DOCKET NO. 50-286

ATTACHMENT II

Nuclear Engineering
CALCULATION CONTROL SHEET

Nuclear Plant: IP3 [x] JAF [ ] **PAGE 1 OF 2**

CALC. NO. IP3-CALC-SWS-02199 REV. 0
CALCULATION IS: PRELIMINARY: ____ FINAL: x

	NAME	SIGNATURE	DATE
PREPARER:	Mara Lakis	M Lakis	12/23/96
CHECKER:	LEON ROBILLARD	Leon Robillard	12/31/96
(DESIGN) VERIFIED:/NA	KAI LO	Kai Lo	1/2/96 KL 97
APPROVED:	Richard S. Drake	Richard S. Drake	1/2/96 97 RSDrake

ORIGINATOR: NYPA [x] OR OTHER [ ]
SYSTEM NO./NAME: F44-0151 / Service Water
TITLE: Wall Thinning Evaluation of Lines No. 11a through 11e

QA CATEGORY: I DISCIPLINE: C/S STRUCTURE: Piping

MODIFICATION NO./TASK NO. N/A DBD REF. NO. IP3-DBD-304

PROBLEM/OBJECTIVE/METHOD

UT results indicated wall thickness less than the allowable of 0.319 in. The structural integrity of the pipe has to be evaluated.

DESIGN BASIS/ASSUMPTIONS

ANSI B31.1 - 1967
NYPA Engineering Standard CES - 7, Rev 2
NRC Generic Letter 90 - 05

SUMMARY/CONCLUSIONS

The pipe is structurally adequate, but must be monitored mid - April (during outage); new decision (for replacement) must be made based on the latest indications.

THIS CALC SUPERSEDES OR VOIDS CALC. NO. N/A

DISTRIBUTION: C = CONTROLLED I = INFO

NAME	DEPT	LOC	C	I
J. Gullick	IDEM	IP3		x

NYPA FORM DCM-2, ATTACHMENT 4.1

9701130213 970103
PDR ADOCK 05000286
P PDR

Nuclear Engineering
CALCULATION CONTROL SHEET

COMPONENTS

MAJOR EQUIPMENT	PIPE NO.	VALVE NO.	SUPT. NO.	INST. NO.	PENE. NO.
	11a	SWN-41-1			
	11b	SWN-41-3			
	11c	SWN-41-4			
	11d	SWN-41-2			
	11e	SWN-41-5			

RELATED DOCUMENTS

1. IP3-CALC-SWS-01596, Rev. 0
2. NDE Report 96UT059 page 2 of 4 (attached)
3. DER 96-2653
4. OD 96-069
5. NDE Report 96UT063
6. NDE Report 96UT060
7. NDE Report 96UT061
8. NDE Report 96UT062

RELATED DRAWINGS

1. 9321-F-53533-9

SECURITY: (Y/N) N COMPUTER PRINTOUT: (Y/N) N

New York Power Authority

IP3 NUCLEAR POWER PLANT

CALCULATION NO. IP3-CALC-SWS-02199 REVISION 0

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EVALUATION OF PIPE WALL THINNING

Piping System : SERVICE WATER
Description : line 11e near valve SWN-41-5
Prepared By : [illegible] Date : 12/18/96
Checked By : [illegible] Date : 12/19/96

STEP 1 : SCREENING EVALUATION Ref. 2

a. Evaluation of Minimum Predicted Thickness : t_p

- Pipe Wall Nominal Thickness, t_{nom} = 0.365 in.
- Latest Measured Minimum Wall Thickness, t_{meas} = 0.12 in.
- Previous Measured Minimun Wall Thickness, t'_{meas} = 0.411 in.
  (If wall has not measured before, $t'_{meas}=1.125*t_{nom}$)
- TIME Between Two Inspections, = 20 yr.
  (If wall has not measured before,
  TIME = service years of the pipe up to first inspection.)
- Erosion/Corrosion Rate, C

$$C = \frac{t'_{meas} - t_{meas}}{TIME} \quad \frac{.411-.12}{20}$$ = 0.015 in/yr

- Years between Latest and Next Inspections, Y = 0.33 yrs.
- $t_p = t_{meas} - C * Y$ $t_p = 0.12 - (.015) \cdot .33$ (if done mid April '97) = 0.115 in.

b. Screening Limits :

- Acceptable Limit = $0.875 * t_{nom}$ = 0.319 in.
- Unacceptable Limit = $0.3 * t_{nom}$ = 0.11 in.

c. Acceptability of the Thinning Wall:

- [ ] Accept As Is for $t_p \geq 0.875*t_{nom}$
- [X] Step 2 Evaluation Required for $0.875*t_{nom} > t_p \geq 0.3*t_{nom}$
- [ ] Repair or Replacement for $0.3*t_{nom} > t_p$

NYPA NSE CHS-7 EVALUATION FORM (SEPT. 1992) PAGE 1 OF 3

Note: This Evaluation Form can be used as a part of calculation for pipe thinning evaluation, but the calculation shall follow the requirements of NYPA DCN.

New York Power Authority

IP3 NUCLEAR POWER PLANT

CALCULATION NO. IP3-CALC-SWS-02199 REVISION 0 PAGE 14 OF 15
2 of 3

EVALUATION OF PIPE WALL THINNING
Piping System : SERVICE WATER
Description : Line 11e near valve SWN-41-5
Prepared By : [illegible] Date : 12/18/96
Checked By : [illegible] Date : 12/19/96

STEP 2 : MINIMUM WALL THICKNESS EVALUATION

a. Pipe Parameters:

- Pipe Outside Diameter, D = 10.75 in.
- Design Pressure, P = 150 psi
- Design Temperature, T_d = 160 °F
- Pipe Material = 1153
- Allowable Stress at Design Temperature, S = 15,000 psi
- Longitudinal Weld Effective Coefficient, E = 1
- An Additional Thickness for Erosion/Corrosion, A = 0 in.

b. Pipe Minimum Wall Thickness Required by Hoop Stress :

- $t^h_{min} = \dfrac{P*D}{2(S*E+0.4P)} + A$ $\quad \dfrac{150(10.75)}{2[15000+.4(150)]}$ = 0.054 in.

c. Pipe Minimum Wall Thickness Required by Axial Stresses :

- Axial Stress due to Design Cond.(P+DW), S_{des} = 2000 psi
- Axial Stress due to Upset Cond.(P+DW+OBE), S_{ups} = 3160 psi
- Axial Stress due to Faulted Cond.(P+DW+DBE), S_{fau} = 3740 psi
- $t_1 = (S_{des}/S)*t_{nom}$ $\quad S_{DES} = 1.1 + 0.9 = 2.0$ = 0.049 in.
- $t_2 = (S_{ups}/1.2S)*t_{nom}$ $\quad S_{UPS} = 3.16$ = 0.064 in.
- $t_3 = (S_{fau}/1.8S)*t_{nom}$ $\quad S_{FAU} = 3.74$ = 0.051 in.

ref. (1)

- t^a_{min} = Largest of (t_1, t_2, t_3) = 0.064 in.

d. Acceptability based on Minimum Wall Thickness Criteria :

- [X] Accept But Monitor for $t_p \geq t^h_{min}$ & t^a_{min}
- [ ] Step 3 Evaluation Required for $t^h_{min} > t_p \geq t^a_{min}$
- [ ] Repair or Replacement for $t^a_{min} > t_p$

$$\frac{PD}{4t} = \frac{150(10.75)}{4(.365)} = 1105 \text{ psi}$$

New York Power Authority

IP3 NUCLEAR POWER PLANT

CALCULATION NO. IP3-CALC-SWS-02199 REVISION 0

EVALUATION OF PIPE WALL THINNING

Piping System : SERVICE WATER

Description : line 11e near valve SWN-41-5

Prepared By : MS Date : 12/18/96

Checked By : SR Date : 12/31/96

STEP 3 : LOCAL THINNING EVALUATION & ESTIMATEION OF REMAINING SERVICE LIFE

a. Pipe Parameters:

$R = D/2 =$ _____ in., $t_{min} = t^b_{min} =$ _____ in., $\sqrt{R*t_{min}} =$ _____ in.

b. Local Thinning Dimensions : (see Figure 7.2)

$L =$ _____ in., $L_b =$ _____ in., $L_{b(t)} =$ _____ in., $L_{b(c)} =$ _____ in.

$L_{b(c)} / \sqrt{R*t_{min}} =$ _____

c. Acceptable Local Thinning thicknesses:

- Case 1 : Applicable if $L_{b(c)} \leq \sqrt{R*t_{min}}$

  t_{aloc}/t_{min} (from curve 1 in Figure 7.3) = _____

  $t_1 = (t_{aloc}/t_{min})*t_{min}$ = _____ in.

- Case 2 : Applicable if $L_b \leq 2.65\sqrt{R*t_{min}}$ & $1.13t_{min} \leq t_{mm}$,

  $t_{21} = [\frac{1.5\sqrt{R*t_{min}}}{L}(1 - \frac{t_{mm}}{t_{min}}) + 1]*t_{min}$ = _____ in.

  $t_{22} = (0.353\ L_b / \sqrt{R*t_{min}})*t_{min}$ = _____ in.

  t_2 = Larger of (t_{21}, t_{22}) = _____ in.

- Case 3 :

  t_{aloc}/t_{min} (from Curve 2 in Figure 7.3) = _____

  $t_3 = (t_{aloc}/t_{min})*t_{min}$ = _____ in.

- Minimum Acceptable Local Thickness

  t_{aloc} = Minimum of (t_1, t_2, t_3) = _____ in.

d. Acceptability based on Local Thinning Critwia :

- [ ] Accept But Monitor for $t_p \geq t_{aloc}$
- [ ] Repair or Replacement for $t_p < t_{aloc}$

e. Pipe Wall Remaining Service Life (RSL):

- t_p = Larger of (t^b_{min}, t^a_{min}) if $t_p \geq t^b_{min}$ & t^a_{min}
  = t_p if $t^b_{min} > t_p \geq t^a_{min}$ = 0.11 in.
  $\geq 0.3*t_{mm}$

$\frac{.12 - .11}{.015} = 0.67 \times 12$

- RSL = $\frac{t_{mm} - t_p}{C}$ (where C= pipe thinning rate) = 8 mos ~~yrs~~.

LIST OF COMMITMENTS

Number	Commitment	Due
IPN-97-002-01	Conduct periodic augmented inspections (UT/RT) to ensure that the SW flawed weld on pipe line number 11e maintains its structural integrity for all design loading conditions.	Every three months from initial UT until code repair/replacement commences.
IPN-97-002-02	Perform qualitative assessment (visual) of the SW flawed weld on pipe line number 11e weekly during plant walkdown to monitor for any change in the condition of the flaw with requirement to conduct UT/RT if leakage rate increases.	Weekly until code repair/replacement commences.
IPN-97-002-03	Code repair weld or replace portion of flawed pipe on SW line number 11e during the next refueling outage RO 9.	Refueling Outage RO 9.
IPN-97-002-04	Re-examine the 5 extent of condition welds during the next refueling outage RO 9.	Refueling Outage RO 9.
IPN-97-002-05	Conduct metallurgical evaluation of the flaw if the affected portion of the piping is replaced.	30 days after end of Refueling Outage RO 9.