the average circumferential pipe wall thickness at the leak location area #3, 80% of the pipe's nominal wall thickness is used. This is conservative because the wall thinning is externally induced by failed coating and is usually localized around the damaged coating location.

6.5 Design Input

1. Pipe Specification TS-MS-027
2. USAS B31.1, Power Piping Code, 1967 & 1973
3. Drawing 9321-F-22363

4. UT report IP3-UT-13-058
5. VT report IP3-VT-13-021

6.6 Reference

1. EN-CS-S-008-MULTI Rev. 0, "Pipe Wall Thinning Structural Evaluation"
2. ASME Code Case N513-3
3. USAS B31.1, Power Piping Code, 1967 & 1973
4. ASME B & PV Code, Section XI, 2001 edition
5. CR-IP3-2013-04174
6. CR-IP3-2013-04416
7. UT report IP3-UT-13-058
8. VT report IP3-VT-13-021
9. EC 47127

6.7 Calculation

See Attachment A.

6.8 Conclusion

1. Based on CC-N513-3, with an adjusted pipe wall thickness of 0.319", the allowable thorough wall flaw length in the circumferential direction is 9", greater than the measured 8.25"; the allowable thorough wall flaw length in the axial direction is 4.7", greater than the measured 2.5". The pipe is structurally adequate and operable. For 1.5 year of service until the outage, with an estimated average corrosion rate of 12 mils per year, the estimate flaw will be 2.54" axially and 8.29" circumferentially.
2. The minimum pipe wall thickness per EN-CS-S-008-MULTI is 0.073", less than the UT measured lowest reading of 0.109" at area #2 & 3. The remaining service life is 4.6 years unless if damaged coating is not repaired.
3. The original CR has identified occasional intermittent weepage at location area 1 at node point 4 on the weld. This has been identified as a pin hole leak with the entire area above the minimum wall thickness. This area is enveloped by the previous CCN513-3 evaluation for area 3.

Attachment A

P = design pressure =	150	psi		
D = outside diameter =	10.75	in		
t = nominal wall thickness =	0.365	in		
S = section modulus =	29.9	in3		
L = pipe span =	8	ft =	96	in
w = uniformn weight of pipe, water & cement lining=	84.2	plf =	7.017	#/inch

Conservatively consider the pipe as simple support

Ma = moment due to DW = $wL^2/8$ =	8083	in-lb		
Ma/S =	270	psi		
For P + DW:				
the leak section is at a straight pipe				
0.75i =	1.0			
PD/4t =	1104	psi		
PD/(4t) + 0.75i(Ma/S) =	1375	psi < Sh =	15000	psi

Using the peak G from DBE ground response spectra for 0.5% damping

MRM = multi modal response multiplier =	1.5			
Gh = horizontal seismic acceleration =	0.64			
Gv = vertical seismic acceleration =	0.427			
Gr = $[Gh^2 + Gv^2]^{0.5}$ =	0.769			
MRM(Gr) =	1.154			
Mb = seismic moment = MRM(Gr)(Ma) =	9326	in-lb		
Ma + Mb =	17409	in-lb		
PD/(4t) + 0.75i(Ma + Mb)/S =	1687	psi < 1.8Sh =	27000	psi
For OBE				
MRM = multi modal response multiplier =	1.5			
Gh = horizontal seismic acceleration =	0.427			
Gv = vertical seismic acceleration =	0.284			
Gr = $[Gh^2 + Gv^2]^{0.5}$ =	0.513			
MRM(Gr) =	0.769			
Mb = seismic moment = MRM(Gr)(Ma) =	6217	in-lb		
Ma + Mb =	14301	in-lb		
PD/(4t) + 0.75i(Ma + Mb)/S =	1583	psi < 1.2Sh =	18000	psi

1. Design Parameters

(Boxed values are input)

D_o: Outside Diameter, (in)	10.75
t_{nom} : Nominal Thickness, (in)	0.365
Material	A53 Gr B
P : Design Pressure, (psi)	150
T : Design Temperature, (°F)	160
S_h : Allowable Stress at Design Temperature, (psi) (See App. A of B31.1)	15000
S_A : Thermal Expansion Allowable Stress , (psi)	22500
A : An additional thickness per Section 104.1 of B31.1, (in)	0

2. Prediction of Min. Thickness at Next Inspection, t_P

t_{meas} : Measured thickness of latest inspection, (in)	lowest UT	0.109
W_r : Wear Rate (in/yr)		0.00711
Y : Service years between the latest and next inspections, (yr)		1.5
SF : Safety factor	(1)	1.1
Projected thermal cycles between the latest and next inspections		80
$t_P = t_{meas} - SF*W_r*Y$, (in)		0.0973
$R_o/t_p \leq 50$, "OK"; or > 50, "Buckling Evaluation Required"	R_o/t_p = 55	Buckling Eval Req

b = estimate width of thinned section =			12.30
Based on clamp support at 4 edges, allowable buckling stress = $8.46E(t_p/b)^2$ =	14760	psi $< S_h$	
Actual compressive stress = $[S_{nor} - PD/(4t_{nom})](t_{nom}/t'_p)(I'/i)$	1014	psi, o.k.	15000
Actual compressive stress = $[S_{ups} - PD/(4t_{nom})](t_{nom}/t'_p)(I'/i)$	1795	psi, o.k.< $1.2S_h$ =	18000
Actual compressive stress = $[S_{emg} - PD/(4t_{nom})](t_{nom}/t'_p)(I'/i)$	2185	psi, o.k.< $1.8S_h$ =	27000

3. Screening Rules for Pipe Wall Thinning

Rule 1: Acceptance Standard = $0.875*t_{nom}$		0.319
Rule 2: Minimum Required Thickness		
$0.3*t_{nom}$ for Class 1	(2), (3)	0.110
$0.2*t_{nom}$ for Class 2 or 3		0.073
Rule 3: Between the above two limits, wall thinning can be accepted by a structural evaluation		

Action required based on the above screening rules for the inspected thinned pipe

Class 1 piping	Replace or repair
Class 2 or 3 piping	Structural Evaluation Req'd

4. Structural Evaluation

a. Minimum Thickness for Hoop Stress :

$t_{min} = P*D_o/[2(S_h+.4*P)] + A$, (in) 0.054

b. Minimum Thickness for Axial Stress : (4)

Is the thermal expansion stress required to be evaluated? (No for $t_p \geq 0.75*t_{nom}$ and cycles $\leq$ 150; Yes for otherwise)	Yes
K_{Nor} : Allowable stress increase factor for Normal Condition	1.0
K_{Ups} : Allowable stress increase factor for Upset Condition	1.2
K_{Emg} : Allowable stress increase factor for Emergency Condition	1.8
γ : Allowable stress increase factor for CC-N-597	1.143

Original Piping Stresses

S_{Nor} : Normal Condition Stress, (psi)	1375
S_{Ups} : Upset Condition Stress, (psi)	1583
S_{Emg} : Emergency Condition Stress, (psi)	1687
S_{The} : Thermal Expansion Stress, (psi)	0

Let t^a_{min} =		0.029
i =		1.0
i' =	(5)	1.0
i' / i =		1.000
$Z/Z' = [D_o^4 - (D_o-2t_{nom})^4]/[D_o^4 - (D_o-2t^a_{min})^4]$	(6)	11.45

Allowable Stress - Axial Stress ≥ 0

Normal conditions:	$\gamma * K_{Nor} * S_h - [P*D_o/4t^a_{min} + (i'/i)*(S_{Nor} - P*D_o/4t_{nom})*(Z/Z')] \geq 0$	148
Upset conditions:	$\gamma * K_{Ups} * S_h - [P*D_o/4t^a_{min} + (i'/i)*(S_{Ups} - P*D_o/4t_{nom})*(Z/Z')] \geq 0$	1195
Emergency conditions:	$\gamma * K_{Emg} * S_h - [P*D_o/4t^a_{min} + (i'/i)*(S_{Emg} - P*D_o/4t_{nom})*(Z/Z')] \geq 0$	10291
Normal and Ther. Expansion conditions:	$\gamma * (S_h + S_A) - [P*D_o/4t^a_{min} + (i'/i)*(S_{Nor} - P*D_o/4t_{nom} + S_{The})*(Z/Z')] \geq 0$	25865

c. Minimum Required Thickness

Class 1:	$t'_{min} = Max. [t_{min}, t^a_{min}, 0.3*t_{nom}]$, (in);	Acceptable if $t_P \geq t'_{min}$	0.110	No
Class 2 & 3:	$t'_{min} = Max. [t_{min}, t^a_{min}, 0.2*t_{nom}]$, (in);	Acceptable if $t_P \geq t'_{min}$	0.073	Yes

5. Remaining Service Life (RSL)

Class 1:	$RSL = [t_{meas} - t'_{min}]/(SF*W_r)$, (yr)	-0.1
Class 2 & 3:	$RSL = [t_{meas} - t'_{min}]/(SF*W_r)$, (yr)	4.6

Notes:

(1) The wear rate will be obtained from Responsible FAC Engineer or based on the Attachment 7.7.

(2) The acceptance standard ($0.875t_{nom}$) can not be applied to:
1. Class 1 short radius elbows,
2. Reinforcement area of a tee or branch connection, and
3. For regions of piping designed to specific wall thickness requirements, such as counterbores or weld attachments.

(3) For the small end of reducers, the standard shall be based on the t_{nom} of the pipe size at the small end. For the large end, the large end transition and the conical portion, it shall be based on the t_{nom} of the pipe size at the larger end.

(4) The formula is applicable for straight pipes, bends, and elbows.
For reducers, t_{min} at each end shall be equal to t_{min} of straight pipe of the same nominal size as the reducer end.
For the conical portion and transition at larger end of reducers, t_{min} shall be that of the large diameter pipe end.
For branch connections and tees, the reinforcement area of the opening shall be based on the B31.1 code.

(5) t^a_{min} can be obtained by the "Trial and Error" method until the "Allowable Stress - Axial Stress" due to Normal, Upset, Emergency, and combined Normal and Thermal Expansion conditions are all positive and one of them shall be close to zero.

(6) *(i) can be calculated from Appendix D of ANSI B31.1. (i') needs to be adjusted for the pipe wall thinning.*
It is suggested that the average thickness or 2 times of the original value be used for the i' calculation.

A. Pipe Parameters

D_o = Pipe OD (in)		10.75
t_{adj} = Pipe wall thickness at flaw location (in)	lowest of 4 readings is 0.378", used $0.875t_{nom}$ =	0.319
t_{ave} = average wall thickness of pipe circumference based on UT report (in)	cons. use $0.8t_{nom}$	0.290
t_{nom} = nominal pipe wall thickness (in)		0.365
p_d = Design Pressure (psi)		150
p_o = Operational Pressure (psi)	(< 275 psig)	90
T = Metal Temperature at evaluation(°F)	(< 200°F)	70
E = elastic modulus at T (ksi)		27800
v = poison ratio		0.3
J_{1c} = material toughness (lb/in)	7161.6	45
S = allowable stress for pipe (ksi)	1104	15
i = SIF = stress intensification factor used in the stress analysis		1.00

Service Level		A	B	C	D
$p_dD_o/(4t_{nom})$ or from stress summary: Axial stress due to design pressure (ksi)		1.10	1.10	1.10	1.10
$s = p_dD_o/(4t_{nom}) + (0.75i)\sigma_b$: Piping Axial Stress (ksi, from stress output)		1.37	1.58	1.69	1.69
SF_m : Level A = 2.7; Level B = 2.4; Level c = 1.8; Level D = 1.3	[C-2621& 2622]	2.7	2.4	1.8	1.3
SF_b : Level A = 2.3; Level B = 2.0; Level c = 1.6; Level D = 1.4	[C-2621]	2.3	2.0	1.6	1.4
R_m = pipe mean radius (in) = $(D_o - t)/2$					5.216
$E' = E/(1 - v^2)$					30549
K_{1c} = material critical stress intensity factor $=J_{1c}{}^*E'/1000)^{0.5}$ (ksi(in)$^{0.5}$)					37.08

B. Evaluate as a planar flaw in axial direction

(Based on LEFM C-7400 & N513-2, I-3.0)

Service Level		A	B	C	D
c = *ℓ/2* = Half axial flaw length (in)	, try "c" to make $K_{Ic} - K_I >= 0.0$	3.21	2.35	2.96	3.82
p = pressure for the service level condition		90	150	150	150
$\sigma_h = p'^*D_o/(2t)/1000$ (ksi)		1.52	2.53	2.53	2.53
For through wall flaw, a = c :					
$\lambda = c/(tR_m)^{0.5}$		2.49	1.82	2.29	2.96
$F = 1 + A\lambda + B\lambda^2 + C\lambda^3 + D\lambda^4 + E\lambda^5$		2.85	2.25	2.67	3.26
Where A= 0.0724 B= 0.6486 C= -0.2327 D= 0.0382		E=	-0.0023		
$K_{Ic} - K_I = K_{Ic} - K_{Im} = (SF_m)F\sigma_h(\pi c)^{0.5}$	(ksi(in)$^{0.5}$)	0.00	0.00	0.00	0.00
flaw length "2c"		6.42	4.70	5.91	7.64

Allowable Axial Flaw Length = Smaller "2c" of four service levels (in.) = 4.70

C. Evaluate as a planar flaw in circumferential direction

Service Level		A	B	C	D
(0.75i) >= 1.0		1.00	1.00	1.00	1.00
$\sigma'_b = (s - p_dD_o/(4t_{nom})/(0.75i)$	(ksi)	0.27	0.48	0.58	0.58
$\sigma_b = \sigma'_b[D_o^4 - (D_o - 2t_{nom})^4]/[D_o^4 - (D_o - 2t_{ave})^4]$	(ksi)	0.334	0.590	0.718	0.718
p = pressure at the service level		90	150	150	150
$\sigma_m = pD_o/(4t_{ave})$: Axial stress due to service pressure (ksi)		0.83	1.39	1.39	1.39
K_{Ic} =		37.1	37.1	37.1	37.1
For through wall flaw, based on a = c					
c : Half circumferential flaw length	, try "c" to make $K_{Ic} - K_I > 0.0$	6.32	4.81	5.65	6.68
$\alpha = c/(\pi R_m)$		0.386	0.293	0.345	0.407
$r = R_m/t$		16.3	16.3	16.3	16.3

		i= 0	1	2	3	A	B	C	D
$A_m = A_{m0} + A_{m1}{}^*r + A_{m2}{}^*r^2 + A_{m3}{}^*r^3$	A_{mi}	-2.0292	1.6776	-0.0799	0.0018	11.7	11.7	11.7	11.7
$B_m = B_{m0} + B_{m1}{}^*r + B_{m2}{}^*r^2 + B_{m3}{}^*r^3$	B_{mi}	7.0999	-4.4239	0.2104	-0.0046	-29	-29	-29	-29
$C_m = C_{m0} + C_{m1}{}^*r + C_{m2}{}^*r^2 + C_{m3}{}^*r^3$	C_{mi}	7.7966	5.1668	-0.2458	0.0054	50.2	50.2	50.2	50.2
$A_b = A_{b0} + A_{b1}{}^*r + A_{b2}{}^*r^2 + A_{b3}{}^*r^3$	A_{bi}	-3.2654	1.5278	-0.0727	0.0016	9.3	9.3	9.3	9.3
$B_b = B_{b0} + B_{b1}{}^*r + B_{b2}{}^*r^2 + B_{b3}{}^*r^3$	B_{bi}	11.363	-3.9141	0.1862	-0.0041	-21	-21	-21	-21
$C_b = C_{b0} + C_{b1}{}^*r + C_{b2}{}^*r^2 + C_{b3}{}^*r^3$	C_{bi}	-3.1861	3.8476	-0.1830	0.0040	28.4	28.4	28.4	28.4
$F_m = 1 + A_m{}^*\alpha^{1.5} + B_m{}^*\alpha^{2.5} + C_m{}^*\alpha^{3.5}$						2.90	2.19	2.55	3.12
$F_b = 1 + A_b{}^*\alpha^{1.5} + B_b{}^*\alpha^{2.5} + C_b{}^*\alpha^{3.5}$						2.32	1.89	2.11	2.44
$K_{Ic} - K_I = K_{Ic} - [(SF_m)(\pi c)^{0.5}(\sigma_m F_m) + SF_b(\pi c)^{0.5}(\sigma_b{}^*F_b)] \geq 0.0$						0.0	0.0	0.0	0.0
Flaw length (2c) =						12.65	9.61	11.30	13.35

Allowable Circumferential Crack Length = Smaller "2c" of 4 service levels (in.) = 9.61

D. Determine the flaw length from the UT report using the adjusted wall thickness, t_{adj}

L_{axial} = length of through wall flaw in the axial direction of the pipe (inch)	2.5"+1.5(2)(.012) =	2.54	**< allow flaw, O.K**
L_{circ} = length of through wall flaw in the circumferential direction of the pipe (inch)	8.25" + 1.5(2)(.012)=	8.29	**< allow flaw, O.K**

E. Minimum remaining ligament thickness requirement

[N-513-3, 3.2(d)]

$t_{min} = P_d{}^*D_o/[2(S+.4{}^*P_d)] + A$, (in), A= 0			0.054
$d_{adj} = 1.5[R_m t_{adj}]^{0.5}(t_{adj} - t_{min})/t_{min}$ (in)	9.59	use	9.00
Mininum remaining ligament thickness requirement = $0.353 d_{adj}(P/S)^{0.5}$ (in)			0.318

Minimum remaining ligament thickness is less than adjusted thickness used in Section A, O.K.

Entergy	CONDITION REPORT	CR-IP3-2013-04416

Originator: Allen II,Robert E

Originator Phone: 6774

Originator Site Group: IP3 P&C Eng Codes Staff IP3

Operability Required: Y

Supervisor Name: Azevedo,Nelson F

Reportability Required: Y

Discovered Date: 10/30/2013 09:39

Initiated Date: 10/30/2013 09:48

Condition Description:

Further visual examination of Line No. 1093 in the 32 MT moat excavation revealed that the corroded area originally found (ref. CR-IP3-2013-04174) extended underneath the pipe to the area that was resting on the wood support. The area now measures 8-1/4" circumferentially and 2" wide in the axial direction. The remainder of the exposed pipe in that area was in good condition with no corrosion.

Immediate Action Description:

The pipe surface was cleaned up and pipe clamp installed over the corroded area.

Suggested Action Description:

Engineering to evaluate this information.

EQUIPMENT:

Tag Name	Tag Suffix Name	Component Code	Process System Code
10 LINE 1093		PIPE	SW

REFERENCE ITEMS:

Type Code	Item Desc
DOC	VT report IP3-VT-13-021
DWG	9321-F-22363
WON	00350692-31

Attachment B

UT Erosion/Corrosion Examination

Entergy

Site/Unit:	IP3 / 3	Procedure:	CEP-NDE-0505	Outage No.:	N/A
Summary No.:	10" Line # 1093	Procedure Rev.:	4	Report No.:	IP3-UT-13-058
Workscope:	BOP	Work Order No.:	00350692-17	Page:	1 of 7

Code: **ANSI B31.1, '67 Ed. - '69 Ad.** Cat./Item: **/** Location: **YD - 5'**

Drawing No.: **9321-F-22363** Description: **Characterize (3) areas of corrosion found in the MT Moat excavation**

System ID: **Service Water**

Component ID: **10" Line # 1093** Size/Length: **10" Sch 40** Thickness/Diameter: **0.365"**

Limitations: **None** Component File No.: **N/A** Start Time: **1418** Finish Time: **1455**

Calibration Information

Calibration Thickness (In) Actual	Measured	Calibration Times / Initials		
0.040"	0.500"	Start:	1418	REA
0.100"	N/A	Verify:	1425	REA
0.200"	N/A	Verify:	N/A	
0.300"	N/A	Verify:	1440	REA
0.400"	N/A	Final:	1455	REA

Partitioning Information

Component	Begin/Col/Row	Ending/Col/Row
M. UPST Ext.	N/A	
Main UPST.	N/A	
Main	N/A	
Main DNST.	N/A	
M. DNST Ext.	N/A	
Branch	N/A	
Branch Ext.	N/A	

Component Information

Component Geometry: **Pipe**
Outside Diameter: **10"** Grid Size: **N/A**
Max. Thickness: **0.394"** Min. Thickness: **0.109"**
Nominal Thickness: **0.365"** Tmin.: **0.319"**
Min. Thickness Location: **Area 1**
Max. Thickness Location: **Area 1 & 2**
Surface Condition: **As preped**

Instrument:
Manufacturer: **Panametrics**
Model: **37-DL Plus**
Serial No.: **031110106**
Gain: **50 dB**
Range: **1.00"**

Transducer:
Manufacturer: **Panametrics**
Serial No.: **536066**
Size: **0.283"** Freq.: **7.5 MHz**
Model: **D798**
# of Elements: **Dual**

Reference/Simulator Block:
Serial No.: **99-7437**
Type: **C/S 0.04"-0.5"**
Ref./Simulator Block Temp.: 76.1 °F
Material/Component Temp.: 74.2 °F

Temp. Tool:
Manufacturer: **Control Co., Inc**
Serial No.: **QS-97**
Couplant:
Type: **Ultragel II**
Batch No.: **12125**

Comments/Obstructions: **The coating was removed and the pipe prepped prior to this exam.**

Results: Accept ☐ Reject ☑ Info ☐ **Tmin = 87.5% Nominal Thickness. Reference CR-IP3-2013-04174**

Examiner	Level	Signature	Date	Reviewer	Signature	Date
Allen, Robert E.	III EOI	[signature]	10/3/2013	N/A		
Examiner	**Level**	**Signature**	**Date**	**Site Review**	**Signature**	**Date**
N/A	N/A			J. Peterson	[signature]	10/7/2013
Other	**Level**	**Signature**	**Date**	**ANII Review**	**Signature**	**Date**
N/A	N/A			N/A		

Supplemental Report

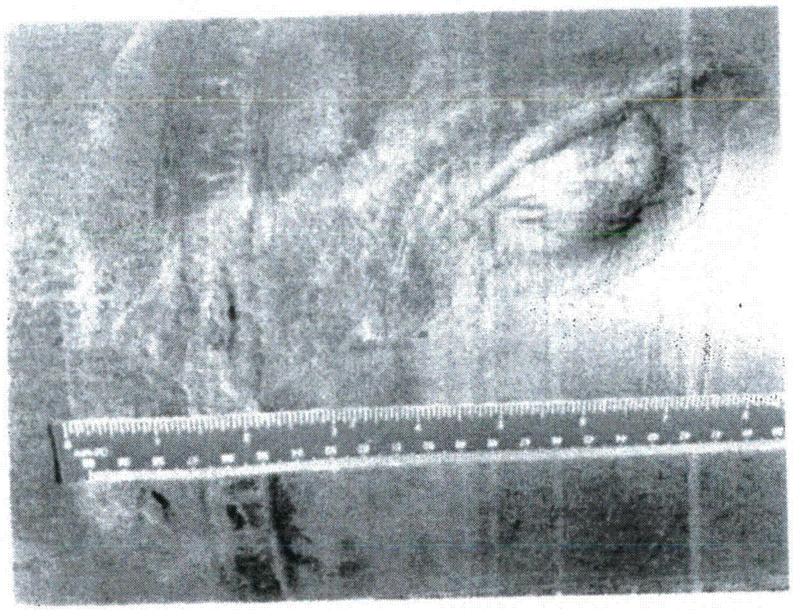
Entergy

Report No.: IP3-UT-13-058

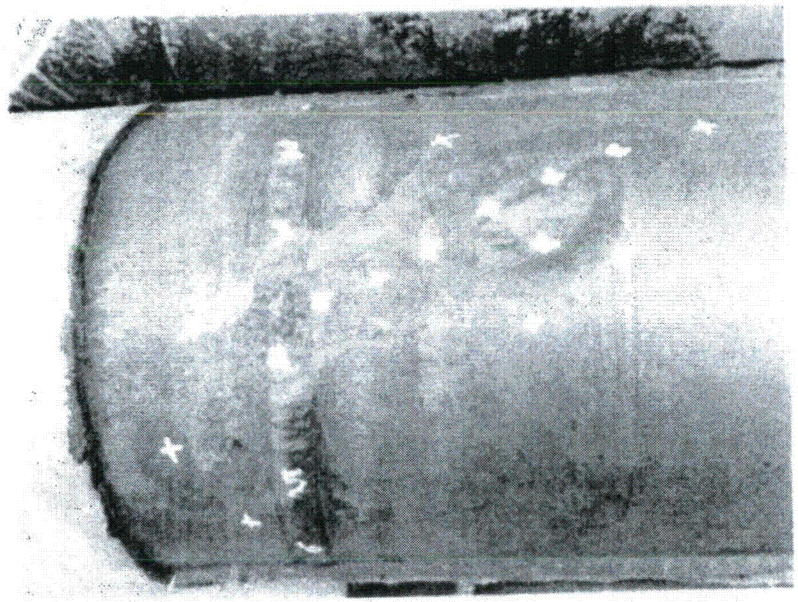
Summary No.:	10" Line # 1093						
Examiner:	Allen, Robert E.	Level:	III EOI	Reviewer:	N/A	Date:	
Examiner:	N/A	Level:	N/A	Site Review:		Date:	10/7/2013
Other:	N/A	Level:	N/A	ANII Review:	N/A	Date:	

Comments: **Photo left below of Area 1, North end of the pipe in the moat. Photo right below showing the UTT locations.**

Sketch or Photo: \\Client\Y$\Iddeal Ver 8\Iddeal_Server\IDDEAL_IP3\Graphics-Pictures\Service Water\10 Line 1093 area 1a.jpg



\\Client\Y$\Iddeal Ver 8\Iddeal_Server\IDDEAL_IP3\Graphics-Pictures\Service Water\10 Line 1093 area 1b.jpg



Supplemental Report

Entergy

Report No.: IP3-UT-13-058

Summary No.: 10" Line # 1093

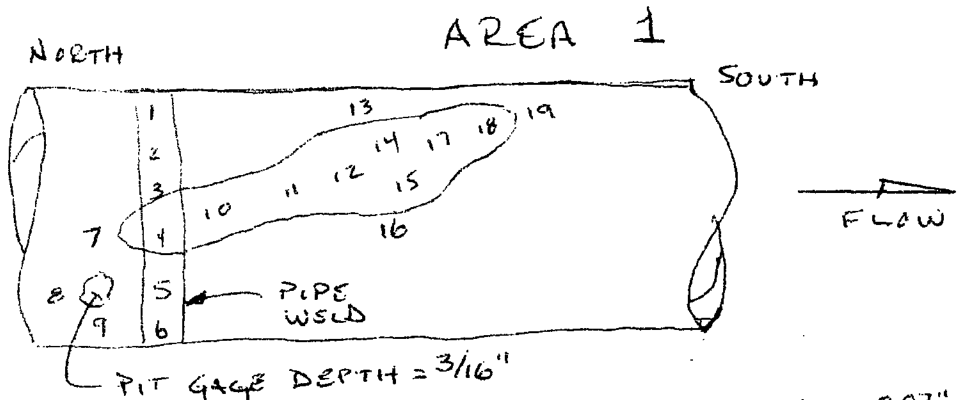
Examiner: Allen, Robert E. Level: III EOI Reviewer: N/A Date:

Examiner: N/A Level: N/A Site Review: Date: 10/7/2013

Other: N/A Level: N/A ANII Review: N/A Date:

Comments: **Area 1 UTT readings.**

Sketch or Photo: \\Client\YS\Iddeal Ver 8\Iddeal_Server\IDDEAL_IP3\Graphics-Pictures\Service Water\10 in Line 1093 Area 1.TIF



1 - .438"	6 - .426"	11 - .272"	16 - .387"
2 - .419"	7 - .368"	12 - .283"	17 - .230"
3 - .425"	8 - .370"	13 - .378"	18 - .300"
4 - .170"	9 - .364"	14 - .279"	19 - .394"
5 - .437"	10 - .266"	15 - .109"	

Supplemental Report

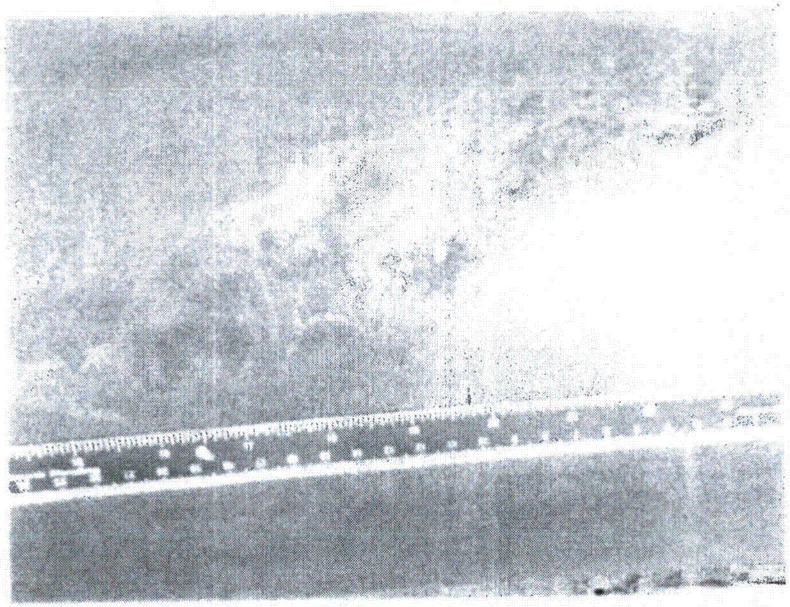
Entergy

Report No.: IP3-UT-13-058

Summary No.:	10" Line # 1093					
Examiner:	Allen, Robert E.	Level:	III EOI	Reviewer:	N/a	Date:
Examiner:	N/A	Level:	N/A	Site Review:		Date: 10/7/2013
Other:	N/A	Level:	N/A	ANII Review:	N/A	Date:

Comments: **Photo left below of Area 2, North end of the pipe in the moat just South of Area 1. Photo right below showing the UTT locations.**

Sketch or Photo: \\Client\Y$\Iddeal Ver 8\Iddeal_Server\IDDEAL_IP3\Graphics-Pictures\Service Water\10 Line 1093 area 2a.jpg



\\Client\Y$\Iddeal Ver 8\Iddeal_Server\IDDEAL_IP3\Graphics-Pictures\Service Water\10 Line 1093 area 2b.jpg

Entergy

Supplemental Report

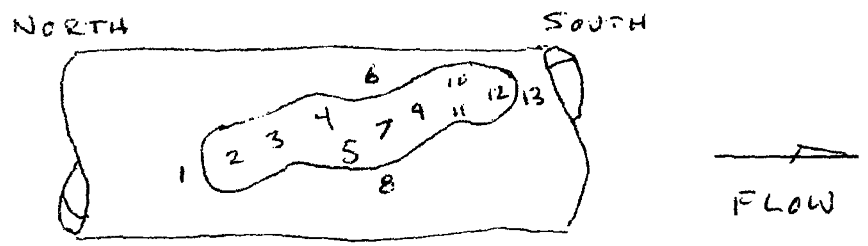
Report No.: **IP3-UT-13-058**

Summary No.:	**10" Line # 1093**						
Examiner:	**Allen, Robert E.**	Level:	**III EOI**	Reviewer:	N/A	Date:	
Examiner:	**N/A**	Level:	**N/A**	Site Review:		Date:	10/17/2013
Other:	**N/A**	Level:	**N/A**	ANII Review:	N/A	Date:	

Comments: **Area 2 UTT readings.**

Sketch or Photo: \\Client\Y$\Iddeal Ver 8\Iddeal_Server\IDDEAL_IP3\Graphics-Pictures\Service Water\10 in Line 1093 Area 2.TIF

AREA 2



1 - .394"	5 - .265"	9 - .326"	13 - .389"
2 - .280"	6 - .391"	10 - .341"	
3 - .320"	7 - .339"	11 - .350"	
4 - .320"	8 - .387"	12 - .354"	

Supplemental Report

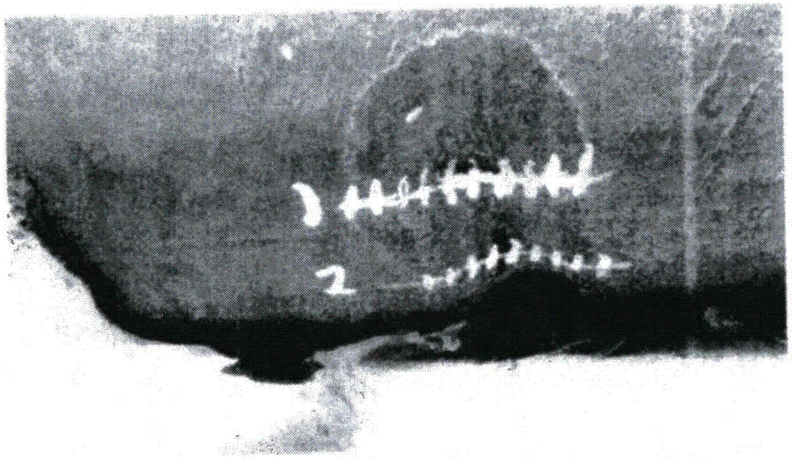
Entergy

Report No.: IP3-UT-13-058

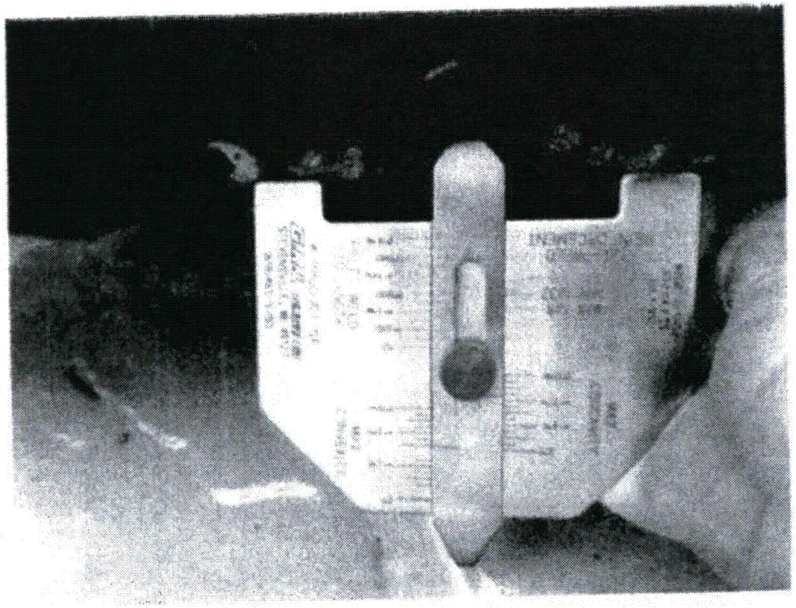
Summary No.:	10" Line # 1093					
Examiner:	Allen, Robert E.	Level:	III EOI	Reviewer:	N/A	Date:
Examiner:	N/A	Level:	N/A	Site Review:	[signature]	Date: 10/7/2013
Other:	N/A	Level:	N/A	ANII Review:	N/A	Date:

Comments: Photo left below of area 3, mid span of the pipe in the moat South of areas 1 & 2. Line 1 and line 2 are the locations where pit gage readings were taken 1/4" apart across the area of thinning. Photo right below showing the pit gage at maximum depth of 3/8".

Sketch or Photo: \\Client\Y$\Iddeal Ver 8\Iddeal_Server\IDDEAL_IP3\Graphics-Pictures\Service Water\10 Line 1093 area 3a.jpg



\\Client\Y$\Iddeal Ver 8\Iddeal_Server\IDDEAL_IP3\Graphics-Pictures\Service Water\10 Line 1093 area 3b.jpg



Supplemental Report

Entergy

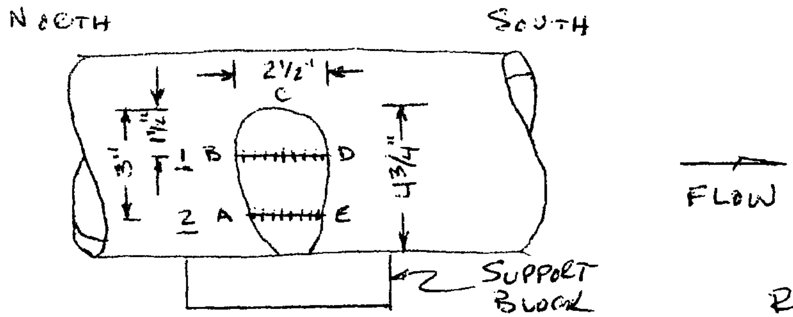
Report No.: IP3-UT-13-058

Summary No.:	10" Line # 1093						
Examiner:	Allen, Robert E.	Level:	III EOI	Reviewer:	N/A	Date:	
Examiner:	N/A	Level:	N/A	Site Review:	[signature]	Date:	10/17/2013
Other:	N/A	Level:	N/A	ANII Review:	N/A	Date:	

Comments: **Area 3 UTT and pit gage readings.**

Sketch or Photo: \\Client\Y$\Iddeal Ver 8\Iddeal_Server\IDDEAL_IP3\Graphics-Pictures\Service Water\10 in Line 1093 Area 3.TIF

AREA 3



PIT GAGE READING @ 1/4" SPACING:

ROW	1/4"	1/2"	3/4"	1"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/4"
1	1/32"	1/16"	3/16"	1/4"	3/8"	3/8"	5/16"	3/16"	1/32"
2	1/64"	1/16"	7/32"	5/16"	3/8"	5/16"	3/16"	1/32"	—

UTT READINGS:

A - .387"
B - .387"
C - .380"
D - .378"
E - .378"