Exelon Generation.

10 CFR 50.55a

August 24, 2014

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Peach Bottom Atomic Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Subject: Emergency Relief Request to Utilize Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1" for an Elbow

In accordance with the provisions of 10 CFR 50.55a(a)(3)(ii), Exelon Generation Company, LLC (Exelon) requests an emergency relief request to use Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1" for the evaluation of a through-wall leak identified in a Class 3 service water piping elbow at Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. PBAPS, Units 2 and 3 was granted a Notice of Enforcement Discretion (NOED) at 1922 on August 23, 2014 for 48 hours until 0100 on August 26, 2014. Exelon is requesting this relief until the conclusion of the fall 2014 refueling outage on PBAPS, Unit 2. The repair will be implemented no later than the completion of the fall 2014 refueling outage or before exceeding the temporary acceptance criteria of Code Case N-513-3 and this relief request, whichever comes first.

Exelon requests approval of the relief prior to the expiration of the NOED which will end at 0100 on August 26, 2014.

On August 23, 2014 a pin hole leak was discovered on the Emergency Service Water (ESW) system on an elbow between check valve CHK-2-33-513 and hand valve HV-2-33-502. Exelon requests the use of Code Case N-513-3 for the analysis of this elbow to allow continued operation. Attached is the relief request.

If you have any questions, please contact Mr. Thomas R. Loomis (610-765-5510).

Respectfully,

Michael J. Massaro

Michael J. Massaro
Site Vice President
Peach Bottom Atomic Power Station

Attachments: 1) Emergency Relief Request
2) Technical Evaluation

A047
NRR

cc: Regional Administrator, Region I, USNRC
USNRC Senior Resident Inspector, PBAPS
Project Manager, USNRC
R. I. McLean, State of Maryland
R. R. Janati, Commonwealth of Pennsylvania
CCN 14-65

1. ASME CODE COMPONENTS AFFECTED:

a) Section XI, Class 3, 90 degree elbow in Emergency Service Water (ESW) system between check valve CHK-2-33-513 and hand valve HV-2-33-502

b) Examination Category D-B, Examination Item Number D2.10

c) 6" ferritic steel standard wall 90^0 elbow 0.280" nominal thickness

d) Design Code ASME B31.1 - 1967

e) Design pressure 150 psig

f) Design temperature 100^0F

2. APPLICABLE CODE EDITION AND ADDENDA:

The applicable ASME Section XI Code Edition and Addenda for Peach Bottom Atomic Power Station, Units 2 and 3 is the 2001 Edition, through 2003 Addenda. This fourth inservice inspection interval began November 5, 2008 and will conclude November 4, 2018.

3. APPLICABLE CODE REQUIREMENT:

In accordance with ASME Code Section XI, 2001 Edition, through 2003 Addenda, subparagraph IWD-3120(b) requires that existing flaws in ASME Code Class components which are unacceptable for continued service be corrected by repair/replacement activity or supplemental examination and analytical evaluation, to the extent necessary to meet the acceptance standards in ASME Code Section XI, Article IWC-3000. In regard to the flaw analysis, IWD-3500, "Acceptance Standards" for Class 3 components, states that the requirements of IWC-3500, "Acceptance Standards" for Class 2 components, may be used. Additionally, IWA-4000 describes the repair/replacement activities to correct an unacceptable flaw. Detection of a minimum wall thickness in the structural portion of an ASME Code Class 1, 2, or 3 component is direct evidence of a defect in the component.

The Code does not include analytical evaluation criteria for acceptance of through-wall flaws in pressure retaining base material of ferritic pipe or fittings. Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1," which has been conditionally approved by the NRC in Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 16, provides analytical evaluation rules for temporary acceptance of flaws in piping. Code Case N-513-3 however does not apply to through-wall flaws located in the pressure retaining base material of pipe fittings such as elbows.

Relief is requested so that code repair of the through-wall flaw at this location may be deferred until the conclusion of the PBAPS, Unit 2 refueling outage which is scheduled for this fall, 2014 or before exceeding the temporary acceptance criteria of Code Case N-513-3 and this relief request, whichever comes first.

4. REASON FOR REQUEST:

In accordance with the provisions of 10 CFR 50.55a(a)(3)(ii), Exelon Generation Company, LLC (Exelon) requests the use of Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1" for the evaluation of a through-wall leak identified in a Class 3 ESW piping elbow at Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. Exelon is requesting this relief until the conclusion of the fall 2014 refueling outage on PBAPS, Unit 2 or before exceeding the temporary acceptance criteria of Code Case N-513-3 and this relief request, whichever comes first. Application of the Code Case with additional criteria of this relief request assures that the elbow degraded area will retain structural and leakage integrity until a permanent Code repair is completed. The repair will be implemented no later than the end of the fall 2014 Unit 2 refueling outage.

Unit 2 and 3 Technical Specification 3.7.2, "Emergency Service Water (ESW) System and Normal Heat Sink," Limiting Condition for Operation, requires "two ESW subsystems and normal heat sink shall be OPERABLE." At 1300 on Saturday, August 23, 2014, both ESW subsystems were declared inoperable, which required both units to be in Mode 3 in 12 hours, and Mode 4 in 36 hours. At 1922 on Saturday, August 23, 2014 a NOED was granted extending the time for both units to be in Mode 3 to 60 hours, which expires at 0100 on Tuesday August 26, 2014.

Without approval of this relief request, both units will be required to enter Mode 3 resulting in undue hardship without a compensating increase in safety. Moving both units to shutdown condition unnecessarily cycles the units and increases the potential of an unnecessary transient which can be avoided through the use of the N-513-3 analysis. No compensating increase in the level of quality and safety would be gained by immediate repair of the flaw. The ESW system continues to be capable of performing its required safety functions and is not susceptible to sudden or catastrophic failure.

Exelon proposes an alternative to the paragraph 1(c) provision of Code Case N-513-3 that prohibits its application to pipe fittings such as moderate energy Class 3 elbows. All other provisions of Code Case N-513-3, including scope expansion and walk downs, will be followed.

The ESW system is a Technical Specification required system that is designed to provide a reliable supply of cooling water to diesel generator coolers, Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) compartment air coolers, Core Spray Pump Motor Oil Coolers and other selected equipment during design basis accident conditions or a loss of normal station

service water due to the design flood condition or the loss of the Conowingo Pond. The system is designed to seismic Class I criteria. The ESW system has sufficient capacity and redundancy so that no single active component failure can prevent the system from achieving its safety objective. The ESW system is common to Unit 2 and Unit 3.

The ESW system consists of two full-capacity pumps installed in parallel and associated equipment coolers, valves, and controls. Normal water supply to the suction of the ESW system pumps is from the Conowingo Pond. Each pump has an independent discharge header, which supplies water to the coolers on all four Emergency Diesel Generators. These two independent headers combine upstream of each of the Emergency Diesel Generator (EDG) coolers. Discharge from the coolers feeds a common header and is normally routed to the discharge pond.

The ESW system may also be operated in conjunction with the emergency heat sink. This configuration (closed loop) is the preferred system alignment during the design flood condition or loss of Conowingo Pond.

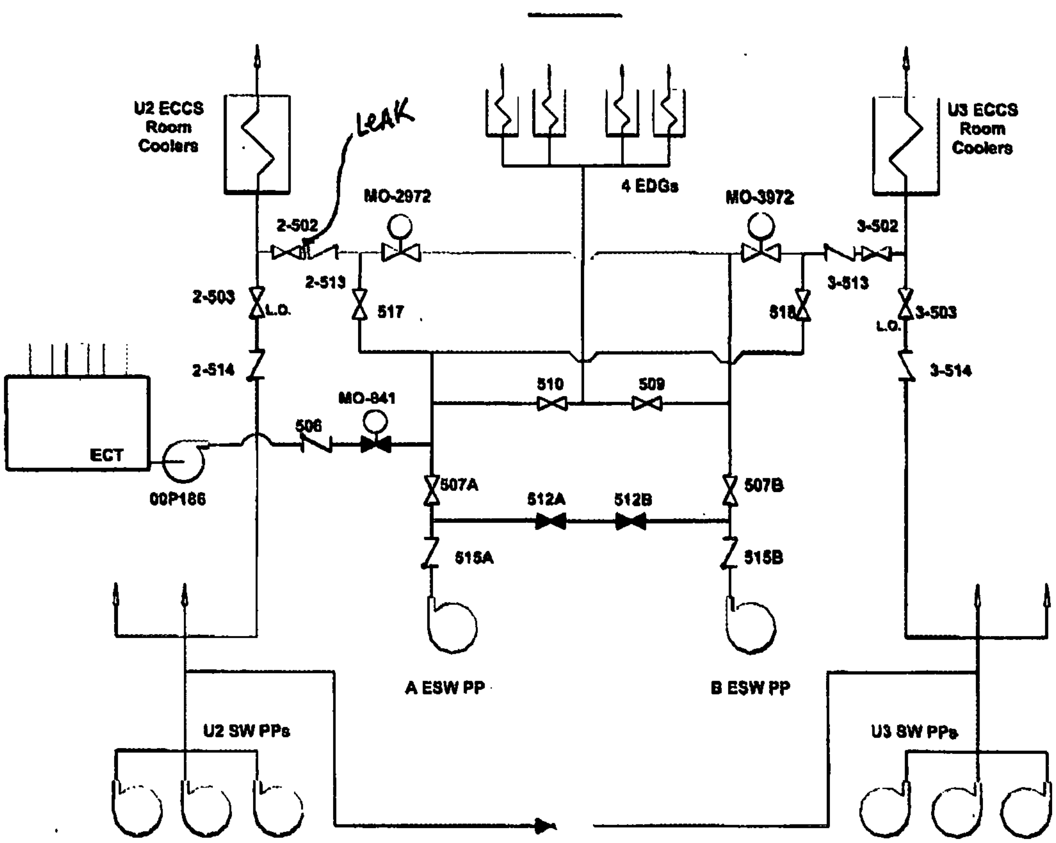

Figure 1 – ESW Simplified Flow Diagram Excerpt (AO 33.6-0, Rev. 2, Page 4)

Class:

The ESW piping is classified as safety related, ASME Code Class 3, and of moderate energy (piping design rating of 150 psig @ 100^{0}F).

Flaw Characterization and Root Cause Determination:

An isolated, through-wall nonplanar flaw was found in the mid-extrados of the elbow between ESW hand valve HV-2-33-502 and check valve CHK-2-33-513 (IR 01695675) in the Reactor Building Closed Cooling Water room in a 6 inch header at floor elevation 116'. The nominal pipe thickness is 0.280 inch. This flaw was identified in a field walk down. The flaw leakage was measured to be approximately 3 mL/min. There are no electrical components in the general area that would be impacted by spray concerns. This is normally an insulated dead leg of piping with no known cavitation issues.

The flaw is characterized as approximately 0.6 inches in diameter (below Code minimum thickness) with a pinhole extending through the pipe wall but not beyond the extrados of the elbow. There are no other nonplanar flaws requiring group evaluations per N-513-3, Section 3.2. The remaining piping beyond the flaw is sufficient to maintain a pressure-retaining boundary and postulated leakage does not exceed operability margins. The nonplanar indication is the result of isolated pitting of carbon steel materials resulting from under deposit corrosion influenced by microbial activity and intermittent flow in raw water piping. Such corrosion indications are limited to localized areas under PBAPS' conditions and do not manifest in general thinning, cracking, or other prompt structural failure precursors. This isolated corrosion area can be reliably monitored to ensure flow and structural integrity are maintained.

5. PROPOSED ALTERNATIVE AND BASIS FOR USE:

Exelon is requesting this relief until the conclusion of the fall 2014 PBAPS, Unit 2 refueling outage. The repair will be implemented no later than the completion of the fall 2014 Unit 2 refueling outage or before exceeding the temporary acceptance criteria of Code Case N-513-3 and this relief request, whichever comes first.

Exelon is proposing an alternative to the flaw evaluation methodology of Code Case N-513-3. The Code Case N-513-3 flaw evaluation methodology is applicable to straight pipe. The Exelon proposed alternative methodology is based upon and consistent with a pending revision to Code Case N-513-3 and is used to evaluate the flaw in the ESW elbow. The evaluation criteria provided in Code Case N-513-3 are only for straight pipe since the technical approach relies on ASME Section XI, Appendix C methods. The pending revision of Code Case N-513-3 referenced above includes rules for the evaluation of pipe fittings such as elbows, branch tees, and reducers. Flaws in these fittings may be evaluated as if in straight pipe provided the stresses used in the evaluation are adjusted to

account for geometric differences. For elbows, hoop stress is adjusted by considering flaw location and primary stress due to elbow ovalization from axial loads. For axial stresses, the stress scaling follows the same approach given in ASME Section III, ND-3600 design by rule using stress indices and stress intensification factors for the adjustment. Details are provided in the pending revision to Code Case N-513-3 for determining these adjusted stresses.

The approach to the evaluation methodology included in N-513-3 is to compute a static fracture toughness factor, K_{IC} for the circumferential and axial flaw evaluations. For this evaluation, as shown in Attachment 2 of Technical Evaluation (TE) 1695675-03, the value of K_{IC} is 94.780 ksi*in $^{0.5}$. This value is based on data extracted from the NRC Pipe Fracture Encyclopedia. The minimum value of 293 in-lb/in^2 for J_{IC} from the encyclopedia was used in this evaluation. The evaluation then computes the stress intensification factors, K_I for the circumferential and axial flaws for the various design modes (normal/upset and emergency/faulted) and then compares these values to the previously calculated value for K_{IC}. If K_I is less than or equal to K_{IC} then the acceptability of the through-wall flaw is demonstrated. As shown in Attachment 2, the TE provides acceptable results.

Additionally, as required by N-513-3, the subject location was evaluated for the effect of thin wall on the normal piping stress and compared to the established design allowable stress for the piping. In this comparison, the allowable stress of 15,000 psi for the fitting material (A-234, Grade WPB) was used per the original design code. The results of this portion of the analysis, shown in the TE, demonstrate that a uniform pipe wall thickness of 0.100 inch is acceptable to provide adequate structural integrity for the design basis loadings.

Therefore, the attached TE provides the justification that the size of the flaw and the surrounding wall thickness is acceptable for continued operation within the requirements of the ASME Code Case N-513-3 and provides an acceptable level of quality and safety.

6. DURATION OF PROPOSED ALTERNATIVE:

Exelon requests approval of this relief request prior to the expiration of the NOED which will end at 0100 on August 26, 2014.

This relief will be applicable until the repair is complete. The repair will be implemented no later than the completion of the fall 2014 refueling outage or before exceeding the temporary acceptance criteria of Code Case N-513-3 and this relief request, whichever comes first.

Attachment 2
Technical Evaluation

See attached Technical Evaluation

Title: Evaluation of a through wall leak downstream of Unit 2 ESW check valve CHK-2-33-513.

ADMINISTRATIVE:

This evaluation was prepared in accordance with Exelon procedure CC-AA-309-101, revision 14, Engineering Technical Evaluations.

A technical task risk/rigor assessment was performed for this activity in accordance with HU-AA-1212, revision 4. Risk rank was determined to be '1' with a medium consequence (C.6, Safety System Loss), 1 human performance risk factor (H.11, Workload), and 1 process risk factor (P.3, Fast Track). Therefore, per table 5.1 of attachment 5 to HU-AA-1212 existing process reviews are adequate.

This conclusion was discussed with Jeff Chizever, Manager PEDM on 08/24/2014.

An impact review per CC-AA-102, revision 27 was performed and it was concluded that procedure revisions are not required. However, the Raw Water Program is impacted by this evaluation.

REASON FOR EVALUATION/SCOPE:

A 10 dpm leak was observed on the 6-inch diameter Emergency Service Water (ESW) piping on an elbow in the Reactor Building Closed Cooling Water (RBCCW) room between hand valve HV-2-33-502 (ESW to Unit 2 Safeguards Inlet Isolation Valve) and check valve CHK-2-33-513 (ESW to Unit 2 Safeguards Inlet Check Valve). The piping was covered with anti-sweat insulation at the time of discovery. The insulation was removed and a pin-hole leak was discovered on the extrados of the affected elbow (see photo, attachment page 16).

The presence of this through wall leak on an elbow warrants an evaluation in accordance with ASME Code Case N-513-4 (Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping, Mandatory Appendix I) in order to allow the associated piping to remain operable until a permanent repair is completed.

ASME Code Case N-513-4 is approved by ASME and is pending publication, but it has not been generically reviewed or approved by the NRC. A relief request has been prepared to allow the evaluation of the discovered through wall leak in accordance with ASME Code Case N-513-3 using the additional requirements form Code Case N-513-4 for the evaluation of through wall flaws in elbows.

DETAILED EVALUATION:

Engineering has performed an analysis of the degraded areas in accordance with ASME Code Case N-513-3 using the additional requirements of CC N-513-4 for evaluation of flaws in elbows. The affected elbow is 6-inch, schedule 40 carbon steel elbow (0.280 inch nominal thickness), SA-234 Grade WPB per Peach Bottom specification M-300 (Piping Materials) and P&ID M-315, sheet 5. The design pressure is 150 psig and the design temperature is 100 deg. F.

As shown on attached page 14, the area found to be less than the minimum wall thickness value of 0.100 inch is approximately 0.6 inch in the axial direction and 0.6 inch in the circumferential direction. Also, the surrounding area was examined by ultrasonic testing for information only to determine extent of the area with less than 87.5% of nominal wall thickness (i.e. 0.245 inch thick). As shown on attached page 14, the area below 87.5% of nominal thickness is approximately 2.9 inches axial by 3.6 inches circumferential.

In accordance with CC N-513-3, the pipe circumference at the location of the flaw was examined volumetrically to characterize the length and depth of all flaws in the pipe section. The results of the circumferential examination show that there are no other flaws in the area that are below the minimum wall thickness and need to be considered in this evaluation.

Forces, moments, and stresses for the subject piping were extracted from reference 5 at node point 151 and they are shown on pages 9 to 12 of the attachment.

The approach to the evaluation methodology included in CC N-513-3 is to compute a static fracture toughness factor, K_{IC} for the circumferential and axial flaw evaluations. For this evaluation, as shown on attached page 2 of 16, the value of K_{IC} is 94.780 ksi*in $^{0.5}$. This value is based on data extracted from the NRC Pipe Fracture Encyclopedia (reference 8). The minimum value of 293 in-lb/in2 for J_{IC} from reference 8 was used in this evaluation. The evaluation then computes the stress intensification factors, K_I for the circumferential and axial flaws for the various design modes (normal/upset and emergency/faulted) and then compares these values to the previously calculated value for K_{IC}. If K_I is less than or equal to K_{IC} then the acceptability of the through wall flaw is demonstrated. The following is a summary of the results of the attached CC N-513-3 evaluation.

K_{IC} = 94.780 ksi*in $^{0.5}$

K_I Circ. Normal/Upset = 31.080 ksi*in$^{0.5}$ < 94.780 ksi*in$^{0.5}$, therefore acceptable.

K_I Circ. Emer./Fault = 35.414 ksi*in$^{0.5}$ < 94.780 ksi*in$^{0.5}$, therefore acceptable

K_I Axial (resultant moments and safety factors from faulted condition) = 50.862 ksi* in$^{0.5}$ < 94.780 ksi*in$^{0.5}$, therefore acceptable.

Alteration to CC N-513-3 evaluation methods required by CC N-513-4:

The hoop stress value (σ_h) used in the axial through wall evaluation uses the equation 9 from CC N-513-4:

$\sigma_h = (pDo/2t)*(2R_{bend} + R_o \sin\phi/2(R_{bend} + R_o \sin\phi)) + (1.95/h^{2/3})*(R_oM_b/I)$ where:

p = maximum operating pressure at the flaw location. This computation conservatively uses the design pressure of 150 psi because maximum operating pressure has not been formally documented at this location (the max operating pressure is believed to be less than 100 psig).

Do = outside diameter = 6.625 inches
t = thickness = 0.100 inch
R_{bend} = elbow bend radius = 1.5 * 6-inches = 9 inches
R_o = outside radius = 3.313 inches
ϕ = 90 degrees per CC N-513-4, figure 7 (sin90 = 1.0)
h = flexibility characteristic per reference 2 = $t_n*R_{bend}/r_{mean}^2 = 0.280*9/((6.625-0.28)2)^2 = 0.25$ which is > 0.1 as required by CC N-513-4, section 3.3.
M_b = resultant primary bending moment = SRSS of resultant moments from deadweight and SSE earthquake (attached page 8) = 21129.12 in-lbf
I= moment of inertia at t = 0.100 inch= $0.0491(D_o^4-D_{inside}^4) = 10.915\ in^4$

Therefore, σ_h is computed as:

σ_h = 4968.75 psi*(0.865) + 4.937*(6413.264 psi) = 35960.252 psi
The circumferential flaw evaluation uses the β_2 primary stress index from ASME Section III, subsection NB-3683.7 as required by CC N-513-4, section 3.3. β_2 is computed as $1.30/h^{2/3} = 1.30/0.395 = 3.291$ and inserted into the calculation for K_{Ib}.

Additionally, as required by CC N-513, the subject location was evaluated for the effect of thin wall on the normal piping stress and compared to the established design allowable stress for the piping. In this comparison, the allowable stress of 15,000 psi for the fitting material (A-234, Grade WPB) was used per the original design code (reference 2). The results of this portion of the analysis, shown on attached pages 1 through 8, demonstrate that a uniform pipe wall thickness of 0.100 inch is acceptable to provide adequate structural integrity for the design basis loadings.

CONCLUSIONS/FINDINGS:

This evaluation of the discovered pin-hole leak provides the justification that the size of the flaw and the surrounding wall thickness is acceptable for continued operation within the requirements of ASME Code Case N-513-3.

REFERENCES:

1. ASME Code Case N-513-3, Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping
2. ASME B31.1, Power Piping, 1967and1973 Editions
3. ASME Section XI, Rules for In-Service Inspection of Nuclear Power Plant Components, 2001 Edition plus addenda through and including 2003
4. Crane Technical Paper 410, Flow of Fluids
5. PBAPS Calculation 33-32, PIPE STRESS ANALYSIS - ESW SYSTEM UNIT 2 RBCCW ROOM, revision 1b
6. IR 1695675, LEAK THROUGH INSULATION ON ESW PIPING
7. Isometric IS0-2-33-17, revision 5
8. Pipe Fracture Encyclopedia, NRC, Volume 1, 1997
9. ASME Code Case N-513-4, Evaluation Criteria for Temporary Acceptance of

Flaws in Moderate Energy Class 2 or 3 Piping

ATTACHMENTS:

Pages 1-8:	ASME Code Case N-513-3 Evaluation
Pages 9-12:	Excerpts from calculation 33-32
Pages 13-15:	NDE Report
Page 16:	Photo of the Leak

Approvals:

Prepared By:	Ken Hudson	08/24/2014
Reviewed By:	Mohamed Kazoun	08/24/2014

Independent Design Review Comments:

This Technical Evaluation conforms with applicable design & configuration control requirements. The inputs, references and computations were reviewed and found to be correct. Computations that were performed by Excel were confirmed by hand computations. The method used for this evaluation is based on an ASME Code Case that is approved by ASME and pending publication by the NRC. Design considerations were identified and were adequately addressed. I concur with the conclusions/findings that are stated in this technical evaluation.

Approved By:	Jeff Chizever, Manager PEDM	08/24/2014

Planar Flaw Evaluation in ferritic piping IAW Code Case N-513-4

PBAPS ESW Min Wall @ Elbow D/S from CHK-2-33-513 ESW (IR 1695675)

Definitions:

Flaw depth		a=	N/A Through Wall Evaluation	
Pipe wall thickness		t=	0.100	in
Maximum measured circumferential flaw length:		l=	0.600	in
Pipe outside diameter:		D=	6.63	in
Mean pipe radius:	$R = \frac{D-t}{2}$	R=	3.26	in
Piping bending moment of inertia:	$I = \frac{\pi[D^4-(D-2t)^4]}{64}$	I=	10.91	in^4
Flaw half-angle per Figure 1, N-513:	$\theta = \frac{l}{2 \cdot R}$	θ=	0.092	rad
Unit definition for kips:			1 kip = 1000 lbf	
Unit definition for psi:			1 ksi = 1000 psi	

Piping Loads:

Maximum operating pressure:		OP=	150.00	psi
Maximum operating pressure axial force:	$P_{OP} = \pi\left(\frac{D}{2}-t\right)^2 \cdot OP$	P_{OP}=	4863.26	lbs
Axial load on pipe for Normal/Upset condition forces:		Pnu =	338.00	lbs
Axial load on pipe for Emergency/Faulted condition forces:		Pnf =	699.00	lbs
Total axial load on pipe, including pressure from piping analysis for normal/upset condition forces:	$P_n = P_{OP}+P_{nu}$	Pn =	5201.26	lbs
Total axial load on pipe, including pressure from piping analysis for emergency/faulted condition forces:	$P_f = P_{OP}+P_{nf}$	Pf =	5562.26	lbs
Applied bending moment on the pipe from piping analysis for normal/upset condition (SRSS(MA, MB, MC) for WT01+SEISOB)		Mn =	800.13	ft-lbf
Applied bending moment on the pipe from piping analysis for emergency/faulted condition (SRSS(MA, MB, MC) for WT01+SEISSS)		Mf =	1760.76	ft-lbf
Pipe thermal expansion stress from piping analysis:		Pe =	0.000	ksi

Circumferential Flaw Evaluation Using N-513

Piping Material Properties (Ref. ASME B31.1):

Young's Modulus:	E=	27900	ksi
Poisson's Ratio:	μ=	0.30	
$E' = (E/(1-\mu^2)$	E'=	30659.34	ksi

Material Properties for Flaws per H-4000:

From ASME XI C-8322	J_{Ic} =	293	$in*lbf/in^2$
Allowable Fracture Toughness, KIc:	K_{Ic} =	94.780	$ksi*in^{0.5}$
$KIc = ((J_{Ic} * E') / (1000\ lbf/kip))^{0.5}$			

N-513 Appendix I Circumferential Flaw equations:

Accurate between 5 and 20. Conservative over 20.	R/t=	32.625	Conservative
$Am = -2.02917 + 1.67763*(R/t) - 0.07987*(R/t)^2 + 0.00176*(R/t)^3$			
	Am=	28.81	
$Bm = 7.09987 - 4.42394*(R/t) + 0.21036*(R/t)^2 - 0.00463*(R/t)^3$			
	Bm=	-74.11	
$Cm = 7.79661 + 5.16676*(R/t) - 0.24577*(R/t)^2 + 0.00541*(R/t)^3$			
	Cm=	102.63	
$Fm = 1.0 + Am*(\theta/\pi)^{1.5} + Bm*(\theta/\pi)^{2.5} + Cm*(\theta/\pi)^{3.5}$			
	Fm=	1.13	
$Ab = -3.26543 + 1.52784*(R/t) - 0.072698*(R/t)^2 + 0.0016011*(R/t)^3$			
	Ab=	24.80	
$Bb = 11.36322 - 3.91412*(R/t) + 0.18619*(R/t)^2 - 0.004099*(R/t)^3$			
	Bb=	-60.50	
$Cb = -3.18609 + 3.84763*(R/t) - 0.18304*(R/t)^2 + 0.00403*(R/t)^3$			
	Cb=	67.46	
$Fb = 1.0 + Ab*(\theta/\pi)^{1.5} + Bb*(\theta/\pi)^{2.5} + Cb*(\theta/\pi)^{3.5}$			
	Fb=	1.12	

Applied Stress Intensity Factor, KI, for Circumferential Flaw:

N-513 Appendix I requires that the flaw depth in the H-7300 stress intensity equations be changed to the flaw half-length, c:

Maximum assumed circumferential flaw length:	l=	0.60	in
Flaw half-length, c = l/2:	c=	0.30	in

Note: Units are converted automatically.

Normal/Upset Condition:

$K_{Im} = \left(\frac{2.7 \cdot P_n}{2 \cdot \pi \cdot R \cdot t}\right) \cdot (\pi \cdot c)^{0.5} \cdot F_m$	K_{Im} =	7.541	ksi-in$^{0.5}$
$K_{Ib} = \left(\frac{B_2 * 2.3 \cdot M_n}{\pi \cdot R^2 \cdot t} + P_e\right) \cdot (\pi \cdot c)^{0.5} \cdot F_b$	K_{Ib} =	23.539	ksi-in$^{0.5}$
$K_I = K_{Im} + K_{Ib}$	K_I =	31.080	ksi-in$^{0.5}$
	Therefore, K_I < KIc:	Acceptable	

Emergency/Faulted Condition:

$K_{Im} = \left(\frac{1.3 \cdot P_f}{2 \cdot \pi \cdot R \cdot t}\right) \cdot (\pi \cdot c)^{0.5} \cdot F_m$	K_{Im} =	3.883	ksi-in$^{0.5}$
$K_{Ib} = \left(\frac{B_2 * 1.4 \cdot M_f}{\pi \cdot R^2 \cdot t} + P_e\right) \cdot (\pi \cdot c)^{0.5} \cdot F_b$	K_{Ib} =	31.531	ksi-in$^{0.5}$
$K_I = K_{Im} + K_{Ib}$	K_I =	35.414	ksi-in$^{0.5}$
	Therefore, K_I < KIc:	Acceptable	

Axial Through-walll Flaw Evaluation Using N-513

Stress Intensity Factor, KI, for an axial flaw subject to the bounding condition:

Axial flaw length:	l=	0.60	in
Flaw half-length, c = l/2:	c=	0.3	in
Maximum operating pressure:	OP=	150	psi
Safety Factor for emergency/faulted conditions from C-2622:	SF=	1.3	
N-513 Appendix I assigned flaw shape parameter for a through-wall flaw:	Q=	1.00	
$\lambda = c/(R*t)^{0.5}$	λ=	0.525	
	Therefore, $0<\lambda<5$:	Acceptable	
Note: Units are converted automatically			
$F = 1.0 + 0.072449*\lambda + 0.64856*\lambda^2 - 0.2327*\lambda^3 + 0.038154*\lambda^4 - 0.0023487*\lambda^5$			
	F =	1.186	
$K_I = SF * \sigma_h * \left(\frac{\pi \cdot c}{Q}\right)^{0.5} \cdot F$	K_I =	53.828	ksi-in$^{0.5}$
	Therefore, K_I < KIc:	Acceptable	
σ_h is computed per CC N-513-4. See TE body for method.			

END OF ASME CODE CASE N-513-4 EVALUATION

Code Minimum Wall Requirement Based on ASME III, ND-3640:			
Joint efficiency factor:	E =	1.00	
Corrosion allowance used:	A =	0.00	in
Maximum allowable stress for pipe material from Section II, Part D:	S =	15.00	ksi
	y =	0.40	
Design Pressure:	PD =	150	psi
Minimum pipe wall required, not including any corrosion allowance:			
$t_m = \frac{PD \cdot D}{2 \cdot (S \cdot E + PD \cdot y)} + A$	t_m =	0.033	in

Minimum Wall Thickness Evaluation @ 0.100 inch Thickness			
Outside diameter of pipe:		D =	6.63 in
As analyzed pipe wall thickness:		t =	0.280 in
Allowable pipe wall thickness - Code minimum:		t1 =	0.100 in
(Use trial and error until satisfying modified stresses below)			
Design inside pipe diameter:	d = D-2*t	d =	6.07 in
New inside pipe diameter:	d1 = D-2*t1	d1 =	6.425 in
As analyzed Section Modulus:	$Z = 0.0982 \frac{D^4 - d^4}{D}$	Z =	8.498 in^3
New Section Modulus:	$Z1 = 0.0982 \frac{D^4 - d1^4}{D}$	Z1 =	3.295 in^3
Design Pressure:		Pd =	150 psig
Maximum Pressure:		Pm =	150 psig
ME101 Output Stress Summary - Input from Calculation 33-32, Revision 1B:			
Design Pressure Stress:		SPd =	776 psi
Maximum Pressure Stress:		SPm =	776 psi
Equation 11 Stress:		Eqn 11 =	1039 psi
Equation 12B Stress:		Eqn 12B =	2619 psi
Equation 12C Stress:		Eqn 12C =	0 psi
Equation 12D Stress:		Eqn 12D =	4831 psi
Equation 13 Stress:		Eqn 13 =	0 psi
Equation 14 Stress:		Eqn 14 =	1039 psi

ME101 Modified Stresses		
		Allowable Stress
Equation 11 Stress = $\left(\text{Eqn 11} - \text{SPd}\right)\cdot\frac{Z}{Zl} + \text{Pd}\cdot\frac{D}{(4*t1)} =$	3163 psi	15,000
Equation 12B Stress = $\left(\text{Eqn 12B} - \text{SPm}\right)\cdot\frac{Z}{Zl} + \text{Pm}\cdot\frac{D}{(4*t1)} =$	7238 psi	18,000
Equation 12C Stress = $\left(\text{Eqn 12C} - \text{SPm}\right)\cdot\frac{Z}{Zl} + \text{Pm}\cdot\frac{D}{(4*t1)} =$	psi	N/A
Equation 12D Stress = $\left(\text{Eqn 12D} - \text{SPm}\right)\cdot\frac{Z}{Zl} + \text{Pm}\cdot\frac{D}{(4*t1)} =$	12942 psi	36,000

Evaluation Input Data From Calculation 33-32 Rev 1b, Node Point 151								
	Fa	Fb	Fc	Ma	Mb	Mc	Mr	PSI σ
Weight	80	99	16	32	58	93	114.18	262
Thermal	0	0	0	0	0	0	0.00	0
OBE	258	449	127	394	293	479	685.95	1580
SSE	619	1076	304	947	703	1149	1646.58	3792
		σ	Allowable σ					
Pressure σ		776						
Equ. 11 σ		1039	15,000					
Equ. 12b σ		2619	18,000					
Equ. 12d σ		4831	36,000					
Equ. 13 σ		N/A						

DEADWEIGHT

86	TNGT	-141	16	14	21	-159	110	185.	1.843	1.000	1.000	B31S73
126		97	-16	-14	-21	148	-97	184.	2.000	1.000	1.000	
126	TNGT	-97	16	14	21	-148	97	362.	2.000	1.000	1.000	B31S73
131		88	-16	-14	-21	145	-93	235.	1.000	1.000	1.000	
131	HV-2-33-502	9	16	14	21	-145	93	128.	1.000	1.000	1.000	B31S73
141		-9	-16	-14	-21	126	-72	109.	1.000	1.000	1.000	
141	BEND	107	-14	16	21	-72	-126	338.	2.266	6.590	6.590	B31S73
151 M		-80	99	-16	32	58	93	262.	2.266	6.590	6.590	
151 M	BEND	80	-99	16	-32	-58	-93	262.	2.266	6.590	6.590	B31S73
156		14	146	-16	60	10	17	146.	2.266	6.590	6.590	
156	CHK-2-33-513	-14	234	-16	-60	10	17	47.	1.000	1.000	1.000	B31S73
161		14	-234	16	60	9	255	195.	1.000	1.000	1.000	
161	TNGT	-14	321	-16	-60	-9	-255	356.	1.000	1.000	1.000	B31S73
171		14	-345	16	60	20	495	822.	2.172	1.000	1.000	
171	TNGT	-2114	-56	56	70	16	-615	269.	2.172	1.000	1.000	B31S73
176		2029	56	-56	-70	-63	569	153.	1.000	1.000	1.000	
176	TNGT	-1654	-56	-56	70	569	63	82.	1.000	1.000	1.000	B31S73
181		1654	56	56	-70	-523	-109	76.	1.000	1.000	1.000	
181	MO-2972	0	190	0	0	0	713	0.	1.000	1.000	1.000	B31S73
186		0	-190	0	0	0	0	0.	1.000	1.000	1.000	
181	TNGT	-1464	-56	-56	70	523	-604	113.	1.000	1.000	1.000	B31S73
191		1464	56	56	-70	-478	557	104.	1.000	1.000	1.000	
191	TNGT	-1089	-56	-56	70	478	-557	196.	1.000	1.000	1.000	B31S73
198		1055	56	56	-70	-459	539	189.	1.000	1.000	1.000	

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ELEMENT FROM TO	TYPE/TITLE	LOCAL FORCES (LB) FA	FB	FC	LOCAL MOMENTS (FT-LB) MA	MB	MC	STRESS (PSI) .75IM/Z	STRESS INT.FAC. (I)	FLEX. IN PLANE	FLEX. OUT PLANE	CODE AND CLASS
198	TNGT	-1055	-56	-56	70	459	-539	189.	1.000	1.000	1.000	B31S73
201		848	56	56	-70	-346	424	147.	1.000	1.000	1.000	
201	TNGT	-848	-56	-56	70	346	-424	147.	1.000	1.000	1.000	B31S73
206 B		424	56	56	-70	-115	190	62.	1.000	1.000	1.000	
206 B	BEND	-424	56	56	70	-115	190	133.	2.862	9.359	9.359	B31S73
206 M		175	-255	-56	7	72	21	43.	2.862	9.359	9.359	
206 M	BEND	-175	255	56	-7	-72	-21	43.	2.862	9.359	9.359	B31S73
206 E		-56	-184	-56	31	-13	301	173.	2.862	9.359	9.359	
206 E	TNGT	56	-184	-56	-31	-13	301	80.	1.000	1.000	1.000	B31S73
207		-56	-402	56	31	333	326	124.	1.000	1.000	1.000	
207	TNGT	402	-56	-56	-333	31	-326	181.	1.000	1.000	1.000	B31S73
208		-484	56	56	333	81	212	156.	1.000	1.000	1.000	
171	TNGT	-2459	-69	-72	90	-44	121	68.	2.172	1.000	1.000	B31S73
209		2807	69	72	-90	290	-358	125.	1.000	1.000	1.000	

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OBE SEISMIC

84	TNGT	130	959	109	521	107	1716	1237.	1.063	1.000	1.000	B31S73
86		130	959	109	521	153	2355	2299.	1.843	1.000	1.000	
86	TNGT	1097	477	169	280	463	1861	3158.	1.843	1.000	1.000	B31S73
91		1097	477	169	280	401	1598	2266.	1.000	1.000	1.000	

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ELEMENT FROM TO	TYPE/TITLE	LOCAL FORCES (LB) FA	FB	FC	LOCAL MOMENTS (FT-LB) MA	MB	MC	STRESS (PSI)	STRESS INT.FAC. (I)	FLEX. IN PLANE	FLEX. OUT PLANE	CODE AND CLASS
91	HV-2-33-503	1104	475	173	280	401	1598	1240.	1.000	1.000	1.000	B31S73
101		1104	475	173	280	325	973	789.	1.000	1.000	1.000	
101	TNGT	1118	475	179	280	325	973	789.	1.000	1.000	1.000	B31S73
106		486	267	548	768	1131	133	1019.	1.000	1.000	1.000	
106	TNGT	488	551	267	768	133	1131	1861.	1.000	1.000	1.000	B31S73
111		488	551	267	768	240	1673	3577.	2.538	1.000	1.000	
111	TNGT	0	0	0	0	0	0	0.	2.538	1.000	1.000	B31S73
112		0	0	0	0	0	0	0.	1.000	1.000	1.000	
111	TNGT	0	0	0	0	0	0	0.	2.538	1.000	1.000	B31S73
113		0	0	0	0	0	0	0.	1.000	1.000	1.000	
86	TNGT	325	132	437	491	872	296	993.	1.843	1.000	1.000	B31S73
126		325	132	437	491	529	192	771.	2.000	1.000	1.000	
126	TNGT	325	131	434	491	529	192	1518.	2.000	1.000	1.000	B31S73
131		325	131	434	491	433	162	915.	1.000	1.000	1.000	
131	HV-2-33-502	324	129	422	491	433	162	501.	1.000	1.000	1.000	B31S73
141		324	129	422	491	297	88	431.	1.000	1.000	1.000	
141	BEND	323	404	127	491	88	297	1338.	2.266	6.590	6.590	B31S73
151 M		258	449	127	394	293	479	1580.	2.266	6.590	6.590	
151 M	BEND	258	449	127	394	293	479	1580.	2.266	6.590	6.590	B31S73
156		404	323	127	155	428	637	1802.	2.266	6.590	6.590	
156	CHK-2-33-513	386	322	123	155	428	637	580.	1.000	1.000	1.000	B31S73
161		386	322	123	155	361	900	728.	1.000	1.000	1.000	
161	TNGT	370	322	118	155	361	900	1330.	1.000	1.000	1.000	B31S73
171		370	322	118	155	334	1094	1904.	2.172	1.000	1.000	
171	TNGT	123	123	108	548	1116	967	683.	2.172	1.000	1.000	B31S73
176		123	123	108	548	1145	941	420.	1.000	1.000	1.000	
176	TNGT	122	74	115	548	941	1145	224.	1.000	1.000	1.000	B31S73
181		122	74	115	548	919	1115	219.	1.000	1.000	1.000	
181	MO-2972	37	113	173	0	650	425	0.	1.000	1.000	1.000	B31S73
186		37	113	173	0	0	0	0.	1.000	1.000	1.000	
181	TNGT	109	90	144	469	919	1188	223.	1.000	1.000	1.000	B31S73
191		109	90	144	469	866	1122	211.	1.000	1.000	1.000	
191	TNGT	109	149	111	469	866	1122	397.	1.000	1.000	1.000	B31S73
198		109	149	111	469	841	1073	384.	1.000	1.000	1.000	

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SSE SEISMIC

68		894	334	506	139	2168	671	1565.	1.000	1.000	1.000	
68	TNGT	902	333	507	139	2168	671	1565.	1.000	1.000	1.000	B31S73
71		902	333	507	139	1657	520	1199.	1.000	1.000	1.000	
71	TNGT	910	333	510	139	1657	520	1199.	1.000	1.000	1.000	B31S73
76 B		2217	558	246	72	1315	1430	1338.	1.000	1.000	1.000	
76 B	BEND	2230	247	559	72	1430	1315	2447.	2.439	7.360	7.360	B31S73
76 M		2147	652	559	646	1506	1228	2578.	2.439	7.360	7.360	
76 M	BEND	2147	652	559	646	1506	1228	2578.	2.439	7.360	7.360	B31S73
76 E		1738	1419	559	1213	1354	831	2517.	2.439	7.360	7.360	
76 E	TNGT	1748	559	1427	1213	831	1354	1376.	1.000	1.000	1.000	B31S73
81 B		1748	559	1427	1213	348	1574	1389.	1.000	1.000	1.000	
81 B	BEND	1765	560	1440	1213	348	1574	2540.	2.439	7.360	7.360	B31S73
81 M		1641	859	1440	1142	209	1454	2342.	2.439	7.360	7.360	
81 M	BEND	1641	859	1440	1142	209	1454	2342.	2.439	7.360	7.360	B31S73
83		560	1765	1440	1251	269	430	1699.	2.439	7.360	7.360	
83	TNGT	319	2290	259	1251	435	249	927.	1.000	1.000	1.000	B31S73
84		319	2290	259	1251	258	4119	2968.	1.063	1.000	1.000	
84	TNGT	313	2301	262	1251	258	4119	2968.	1.063	1.000	1.000	B31S73
86		313	2301	262	1251	367	5651	5517.	1.843	1.000	1.000	
86	TNGT	2633	1144	406	672	1111	4467	7578.	1.843	1.000	1.000	B31S73
91		2633	1144	406	672	963	3836	5437.	1.000	1.000	1.000	

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ELEMENT FROM TO	TYPE/TITLE	LOCAL FORCES (LB) FA	FB	FC	LOCAL MOMENTS (FT-LB) MA	MB	MC	STRESS (PSI)	STRESS INT.FAC. (I)	FLEX. IN PLANE	FLEX. OUT PLANE	CODE AND CLASS
91	HV-2-33-503	2649	1141	414	672	963	3836	2976.	1.000	1.000	1.000	B31S73
101		2649	1141	414	672	779	2336	1893.	1.000	1.000	1.000	
101	TNGT	2682	1140	429	672	779	2336	1893.	1.000	1.000	1.000	B31S73
106		1166	641	1315	1844	2713	320	2445.	1.000	1.000	1.000	
106	TNGT	1171	1323	642	1844	320	2713	4467.	1.000	1.000	1.000	B31S73
111		1171	1323	642	1844	576	4016	8584.	2.538	1.000	1.000	
111	TNGT	0	0	0	0	0	0	0.	2.538	1.000	1.000	B31S73
112		0	0	0	0	0	0	0.	1.000	1.000	1.000	
111	TNGT	0	0	0	0	0	0	0.	2.538	1.000	1.000	B31S73
113		0	0	0	0	0	0	0.	1.000	1.000	1.000	
86	TNGT	781	317	1048	1180	2093	710	2383.	1.843	1.000	1.000	B31S73
126		781	317	1048	1180	1268	461	1850.	2.000	1.000	1.000	
126	TNGT	780	316	1041	1180	1268	461	3644.	2.000	1.000	1.000	B31S73
131		780	316	1041	1180	1039	390	2195.	1.000	1.000	1.000	
131	HV-2-33-502	778	311	1012	1180	1039	390	1201.	1.000	1.000	1.000	B31S73
141		778	311	1012	1180	713	211	1034.	1.000	1.000	1.000	
141	BEND	776	969	304	1180	211	713	3212.	2.266	6.590	6.590	B31S73
151 M		619	1076	304	947	703	1149	3792.	2.266	6.590	6.590	

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STRESS SUMMARY

ELEMENT FROM / TO	TYPE TITLE	SUSTAINED LOAD PD/4T PSI	SUSTAINED LOAD EQN 11 CALC PSI	SUSTAINED LOAD EQN 11 ALLOW PSI	OCCASIONAL LOAD PD/4T PSI	OCCASIONAL LOAD LEVEL B EQN 12 CALC PSI	OCCASIONAL LOAD LEVEL B EQN 12 ALLOW PSI	OCCASIONAL LOAD LEVEL C EQN 12 CALC PSI	OCCASIONAL LOAD LEVEL C EQN 12 ALLOW PSI	LEVEL D EQN 12 CALC PSI	LEVEL D EQN 12 ALLOW PSI	EXPANSION EQNS 13/14 CALC PSI	EXPANSION EQNS 13/14 ALLOW PSI	ANCHOR MOV EQN *** CALC PSI	ANCHOR MOV EQN *** ALLOW PSI
141	BEND	776	1115	15000	776	2453	18000	0	0	4327	36000	0	0	0	0
151 M			1039	15000		2619	18000	0	0	4831	36000	0	0	0	0
151 M	BEND	776	1039	15000	776	2619	18000	0	0	4831	36000	0	0	0	0
156			922	15000		2725	18000	0	0	5248	36000	0	0	0	0
156	TNGT	335	382	15000	335	962	18000	0	0	1775	36000	0	0	0	0
161	CHK-2-33-513		529	15000		1257	18000	0	0	2276	36000	0	0	0	0
161	TNGT	776	1132	15000	776	2463	18000	0	0	4325	36000	0	0	0	0
171			1599	15000		3503	18000	0	0	6169	36000	0	0	0	0
171	TNGT	1164	1432	15000	1164	2115	18000	0	0	3071	36000	0	0	0	0
176			1317	15000		1737	18000	0	0	2326	36000	0	0	0	0
176	TNGT	527	609	15000	527	832	18000	0	0	1145	36000	0	0	0	0
181			604	15000		822	18000	0	0	1128	36000	0	0	0	0
181	CMPT	0	0	15000	0	0	18000	0	0	0	36000	0	0	0	0
186	MO-2972		0	15000		0	18000	0	0	0	36000	0	0	0	0
181	TNGT	527	641	15000	527	863	18000	0	0	1175	36000	0	0	0	0
191			632	15000		843	18000	0	0	1138	36000	0	0	0	0
191	TNGT	1164	1360	15000	1164	1757	18000	0	0	2313	36000	0	0	0	0
198			1353	15000		1736	18000	0	0	2274	36000	0	0	0	0
198	TNGT	1164	1353	15000	1164	1736	18000	0	0	2274	36000	0	0	0	0
201			1311	15000		1607	18000	0	0	2021	36000	0	0	0	0
201	TNGT	1164	1311	15000	1164	1607	18000	0	0	2021	36000	0	0	0	0
206 B			1226	15000		1413	18000	0	0	1675	36000	0	0	0	0
206 B	BEND	1164	1297	15000	1164	1699	18000	0	0	2262	36000	0	0	0	0
206 M			1207	15000		1638	18000	0	0	2241	36000	0	0	0	0
206 M	BEND	1164	1207	15000	1164	1638	18000	0	0	2241	36000	0	0	0	0
206 E			1336	15000		1751	18000	0	0	2331	36000	0	0	0	0
206 E	TNGT	1164	1244	15000	1164	1437	18000	0	0	1707	36000	0	0	0	0
207			1288	15000		1646	18000	0	0	2147	36000	0	0	0	0
207	TNGT	993	1174	15000	993	1696	18000	0	0	2427	36000	0	0	0	0
208			1150	15000		1749	18000	0	0	2587	36000	0	0	0	0

* EXCEEDED ALLOWABLE IN EQUATION 13, EQUATION 14 USED
** EXCEEDED ALLOWABLE

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CODE B31S73

ELEMENT FROM / TO	TYPE TITLE	SUSTAINED LOAD PD/4T	SUSTAINED LOAD EQN 11 CALC	SUSTAINED LOAD EQN 11 ALLOW	OCCASIONAL LOAD PD/4T	OCCASIONAL LOAD LEVEL B EQN 12 CALC	OCCASIONAL LOAD LEVEL B EQN 12 ALLOW	OCCASIONAL LOAD LEVEL C EQN 12 CALC	OCCASIONAL LOAD LEVEL C EQN 12 ALLOW	LEVEL D EQN 12 CALC	LEVEL D EQN 12 ALLOW	THERMAL EXPANSION EQNS 13/14 CALC	THERMAL EXPANSION EQNS 13/14 ALLOW	NON-REPEATED ANCHOR MOV EQN *** CALC	NON-REPEATED ANCHOR MOV EQN *** ALLOW

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Exelon Generation.	RAW WATER CORROSION ULTRASONIC EXAMINATION REPORT FORM WORK ORDER # C0253805-04	NDE SUPPORT GROUP

STATION / UNIT	PBAPS UNIT 2	EXAM AREA	WELD	STRAIGHT
EXAM LOCATION ID#	HV-2-33-502 U/S	(X - ONE)	[ ]	[X]
PIPE NOMINAL WALL	.280"	EXAM POSITION	HORIZ	VERT
PIPE MINIMUM WALL	.100"	(X - ONE)	[ ]	[X]
PIPE DIA. 6"	ELEV. 116'	AREA 33	ROOM	U/2 RBCCW

INSTRUMENT: Mfgr: Olympus Model: 37DL Plus Serial '041169405

SPECIAL GRIDING: N/A

SEARCH UNIT: Mfgr: Panametrics S/N: 810577 Make: D798

Size: .283" Frequency: 7.5 Mhz

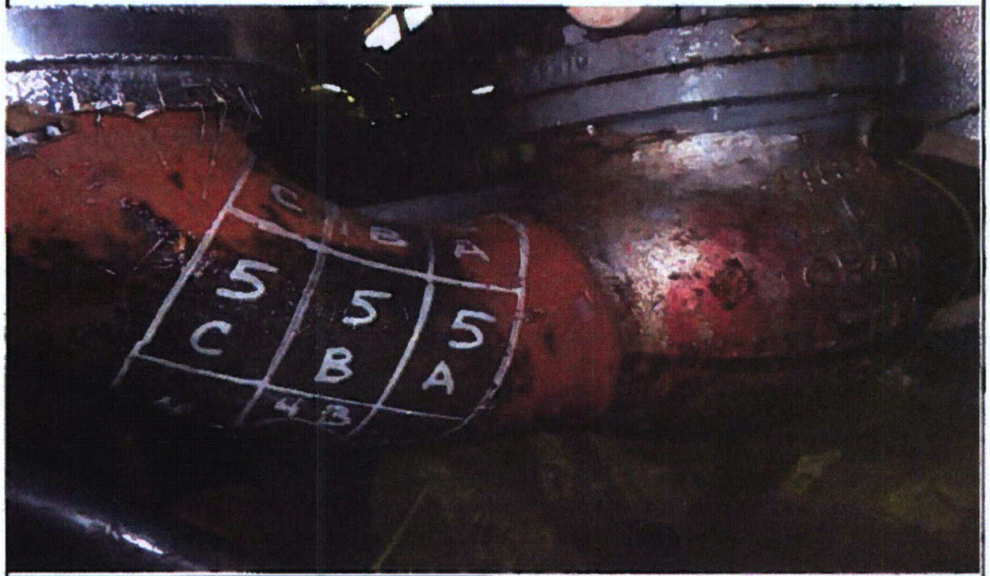
Couplant: Humex / 04165 Reference Block 2878320

CALIBRATION TIMES: Initial: 15:00 Final: 19:00 Other: N/A

THERMOMETER: 0002630031 Due 10/28/14 CAL TEMP 70° COMP TEMP 78°

DRAWING (If Applicable)

HV-2-33-502 U/S Elbow



See UT Data Sheet For Readings

COMMENTS:

Thru Wall leak was identified on extradose of elbow.

Reference Procedures ER-AA-335-004 REV. 7 & Mag-CG-409 REV .3

Reference Acceptance Criteria per Min-Wall and Engineering Direction AR A1966963 E03

Surface Condition = Prepped, Paint Removed. Material: Carbon Steel.

Calibration	
Actual	Meas.
.500"	.500"
.400"	.400"
.300"	.300"
.200"	.200"
.100"	.100"

James Martin II / 8/23/14 /

NAME / LEVEL DATE NAME / LEVEL DATE

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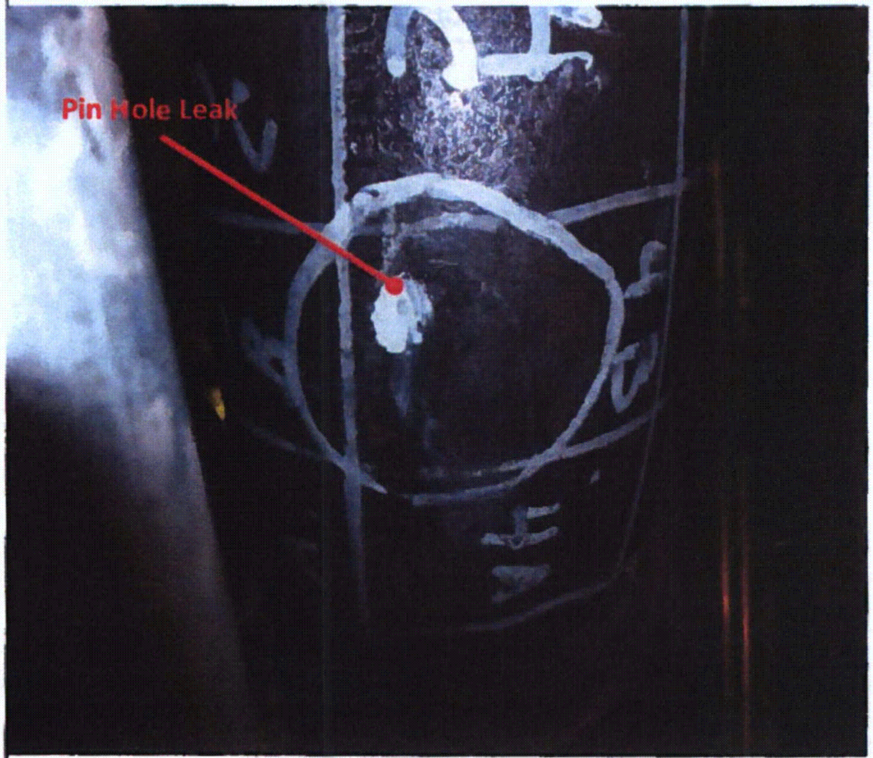
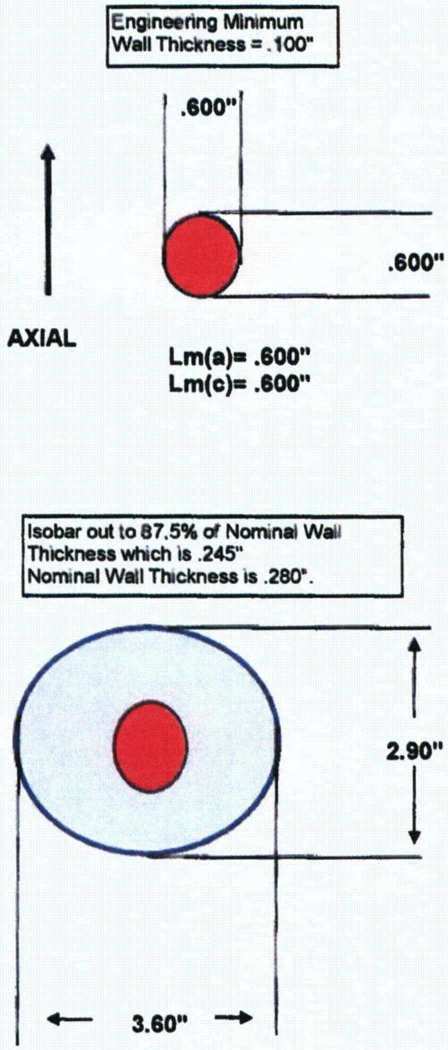
ExelonGeneration.	ULTRASONIC EXAMINATION PHOTO SHEET	NDE SUPPORT GROUP

HV-2-33-502 U/S Elbow





COMMENTS: Ultrasonic inspection was performed on the area surrounding the thru wall leak on HV-2-33-502 U/S Elbow to quantify the flaw size.

James Martin II / 8/23/14	/
NAME / LEVEL — DATE	NAME / LEVEL — DATE

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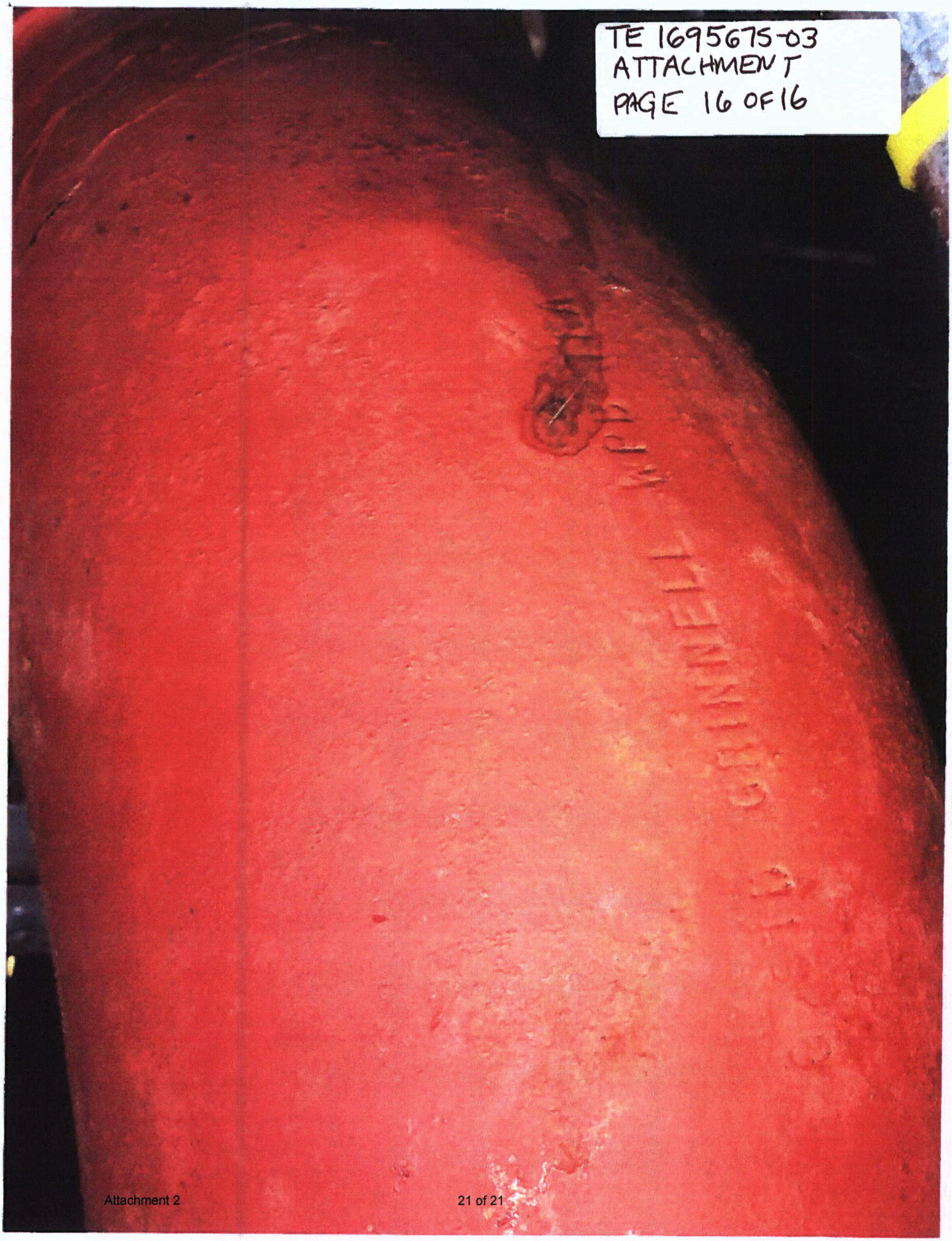
Exelon Generation.	RAW WATER CORROSION, ULTRASONIC EXAMINATION REPORT FORM WORK ORDER # C0253805-04	NDE SUPPORT GROUP

HV-2-33-502 U/S Elbow

	Band A	Band B	Band C
1	.273 "	.287 "	.258 "
2	.212 "	.284 "	.219 "
3	.226 "	.169 "	.226 "
4	.182 "	.034 "	.143 "
5	.264 "	.227 "	.171 "
6	.235 "	.213 "	.266 "

James Martin II	8/23/14		
NAME / LEVEL	DATE	NAME / LEVEL	DATE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