S U M M A R Y R E P O R T

PRIMARY PLANT MAKE UP STORAGE TANK SEISMIC UPGRADE

SAN ONOFRE NUCLEAR GENERATING STATION

UNIT - 2

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SOUTHERN CALIFORNIA EDISON

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1. PURPOSE/BACKGROUND

The existing Component Cooling Water (CCW) system at each of Southern California Edison's (SCE) San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 consists of two redundant trains (critical loops), and one non-critical loop which can be aligned to either one of the critical loops. The make-up water to the CCW surge tank is supplied by the seismically-qualified mobile fire tankers to ensure adequate water supply for a 7-day period, using the temporary connection. This arrangement, however, is very labor intensive to operate, and the tankers may require several refills to perform their function for the desired 7-day time period.

To eliminate the reliance of the CCW system on the fire tankers for the make-up water, the primary make-up water system will be integrated into the CCW system to provide the necessary supply of make-up water. The make-up system will be modified to supply water to the CCW critical loops following loss of normal make-up from the nuclear service water system. It will provide the necessary water inventory to compensate for the maximum allowable leak from both CCW critical loops for a period of seven days.

The make-up system of each unit includes a 300,000 gallon Primary Plant Make-Up Storage (PPMS) tank, T-056 for Unit 2 and T-055 for Unit 3. These tanks were originally designed to the American Petroleum Institute (API)-620 Standard, 5th. Edition, and constructed and tested to API-650 Standard, 5th. Edition; and were classified as Seismic Class II components. Both tanks will be upgraded to Quality Class II, Seismic Category I to establish American Society of Mechanical Engineers (ASME) Code, Section III, Class 3 equivalency without ASME stamping. This tank upgrade is necessary in order to qualify as an integral part of the CCW system, as explained above. The methodology of the tank seismic upgrade is based on Reference 5 (Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment). This methodology is outlined in Section 5 of this report. Comparison between the API 650 Standard, which was the basis for the original tank construction and testing, and the ASME Code (1989 Edition, no addenda) was made to identify and reconcile the differences between the requirements of the two codes. These differences were resolved, as part of the tank upgrade analysis.

This report provides a summary of the results of the analyses, and the ASME Code reconciliation performed to upgrade the Unit-2 PPMS tank to Seismic Category I, and to qualify this tank per ASME Code, Section III, Class 3 to meet the requirements described above. This report also provides a summary of all the design input required to perform the upgrade analyses, and the analysis methodology.

Results in this report are for SONGS Unit-2 only.

2. RESULTS/CONCLUSIONS

1. For the existing tank to meet the seismic loads and Generic Implementation Procedure (GIP) requirements, the tank was reinforced by 36 vertical stringers and 34 additional anchor bolts. Tank modification details are provided in Appendix A and Reference 1. Analysis details can be found in SCE Calculation No. M-DSC-280.

2. Anchor bolt chairs were replaced by a new ring-type chairs. Details of the anchor bolt chair modified design can be found in Appendix A.

3. The water inside the tank is expected to slosh against the roof. However, the roof was shown to be capable of withstanding the sloshing loads during a Design Basis Earthquake (DBE) seismic event (SCE Calculation No. M-DSC-280, Appendix A).

4. A 1/4" thick reinforcing pad was added to the man hole of each tank. Details are given in Appendix A, and Reference 1.

5. Reinforcing pads were added to some nozzles so that local stresses in the shell do not exceed their allowables. SCE Calculation No. M-DSC-280 provides a list of the nozzles requiring reinforcing pads.

6. Some anchor bolts may be moved radially out a distance up to 1 5/16" to avoid interference with the rebars in the concrete base without exceeding any of the allowable stress limits. Similarly, anchor bolt chairs may be moved up to 4" in the circumferential direction from their nominal position to avoid interference with tank attachments.

7. The stress in the existing tank wall-to-bottom weld is within the allowable of the weld material.

8. The modified tank has been evaluated for buckling per the Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment, Revision 2 (Reference 17, Appendix A). This evaluation shows that the modified tank meets the GIP requirements.

Furthermore, the tank has been evaluated for buckling at higher elevations, above the reinforcing stringers, using Code Case N-284 and shown to be acceptable. It should be noted that this additional evaluation, at higher elevations, is not required by the GIP. It was performed basically to ensure that the analysis covers the entire tank shell height.

Also, the tank does not have any large asymmetric openings; therefore, axisymmetric analysis techniques should be applicable.

9. ASME Code reconciliation is summarized below:

- A detailed ASME Code reconciliation is included in the PPMS tank design report (SCE Calculation No. M-DSC-280, Appendix A, Sections 10 and 11). Results can be summarized as follows:

  (a) Tank Shell Design: the minimum tank shell thickness requirements of ND-3324.3, referred to by ND-3842, are satisfied at all elevations.

  (b) Tank Bottom Design: the requirements of ND-3831 are satisfied by the tank bottom. The foundation also meets the requirements of ND-3831, since the PPMS tanks were built to the standards of API-650.

  (c) Tank Roof Design: the tank roof satisfies all the requirements of ND-3856. Furthermore, it is shown, in Appendix A of SCE Calculation M-DSC-280, that the roof and the junction to the cylindrical shell will withstand the water pressure caused by sloshing.

  (d) Tank Manway: the manway, reinforced by a 0.25" thick plate, meets the requirements of ND-3332.

  (e) Code Stress Limits: stresses in the tank shell meet the requirements of ND-3821.5 under Design, Operating Basis Earthquake (OBE), and Design Basis Earthquake (DBE) conditions.

- A survey of SONGS-2 tank, T056, was performed for roundness at elevations 7' above the bottom and 6' below the top. Results of the survey are attached in Appendix D. Based on these results, it is concluded the tank meets the out-of-roundness requirements of the ASME Code (maximum out-of-roundness is 0.22' per the survey results; maximum allowed per Section ND-4224 is 0.4', as shown in Section 8 of SCE Calculation No. M-DSC-280).

- The National Board Inspection Code (NBIC) procedure for State approval is not applicable since atmospheric tanks are exempted by the State of California (California Code of Regulations, Title 8, Chapter 4, dated 5/1/1992). However, tank design and modification will be performed to the ASME Code, Section III.

- The Certified Material Test Reports (CMTRs) and welding data for the existing tank components were recovered and reviewed.

- The tank has been pressure tested according to ASME Code, Section III, Subsection ND-6000 requirements after the modifications were implemented. Testing was performed by filling it to the maximum possible water level.

- The results of the radiographic survey of the weld seams of Unit-2 PPMS tank revealed unacceptable defect sizes that range from 1/32" to 4.875" in length. Most of the defects are below 1/4" long. A statistical analysis was performed to describe the maximum flaw size that can exist in the welding with 95% reliability and 95% confidence level. The result of the analysis, based on sample size of 60 radiographs representing a population of 283 defects, showed that such defect to be < 1.525".

- The statistical analysis was followed by fracture mechanics analysis with a maximum defect size of 5"in length, that was assumed to exist at the highest stress location of the tank shell. The result of the analysis showed that such a defect is acceptable with factor of safety > 3 (analysis methodology is summarized in Section 5 of this report).

3. ASSUMPTIONS

1. The nozzles and the ladder attached to the PPMS tank were not included in the finite element models. It is assumed that their effect on the anchor bolt load distribution is negligible, since their weight is very small compared to the weight of the tank and its contents.

2. For calculating the maximum stress in the PPMS tank shell due to hydrostatic pressure, the maximum water height in the tank is conservatively assumed to be 34 ft, which is the maximum height of the tank (2 ft higher than the overflow line elevation per SCE Calculation No. S023-407-3-97-0). Hydrostatic water head of 34 ft, therefore, exceeds the maximum possible water head in the tank.

3. Design Basis Earthquake (DBE) = 2 * Operating Basis Earthquake (OBE).

4. The WRC Bulletin 297 is the best practical method presently available for estimating stiffness values of the tank nozzles. However, it provides data on a narrow range of parameters and therefore some interpolation and estimation are performed to obtain approximate stiffness values. The magnitude of nozzle stiffness obtained is adequate to provide realistic translational and rotational restraint conditions at the tank connections. (Note : The ASME code flexibility factor equations are not sufficient to calculate nozzle flexibilities in tanks with D/T ratio > 100, and do not have flexibility guidance on thrust loadings).

   Based on the data available, only the translational load (radial), in-plane moment load and out-plane moment load cause significant tank shell deformations.

5. Stresses due to dead weight of the tank shell are not included in the local stress check at the nozzle locations. Per Appendix A, the combined weight of the tank roof and the cylindrical shell is 53,077 lb. The corresponding compressive stress at the base of the cylindrical shell is only 113 psi, which is considerably smaller than the other stress components (for example, the maximum hoop stress in the shell due to hydrostatic pressure is > 10,000 psi).

4. DESIGN INPUT

4.1 Tank Description and Geometry

The Primary Plant Make-Up Storage (PPMS) Tank is a 40 ft inside diameter x 34 ft high atmospheric tank with a capacity of 300,000 gallons (Reference 25). The tank is made up of stainless steel, SA 240-304, plates; and is anchored to the foundation by 36 equally-spaced anchor bolts. The anchor bolt chair material is A-36 (Reference 24). A more detailed description of the tank and the anchor bolt assemblies can be found in Appendix A of this calculation.

Figure 4.1 shows the main dimensions of the PPMS tank. It shows the tank diameter, height, and plate wall thickness of the bottom, wall, and roof (Reference 25).

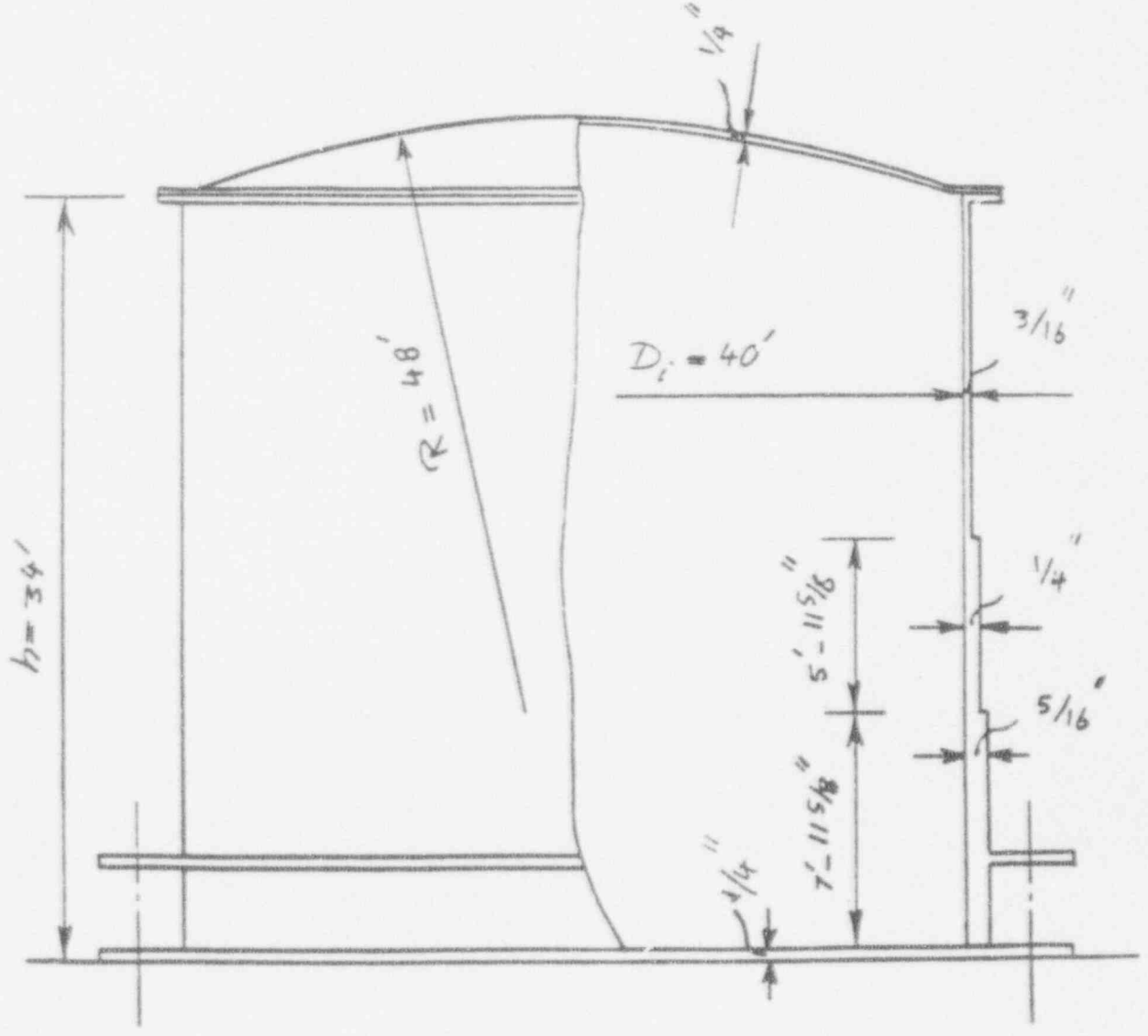


Figure 4.1 Main Dimensions of the PPMS tank

4.2 Material Properties

Tank Shell Material: Stainless Steel, SA 240-304 (Reference 25)

The following material properties of SA 240-304, at 120°F(1), were used in the analysis (Reference 2):

Young's modulus (E) = 28.0×10^6 psi,

Poisson's ratio (ν) = 0.3

Allowable stress intensity (S_m) = 20,000 psi

The anchor bolt chair material: A-36 (Reference 24)

The yield strength of A-36, at 110°F(1), is 35.68 ksi (Reference 2). This value was used for anchor bolt chair design (Appendix A of SCE calculation M-DSC-280).

Note (1): The actual design temperature, per FCN F-7519M for P&ID number 40133, is 104°F. Therefore, the use of either 110°F or 120°F as reference temperature for material properties is conservative.

4.3 Reinforcing Bars

Per Reference 4, the concrete base is reinforced by #18 size reinforcing bars (rebars). These rebars are 2.257" in diameter, and are separated by a 16" center-to-center distance.

4.4 Anchor Bolt Assemblies

Figure 4.2 shows the main dimensions of a typical anchor bolt assembly. Two different bolt sizes exist in the tank after modification:

1. 1.5" bolts (36 existing anchor bolts),

2. 2" bolts (34 new anchor bolts).

Also, a ring will be welded to the outside edge of the bottom plate as shown in Figure 4.2. Holes for anchor bolts will be drilled in the ring (1 5/8" for the existing bolts, and 2 1/8" for the new bolts).

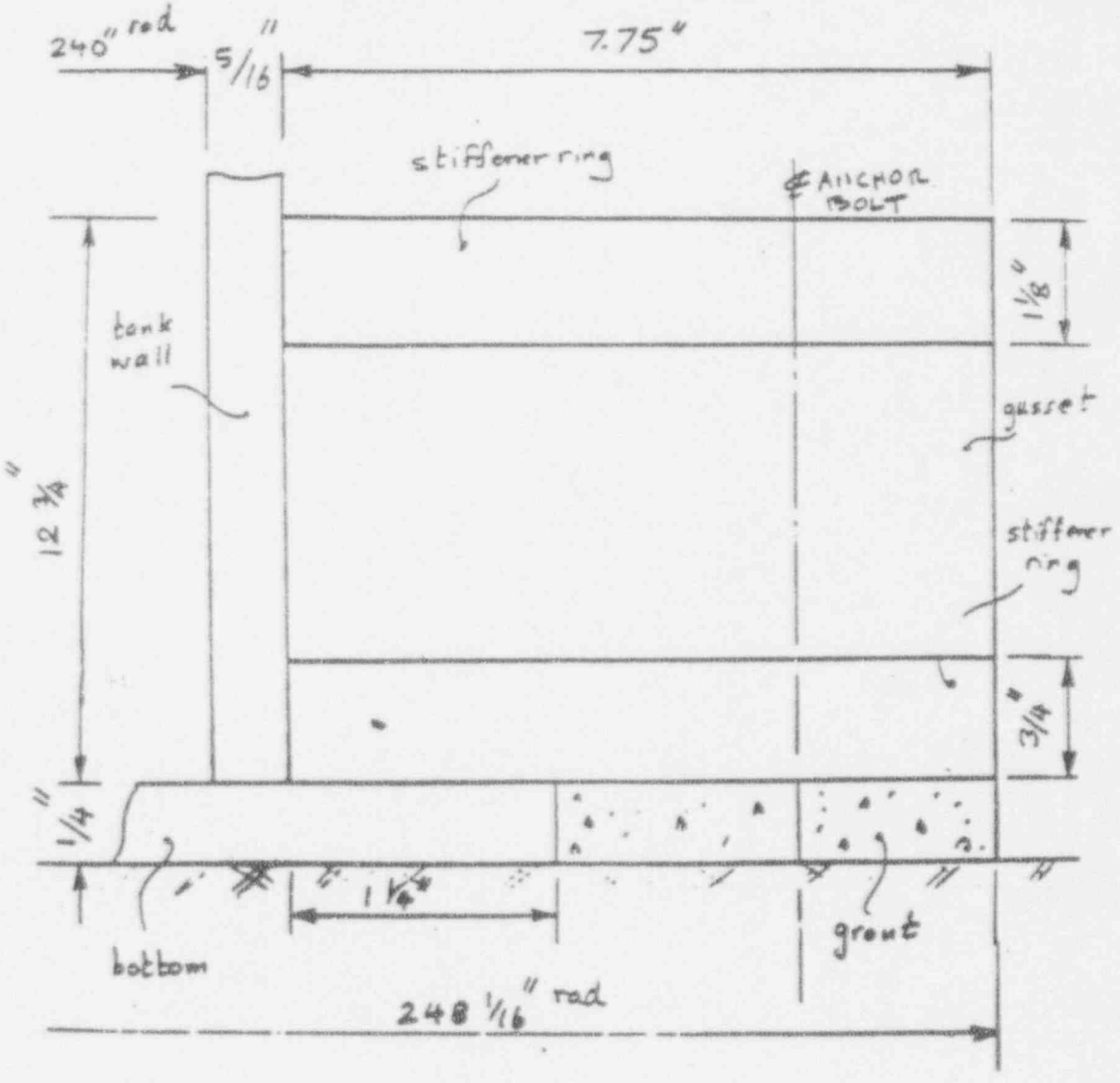


Figure 4.2 Modified Anchor Bolt Assembly

4.5 Nozzle and Piping Data

The nozzle loads evaluated are given in data sheets, attached in SCE Calculation No. M-DSC-280, Appendix D, which were extracted from various calculations as noted in the nozzle load data sheets.

Per References 23 and 24, the following piping is attached to the PPMS tank:

4" Sch. 40S SA-312 TP304 @ elev. 31'-0"

3" Sch. 40S SA-312 TP304 @ elev. 10'-7"

2-1/2" Sch. 40S SA-312 TP304 @ elev. 31'-0"

2" Sch. 80S SA-312 TP304 @ elev. 31'-0" (two places)

1" Sch. 80S SA-312 TP304 @ elev. 16'-0"

4.6 Out-of-Roundness Measurements

Field tests were conducted on PPMS tank T-056 to measure the diameter at different angles. These measurements were taken at two elevations. Results of the survey are documented in Reference 26, and a copy is attached in SCE Calculation No. M-DSC-280, Appendix D.

5. METHODOLOGY

The tank design report was prepared by Structural Integrity Associates, Inc. of San Jose, California. This report is included, in its entirety, in Appendix A of SCE Calculation No. M-DSC-280. The methodology of the analysis is based on "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment," Reference 5; and ASME Boiler and Pressure Vessel Code, Reference 2. A summary of the tank design methodology is given in Section 5.1 of this report, which includes the following subsections:

- Section 5.1.1 includes tank design per GIP procedure (Reference 5). This section also includes roof evaluation for sloshing loads, and qualification of the tank to ASME Code design rules.

- Section 5.1.2 includes the application of ASME Code Case N-284 (Reference 28) analysis methodology. The additional analysis per Code Case N-284 deals with the reinforced modified tank since the GIP procedure does not include the effect of the tank reinforcing stiffeners (stringers). Code Case N-284 was also used to evaluate the tank shell at different elevations. The GIP procedure addresses only the bottom elevation.

The methodology of developing the tank stick model is included in Appendix B of SCE Calculation No. M-DSC-280. The stick model was used in the stress analysis of the piping attached to the PPMS tanks.

In addition to the above analyses, the following supporting analyses were also performed:

1. Angular shear stress distribution in the anchor bolts,
2. Bolt location adjustment due to the rebars,
3. Calculation of translational and rotational nozzle stiffness,
4. Local stress check, and
5. Out-of-roundness check.

The methodologies used in these analyses are summarized in sections 5.2 through 5.6 of this report.

Since the tank shell welding did not meet the ASME Code requirements, extensive radiographic examination was performed to provide a statistical base for characterizing the tank welding defects. The statistical characterization of the flaws was followed by a fracture mechanics analysis to demonstrate acceptability of the welds with high degree of reliability. A summary of the methodologies used is provided in Section 5.8 of this report; details can be found in SCE Calculation M-DSC-280, Appendices E and F.

5.1 PPMS Tank Seismic Evaluation

5.1.1 Analysis Per GIP (Reference 5)

The methodology outlined in this section, obtained from Reference 5, pertains to large, flat-bottom, cylindrical vertical tanks. The evaluation includes the following features:

- Tank shell buckling.
- Anchor bolts and their embedments have adequate strength against breakage and pullout.
- The anchorage connection between the anchor bolts and the tank shell has adequate strength.

The seismic evaluation of the tank is performed using the step-by-step procedure described briefly below.

Step 1 Input data

R	Nominal radius of the tank, in.
H'	Height of tank shell, in.
t_{min}	Minimum shell thickness at the top of the tank, in.
t_s	Minimum thickness of the tank shell, in.
σ_y	Yield strength of the tank shell material, psi
h_c	Height of anchor bolt chair, in.
E_s	Young's modulus of the tank shell material, psi
V_s	Average shear wave velocity of soil, ft/sec
γ_f	Weight density of fluid in tank, lb_f/in^3
H	Maximum height of fluid in the tank, in.
h_f	Height of freeboard above fluid surface, in.
N	Number of anchor bolts
d	Diameter of anchor bolt, in.
h_b	Effective length of bolt from anchor plate to chair top, in.
E_b	Young's modulus of anchor bolt material, psi
F_f	Tank frequency, Hz.

Step 2 Calculate the following ratios and values:

H/R

t_s/R

$t_{av} = (\Sigma\ t_i\ h_i)/H', \quad i=1,n$

where, n = total number of sections of the tank shell with different thicknesses,
t_i, h_i = the thickness and height of the ith section of the tank shell.

$t_{ef} = (t_{av} + t_{min})/2$

t_{ef}/R

$$A_b = \pi d^2/4$$

$$t' = [(N A_b)/(2 \pi R)](E_b/E_s)$$

$$c' = (t'/t_s)(h_c/h_b)$$

$$W = \pi R^2 H \gamma_f$$

Step 3 Fluid-structure modal frequency

F_r, Hz from Table 7-3

by entering Table 7-3 with: R, t_{ef}, and H/R from Steps 1 and 2. Table 7-3 is attached in Appendix B (table number is retained from Reference 5 for convenience).

Step 4 Spectral acceleration (Sa_r)

Determine the maximum spectral acceleration (Sa_r), for 4% damping, and over the frequency (F) range:

$$0.8 F_r < F < 1.2 F_r$$

Step 5 Base shear load (Q)

Base shear load (Q) is determined by entering Figure 7-3 with H/R and t_{ef}/R, both from Step 2, to determine the shear coefficient (Q').

Calculate the shear load at the base of the tank:

$$Q = Q' W Sa_r \quad \text{lb}_f$$

Figure 7-3 is attached in Appendix B (figure number is retained from Reference 5 for convenience).

Step 6 Base overturning moment (M)

Determine the base overturning moment (M) by entering Figure 7-4 with H/R and t_{ef}/R, both from Step 2, to determine the base overturning moment coefficient (M').

Calculate the overturning moment at the base of the tank:

$$M = M' \; W \; H \; Sa_r \qquad \text{in-lb}_r$$

Figure 7-4 is attached in Appendix B (figure number is retained from Reference 5 for convenience).

The seismic capacity of the tank shell and anchorage to resist the overturning moment (M) calculated in Step 6 above is evaluated below. The overturning moment is resisted by compression in the tank wall and tension in the anchor bolts. Thus, the overturning moment capacity is controlled by shell buckling on the compression side and anchor bolt capacity on the tension side.

Step 7 Bolt tensile capacity

In this step, the anchor bolt tensile load capacity (P_u lb_r) is calculated per Section 4 and Appendix C of Reference 5. This bolt capacity is based on "ductile failure" in the bolt rather than the concrete. The allowable bolt stress (F_b) is given by:

$$F_b = P_u/A_b$$

Next step is to determine the anchorage connection capacity to resist the bolt tensile load capacity (P_u) calculated above.

Step 8 Top plate

The top plate transfers the anchor bolt load to the vertical stiffeners and the tank wall (see Figure 4.2). The maximum bending stress in the top plate is given by:

$$\sigma = \frac{(0.375g - 0.22d)P_u}{f\,c^2}$$

The top plate is adequate if $\sigma < f_y$. If this condition is not met, calculate the load reduction factor f_y/σ. This reduction factor is applied to F_b to calculate reduced allowable bolt stress (F_r) as follows:

$$F_r = F_b\,(f_y/\sigma)$$

The reduced bolt stress allowable should be used to calculate the tank overturning moment capacity.

Step 9 Tank shell stress

The anchor bolt loads are transferred to the tank shell as a combination of direct vertical load and bending moment. The maximum bending stress in the tank shell is:

$$\sigma = \frac{P_u e}{t_s^2}\left[\frac{1.32\ Z}{\frac{1.43\ a\ h^2}{R\ t_s^2} + (4\ a\ h^2)^{0.333}} + \frac{0.031}{\sqrt{R\ t_s}}\right]$$

where:

$$Z = \frac{1.0}{\frac{0.177\ a\ t_b}{\sqrt{R\ t_s}}\left(\frac{t_b}{t_s}\right)^2 + 1.0}, \quad t_b = \text{bottom thickness}$$

The tank shell is adequate if $\sigma < f_y$. If this condition is not met, calculate the load reduction factor f_y/σ. This reduction factor is applied to F_b to calculate reduced allowable bolt stress (F_r) as follows:

$$F_r = F_b\ (f_y/\sigma)$$

The reduced bolt stress allowable should be used to calculate the tank overturning moment capacity.

Step 10 Vertical stiffener plates

Vertical stiffener plates are considered adequate for shear stress, buckling, and compressive stress if the followirg three guidelines are satisfied:

- $\frac{k}{j} < \frac{95}{\sqrt{\frac{f_y}{1000}}}$

- $j > 0.04(h - c)$ and $j > 0.5$ inch

- $\frac{P_u}{2\ k\ j} < 21{,}000$ psi

where the dimensions k and j are defined in Figure B-1.

Step 11 Chair-to-tank wall weld

The load per linear inch of weld is given by:

$$W_w = P_u \sqrt{\left(\frac{1}{a + 2h}\right)^2 + \left(\frac{e}{a\,h + 0.667\,h^2}\right)^2} \leq \frac{30{,}600\,t_w}{\sqrt{2}}$$

where allowable weld strength is 30,600 psi.

Step 12 Fluid pressure for elephant foot buckling

The fluid pressure coefficient for elephant foot buckling (P_e') is determined by entering Figure 7-7 with Sa_s from Step 4 and H/R from Step 2. Then the fluid pressure at the base of the tank (P_e) is given by:

$$P_e = P_e'\ \gamma_f\ R \quad \text{psi}$$

Figure 7-7 is attached in Appendix B (figure number is retained from Reference 5 for convenience).

Step 13 Elephant-foot buckling stress capacity factor

Determine elephant-foot buckling stress capacity factor using the following formula:

$$\sigma_{pe} = \frac{0.6E_s}{(R/t_s)}\left[1-\left(\frac{P_e R}{\sigma_y t_s}\right)^2\right]\left[1-\frac{1}{1.12+S_1^{1.5}}\right]\left[\frac{S_1+\sigma_y/36{,}000}{S_1+1}\right]$$

where:

$S_1 = R/(400\ t_s)$

P_e = elephant-foot buckling stress capacity factor from Step 12.

E_s = elastic modulus of elasticity of tank shell material from Step 1 (psi),

R = nominal radius of tank from Step 1 (in.)

t_s = minimum thickness of tank shell in the lowest 10% of the shell height (H') from Step 1 (in.)

Step 14 Fluid pressure for diamond-shape buckling

The fluid pressure coefficient for diamond-shape buckling (P_d') is determined by entering Figure 7-9 with Sa_r from Step 4 and H/R from Step 2. Then the fluid pressure at the base of the tank (P_d) is given by:

$$P_d = P_d' \gamma_t R \quad \text{psi}$$

Figure 7-9 is attached in Appendix B (figure number is retained from Reference 5 for convenience).

Step 15 Diamond-shape buckling stress capacity factor

Determine diamond-shape buckling stress capacity factor using the following formula:

$$\sigma_{pd} = (0.6\gamma + \Delta\gamma)\frac{E_s}{R/t_s}$$

where:

$$\gamma = 1 - 0.73(1 - e^{-\Phi})$$

$$\Phi = \frac{1}{16}\sqrt{\frac{R}{t_s}}$$

E_s = elastic modulus of elasticity of tank shell material from Step 1 (psi),

R = nominal radius of tank from Step 1 (in.)

t_s = minimum thickness of tank shell in the lowest 10% of the shell height (H') from Step 1 (in.)

$\Delta\gamma$ = increase factor for internal pressure from Figure 7-11.

Figure 7-11 is attached in Appendix B (figure number is retained from Reference 5 for convenience).

Step 16 Allowable buckling stress

Allowable buckling stress (σ_c) is calculated as 72% of the lower value of σ_{pe} or σ_{pd}:

$$\sigma_c = 0.72\ [\min.(\sigma_{pe},\ \sigma_{pd})] \qquad \text{psi}$$

Step 17 Overturning moment capacity

The base overturning moment coefficient for ductile failure (M'_{cap}) is determined from Figure 7-12 with c' from Step 2, σ_c (psi) from Step 16, F_b (psi) being the smaller of F_b from Step 7 or F_c from either Step 8 or Step 9, h_c (in.) from Step 1, and h_b (in.) from Step 1.

Compute M_{cap}:

$$M_{cap} = (M'_{cap})(2F_b)(R^2\ t_s)(h_b/h_c)$$

Step 18

Compare the overturning moment capacity of the tank (M_{cap}) from Step 17 with the overturning moment (M) from Step 6. The tank is considered adequate if

$$M_{cap} \geq M$$

Step 19 Base shear load capacity

Compute the base shear load capacity as follows:

$$Q_{cap} = 0.55\ (1 - 0.21\ Sa_r)\ W$$

Using Sa_r (g) from Step 4 and W (lb_r) from Step 2.

Step 20

Compare the base shear load capacity of the tank (Q_{cap}) from Step 19 with the base shear load (Q) from Step 7. The tank is considered adequate if

$$Q_{cap} \geq Q$$

Step 21 Slosh height

The slosh height is given by the following equation:

$$h_s = 0.837\ R\ Sa_s$$

where Sa_s is the spectral acceleration (1/2% damping) of the ground at the sloshing mode (F_s), which is calculated as follows:

$$F_s = \frac{1}{2\pi}\sqrt{\frac{1.84G}{R}\tanh\left(1.84\frac{H}{R}\right)} \quad Hz$$

where:

G = acceleration of gravity (=386.4 in/sec^2)

Step 22 Available freeboard

Compare the available freeboard (h_f) from Step 1 within the slosh height (h_s) calculated in Step 21. The tank is adequate if:

$$h_f \geq h_s$$

Roof Qualification for Sloshing

Since the guideline of Step 22 above was not satisfied, the hydraulic forces acting on the roof due to sloshing were calculated as follows:

- Conservatively, calculate the sloshing water volume as the entire volume under the roof and above the cylindrical shell. The sloshing water mass is then calculated by multiplying by the density of water.
- Calculate the total sloshing load on the roof as the square root of the sum of the squares of the horizontal and vertical sloshing loads calculated as follows:

  Resultant horizontal load= sloshing mass x DBE horizontal acceleration,
  Vertical load = sloshing mass x DBE vertical acceleration.

- Calculate the membrane stress in the roof, and the roof-to-cylindrical shell weld stress based on the resultant sloshing load calculated above.
- Compare calculated stresses in the roof and the weld throat with the corresponding allowables.

Details of the analyses performed per Steps 1 through 22 above can be found in Appendix A of SCE Calculation No. M-DSC-280. The appendix also includes the qualification of the tank shell per ASME Code, Section III, subsection ND-3800.

Appendix B of this report includes some of the tables and figures used in the analysis from Reference 5.

5.1.2 ASME Code Case N-284

The GIP methodology described in Section 5.1.1 is based on calculating the overturning moment and base shear at the bottom of the tank, where both quantities reach their maximum values. The methodology of Reference 27 was used to calculate the moment and shear loads at various levels of the tank. These moment and shear loads were used to qualify the tank shell per ASME Code Case N-284 at the following levels:

- Level A: at the bottom of the tank.
- Level B: at the top of the first tier (see Figure 4.1).
- Level C: at the top of the second tier (see Figure 4.1).

ASME Code Case N-284 provides an alternative methodology for determining the allowable compressive stress in the tank shell. This methodology is defined for both unstiffened and stringer stiffened cylindrical shell.

5.2 Angular Distribution of Shear Load in the Anchor Bolts

To determine the maximum shear stress in the tank anchor bolts, a sinusoidal [illegible] force distribution was assumed. Finite element analysis was performed to [illegible]fy this assumption. A tank model was generated using the finite element program ANSYS. The model is made up of ANSYS element type STIF63, which is an elastic quadrilateral shell element (Reference 3). This element type has six degrees of freedom at each corner node: translations in the x, y and z directions, and rotations about the x, y and z axes. The element has stress stiffening and large deflection capabilities. It is also capable of modeling plates on elastic foundations. This feature was utilized to model the bottom plates.

Figure 5.1 shows a computer plot of the finite element model used in the analysis. The model dimensions and material properties are based on the tank data summarized in Section 4. Figure 5.1 also shows the locations of the anchor bolts.

Two models, with different loading conditions, were used:

1. In the first model, the horizontal seismic load is represented by a concentrated horizontal unit force, of 10^6 lb, applied near the top of the shell in the x-direction, as shown by Figure 5.2a.

2. In the second model, the horizontal seismic load is represented by a distributed horizontal load, as shown by Figure 5.2b. A force of 1000 lb, acting in the x-direction, was applied at each node of the tank shell above the bottom.

The unit loads, 10^6 lb in the first model and nodal forces of 1000 lb in the second model, were used to determine only the relative bolt load distribution as a function of bolt position. These models were not used to calculate the actual bolt loads, since the purpose was to verify the sinusoidal bolt load distribution assumption only. In both models, all displacement components were constrained at the anchor bolt locations.

Results of the analysis were obtained in the form of horizontal (shear) reaction forces, and vertical (pull) reaction forces at all anchor bolt locations. These forces were normalized and plotted versus the angle (θ) measured from the positive x-directions, as shown by Figure 5.1.

Figures 5.3 and 5.4 show the normalized shear force in anchor bolts, for both models, plotted versus the angle (θ). Both figures also show a plot of a true sinusoidal distribution. Results shown in these two figures clearly indicate the validity of the sinusoidal distribution assumption.

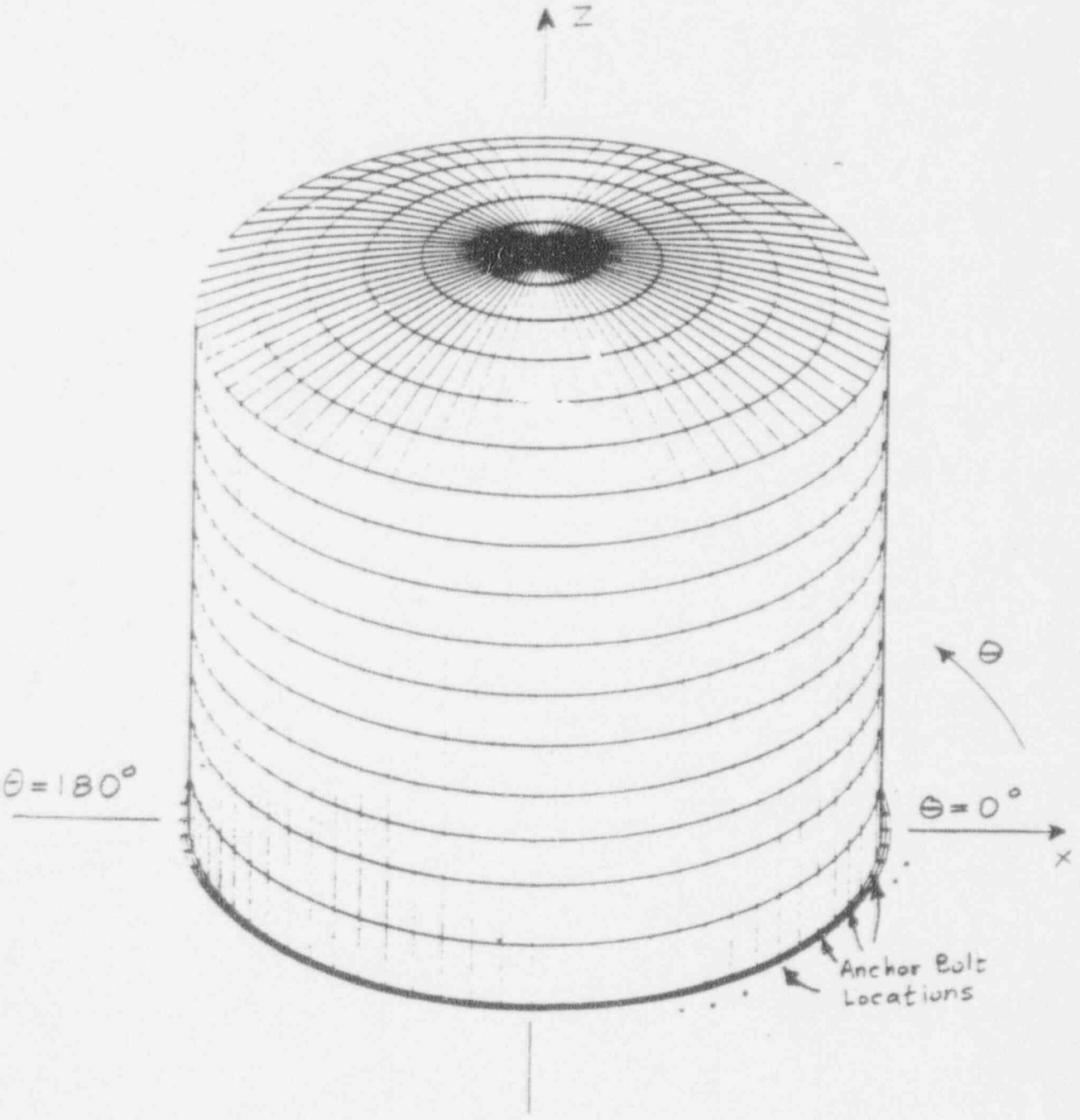


Figure 5.1 Finite Element Model of the PPMS Tank

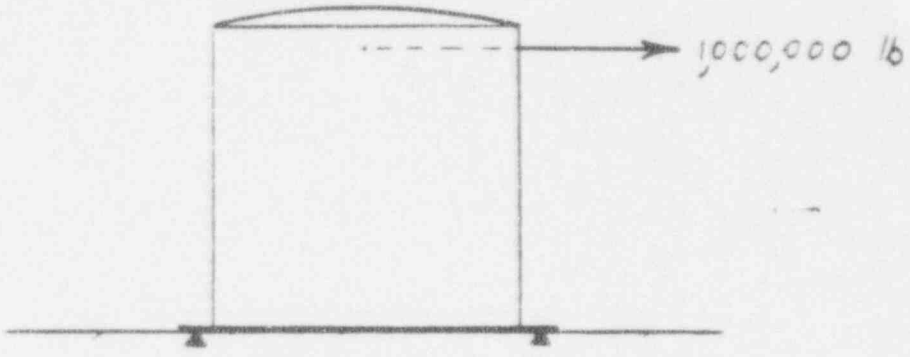


Figure 5.2a Concentrated Force Near the Top of the Tank

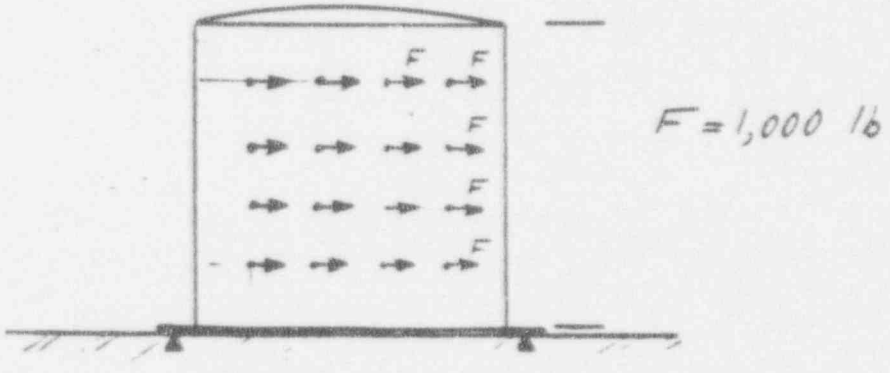


Figure 5.2b Distributed Force Acting on the Tank Shell

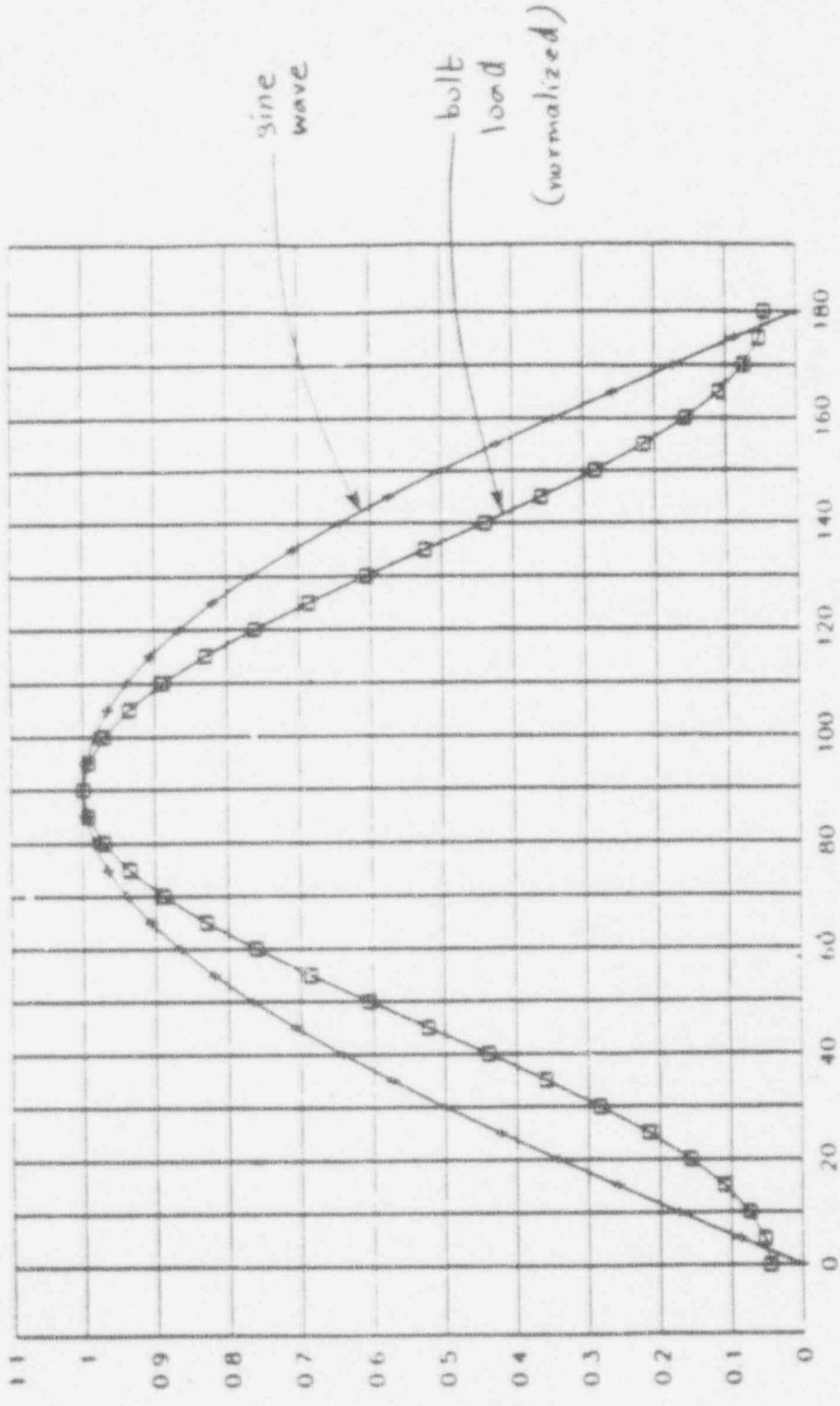


Figure 5.4 Normalized Bolt Shear Force (Model with Distributed Force)

ited Force)

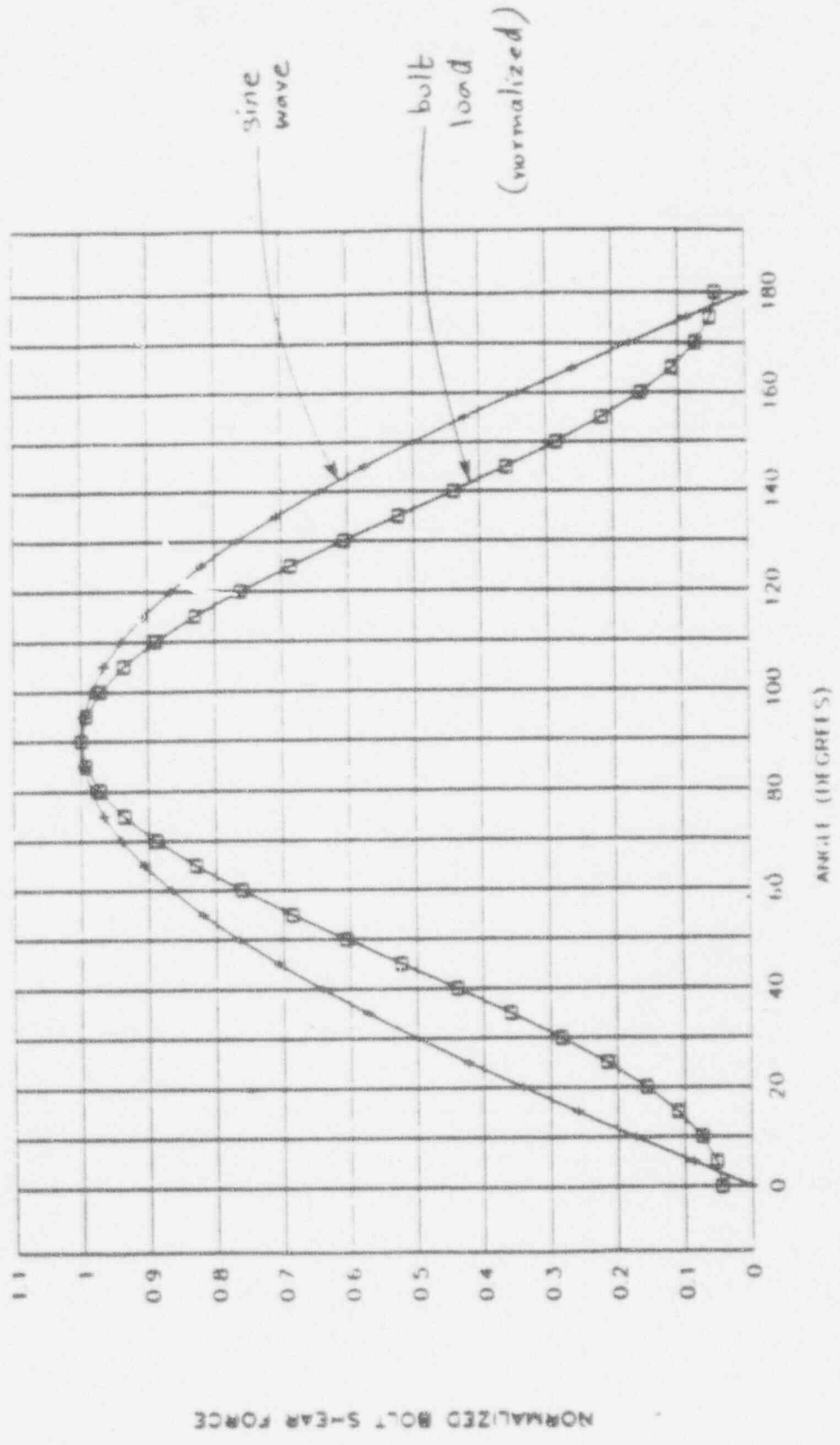


Figure 5.4 Normalized Bolt Shear Force (Model with Distributed Force)

5.3 Effect of Relocation of Some Anchor Bolts

The nominal bolt circle diameter for the new bolts is 40'-8", which corresponds to eccentricity (e) of 3.6875" (see Figure B-1). However, to avoid interference with the rebars embedded in the concrete foundation, some of the new anchor bolts may have to be moved radially outward. The effect of increasing the eccentricity of the anchor bolts is evaluated in this subsection. This evaluation is based on the methodology of the design report (summarized in Section 5.1 of this report). This methodology consists of several analysis steps, and only those steps impacted by the increased eccentricity are to be re-analyzed, namely:

1. Tank Shell Stress

   Step 9, Section 9 of Section 5.1 is impacted. The allowable tensile bolt stress to compute the overturning moment (F_t) is calculated based on the re-calculated tank shell stress. The new tank shell stress is obtained using the equations given in Section 5.1 with the modified eccentricity of 5" representing the relocated bolts.

2. Vertical Stiffener Plate

   Step 10, Section 9 of Section 5.1 is impacted. The adequacy of the stiffener plates is evaluated using plate size (k) from the modified anchor bolt assembly.

3. Chair-to-Tank Weld

   Step 11, Section 9 of Section 5.1 is impacted. Modified weld stress (W_s lb/in) is calculated based on the eccentricity of the relocated anchor bolts, and compared with the allowable specified by Reference 2.

4. Buckling Bending Moment Capacity

   Step 17, Section 9 of Section 5.1 is impacted. A modified value of the bending moment capacity (M_{CAP}) is calculated based on the re-calculated value of F_t.

Mathematical formulas used in the above steps are summarized in Section 5.1 of this report. More detailed analysis can be found in the tank design report (Appendix A of SCE Calculation No. M-DSC-280), or Reference 2.

Finally, methodology of Reference 7 (and Reference 8) was used to evaluate the added bottom ring. This ring, which is not included in the design report, is added for better constructibility of the modified anchor bolt chairs. The methodology of these two references can be summarized as follows:

1. Tearout Failure

   A tearout stress check is performed to calculate the shear stress on the area shown in Figure 5.5a. The allowable shear stress is conservatively taken equal to 13 ksi per Reference 2 (Subsection ND-3852.6).

2. Pure Tension Rupture

   This failure mode is illustrated in Figure 5.5b. The tensile stress in the plate should not exceed the allowable stress (S=12.6 ksi per Reference 2). The use of this allowable is conservative since it is being used to evaluate Level D loading.

3. Failure by Crushing

   This failure mode is illustrated in Figure 5.5c. The stress acting on the projected area should not exceed the yield stress (f_y).

5.4 Nozzle Stiffness Evaluation

The nozzle stiffness values are approximated using the methodology and formulas in WRC Bulletin 297 (Reference 14).

Due to the narrow range of parameters given in the bulletin, interpolations and estimations were used as appropriate. The magnitude of nozzle stiffness obtained by this process gives a realistic translational and rotational end reactions at the nozzle-shell connections, and therefore provides a reasonable basis for piping design analysis.

5.5 Local Stress Check

The local stresses were calculated using computer program ME101LS (Reference 12). The maximum local stress intensities calculated are combined with the pressure and seismic stresses of the tank. The combined stresses are then compared against the ASME code allowables (Reference 2). It should be noted that the stresses due to the dead weight of the tank shell have been ignored in the local stress calculation since they are much smaller than all the other stress components.

DBE primary moment loads at the tank shell are used to evaluate primary stresses under design conditions and will give conservative results.

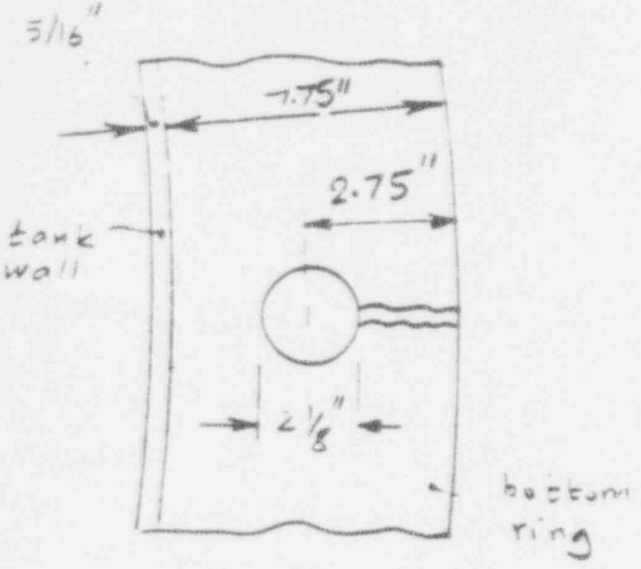


Figure 5.6a Tearout Failure

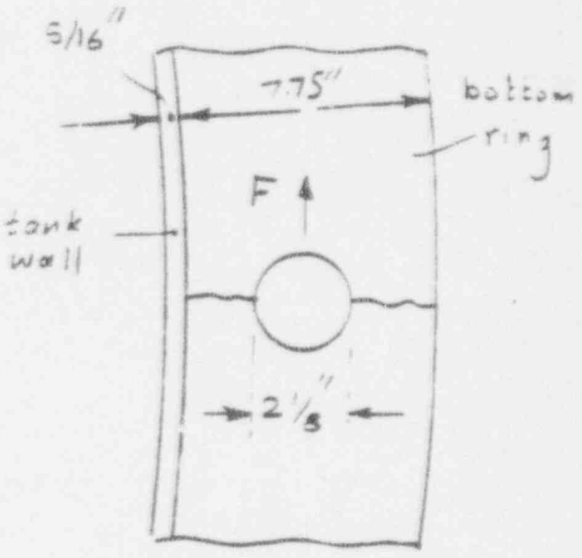


Figure 5.6b Tensile Failure

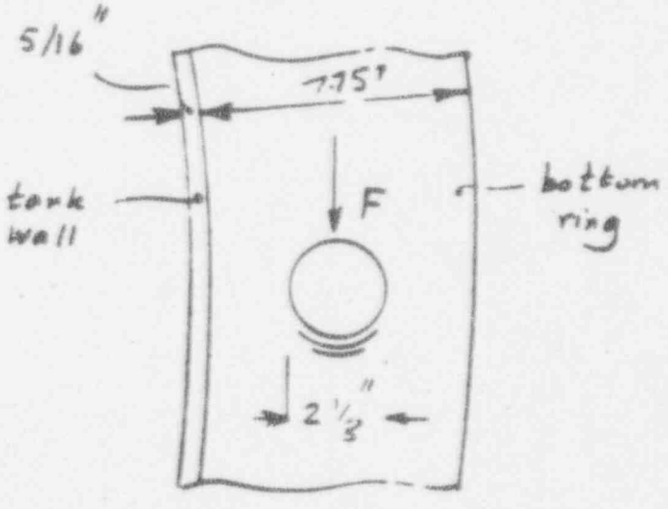


Figure 5.6c Failure by Crushing

Figure 5.6 Bottom Ring Failure Modes

5.6 Out-of-Roundness Requirements

Per reference 2, Subsection ND-4224, the tank must meet the out-of-roundness requirement outlined in that subsection. This out-of-roundness requirement is checked as follows:

1. Step 1
   Calculate $D_{ave}/100$, where D_{ave} is the average diameter of the tank in inches.

2. Step 2
   Based on field measurements, calculate the maximum diametral out-of-roundness for each tank.

SONGS Unit-2 PPMS tank will meet the Code requirements if the maximum measured out-of-roundness is less than the amount calculated in step 1 above. The tank was tested for out-of-roundness at elevations: 7' above the bottom, and 6' below the roof-to-shell weld.

5.7 Statistical Analysis of Examination Data and Fracture Mechanics Evaluation

Examination of existing radiographic examination results revealed that many tank shell welds did not meet the requirements of ASME Code, Section III, Subsection ND-5000. Excessive weld reinforcement, excessive undercuts, and slag inclusions in some welds were observed. In order to address the weld quality issue, a statistical approach, combined with a fracture mechanics evaluation was adopted by SCE to demonstrate acceptability of the tank shell welds with high reliability. This approach consists mainly of:

- Statistical analysis based on re-examination of the tank by spot radiography. A large number of spots was specified to ensure an adequate statistical base to provide at least a 95% confidence level that 95% of the defects do not exceed a given size.

- Fracture mechanics evaluation using a bounding defect size to demonstrate that a considerable factor of safety exists.

A more detailed description of these analyses is given below.

5.7.1 Statistical Analysis of Radiographic Examination Data

The purpose of the statistical analysis is to calculate the 95th percentile bounding defect length with at least a 95% probability that any flaw size is bounded by the calculated bounding flaw length with 95% confidence level. Sixty radiographic examination spots, covering the tank from the bottom tier up to the top tier, were specified to provide the required sample population for statistical analysis. Figure 5.7 shows the spots selected for radiographic examination. They include vertical seams, horizontal seams and intersections, and covers all the welders involved in the tank construction. Examination of the spot radiography results showed 283 welding flaws ranging in size from 1/32" to 4 7/8"; these results are plotted in Figure 5.8. A complete listing of all 283 flaws can be found in Appendix C of this report. The flaw population size has a mean value of 0.364", and standard deviation of 0.547".

The next step of the statistical analysis is to apply the theory of order statistics for non-parametric testing as follows (References 30 and 31):

- Establish the minimum sample size for 95% confidence that 95% of the population is bounded by a given defect length. Based of the methodology of Reference 30, this population size is 93, which is much less than the available 283 population size produced by tank examination.

- Arrange the flaw population in ascending order based on size:

$$a_1 \le a_2 \le \ldots \le a_s \le \ldots \le a_n$$

  where a_i is the size of the ith flaw (i=1,...,n & n=283 is the total number of samples). The value of a_s represents the desired bounding flaw size.

- According to Reference (2), the order (s) of the upper bound flaw size which has a 95% confidence that it bounds 95% of the population is given by:

$$s = np + w_\alpha\sqrt{np(1-p)}$$

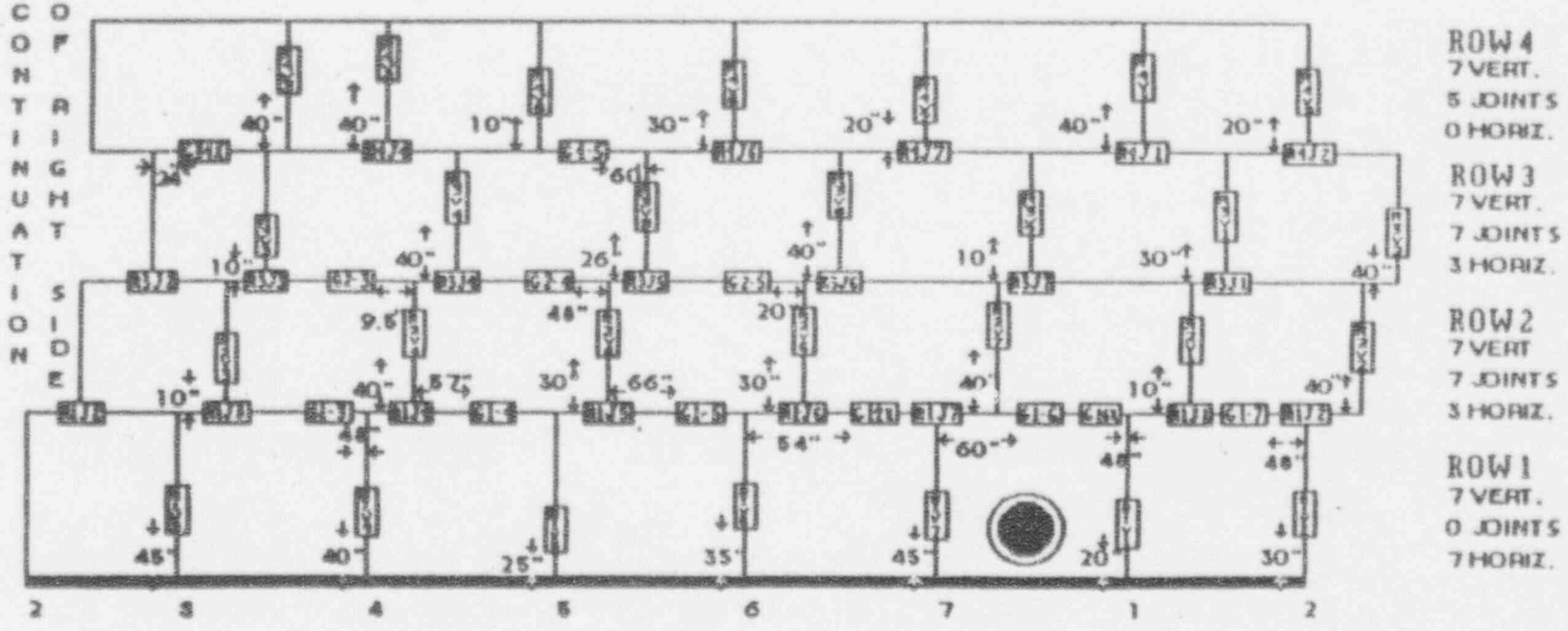
  where:

  p is the specified probability = 0.95,
  w_α is the one-tailed 95th percentile of the Gaussian distribution = 1.645.

  The value of the order (s) was calculated at 275, and the corresponding flaw size is 1.625". Therefore, it is concluded that 95% of the flaws are bounded by the value 1.625" with 95% confidence level.

Conservatively, a 5" flaw size, exceeding both the bounding defect size shown above and the maximum flaw size detected by examination, was used as basis for the subsequent fracture mechanics evaluation described in Section 5.7.2 of this report. Details of the analysis can be found in Appendix E of SCE Calculation No. M-DSC-280.

TANK T-056
RADIOGRAPHY MAP



BASE

Figure 5.7 Radiographic Examination Map

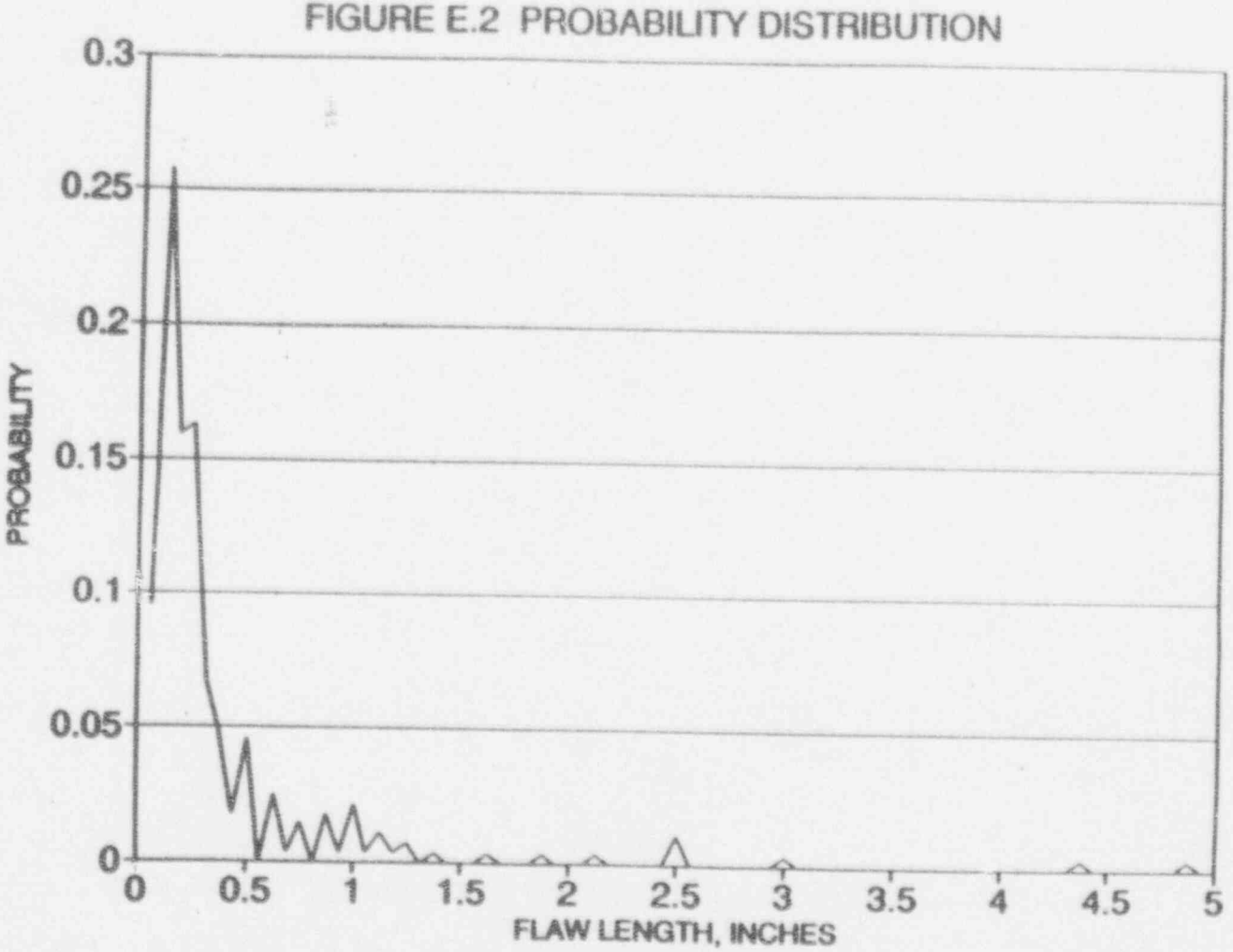


Figure 5.7 Weld Defect Size Population Distribution

5.7.2 Fracture Mechanics Evaluation

Based on the results of the radiographic examination, and the statistical analysis of the examination data, a fracture mechanics evaluation of the tank welding defects was performed. The fracture mechanics analysis can be described briefly as follows:

- Calculation of the stress components in the tank:

  (a) meridional stress in the tank is calculated using the overturning moment from the tank design results (see Section 5.1). The corresponding stress (σ) is then calculated using the simplified familiar formula:

$$\sigma = \frac{Mr}{I}$$

  where:

  M = the overturning moment,
  r = tank radius (240"),
  I = moment of inertia of the tank cross section.

  (b) hoop stress in the tank is calculated using the three-dimensional finite element model shown in Figure 5.1. Additional hydrostatic pressure, to account for water sloshing during a DBE event, was included. Hoop stress distribution is shown in Figure 5.9; it can be seen that the maximum hoop stress occurs near the bottom of the second tier - a short distance above the reinforcing ring at the top of the tank shell stiffeners.

- Conservatively, a crack size exceeding the worst crack defect from examination results was postulated in the axial direction in the highest stress region of the tank so that it is subjected to the maximum crack opening stress. Figure 5.10 shows the geometry of the postulated crack in the tank shell. The crack depth is conservatively taken as:

  - half the wall thickness of the tank shell wall in the first fracture mechanics model, and

  - through-wall crack in the second model (tank examination revealed no through-wall cracks).

  The postulated cracks described above bound all defects reported in the examination results.

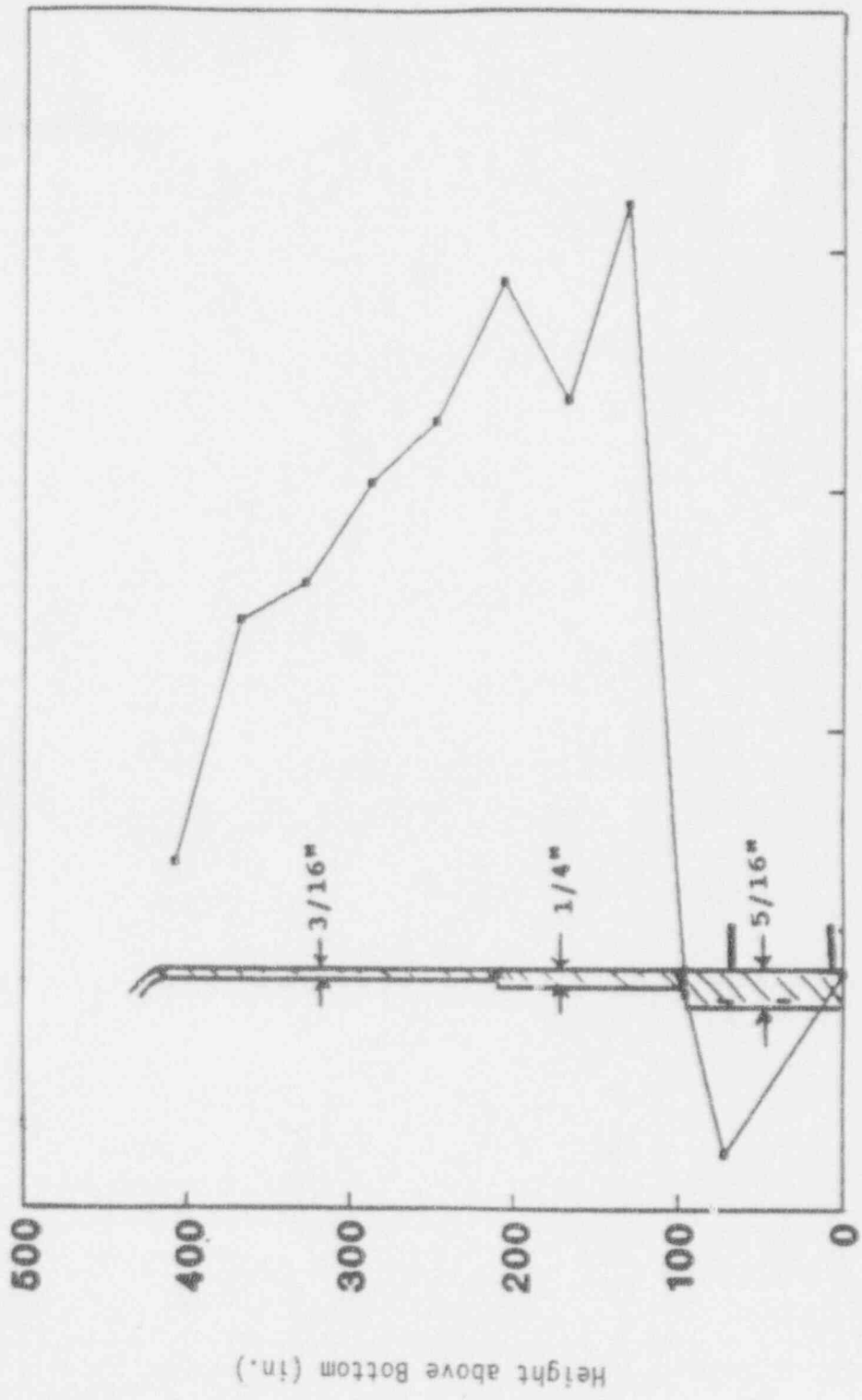


Figure 5.9 Hoop Stress Distribution in the Tank Shell

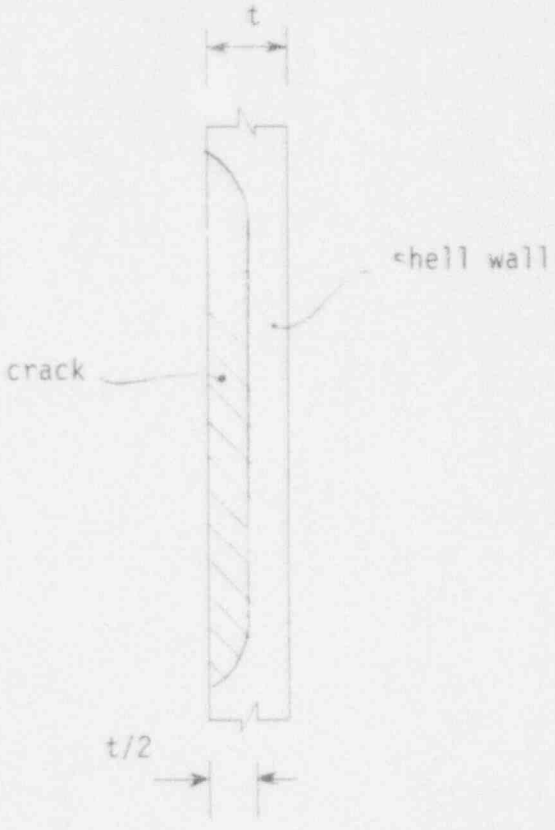


Figure 5.10 Postulated Crack Geometry

For such crack, the stress intensity (K) is given by (Reference 29):

$$K = G_o \sigma \sqrt{\frac{\pi a}{Q}}$$

where:

G_o = Free surface correction factor as a function of flaw aspect ratio

σ = Maximum hoop stess (ksi) in the tank. It includes the effect of water sloshing, and local stress due to geometrical discontinuities. This stress was calculated using the finite element method.

a = Crack depth (taken as half the shell thickness).

Q = Flaw shape parameter given by:

$$Q = 1 - [G_0\ \sigma/\sigma_{ys}]^2/6$$

where σ_{ys} is the material yield strength.

- A second fracture mechanics analysis was also performed assuming a 5" long through-wall crack, and the stress intensity factor was calculated using the computer program PcCRACK, which is a verified PC-based fracture mechanics evaluation program. Analysis in this case is based on Linear Elastic Fracture Mechanics (LEFM) using standard formulas for through-wall cracks.

- Calculate the critical stress intensity factor (K_{IC}) using the following formula:

$$K_{IC} = \sqrt{J_{IC} E}$$

where:

J_{IC} = critical J-integral value for the tank shell material (SA 240 - 304),

E = Young's modulus of the tank shell material.

- Calculate the factor of safety (FS):

$$FS = \frac{K_{IC}}{K}$$

6. REFERENCES

1. Field Change Notice (FCN) numbers F-7520 M, F-7521 M, and F-7522 M. These FCN's document the tank modification details.

2. ASME Boiler and Pressure Vessel Code, Section III, Division 1, 1989, no addenda.

3. ANSYS User's Manual, Revision 4.4, Swanson Analysis Systems Inc., May 1, 1989.

4. Calculation number C-258-9.10, Revision 0,"Primary Plant Make-Up Storage Tank Evaluation."

5. "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment," Revision 8, Corrected 2/14/1992, SQUG.

6. ASME Boiler and Pressure Vessel Code, Section II, Division 1, 1989, Material Specifications (Ferrous).

7. Shigley, Joseph E.,"Mechanical Engineering Design," Third Edition, 1977, McGraw-Hill Book Company.

8. "Standard Handbook of Machine Design," Editors Shigley, J. E., and Mischke, C. R., 1986, McGraw-Hill Book Company.

9. Manual of Steel Construction, Eighth Edition, American Institute of Steel Construction, Inc., 1980.

10. "Design of Welded Structures," Omer W. Blodgett, The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio, March 1982.

11. Design Bases Document S023-TR-EQ, Revision 0,"Environmental Qualification Topical Report."

12. Computer program ME101LS Version M10.

13. Design of Piping Systems, MW Kellogg, Revised 2nd Edition.

14. Welding Research Council Bulletin 297 September 1987.

15. MW Kellogg Company, Design of Piping Systems, Revised 2nd Edition

16. Calculation number M-1203-476-2A, Revision 0.

17. Calculation number M-1203-478-2A, Revision 0.

18. Calculation number S-1415-22, Revision 0.

6. REFERENCES - cont.

19. Calculation number 844, Revision 0.

20. Calculation number S-1415-06, Revision 0.

21. Calculation number S-1415-37, Revision 0.

22. Calculation number S-1415-56, Revision 0.

23. Piping Material Specifications 90004 Rev. 53

24. Drawing number S023-407-3-61-2, 40' dia. x 34' high Primary Plant Make-Up Storage Tank Shell Plate Layout.

25. Drawing number S023-407-3-62-3, 40' dia. x 34' high Primary Plant Make-Up Storage Tank Roof and Bottom Layout.

26. Construction Work Order number 92092078000, Out-of-Roundness Test Results.

27. Haroun, M. A.,"Vibration Studies and Tests of Liquid Storage Tanks," Earthquake Engineering and Structural Dynamics, Vol. 11, pp 179-206, 1983.

28. ASME Code Case N-284,"Metal Containment Shell Buckling Design Methods," Reaffirmed July 10, 1989.

29. ASME Section XI working group on flaw evaluation, replacement of stress intensity factor calculation of Article A-3000 of Appendix A, Section XI with stress analysis of cracks handbook by Tada and Paris, Second Edition.

30. Hesson, G. M., Cliff, W. C., and Stevens, D. L.,"A Mathematical Model for Assessing the Uncertainties of Instrumentation Measurements for Power and Flow of PWR Reactors," NUREG/CR-3659, PNL-4973, 1985.

31. Conover, W. J., "Practical Nonparametric Statistics," John Wiley & Sons, Inc.

7. NOMENCLATURE

A = Area, in^2

C1 = Maximum length of nozzle in circumferential direction, inch

C2 = Maximum length of nozzle in longitudinal direction, inch

d = Outside diameter of nozzle, in.

D_i = Inside diameter, inch.

D_o = Outside diameter, inch.

DBE Design Basis Earthquake

e = Bolt eccentricity, in

E = Modulus of elasticity, psi.

F = Force, lb

F_b = Allowable bolt stress, psi

F_r = Allowable bolt stress after applying a reduction factor, psi

f_y = Yield stress, psi

h = Height, in

j = Distance between stiffener plates, in

k = Stiffener plate width, in

L = Height of tank, in.

M = Overturning moment, in-lb

MA = Resultant moment at the tank shell due to primary loads, ft-lbs

MB = Resultant moment at the tank shell due to primary+secondary loads, ft-lbs

M_{CAP} = Overturning moment capacity, in-lb

MC = Circumferential, moment, in-lbs

ML = Longitudinal moment, in-lbs

MT = Torsional moment, in-lbs

OBE Operating Base Earthquake

7. NOMENCLATURE - cont.

P = Radial load, lbs

R = Radius, inch

S = Allowable stress, psi

SHA Shape of nozzle (CIR = circular)

t = Thickness, inch

VC = Circumferential load, lbs

VD = Mean diameter of tank, inch

VL = Longitudinal load, lbs

VT = Tank wall thickness, inch

w = Radial deflection due to P, inch

ν = Poisson's ratio

σ = Stress, psi

θ = Angle, degrees

Θ = Rotation at centerline of nozzle, radians

τ = Shear stress, psi

APPENDIX A

PPMS TANK DESIGN MODIFICATION DRAWINGS

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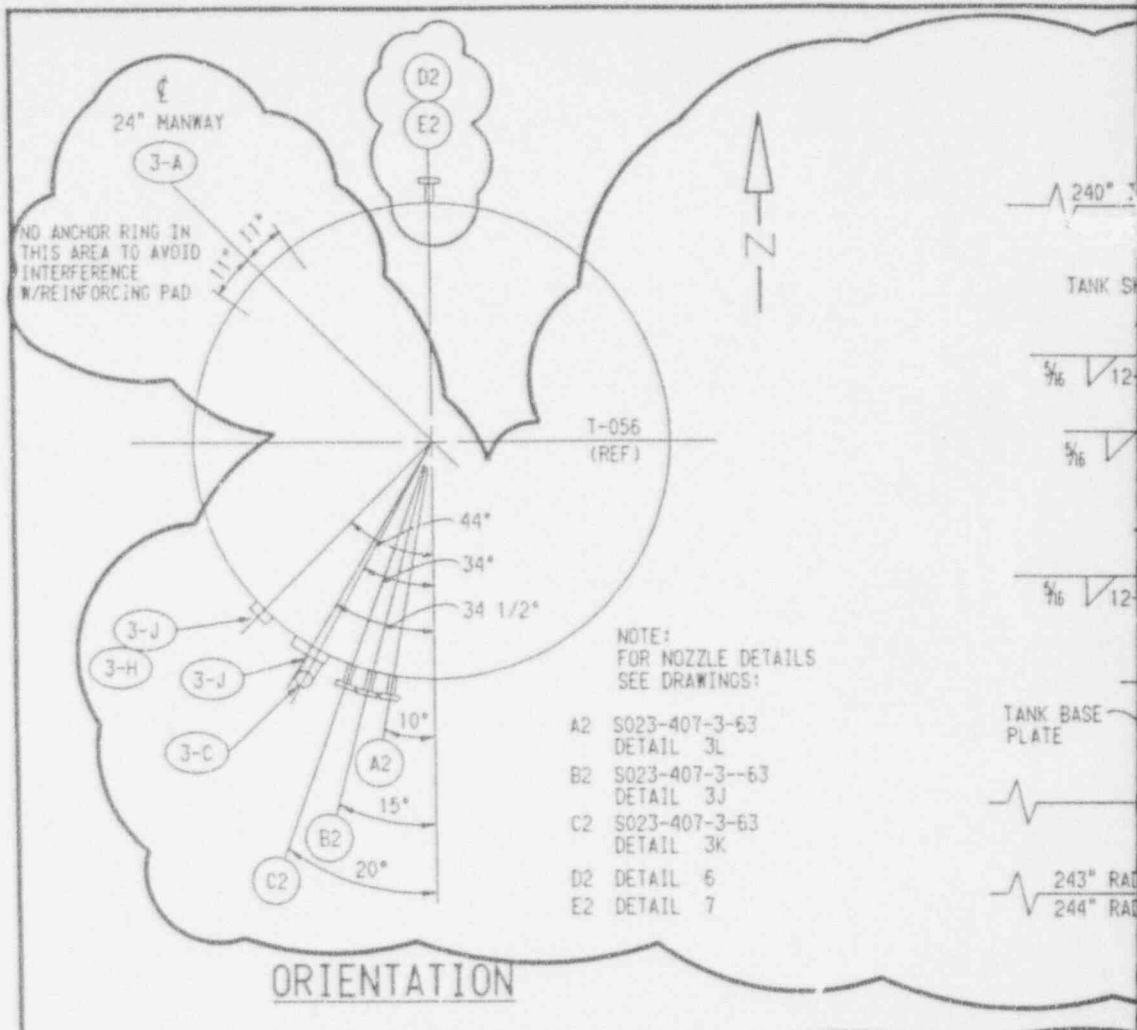
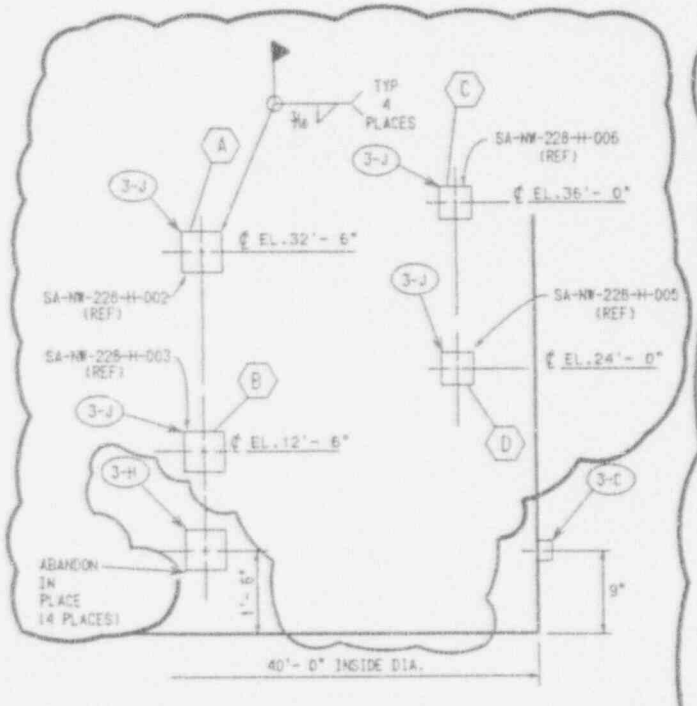
Tank Modification Details

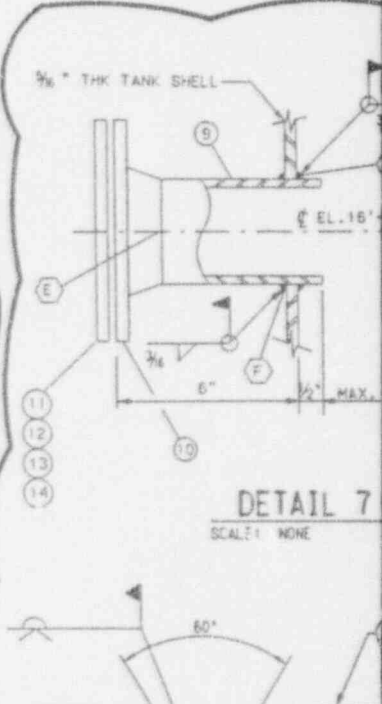
- Anchor bolt chair,
- Nozzle locations,
- Upper chair ring weld.



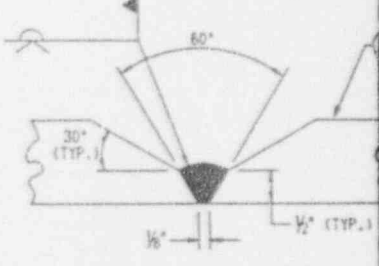
ORIENTATION



ELEVATION



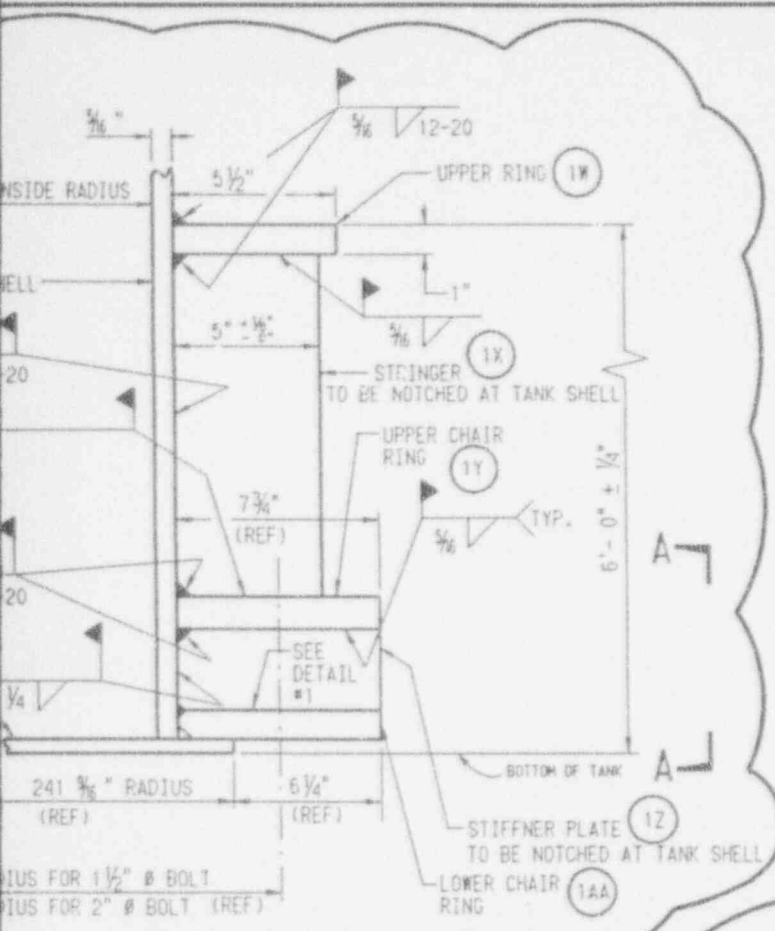
DETAIL 7
SCALE: NONE



DETAIL 2
LOCATE RING SPLICE AS REQUIRED AT MID POINT BETWEEN ADJACENT ANCHOR BOLTS OR STRINGER

FIELD NOTE:

1. FIELD MAY RELOCATE GROUNDING PAD AS REQUIRED.
2. PROPER PRECAUTION SHOULD BE TAKEN TO PROTECT CONCRETE.



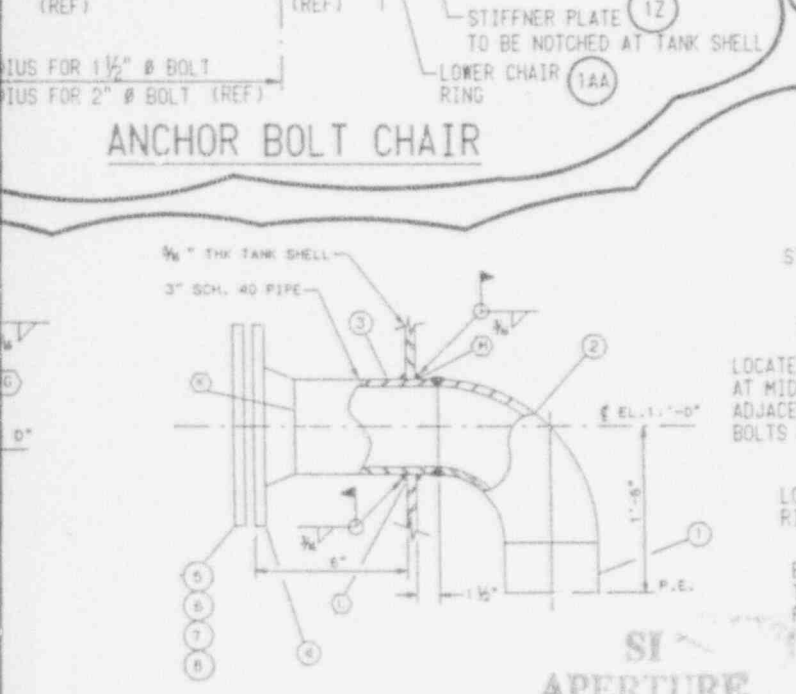
ANCHOR BOLT CHAIR

MARK	QTY	DESCRIPTION	SPEC	WT	P.O. NO.
		Y4-8105358-1 B/M FOR 2 TANKS			
1-1	14	4 2½"X 2½"X⅜" "X 20'-0" LG. (TRIM 6" BOTH ENDS) ROLL LEG OUT TO 20'-0" ISE	SA-479-304	(1400)	
1-4	64	½" FLE X CELL X SK	FLEXCELL	(296)	60
1W	1#	UPPER RING 1"X 5½"X 20'-0⅜" INSIDE RADIUS FIELD CUT LENGTH AS REQUIRED	SA-36	-	-
1X	28#	STRINGERS 1⅜" X 5" X 4'-10" EQUALLY SPACED	SA-36	-	-
1Y	1#	UPPER CHAIR RING 1⅜"X 7¾"X 20'-0⅜" INSIDE RADIUS FIELD CUT LENGTH AS REQUIRED	SA-36	-	-
1Z	14#	STIFFNER PLATE ⅜"X 7¾"X 0'-10⅜"	SA-36	-	-
1AA	1#	LOWER CHAIR RING PLATE ⅜"X 7¾"X 20'-0⅜" I.D. RADIUS FIELD CUT LENGTH AS REQUIRED	SA-36	-	-
3J	4#	PLATE ½" X 8" X 0'- 8" INTEGRAL ATTACHMENT,USE ASME SECTION III, SUBSECTION "NO" MATERIAL.	SA-36		

1	0L/F#	3"Ø PIPE SCH.40 S.S.	SA-312 TP304		
2	1#	3"Ø 90° PIPE ELBOW SCH.40	SA-403 WP304		
3	0L/F#	3"Ø PIPE SCH.40 S.S.	SA-312 TP304		
4	1#	3" 150# R.F.W.N. FLANGE SCH.40	SA-182 F316		
5	1#	3" 150# BLIND FLANGE	SA-182 F316		
6	1#	3" 150# GASKET GRAFOIL	ANSI B16.21		
7	4#	⅝"Ø STUD BOLT (3½" LONG)	SA-193 GR.B7		
8	8#	⅝"Ø HEX NUT	SA-194 GR.2H		
9	0L/F#	1" PIPE SCH.80	SA-312 TP304		
10	1#	1" 150# R.F.W.N FLANGE SCH. 80	SA-182 F316		
11	1#	1" 150# BLIND FLANGE	SA-182 F316		
12	1#	1" 150# GASKET GRAFOIL	ANSI B16.21		
13	8#	½"Ø STUD BOLT (2½" LONG)	SA-193 GR.B7		
14	8#	½" HEX NUT	SA-194 GR.2H		

2 Ø QUANTITIES ARE FOR TANK T-056 ONLY

STRESS CALC. M-DSC-269 SHT 5



DETAIL 6
SCALE: NONE

ANCHOR BOLT CHAIR

NOTES:

1. DRILL BOLT HOLES IN RINGS @ COMPLETION OF ANCHOR BOLT INSTALLATION.
2. SEE BOLT PATTERN ON DWG 25170 FOR NEW & EXISTING LOCATIONS
3. TRIM TO MAINTAIN A CLEARANCE OF ½" BETWEEN THE ANCHOR BOLT CHAIR UPPER RING AND ALL OBSTRUCTIONS
4. RING PLATE LENGTHS SHALL BE CUT TO SUIT BY FIELD.
5. STRINGERS ARE TO BE EQUALLY SPACED ± 2" IN EITHER DIRECTION TO AVOID INTERFERENCE.
6. PIPE MATERIAL AND WELDS TO BE PER ASME SECTION III, CODE CLASS 3, 1989 EDITION, NO ADDENDA.
7. DIMENSIONAL TOLERANCE ± ½" UNLESS OTHERWISE NOTED

QUALITY CLASS II

PAGE 3 OF 3

DCP/NWP NO.(If FDCN is Only) REV.

Southern California Edison Company
FIELD CHANGE NOTICE (FCN)
~~FIELD INTERFACE DESIGN CHANGE NOTICE (FIDCN)~~
SUPPLEMENTAL PAGE

FCN NO.	FIDCN NO.	DCN NO.	DOC REV
F-7520M			
DOCUMENT NO. S023-407-3-61		SHEET NO. -	REV 2
Q-CLASS DOCUMENT II.3	Q-CLASS EQUIPMENT II	ORIGINATOR F. GOPAR	

DESCRIPTION OF CHANGE ☐ BEFORE ☒ AFTER ☐ AS-FOUND ☐ ADD ☐ INTERIM ☐ INFORMATION ONLY

9309090077-01

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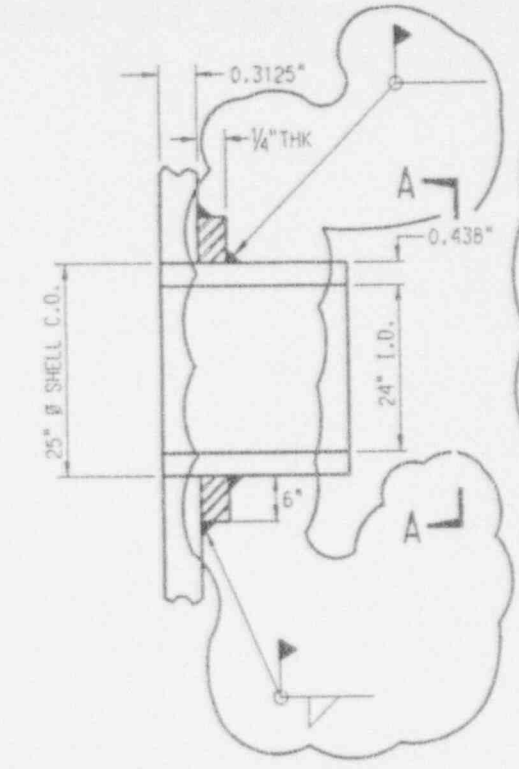
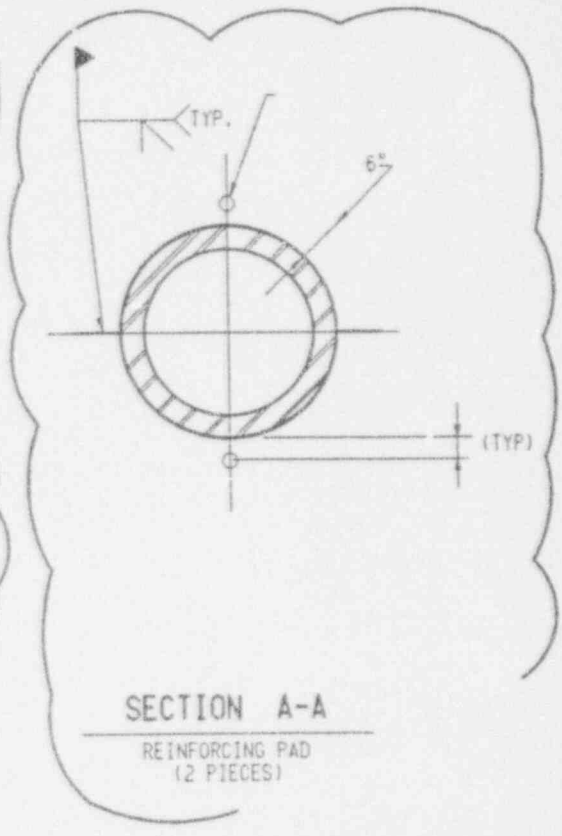


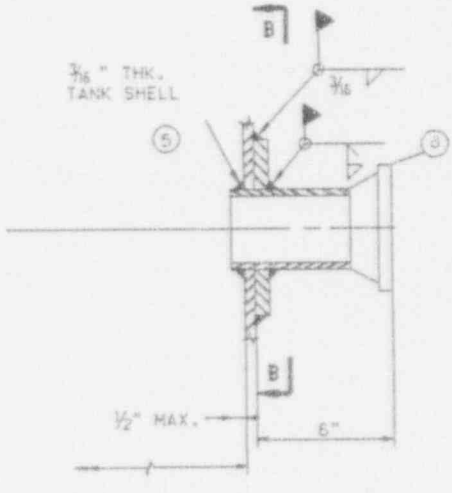
3A 24" SHELL MANWAY



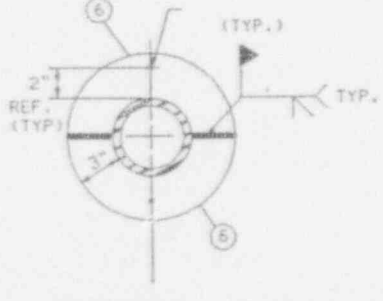
SECTION A-A
REINFORCING PAD
(2 PIECES)

Tank Modification Details

- Manway reinforcement
- Nozzle reinforcement



3J INLET
SA-1415-ML-011



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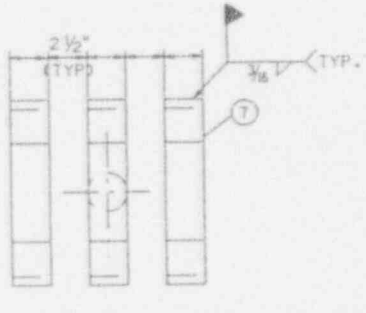

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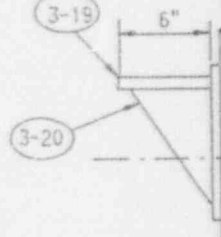
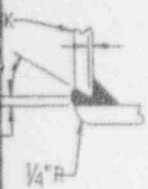
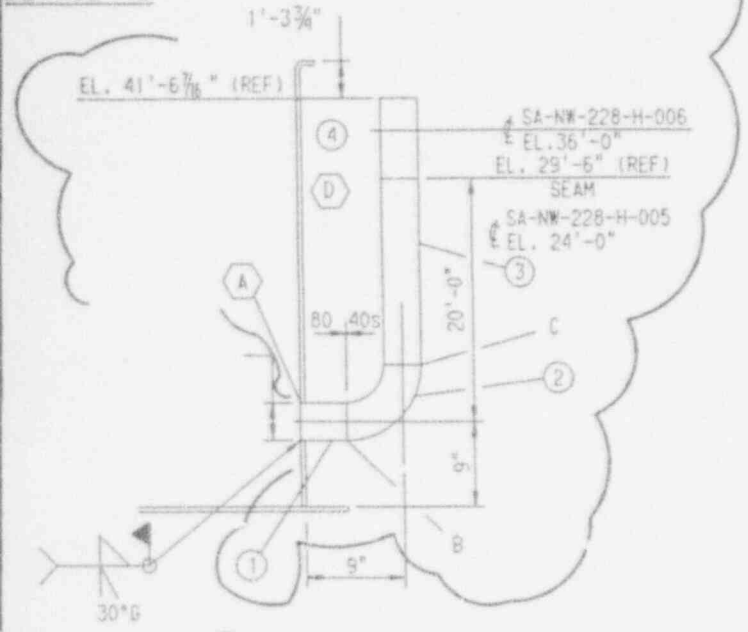


3H

WELD JOINT SYMBOL FOR ASME SECT. III CODE WELDS



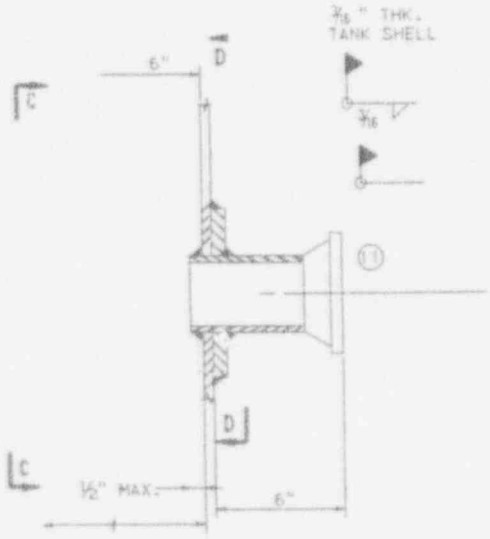
DETAIL #3



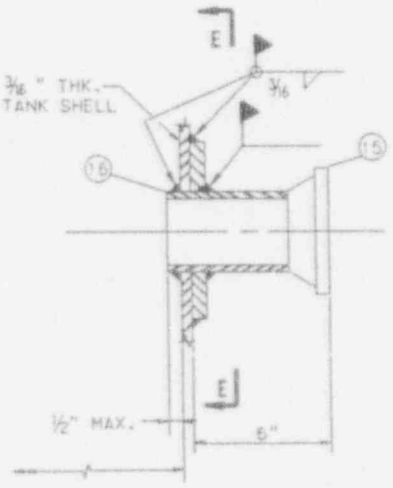
3-C 4" OVERFLOW

MARK			QTY.	94-1033O6-3 DESCRIPTION (QTY FOR 2 TANKS)	SPEC	WT	P.O. NO.
3-A			2	24" SHELL MANWAY		(503)	
		3-1	2	[illegible]" X 7½" X 6'-4¾" LG	SA-240-304	145	11
		3-2	2	[illegible]"X 24⅞" I.D. X 32¾" O.D.	SA-240-304	77	12
		3-3	2	[illegible]"X 32¾" O.D.	SA-240-304	242	13
		3-4	4	BAR⅝" D X 12⅝" LG X BR	SA-479-304	6	16
		3-5	2	GASKET ⅛" THK. X 24" I.D. X 29⅜" O.D.	RUBBER	2	15
		3-6	56	BOLT⅝" D X 2¾" LG HEX HD B/HT HEX NUT	SA-193-B7 / SA-194-2H	31	14
			18	SPLIT RING REINFORCING PAD 25" ID X 37" O.D. ¾" THK W/ ½" Ø WEEP HOLE 20'-0" RADIUS TANK	SA-240-304		
3-C			2	4" OVERFLOW			
			1	PIPE 4" SCH 80 X 2⅜" L.S. (COUNTER MORE DME END TO SCH 40s)	SA-312-TP304		
			2	90° ELBOW 4" LR SCH 40S	SA-403-WP304		
			3	PIPE 4" SCH 40S X 20'-0" LG.	SA-312-TP304		
			4	PIPE 4" SCH 40S X 13'-0" LG.	SA-312-TP304		
3-H		2	4	OVERFLOW PIPE SUPPORTS		(154)	
		3-18	4	R½" X 1'-0" X 1'-0" ABANDON IN PLACE	C.S.	80	88
		3-19	4	R⅜" X 8½" X 9½"	C.S.	52	89
		3-20	4	R⅜" X 8K.	C.S.	22	89
3-J			5	2½" PIPE SCH.40S (CUT TO SUIT)	SA-376-TP304		
			6	SPLIT RING REINF.PAD ½"X 9⅜" O.D.			
			7	PLATE ¼"X 2½"X 1'-0" (CUT TO SUIT)	SA-182-F316		
			8				
3-K			9	4" PIPE SCH. 40S	SA-376-TP304		
			10	SPLIT RING REINF.PAD ½"X 12" O.D.			
			11		SA-182-F316		
			12		SA-182-F316		
			14		SA-376-TP304		
3-L			15	SPLIT RING REINF.PAD ½"X 9⅜" O.D.			

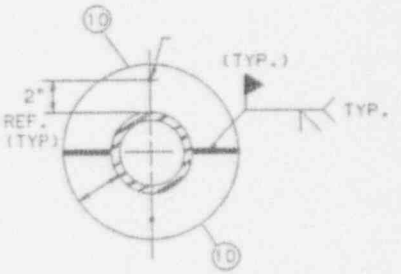
STRESS CALC. M-DSC-~~269~~ 280 REV E



3K PUMP SUCTION
SA-1415-ML-018



3L INLET RECIRC.
SA-1415-ML-023



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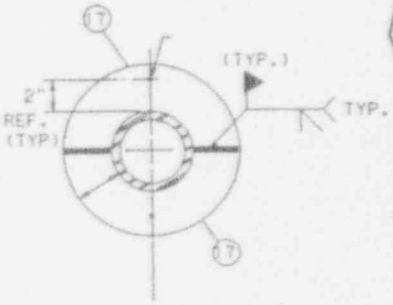

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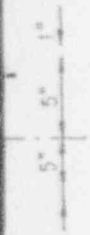

TANK SHELL (I.D.)

O.C. II

REVISED NOZZLES: 9309090077-02

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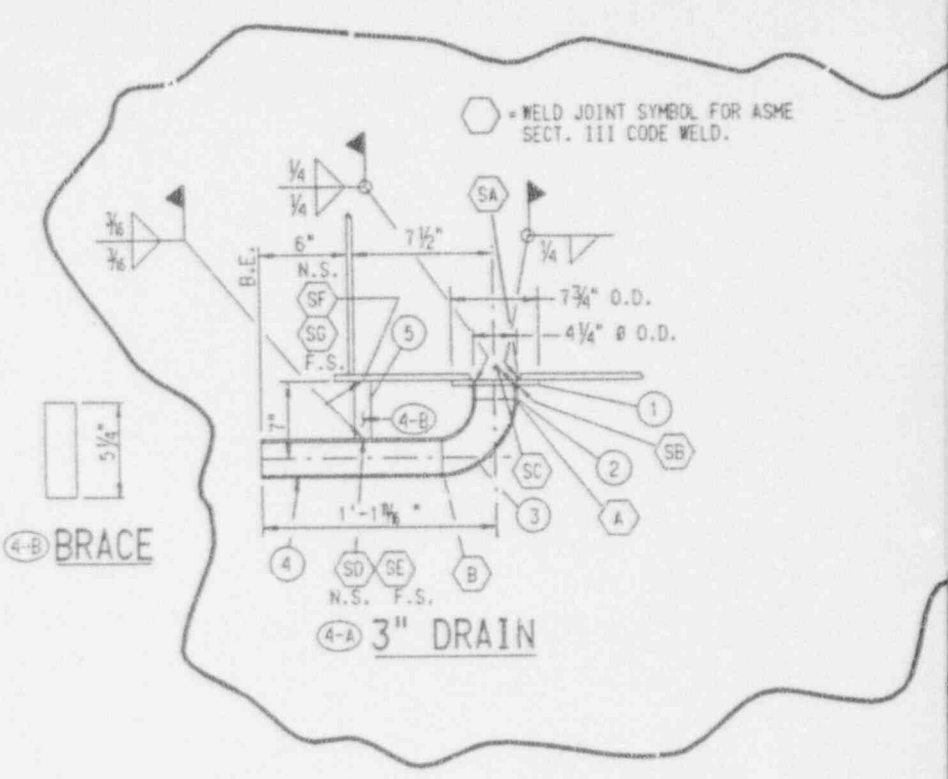
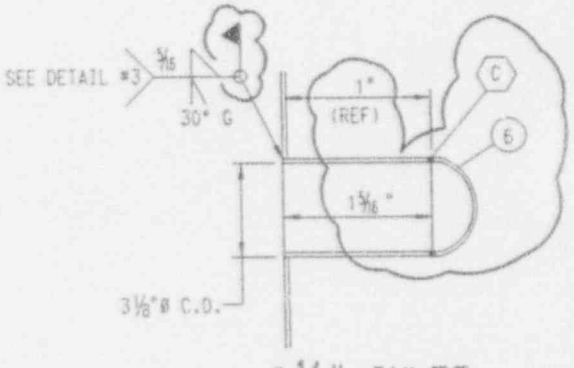
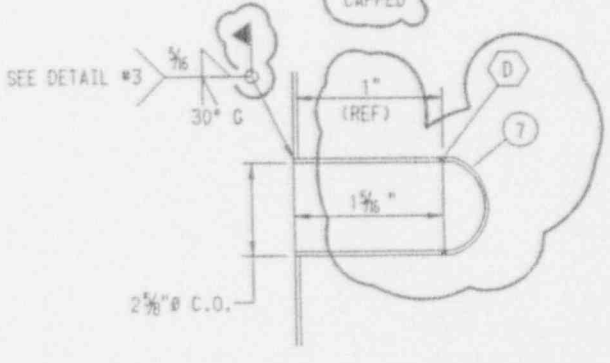
Tank Modification Details

- Tank Drain.
- Capped nozzles







SEE DETAIL

MARK			QTY	DESCRIPTION	SPEC	WT	P.O. NO.
				BOM FOR 2 TANKS			
4-A				3" DRAIN			
		1	-1	PLATE ⅜" X 3½" I.D. X 7¾" O.D. *	SA-240-304		
		2	-1	PIPE 3" SCH. 80 X 2½" LG.	SA-312 TP304		
		3	-1	90° ELBOW SCH. 80	SA-403 WP304		
		4	-1	PIPE 3" SCH. 80 X 9⅝" LG.	SA-312 TP304		
4-B		5	-1	P.B. ½" X 4" X 5¾" LG. (BRACE) *	SA-240-304		
4-C		6	2	PIPE 2½" SCH. 80 X 7⅜" LG. (INLET)	SA-312-304	(18)	59
		6	1	CAP 2½" SCH.80 B.W.	SA-403 WP304		
4-F		7	1	CAP 2 " SCH.80 B.W.	SA-403 WP304		
4-G		8	1	CAP 4 " SCH.80 B.W.	SA-403 WP304		

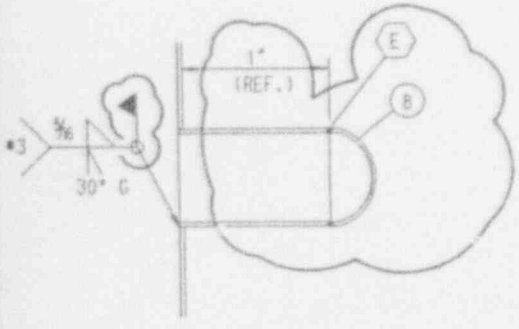
* INTEGRAL ATTACHMENT USE ASME SECTION III, SUBSECTION "ND" MATERIAL.

+ QUANTITIES FOR ONE TANK ONLY T056

NOTES:

1.) PIPE MATERIAL AND WELDS TO BE PER ASME SECTION III , CODE CLASS 3, 1989 EDITION ,NO ADDENDA.

2.) DIMENSIONAL TOLERANCE ± ⅛".



4-G 4" PUMP SUCTION

CAPPED

QUALITY CLASS II

DCP/MMP WCAP or FECHA (Info) REV.

Southern California Edison Company
FIELD CHANGE NOTICE (FCN)
~~FIELD VERIFICATION RECORD~~
~~CHANGE NOTICE OF FCDM~~
SUPPLEMENTAL PAGE

FCN NO.	FECH NO.	DCK NO.	DCK REV
F-7522M			
DOCUMENT NO. S023-407-3-64		SHEET NO. –	REV 1
Q-CLASS DOCUMENT II	Q-CLASS EQUIPMENT II	ORIGINATOR F.GOPAR	

DESCRIPTION OF CHANGE ☐ BEFORE ☒ AFTER ☐ AS-FOUND ☐ ADD ☐ INTERIM ☐ INFORMATION ONLY

9309090077-03

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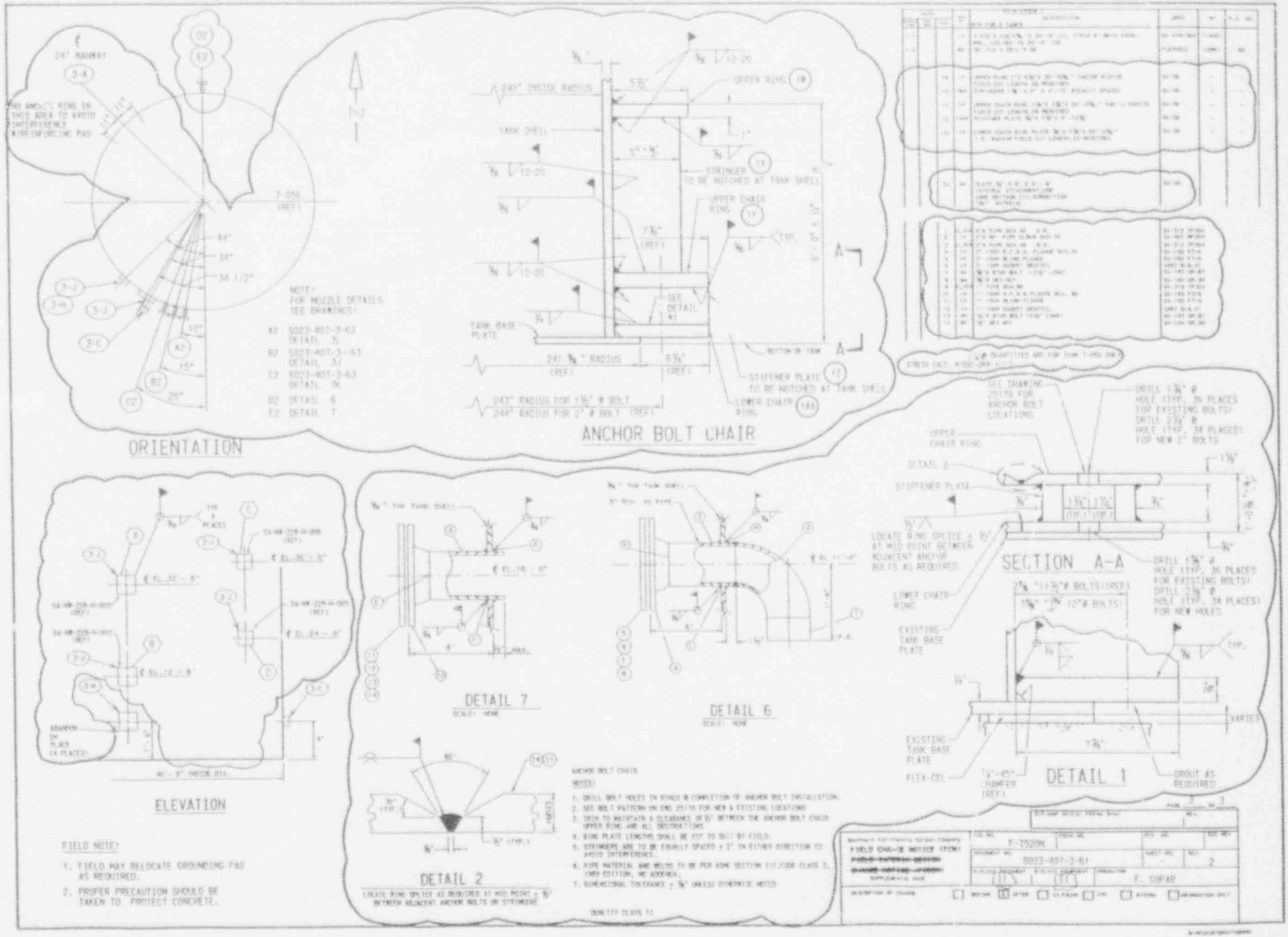
wk Modification Details

Anchor bolt chair,

Nozzle locations,

Upper chair ring weld.



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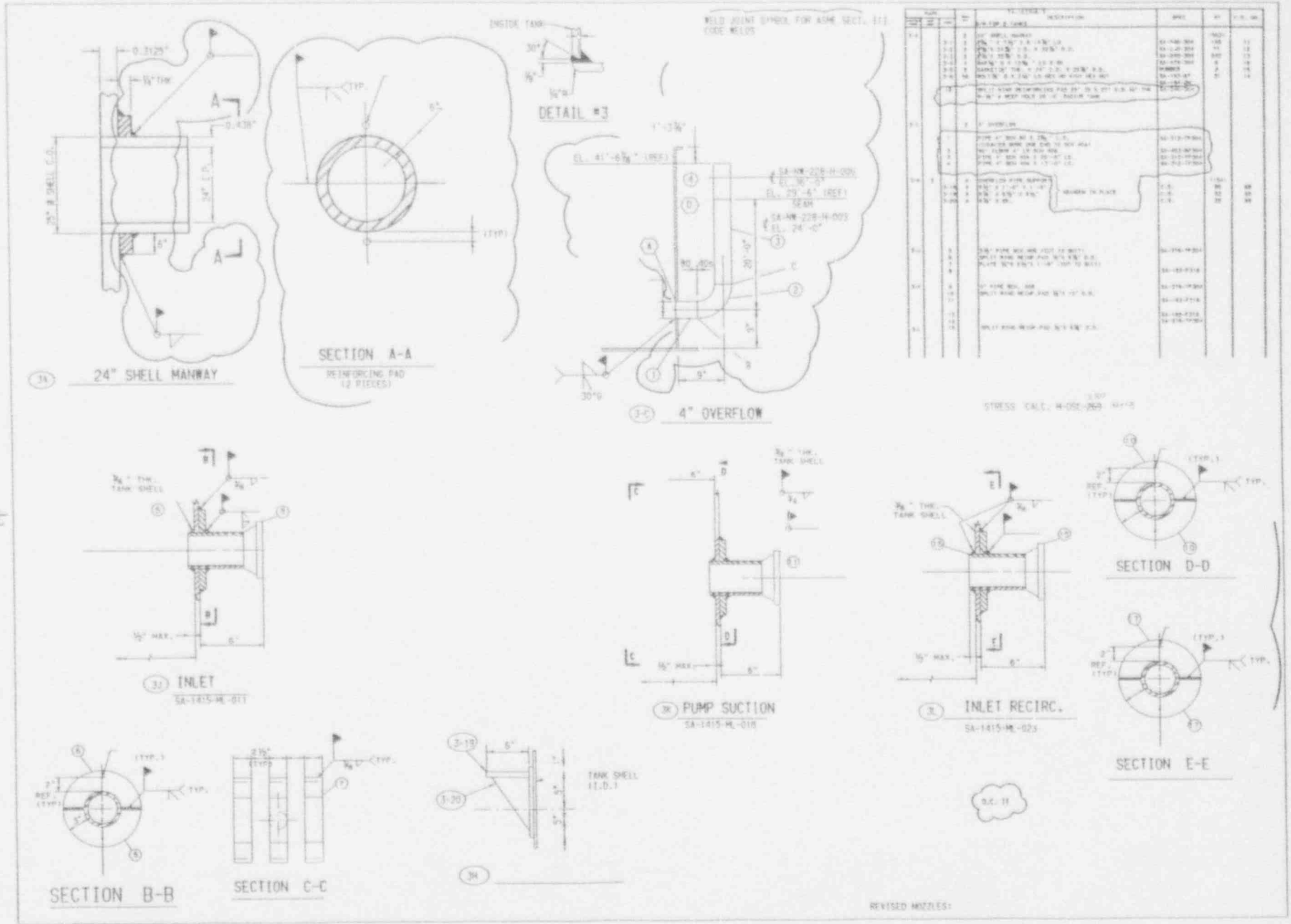
& Modification Details

Manway reinforcement

Nozzle reinforcement



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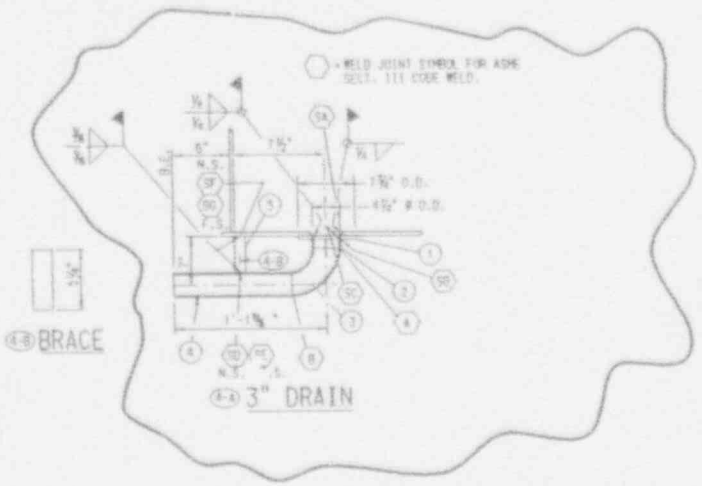
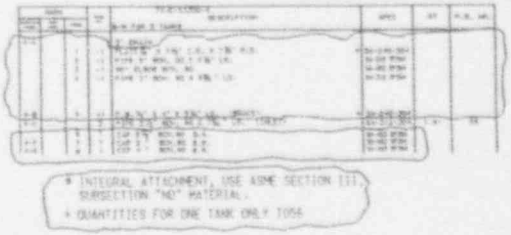
Modification Details

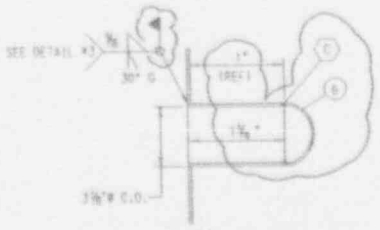
Tank Drain.

Capped nozzles



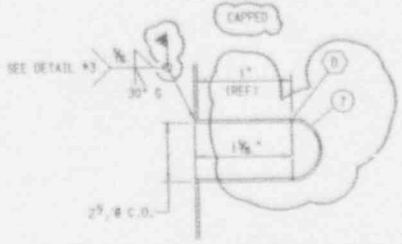


* INTEGRAL ATTACHMENT, USE ASME SECTION III, SUBSECTION "ND" MATERIAL.
+ QUANTITIES FOR ONE TANK ONLY TOSA



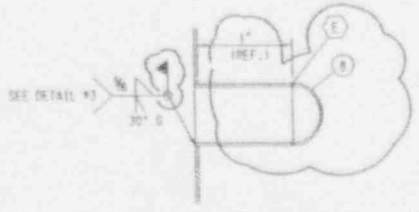
2½" INLET

CAPPED



2" INLET-RECIRC

CAPPED



4" PUMP SUCTION

CAPPED

NOTES:
1. PIPE MATERIAL AND WELDS TO BE PER ASME SECTION III , CODE CLASS 3, 1989 EDITION ,NO ADDENDA.
2. DIMENSIONAL TOLERANCE ± ⅛".

QUALITY CLASS II

FIELD CHANGE NOTICE (FCN)

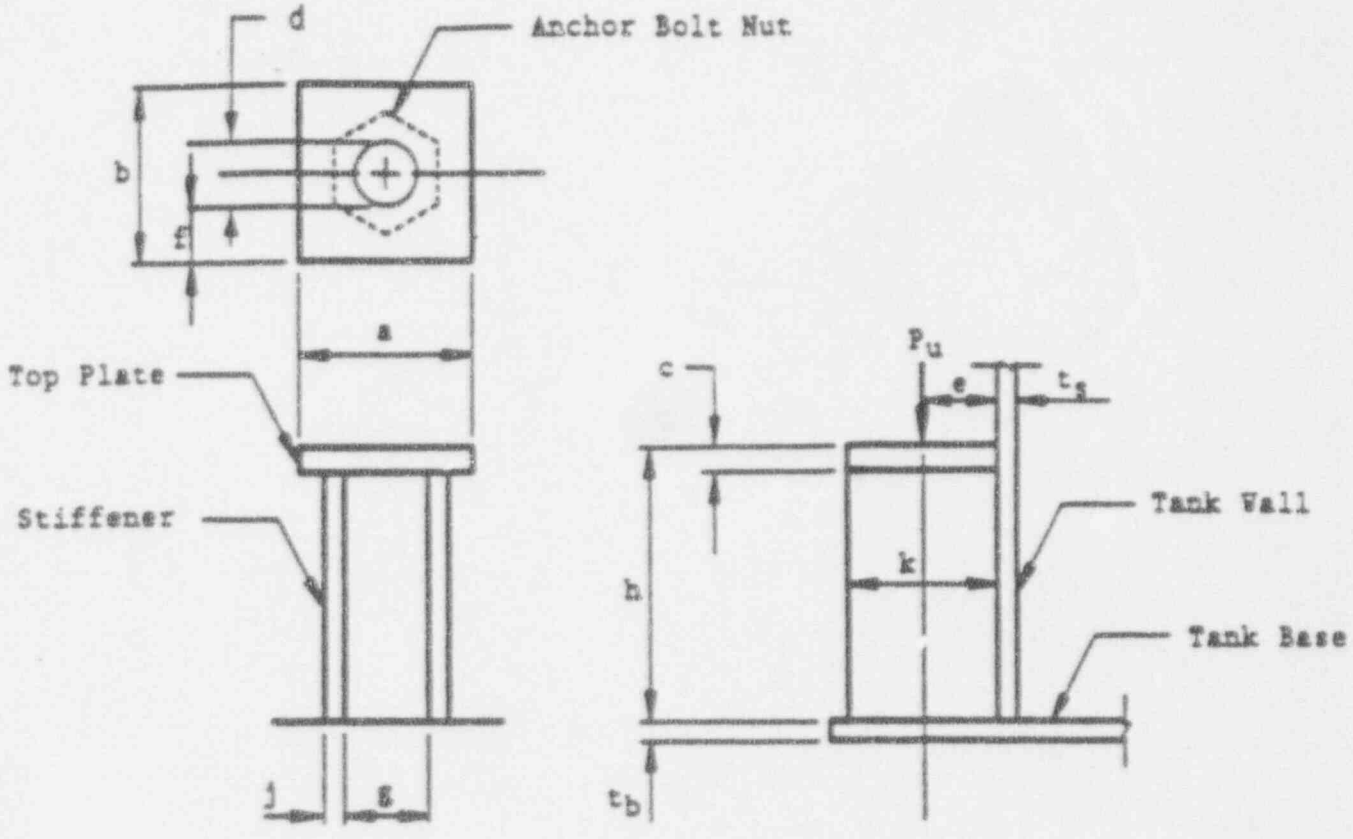
F-7522H

S023-407-3-64

F.COFAR

APPENDIX B

REFERENCE MATERIAL FOR GIP ANALYSIS



(a) Typical Plan and Outside Views

(b) Side View

Figure B-1 Typical Anchor Bolt Chair

Table 7-3

FLUID-STRUCTURE IMPULSIVE MODE FREQUENCIES (F_i, Hz)
FOR VERTICAL CARBON STEEL TANKS CONTAINING WATER

(Source: Reference 26, Table 2.2)

		TANK RADIUS (R, in.)						
H/R	t_{ef}/R	60	120	180	240	300	360	420
1.0	0.001	46.7	23.3	15.6	11.7	9.3	7.8	6.7
1.0	0.002	65.2	32.6	21.7	16.3	13.0	10.9	9.3
1.0	0.003	79.3	39.7	26.4	19.8	15.9	13.2	11.3
1.0	0.004	91.2	45.6	30.4	22.8	18.2	15.2	13.0
1.0	0.005	101.6	50.8	33.9	25.4	20.3	16.9	14.5
1.0	0.007	119.5	59.7	39.8	29.9	23.9	19.9	17.1
1.0	0.010	142.0	71.0	47.3	35.5	28.4	23.7	20.3
1.5	0.001	32.2	16.1	10.7	8.0	6.4	5.4	4.6
1.5	0.002	45.1	22.6	15.0	11.3	9.0	7.5	6.4
1.5	0.003	55.0	27.5	18.3	13.7	11.0	9.2	7.9
1.5	0.004	63.3	31.6	21.1	15.8	12.7	10.5	9.0
1.5	0.005	70.6	35.3	23.5	17.6	14.1	11.8	10.1
1.5	0.007	83.2	41.6	27.7	20.8	16.6	13.9	11.9
1.5	0.010	99.0	49.5	33.0	24.7	19.8	16.5	14.1
2.0	0.001	23.6	11.8	7.9	5.9	4.7	3.9	3.4
2.0	0.002	33.0	16.5	11.0	8.2	6.6	5.5	4.7
2.0	0.003	40.1	20.1	13.4	10.0	8.0	6.7	5.7
2.0	0.004	46.1	23.1	15.4	11.5	9.2	7.7	6.6
2.0	0.005	51.4	25.7	17.1	12.8	10.3	8.6	7.3
2.0	0.007	60.5	30.2	20.2	15.1	12.1	10.1	8.6
2.0	0.010	71.8	35.9	23.9	18.0	14.4	12.0	10.3
2.5	0.001	17.8	8.9	5.9	4.5	3.6	3.0	2.5
2.5	0.002	25.0	12.5	8.3	6.2	5.0	4.2	3.6
2.5	0.003	30.4	15.2	10.1	7.6	6.1	5.1	4.3
2.5	0.004	35.0	17.5	11.7	8.7	7.0	5.8	5.0
2.5	0.005	39.0	19.5	13.0	9.7	7.8	6.5	5.6
2.5	0.007	45.9	23.0	15.3	11.5	9.2	7.7	6.6
2.5	0.010	54.6	27.3	18.2	13.7	10.9	9.1	7.8
3.0	0.001	13.9	7.0	4.6	3.5	2.8	2.3	2.0
3.0	0.002	19.5	9.7	6.5	5.9	3.9	3.2	2.8
3.0	0.003	23.7	11.8	7.9	4.9	4.7	3.9	3.4
3.0	0.004	27.2	13.6	9.1	6.8	5.4	4.5	3.9
3.0	0.005	30.3	15.1	10.1	7.6	6.1	5.0	4.3
3.0	0.007	35.6	17.8	11.9	8.9	7.1	5.9	5.1
3.0	0.010	42.2	21.1	14.1	10.6	8.4	7.0	6.0

Table 7-3 (Continued)

FLUID-STRUCTURE IMPULSIVE MODE FREQUENCIES (F_i, Hz)
FOR VERTICAL CARBON STEEL TANKS CONTAINING WATER

(Source: Reference 26, Table 2.2)

		TANK RADIUS (R, in.)						
H/R	t_{ef}/R	60	120	180	240	300	360	420
3.5	0.001	11.2	5.6	3.7	2.8	2.2	1.9	1.6
3.5	0.002	15.5	7.8	5.2	3.9	3.1	2.6	2.2
3.5	0.003	18.8	9.4	6.3	4.7	3.8	3.1	2.7
3.5	0.004	21.6	10.8	7.2	5.4	4.3	3.6	3.1
3.5	0.005	24.0	12.0	8.0	6.0	4.8	4.0	3.4
3.5	0.007	28.2	14.1	9.4	7.0	5.6	4.7	4.0
3.5	0.010	33.4	16.7	11.1	8.3	6.7	5.6	4.8
4.0	0.001	9.1	4.6	3.0	2.3	1.8	1.5	1.3
4.0	0.002	12.6	6.3	4.2	3.2	2.5	2.1	1.8
4.0	0.003	15.2	7.6	5.1	3.8	3.0	2.5	2.2
4.0	0.004	17.4	8.7	5.8	4.4	3.5	2.9	2.5
4.0	0.005	19.3	9.7	6.4	4.8	3.9	3.2	2.8
4.0	0.007	22.6	11.3	7.5	5.7	4.5	3.8	3.2
4.0	0.010	26.7	13.4	8.9	6.7	5.3	4.5	3.8
4.5	0.001	7.5	3.8	2.5	1.9	1.5	1.3	1.1
4.5	0.002	10.3	5.2	3.4	2.6	2.1	1.7	1.5
4.5	0.003	12.4	6.2	4.1	3.1	2.5	2.1	1.8
4.5	0.004	14.2	7.1	4.7	3.5	2.8	2.4	2.0
4.5	0.005	15.7	7.9	5.2	3.9	3.1	2.6	2.2
4.5	0.007	18.3	9.2	6.1	4.6	3.7	3.1	2.6
4.5	0.010	21.6	10.8	7.2	5.4	4.3	3.6	3.1
5.0	0.001	6.2	3.1	2.1	1.6	1.2	1.0	0.9
5.0	0.002	8.5	4.2	2.8	2.1	1.7	1.4	1.2
5.0	0.003	10.2	5.1	3.4	2.5	2.0	1.7	1.5
5.0	0.004	11.6	5.8	3.9	2.9	2.3	1.9	1.7
5.0	0.005	12.8	6.4	4.3	3.2	2.6	2.1	1.8
5.0	0.007	14.9	7.4	5.0	3.7	3.0	2.5	2.1
5.0	0.010	17.5	8.7	5.8	4.4	3.5	2.9	2.5

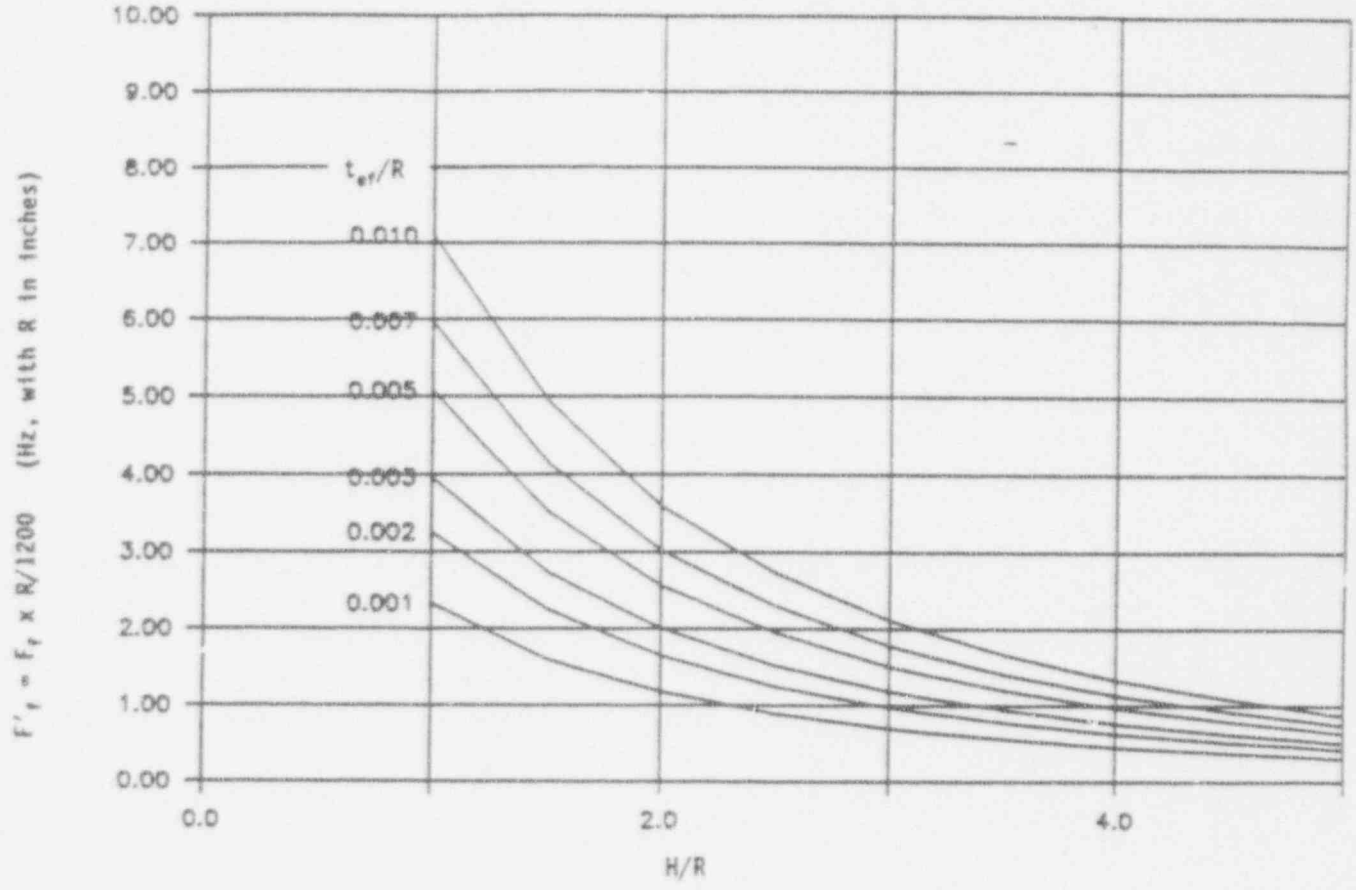


Figure 7-2. Fluid-Structure Impulsive Mode Frequency Coefficient for Vertical Carbon Steel Tanks Containing Water. (Source: Reference 26, Figure 2.3)

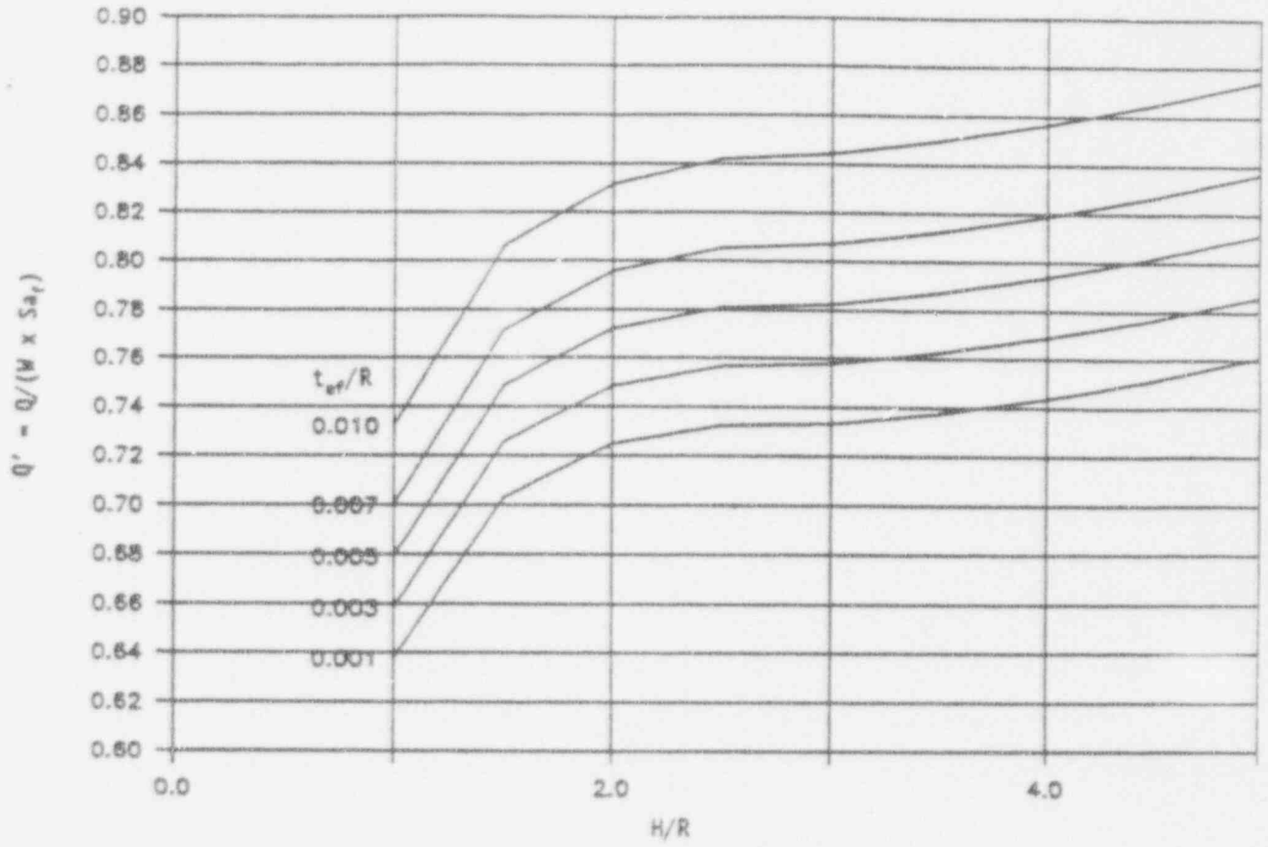


Figure 7-3. Base Shear Load Coefficient For Vertical Tanks
(Source: Reference 26, Figure 2.4)

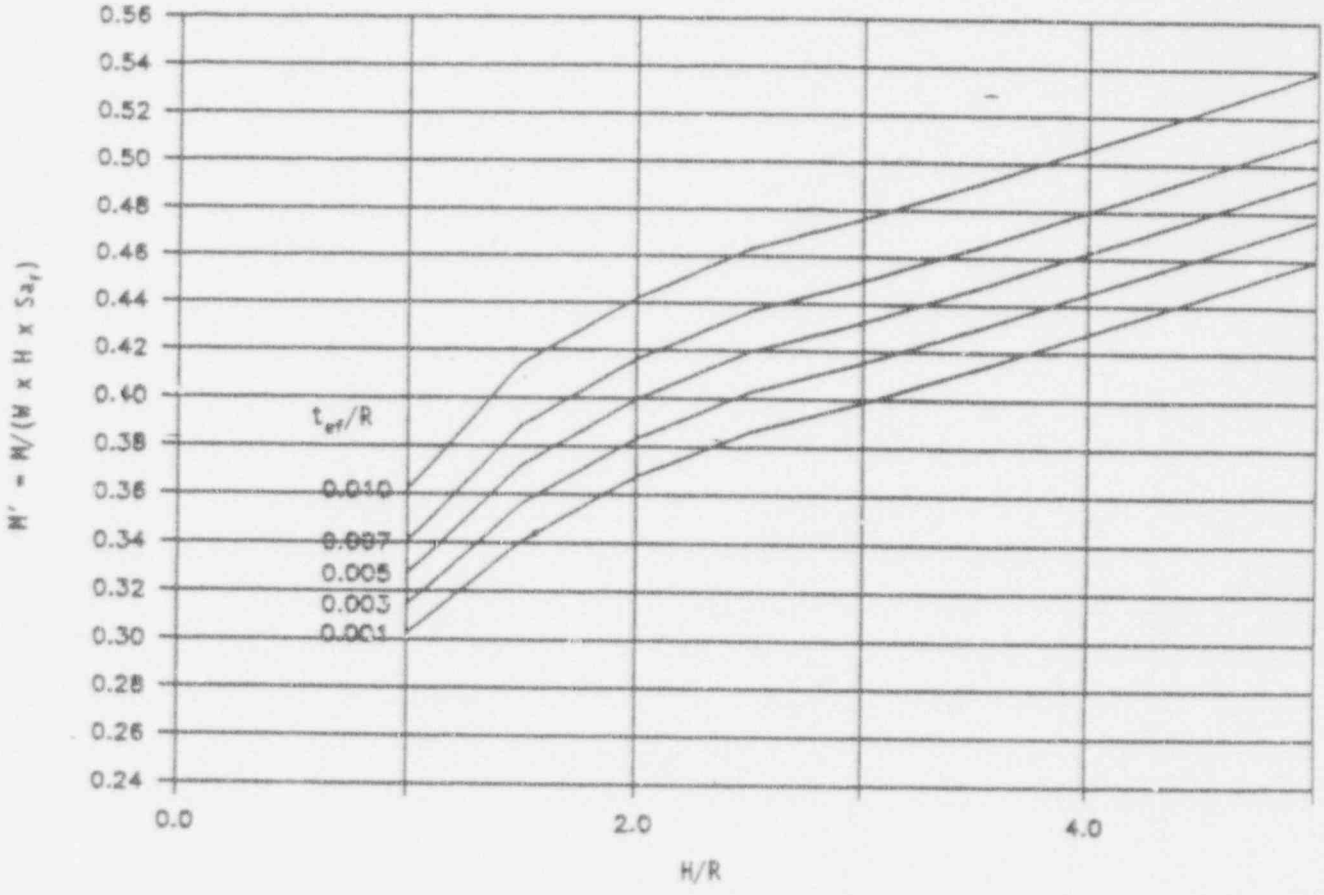


Figure 7-4. Base Overturning Moment Coefficient For Vertical Tanks (Source: Reference 26, Figure 2.5)

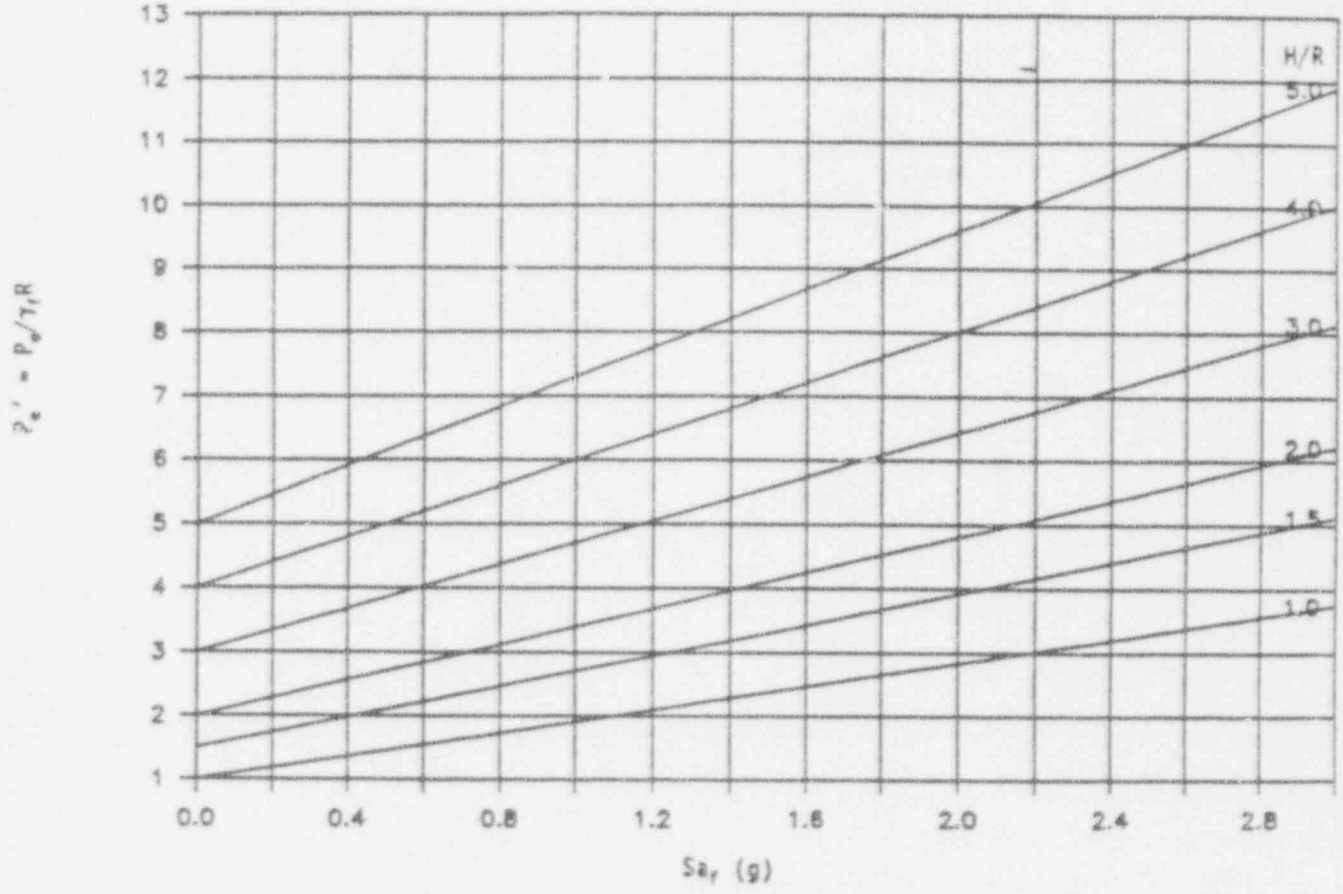


Figure 7-7. Pressure Coefficient For Elephant-Foot Buckling of Vertical Tanks
(Source: Reference 26, Figure 2.6)

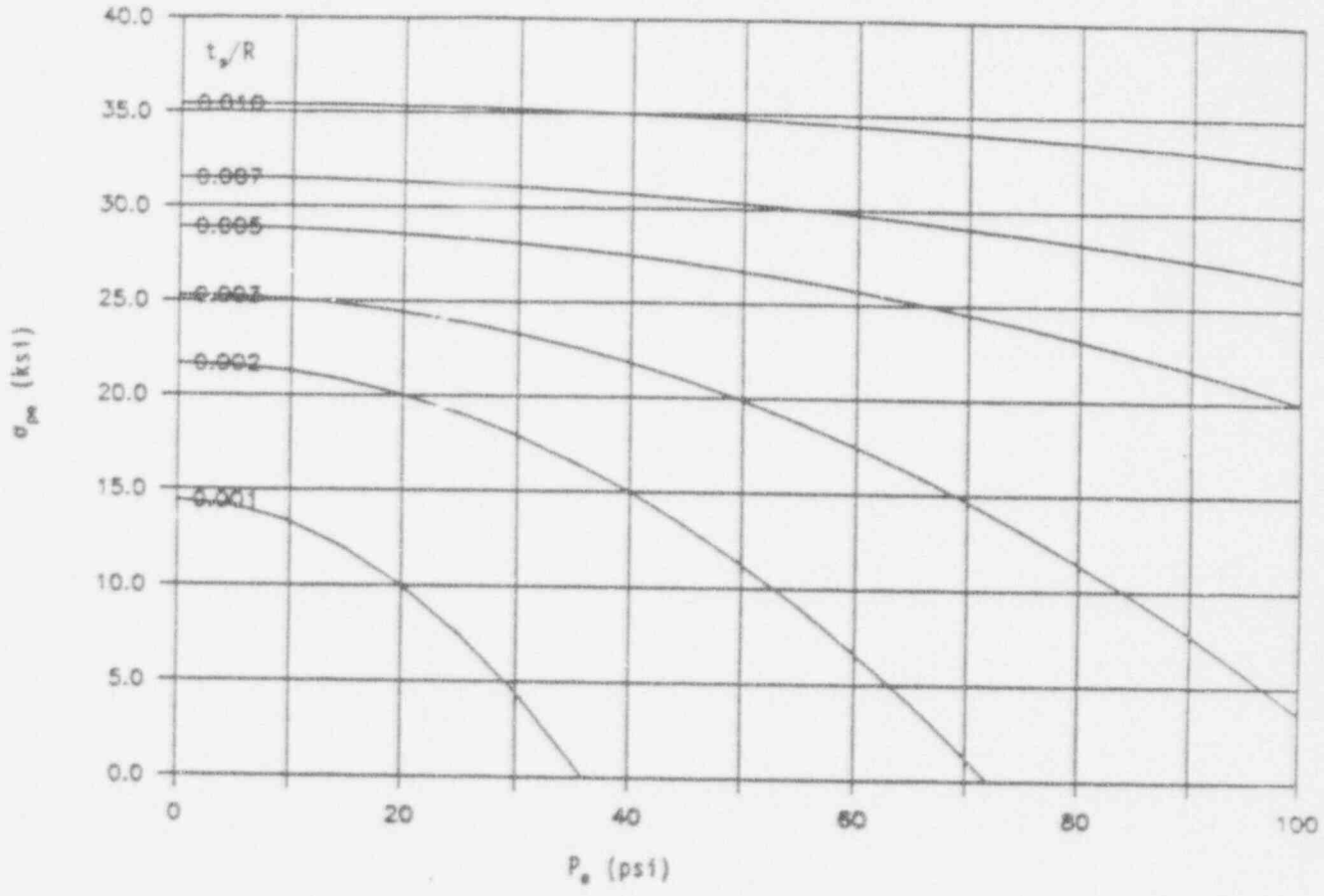


Figure 7-8. Compressive Axial Stress Capacity For Vertical Tanks, Elephant-Foot Buckling (Steel, E = 30,000 psi, σ_y = 36,000 psi) (Source: Reference 26, Figure 2.8)

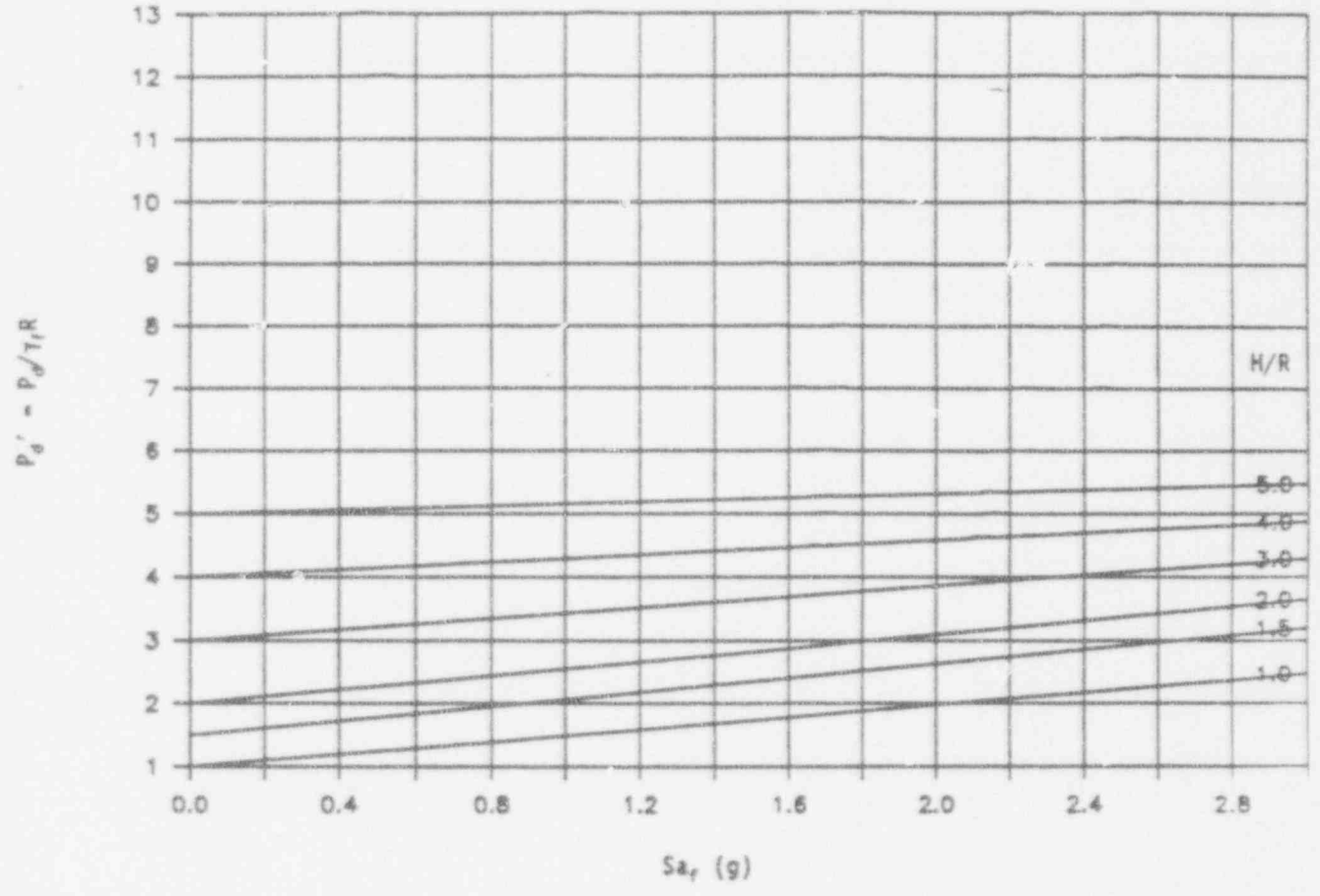


Figure 7-9. Pressure Coefficient For Diamond-Shape Buckling of Vertical Tanks
(Source: Reference 26, Figure 2.7)

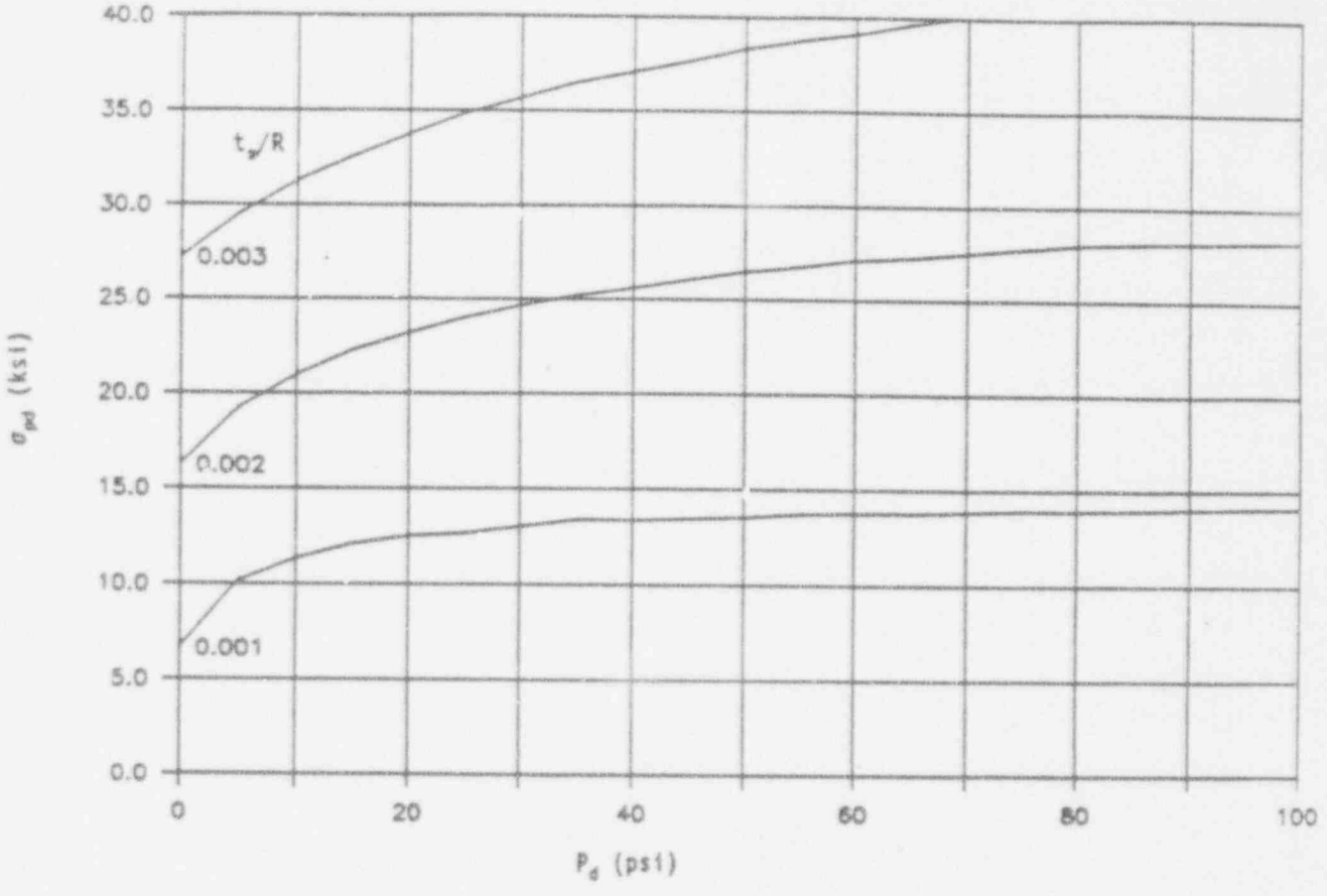


Figure 7-10. Compressive Axial Stress Capacity For Vertical Tanks, Diamond-Shape Buckling (Steel, E = 30,000 psi) (Source: Reference 26, Figure 2.10)

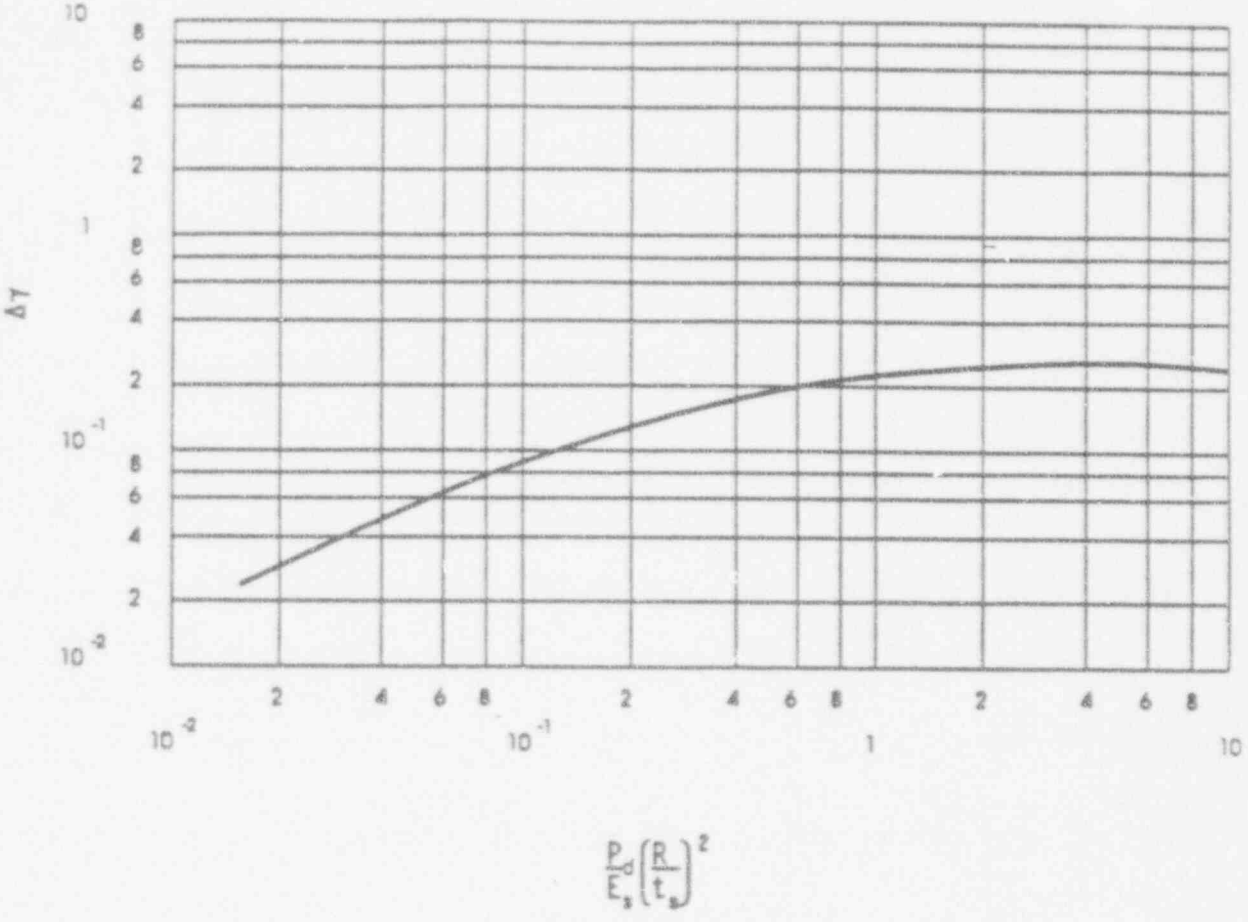


Figure 7-11. Increase Factor $\Delta\gamma$ for Diamond-Shape Buckling (Source: Reference 26, Figure 2.9)

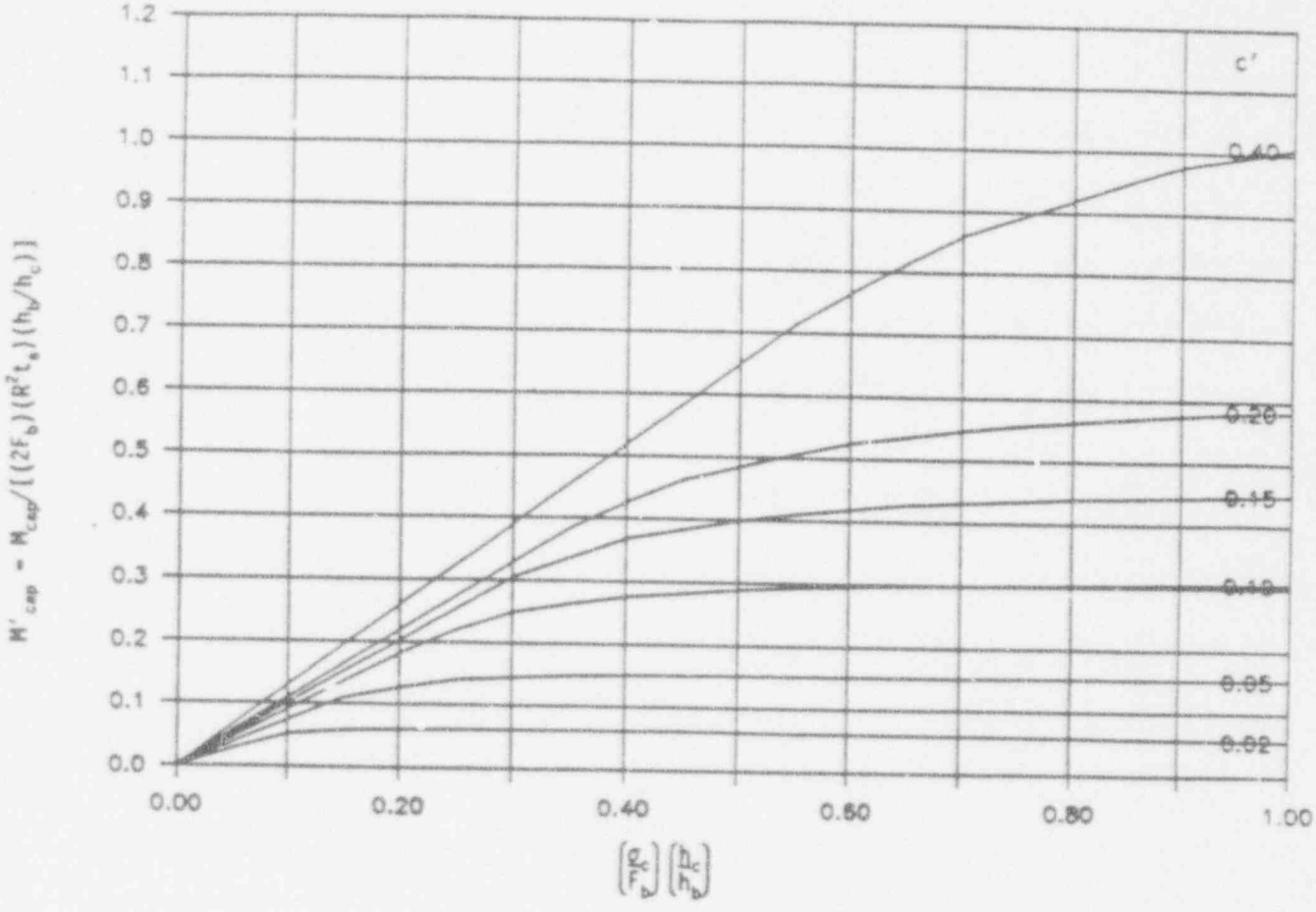
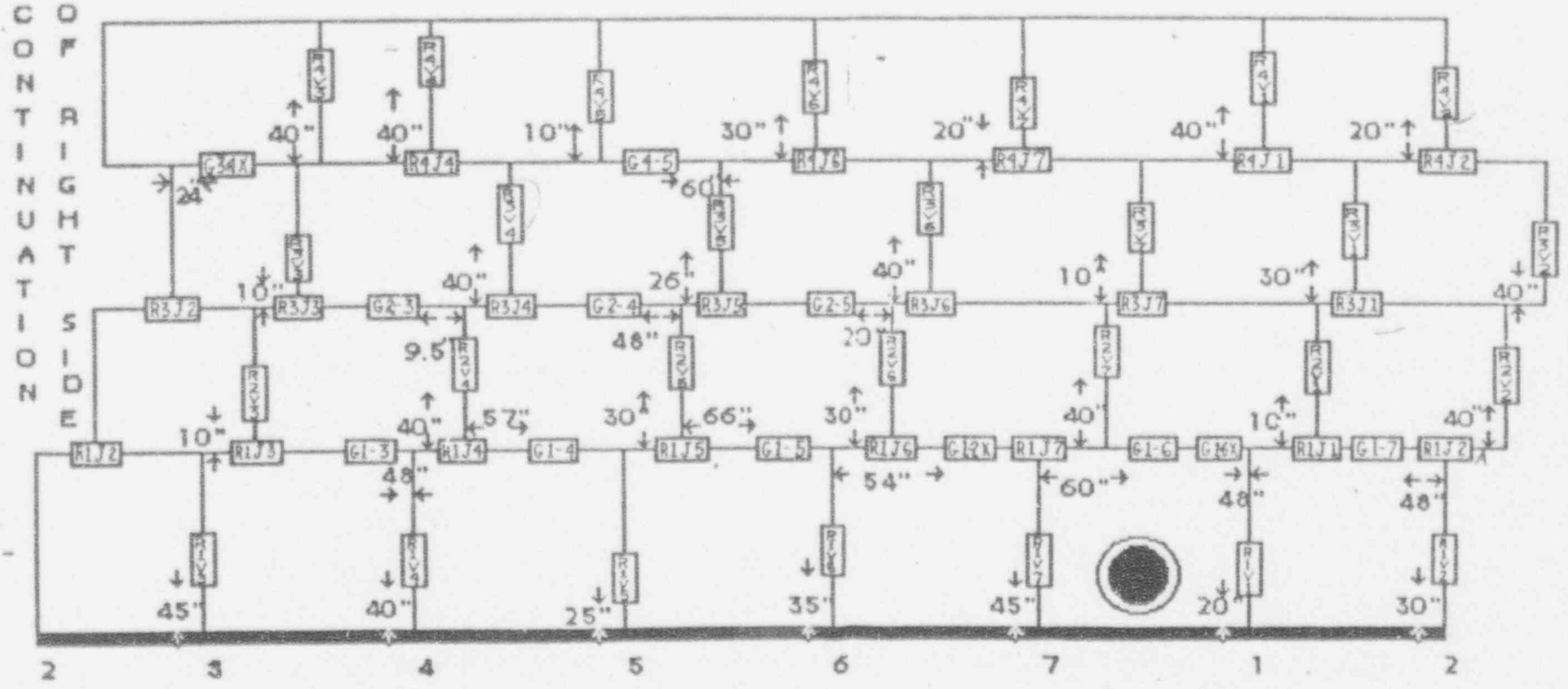


Figure 7-12. Base Overturning Moment Capacity Coefficient For Vertical Tanks (Source: Reference 26, Figure 2.12)

APPENDIX C

SPOT RADIOGRAPHY RESULTS

TANK T-056
RADIOGRAPHY MAP



SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET

NDER-010 Rev. 1

REPORT NO. 2 RT-244-93
PAGE 1 OF 2
DATE 6-23-93

JOB LOCATION: SONGS	UNIT IDENTIFICATION: U-2	ITEM INSPECTED: SA1415 MT 056 WELD R2V3
MO/WO/WORK ORDER #: 9306186	OTHER DOCUMENT: DCP 2-6742.07	ITEM LOCATION: U2 RADWASTE RM 127A SA1415MT056 WELD R2V3 ND5322
INSPECTION PROCEDURE/STANDARD: SEP-ET-ACI REV. 2	ACCEPTANCE STANDARD: ASME III 1989 ED ND 5322	

MATERIAL TYPE	MATERIAL THICKNESS	WELD PROCESS	QUALITY CLASS	CODE CLASS
S/S	.248	SMAW	III	III

EXPOSURE DATA TIME: 1 Min. 45 Sec. SFD 18 IN | NUMBER OF EXPOSURE: 1 | FILM PER CASSETTE: 2 | NUMBER OF FILMS: 2

FILM VIEWING METHOD: SINGLE WALL | VIEWING TECHNIQUE: SINGLE FILM

FILM INTERPRETATION

DEFECT CODES: BT - BURN THROUGH; C - CRACK; CV - ROOT CONCAVITY; CX - ROOT CONVEXITY; DT - DROP THROUGH; FA - FILM ARTIFACT; IF - INCOMPLETE FUSION; IP - INADEQUATE PENETRATION; M - MISMATCH; OX - OXIDIZED ROOT; P - POROSITY; SI - SLAG INCLUSION; SL - SLAG LINE; TI - TUNGSTEN INCLUSION; U - UNDERCUT

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODE	REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
A-B	X		SI, U		acc.	3.23

RADIOGRAPHER [signature] LEVEL II DATE 6-25-93
FILM INTERPRETER [signature] LEVEL III DATE 6-23-93
SCE LEVEL III _____ DATE _____
ANII REVIEW _____ DATE _____

DC

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT

RADIOGRAPHIC EXAMINATION
TECHNIQUE SHEET

NDEDR -015

REPORT # 2R7244-93
PG 2 OF 2
DATE 6-24-93

WO/CWO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061684	OCP 2-674207	SA1415 MT 056 HEAD RDV3

MATERIAL SURFACE CONDITION	WELD	PIPE/BOX	PLATE (TANK WALL)	OTHER
AS WELDED / GROUND	L	N/A	K	N/A

ISOTOPE DATA:	STRENGTH	SIZE:	CAMERA MAKE / MODEL / SERIAL #
IR 192	91.34 Ci.	.148	AMERTEST 660 4338

PENETRAMETERS: ASME ☑ OTHER ☐	DESIGNATION	NO. USED	☑ SOURCE SIDE
B/B ☑ CARBON STEEL ☐ OTHER ☐	12	2	☐ FILM SIDE

SHIM (s): MATERIAL / THICKNESS	FILM: BRAND / TYPE	NO. USED	SIZE
S/S .048	KODAK M	2	4½ x 10

EXPOSURE:	DEVELOPMENT:	TIME	TEMP.	SCREENS:		
☑ SINGLE WALL ☐ DOUBLE WALL	☑ AUTOMATIC ☐ MANUAL	11 MIN	82°	FRONT .010" BACK .010"	☐ OTHER	☑ LEAD FOIL ☐ READY PAC ☐ FLUORESCENT

GEOMETRIC UNSHARPNESS (Ug)

$$Ug = \frac{F \times t}{D}$$

F: Source Size

t: Specimen Thickness (including all gaps between specimen and film)

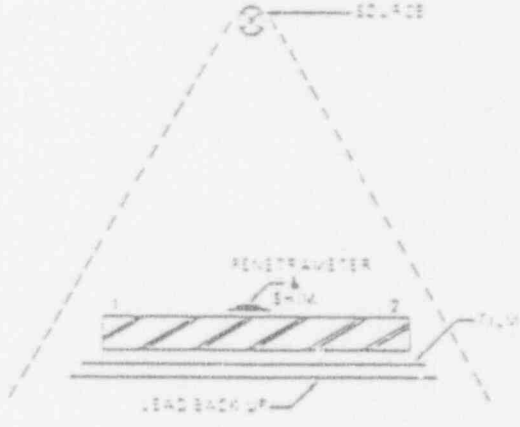
D: Source to Specimen Distance

SOURCE SIZE	.148 IN.	(F)
SPECIMEN THICKNESS	.298 IN.	(t)
SOURCE TO SPECIMEN DISTANCE	17.702 IN.	(D)

Ug = .002 IN.

SOURCE SIDE PENETRAMETERS
SINGLE WALL EXPOSURE SINGLE WALL VIEWING

NOTE:
PENETRAMETERS
CAN BE POSITIONED
AXIALLY OR
LONGITUDINALLY



COMMENTS / REMARKS

RADIOGRAPHER _____ LEVEL II DATE 6-25-93

REVIEWED BY _____ LEVEL _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET

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REPORT NO. 2RT-245-93

PAGE 1 OF 2

DATE 6-23-93

JOB LOCATION: SONGS	UNIT IDENTIFICATION: U2	ITEM INSPECTED: SA1415MT056L WELD G2-3
MO/WO/WORK ORDER #: 9306/686	OTHER DOCUMENT: DCP 2-6742.07	ITEM LOCATION: SA1415MT056 U2 RADWASTE WELD G-2-3 RM 127A
INSPECTION PROCEDURE/STANDARD: NDEP-RT-001 REV. 2		ACCEPTANCE STANDARD: ASME III ND 89 ed NC ADD ND 5322

MATERIAL TYPE	MATERIAL THICKNESS	WELD PROCESS	QUALITY CLASS	CODE CLASS
S/S	.298	SMAW	III	III

EXPOSURE DATA TIME	NUMBER OF EXPOSURE	FILM PER CASSETTE	NUMBER OF FILMS
1 min. 45 sec. SFD 18 in.	1	2	2

FILM VIEWING METHOD: SINGLE WALL

VIEWING TECHNIQUE: SINGLE FILM

FILM INTERPRETATION

DEFECT CODES: ET - BURN THROUGH; C - CRACK; CV - ROOT CONCAVITY; CX - ROOT CONVEXITY; DT - DROP THROUGH; FA - FILM ARTIFACT; IF - INCOMPLETE FUSION; IP - INADEQUATE PENETRATION; M - MISMATCH; OX - OXIDIZED ROOT; P - POROSITY; SI - SLAG INCLUSION; SL - SLAG LINE; TI - TUNGSTEN INCLUSION; U - UNDERCUT

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODE	REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
A-B		X	(IF)	UNDER LOCATION MARKER "A" AND FROM AREA ABOVE PENN TO EDGE OF FILM	acc	3.62
				2 INDICATIONS (EA.) 2.5" AND 4.875" LONG. RT-7-25-93		

RADIOGRAPHER [signature] LEVEL II DATE 6-25-93

FILM INTERPRETER [signature] LEVEL III DATE 6-23-93

SCE LEVEL III _____ DATE _____

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT

RADIOGRAPHIC EXAMINATION
TECHNIQUE SHEET

NDEDR - 015

REPORT # 2RT-245.43
PG 2 OF 2
DATE 6-24-93

MO/CMO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
9306 1686	DCP 2-6742.07	SA 1415 MT 056 WELD 62-3

MATERIAL SURFACE CONDITION	WELD	FIRE/ECH	PLATE (TANK WALL)	OTHER
AS WELDED / GROUND	✓	N/A	✓	N/A

ISOTOPE DATA	STRENGTH	SIZE:	CAMERA MAKE / MODEL / SERIAL #
IR 192	41.34 Ci	.148	AMERTEST 660 4338

PENETRAMETERS: ASME ☒ OTHER ☐	DESIGNATION	NO. USED	SOURCE SIDE
S/S ☑ CARBON STEEL ☐ OTHER ☐	12	2	☐ FILM SIDE

SHIM (s) MATERIAL / THICKNESS	FILM BRAND / TYPE	NO. USED	SIZE
S/S .048	KODAK AA	2	4½ x 10

EXPOSURE:	DEVELOPMENT:	TIME	TEMP.	SCREENS:	
☑ SINGLE WALL ☐ DOUBLE WALL	☒ AUTOMATIC ☐ MANUAL	11 MIN	82°	FRONT .010" PB BACK .010" PB	☐ OTHER ☒ LEAD FOIL ☐ READY PAC ☐ FLOURESCENT

GEOMETRIC UNSHARPNESS (Ug)

$$Ug = \frac{F \times t}{D}$$

F: Source Size

t: Specimen Thickness (including all gaps between specimen and film)

D: Source to Specimen Distance

SOURCE SIZE .148 IN. (F)

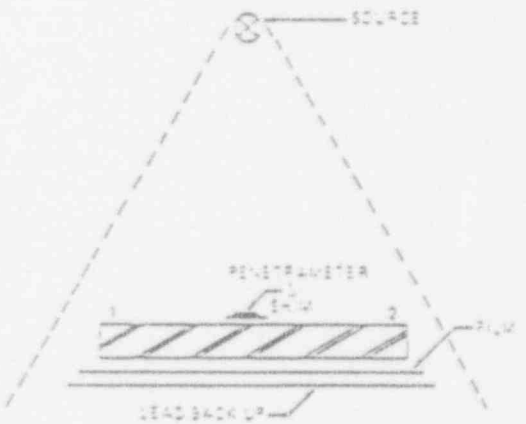
SPECIMEN THICKNESS .298 IN. (t)

SOURCE TO SPECIMEN DISTANCE 17.202 IN. (D)

Ug = .002 IN.

SOURCE SIDE PENETRAMETERS
SINGLE WALL EXPOSURE SINGLE WALL VIEWING

NOTE:
PENETRAMETERS
CAN BE POSITIONED
AXIALLY OR
LONGITUDINALLY



COMMENTS / REMARKS

RADIOGRAPHER [signature] LEVEL II DATE 6-25-93

REVIEWED BY _____ LEVEL _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET

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REPORT NO. 2RT-247-93

PAGE 1 OF 2

DATE 6-24-93

JOB LOCATION: SONGS	UNIT IDENTIFICATION: U-2	ITEM INSPECTED: SA1415 MT 056 WELD G1-2
MO/WO/WORK ORDER #: 93061636	OTHER DOCUMENT: DCP 2-6742.07	ITEM LOCATION: U2 RADWASTE RM 127A
INSPECTION PROCEDURE/STANDARD: NDEP-RT-001 REV. 2		ACCEPTANCE STANDARD: ASME III 89EP NO ADD. NO 5322

MATERIAL TYPE	MATERIAL THICKNESS	WELD PROCESS	QUALITY CLASS	CODE CLASS
S/S	.312	SMAW	III	III

EXPOSURE DATA TIME	min.	sec.	SFD	in.	NUMBER OF EXPOSURE	FILM PER CASSETTE	NUMBER OF FILMS
1	45		18		1	2	2

FILM VIEWING METHOD: SINGLE WALL

VIEWING TECHNIQUE: SINGLE WALL FILM

FILM INTERPRETATION

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES			DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
			ET - BURN THROUGH; C - CRACK; CV - ROOT CONCAVITY; CX - ROOT CONVEXITY; DT - DROP THROUGH	FA - FILM ARTIFACT; IF - INCOMPLETE FUSION; IP - INADEQUATE PENETRATION; M - MISMATCH; OX - OXIDIZED ROOT	P - POROSITY; SI - SLAG INCLUSION; SL - SLAG LINE; TI - TUNGSTEN INCLUSION; U - UNDERCUT		
			DEFECT CODE	REMARKS			
G1-2	X			UC NOTED		A	2-4-3

RADIOGRAPHER	[signature]	LEVEL II	DATE 6-25-93
FILM INTERPRETER	[signature]	LEVEL II	DATE 6-25-93
SCE LEVEL III			DATE
ANII REVIEW			DATE

SOUTHERN CALIFORNIA EDISON

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TECHNIQUE SHEET

NDEDR -015

REPORT # SRT-247-93
PG 2 OF 2
DATE 6-24-93

WO/CWO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
9306186	PCF 2-6742.17	SA1415 MT056 WELD G1-2

MATERIAL SURFACE CONDITION	WELD	PIPE/BCH	PLATE (TANK WALL)	OTHER
AS WELDED & GROUND	✓	N/A	✓	N/A

ISOTOPE DATA	STRENGTH	SIZE	CAMERA MAKE / MODEL / SERIAL #
IR 192	91.34 CI.	.148	AMERTEST 610 4338

PENETRAMETERS: ASME ☒ OTHER ☐	DESIGNATION	NO. USED	☐ SOURCE SIDE
S/S ☒ CARBON STEEL ☐ OTHER ☐	12	2	☐ FILM SIDE

SHIM (S) MATERIAL / THICKNESS	FILM: BRAND / TYPE	NO. USED	SIZE
S/S .048	KODAK AA	2	5 x 7

EXPOSURE: ☒ SINGLE WALL ☒ DOUBLE WALL	DEVELOPMENT: ☒ AUTOMATIC ☐ MANUAL	TIME	TEMP.	SCREENS: FRONT .010" BACK .010"	☐ OTHER	☐ LEAD FOIL ☐ READY PAC ☐ FLUORESCENT
		11 MIN	82°			

GEOMETRIC UNSHARPNESS (Ug)

$$Ug = \frac{F \times t}{D}$$

F: Source Size

t: Specimen Thickness (including all gaps between specimen and film)

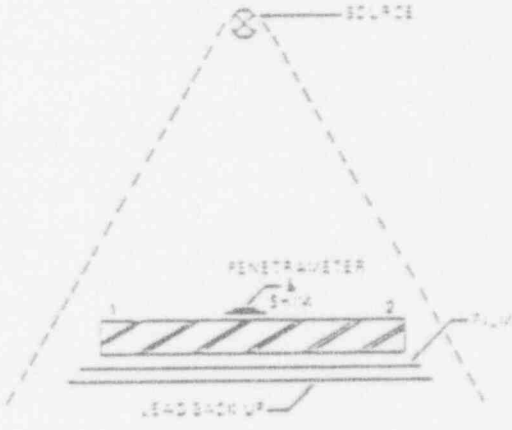
D: Source to Specimen Distance

SOURCE SIZE	.148 IN.	(F)
SPECIMEN THICKNESS	.312 IN.	(t)
SOURCE TO SPECIMEN DISTANCE	7.688 IN.	(D)

Ug = .002 IN.

SOURCE & DE PENETRAMETERS
SINGLE WALL EXPOSURE SINGLE WALL VIEWING

NOTE:
PENETRAMETERS
CAN BE POSITIONED
AXIALLY OR
LONGITUDINALLY



COMMENTS / REMARKS

RADIOGRAPHER [signature] LEVEL II DATE 6-25-93

REVIEWED BY _____ LEVEL _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET
NDER-010 Rev. 1

REPORT NO. 2RT-245-93
PAGE 1 OF 2
DATE 6-24-93

JOB LOCATION: SONGS	UNIT IDENTIFICATION: U-2	ITEM INSPECTED: SI #45 MTOSG WELD R3V7
MO/CWO/WORK ORDER #: 930616 86	OTHER DOCUMENT: DCP 2-6742.07	ITEM LOCATION: U-2 RADWASTE RM 127A
INSPECTION PROCEDURE/STANDARD: NDEP RT-001 REV. 2		ACCEPTANCE STANDARD: ASME III ND 89ED NO ADD ND 5322

MATERIAL TYPE	MATERIAL THICKNESS	WELD PROCESS	QUALITY CLASS	CODE CLASS
S/S	.235	SMAW	III	III

EXPOSURE DATA TIME				SFD			NUMBER OF EXPOSURE	FILM PER CASSETTE	NUMBER OF FILMS
	1	MIN.	45	SEC.	18	IN.	1	2	2

FILM VIEWING METHOD: SINGLE WALL
VIEWING TECHNIQUE: SINGLE FILM

FILM INTERPRETATION

DEFECT CODES: BT - BURN THROUGH; C - CRACK; CV - ROOT CONCAVITY; CX - ROOT CONVEXITY; DT - DROP THROUGH; FA - FILM ATRIFACT; IF - INCOMPLETE FUSION; IP - INADQUATE PENETRATION; M - MISMATCH; OX - OXIDIZED ROOT; P - POROSITY; SI - SLAG INCLUSION; SL - SLAG LINE; TI - TUNGSTEN INCLUSION; U - UNDERCUT

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODE	REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
A-B		X	(SI)	SI > 3/4" located below and slightly left of location mark A	acc	320

RADIOGRAPHER [signature] LEVEL II DATE 6-25-93
FILM INTERPRETER [signature] LEVEL III DATE 6-23-93
SCE LEVEL III _____ DATE _____
ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT

RADIOGRAPHIC EXAMINATION
TECHNIQUE SHEET

NCEDR -015

REPORT #	
	SRT-248-93
PG	2 OF 2
DATE	6-24-93

WO/CLO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
930 (1686	PCF 2-6742.07	SAW15 INTOSH WELD RBU7

MATERIAL SURFACE CONDITION	WELD	PIPE/BCH	PLATE (TANK WALL)	OTHER
AS WELDED & GRIND	✓	N/A	✓	N/A

ISOTOPE DATA:	STRENGTH	SIZE:	CAMERA MAKE / MODEL / SERIAL #		
IR 192	91.34 CI.	.148	AMERTEST	660	4338

PENETRAMETERS: ASME ☑ OTHER ☐	DESIGNATION	NO. USED	☐ SOURCE SIDE
B/S ☑ CARBON STEEL ☐ OTHER ☐	12	2	☐ FILM SIDE

SHIM (s) MATERIAL / THICKNESS	FILM BRAND / TYPE	NO. USED	SIZE
S/S .048	KODAK M	2	4½ × 10

EXPOSURE:	DEVELOPMENT	TIME	TEMP.	SCREENS:		
☑ SINGLE WALL ☐ DOUBLE WALL	☑ AUTOMATIC ☐ MANUAL	11 MIN	82°	FRONT .010"	☐ OTHER	☑ LEAD FOIL ☐ READY PAC ☐ FLOURESCENT
				BACK .010"	✓	

GEOMETRIC UNSHARPNESS (Ug)

$$Ug = \frac{F \times t}{D}$$

F: Source Size

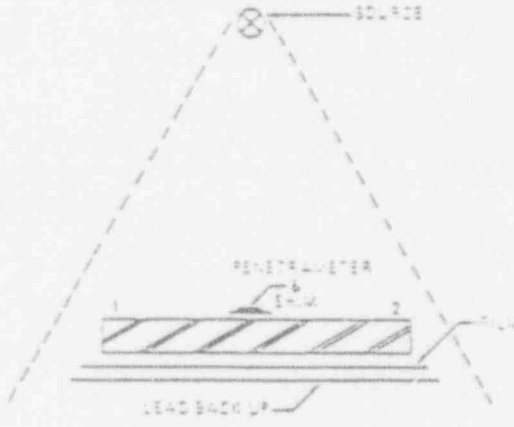
t: Specimen Thickness (including all gaps between specimen and film)

D: Source to Specimen Distance

SOURCE SIZE	.148 IN.	(F)
SPECIMEN THICKNESS	.235 IN.	(t)
SOURCE TO SPECIMEN DISTANCE	17.25 IN.	(D)
Ug =	.001 IN.	

SOURCE SIDE PENETRAMETERS
SINGLE WALL EXPOSURE SINGLE WALL VIEWED

NOTE
PENETRAMETERS
CAN BE POSITIONED
ANNULLY OR
LONGITUDINALLY



COMMENTS / REMARKS

RADIOGRAPHER [signature] LEVEL II DATE 6-25-93

REVIEWED BY _____ LEVEL _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET

NDER-010 Rev. 1

REPORT NO. 2RT-250-93 | PAGE 1 OF 2 | DATE 6-24-93

JOB LOCATION: SONGS	UNIT IDENTIFICATION: U-2	ITEM INSPECTED: SA1415MT056 WELD ADV 8
MO/WO/WORK ORDER #: 93061686	OTHER DOCUMENT: OCP 2-6742.07	ITEM LOCATION: U2 RADWASTE Rm 127A SA1415MT056 WELD ~~R2V8~~ R2V1
INSPECTION PROCEDURE/STANDARD: NDEP-RT-001 REV. 2	ACCEPTANCE STANDARD: ASME III ND 1989 ED NO ADD. ND 5322	

MATERIAL TYPE	MATERIAL THICKNESS	WELD PROCESS	QUALITY CLASS	CODE CLASS
S/S	.298	SMAW	III	III

EXPOSURE DATA TIME	NUMBER OF EXPOSURE	FILM PER CASSETTE	NUMBER OF FILMS
1 Min. 45 Sec. SFD 18 IN	1	2	2

FILM VIEWING METHOD: SINGLE WALL

VIEWING TECHNIQUE: SINGLE WALL FILM

FILM INTERPRETATION

DEFECT CODES

BT - BURN THROUGH	FA - FILM ARTIFACT	P - POROSITY
C - CRACK	IF - INCOMPLETE FUSION	SI - SLAG INCLUSION
CV - ROOT CONCAVITY	IP - INADEQUATE PENETRATION	SL - SLAG LINE
CX - ROOT CONVEXITY	M - MISMATCH	TI - TUNGSTEN INCLUSION
DT - DROP THROUGH	OX - OXIDIZED ROOT	U - UNDERCUT

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODE	REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
A-B		X	IF	IF @ TOP OF WELD ≈ 1½ to the left of location marks A IF is ≈ 3/8" long	acc	2AI

RADIOGRAPHER: [signature] LEVEL II DATE 6-25-93

FILM INTERPRETER: [signature] LEVEL III DATE 6-23-93

SCE LEVEL III _____ DATE _____

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT

RADIOGRAPHIC EXAMINATION
TECHNIQUE SHEET

NDEDR -015

REPORT #	SRT-250-53
PG 2 OF 2	
DATE	6-24-93

WO/CHO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
9306686	DCP - 2-6743.07	SA1415MT056 WELD ~~R2V5~~ R2V1 7-14-93

MATERIAL SURFACE CONDITION	WELD	PIPE/BOX	PLATE (TANK WALL)	OTHER
AS WELDED & GROUND	✓	N/A	✓	N/A

ISOTOPE DATA:	STRENGTH	SIZE:	CAMERA MAKE / MODEL / SERIAL #
IR 192	91.34 CI.	.148	AMERTEST 660 4338

PENETRAMETERS: ASME ☑ OTHER ☐	DESIGNATION	NO. USED	☑ SOURCE SIDE
S/S ☑ CARBON STEEL ☐ OTHER ☐	12	2	☐ FILM SIDE

SHIM (s): MATERIAL / THICKNESS	FILM: BRAND / TYPE	NO. USED	SIZE
S/S .048	KODAK M	2	4½ x 10 ____ x ____

EXPOSURE:	DEVELOPMENT:	TIME	TEMP.	SCREENS:		
☑ SINGLE WALL ☐ DOUBLE WALL	☑ AUTOMATIC ☐ MANUAL	11 MIN	82°	FRONT .010	☐ OTHER	☑ LEAD FOIL ☐ READY PAC
				BACK .010		☐ FLOURESCENT

GEOMETRIC UNSHARPNESS (Ug)

$$Ug = \frac{F \times t}{D}$$

F = Source Size

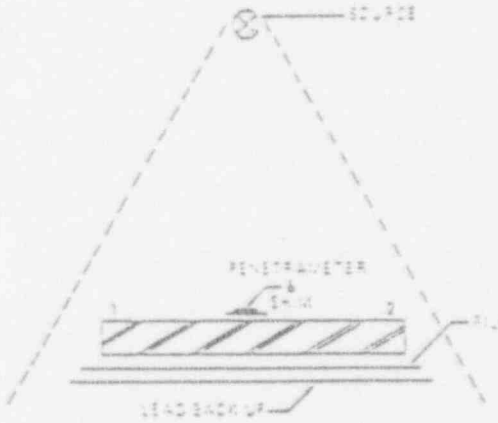
t = Specimen Thickness (including all gaps between specimen and film)

D = Source to Specimen Distance

SOURCE SIZE	.148 IN.	(F)
SPECIMEN THICKNESS	.248 IN.	(t)
SOURCE TO SPECIMEN DISTANCE	12702 IN.	(D)
Ug =	.002 IN.	

SOURCE & DE PENETRAMETERS
SINGLE WALL EXPOSURE SINGLE WALL VIEWING

NOTE:
PENETRAMETERS
CAN BE POSITIONED
AXIALLY OR
CIRCUMFERENTIALLY



COMMENTS / REMARKS

RADIOGRAPHER _____ LEVEL II DATE 6-25-93

REVIEWED BY _____ LEVEL _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET

NDER-010 Rev. 1

REPORT NO. 2RT-254.93
PAGE 1 OF 2
DATE 6-24-93

JOB LOCATION: SONGS	UNIT IDENTIFICATION: U-2	ITEM INSPECTED: SA141SMT056 WELD R3V5
MO/WO/WORK ORDER #: 93061686	OTHER DOCUMENT: DCP 2-6742.07	ITEM LOCATION: U-2 RADWASTE RM 127A SA141SMT056 WELD ~~R4V5~~
INSPECTION PROCEDURE/STANDARD: NDEP-RT-001 REV. 2		ACCEPTANCE STANDARD: ASME III ND 1989ED NO ADD ND 5322

MATERIAL TYPE	MATERIAL THICKNESS	WELD PROCESS	QUALITY CLASS	CODE CLASS
S/S	.235	SMAW	III	III

EXPOSURE DATA TIME	NUMBER OF EXPOSURE	FILM PER CASSETTE	NUMBER OF FILMS
1 min. 45 sec. SFD 18 IN	1	2	2

FILM VIEWING METHOD: SINGLE WALL — VIEWING TECHNIQUE: SINGLE WALL F.C.N.

FILM INTERPRETATION

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODE	REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
A-B		X	(SI) (IF)	SI > 1/4" Between A & B also Past B IF in area Right under location marker "B"	OK	3.14
				I.F. @ 4.375" Long

DEFECT CODES

BT - BURN THROUGH	FA - FILM ARTIFACT	P - POROSITY
C - CRACK	IF - INCOMPLETE FUSION	SI - SLAG INCLUSION
CV - ROOT CONCAVITY	IP - INADEQUATE PENETRATION	SL - SLAG LINE
CX - ROOT CONVEXITY	M - MISMATCH	TI - TUNGSTEN INCLUSION
DT - DROP THROUGH	OX - OXIDIZED ROOT	U - UNDERCUT

RADIOGRAPHER	[signature]	LEVEL II	DATE	6-25-93
FILM INTERPRETER	[signature]	LEVEL III	DATE	6-23-93
SCE LEVEL III			DATE	
ANII REVIEW			DATE	

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT

RADIOGRAPHIC EXAMINATION
TECHNIQUE SHEET

NDEDR -015

REPORT #	RT-254-93
PG	2 OF 2
DATE	6-24-93

NO/CWO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP 2-6740.07	SA1415MT056 WELD #3V5

MATERIAL SURFACE CONDITION	WELD	PIPE/SCH	PLATE (TANK)	OTHER
AS WELDED & GROUND	✓	N/A	✓	N/A

(ISOTOPE DATA)	STRENGTH	SIZE	CAMERA MAKE / MODEL / SERIAL #
IR 192	91.34 CI.	.148	AMERTEST 660 4338

PENETRAMETERS: ASME ☒ OTHER ☐	DESIGNATION	NO. USED	SOURCE SIDE ☒ FILM SIDE ☐
B/B ☒ CARBON STEEL ☐ OTHER ☐	12	2	

SHIM (S) MATERIAL / THICKNESS	FILM BRAND / TYPE	NO. USED	SIZE
S/S .048	KODAK M	2	4½ x 10

EXPOSURE: ☒ SINGLE WALL ☐ DOUBLE WALL	DEVELOPMENT: ☒ AUTOMATIC ☐ MANUAL	TIME	TEMP.	SCREENS: FRONT .010" BACK .010"	☐ OTHER	☒ LEAD FOIL ☐ READY PAC ☐ FLUORESCENT
		11 MIN.	82°			

GEOMETRIC UNSHARPNESS (Ug)

$$Ug = \frac{F \times t}{D}$$

F = Source Size

t = Specimen Thickness (including all gaps between specimen and film)

D = Source to Specimen Distance

SOURCE SIZE .148 IN. (F)

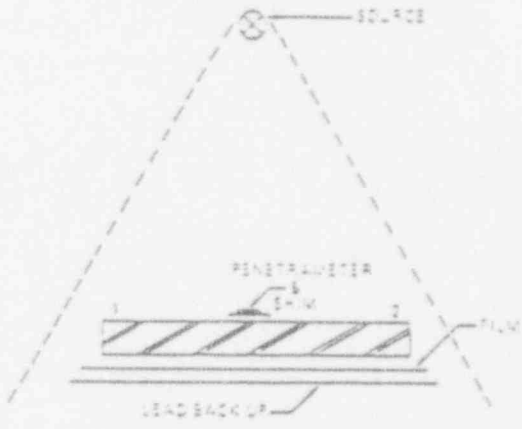
SPECIMEN THICKNESS ~~.295~~ .235 IN. (t) RT-6-25-93

SOURCE TO SPECIMEN DISTANCE ~~17.75~~ 17.65 IN. (D) RT-6-25-93

Ug = .001 IN.

SOURCE SIDE PENETRAMETERS
SINGLE WALL EXPOSURE SINGLE WALL VIEWING

NOTE:
PENETRAMETERS
CAN BE POSITIONED
AXIALLY OR
LONGITUDINALLY



COMMENTS / REMARKS

RADIOGRAPHER _____ LEVEL II DATE 6-25-93

REVIEWED BY _____ LEVEL _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET

NDER-010 Rev. 1

REPORT NO. SRT-259-93

PAGE 1 OF 2

DATE June 25 1993

JOB LOCATION SCNGS	UNIT IDENTIFICATION ~~#2~~ U-2	ITEM INSPECTED SA1415MTL56 G3-4X
MO/CWO/WORK ORDER # 9206/16F6CCC	OTHER DOCUMENT ~~XPZ-6742.07~~ ~~#2~~ ITC 25-93	ITEM LOCATION U-2 RADWASTE RM 127
INSPECTION PROCEDURE/STANDARD NDEP-RT-001 REV. 2	ACCEPTANCE STANDARD ASME III 1989 NB 5322	
MATERIAL TYPE S/S	MATERIAL THICKNESS .235 IN	WELD PROCESS SMAW
QUALITY CLASS III	CODE CLASS III	
EXPOSURE DATA: TIME 1 Min. 45 Sec. SFD 18 IN	NUMBER OF EXPOSURE 1	FILM PER CASSETTE 2
NUMBER OF FILMS 2		
FILM VIEWING METHOD: SINGLE WALL	VIEWING TECHNIQUE SINGLE FILM	

FILM INTERPRETATION

DEFECT CODES

BT - BURN THROUGH	FA - FILM ARTIFACT	P - POROSITY
C - CRACK	IF - INCOMPLETE FUSION	SI - SLAG INCLUSION
CV - ROOT CONCAVITY	IP - INADEQUATE PENETRATION	SL - SLAG LINE
CX - ROOT CONVEXITY	M - MISMATCH	TI - TUNGSTEN INCLUSION
DT - DROP THROUGH	OX - OXIDIZED ROOT	U - UNDERCUT

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODE	REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
G3-4	✓				A	5-18

RADIOGRAPHER [signature] LEVEL ~~II~~ DATE June 25 1993

FILM INTERPRETER [signature] LEVEL II DATE 6/27/93

SCE LEVEL III DATE

ANII REVIEW DATE

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT

RADIOGRAPHIC EXAMINATION
TECHNIQUE SHEET

NDEDR - 015

REPORT #	2RT-254-93
PG	2 OF 2
DATE	6-25-93

WO/SWO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
9316666000	XPL-6742.07	SI 1415 MTC 56 G3-4

MATERIAL SURFACE CONDITION	WELD	PIPE/BOX	PLATE (HANDWALL)	OTHER
AS WELDED FINISH	V	N/A	V	N/A

ISOTOPE DATA:	STRENGTH	SIZE:	CAMERA MAKE / MODEL / SERIAL #
IR 192	91 CI.	.148	AMERTEST 160 4338

PENETRAMETERS: ASME ☐ OTHER ☐	DESIGNATION	NO. USED	☑ SOURCE SIDE
B/E ☑ CARBON STEEL ☐ OTHER ☐	10	2	☐ FILM SIDE

SHIM (S): MATERIAL / THICKNESS	FILM: BRAND / TYPE	NO. USED	SIZE
S/S .048	KODAK M	2	4.5" x 10"

EXPOSURE:	DEVELOPMENT:	TIME	TEMP.	SCREENS:	
☑ SINGLE WALL	☑ AUTOMATIC	11 MIN	82°F	FRONT .010"	☐ OTHER ☐ LEAD FOIL
☐ DOUBLE WALL	☐ MANUAL			BACK .010"	☐ READY PAC ☐ FLOURESCENT

GEOMETRIC UNSHARPNESS (Ug)

$$Ug = \frac{F \times t}{D}$$

F: Source Size

t: Specimen Thickness (including all gaps between specimen and film)

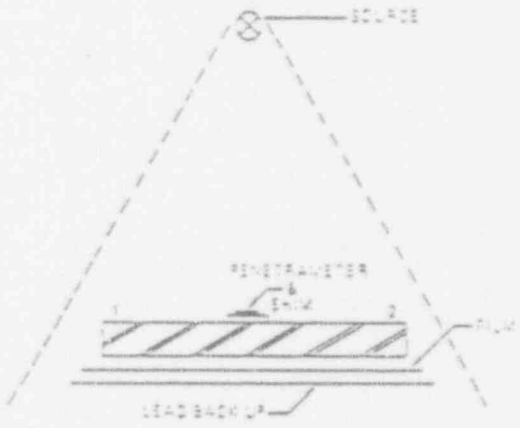
D: Source to Specimen Distance

SOURCE SIZE	.148 IN.	(F)
SPECIMEN THICKNESS	.235 IN.	(t)
SOURCE TO SPECIMEN DISTANCE	7.25 IN.	(D)

Ug = .001 IN.

SOURCE SIDE PENETRAMETERS
SINGLE WALL EXPOSURE SINGLE WALL VIEWING

NOTE:
PENETRAMETERS
CAN BE POSITIONED
AXIALLY OR
LONGITUDINALLY



COMMENTS / REMARKS

RADIOGRAPHER [signature] LEVEL II DATE 6-25-93

REVIEWED BY _____ LEVEL _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET

NDER-010 Rev. 1

REPORT NO.	2RT-301-93
PAGE	1 OF 4
DATE	July 5 1993

JOB LOCATION: SONGS	UNIT IDENTIFICATION: UNIT 2	ITEM INSPECTED: First Level Vert. Snubs. SA 1418 MT DEB
MO/CWO/WORK ORDER #: 93061888	OTHER DOCUMENT: DCP 2-8742.07	ITEM LOCATION: UNIT 2 RADWASTE Rm 127A
INSPECTION PROCEDURE/STANDARD: NDEP-RT-001 REV 2		ACCEPTANCE STANDARD: ASME III 1989 ED. ND 5322

MATERIAL TYPE	MATERIAL THICKNESS	WELD PROCESS	QUALITY CLASS	CODE CLASS
S/S	IN	SMAW	3	3

EXPOSURE DATA: TIME	NUMBER OF EXPOSURE	FILM PER CASSETTE	NUMBER OF FILMS
300 Min. 0 Sec. SFD 240 IN	1	2	14

FILM VIEWING METHOD:	VIEWING TECHNIQUE
SINGLE WALL	SINGLE FILM

FILM INTERPRETATION

DEFECT CODES

BT - BURN THROUGH	FA - FILM ARTIFACT	P - POROSITY
C - CRACK	IF - INCOMPLETE FUSION	SI - SLAG INCLUSION
CV - ROOT CONCAVITY	IP - INADEQUATE PENETRATION	SL - SLAG LINE
CX - ROOT CONVEXITY	M - MISMATCH	TI - TUNGSTEN INCLUSION
DT - DROP THROUGH	OX - OXIDIZED ROOT	U - UNDERCUT

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODE	REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
RIV-1	X			See page # 3 *		
RIV-2		X		See page # 3 *		
RIV-3		X		See page # 3 *		
RIV-4		X		See page # 4 *		
RIV-5	X			See page # 4 *		
RIV-6		X		See page # 4 Sht 7/6/93	JB	
RIV-7		X		See page # 4 *		
				* Film ID sticker added for MO# & DCP# Missing CW		
				Film Rush. Per BB Hannan SCE III RT. 7/6/93		

RADIOGRAPHER JPB/GO Jim Bell LEVEL II DATE 7/5/93

FILM INTERPRETER D. Crawford LEVEL II DATE 7-6-93

SCE LEVEL III _____ DATE _____

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET
NDER-012

REPORT NO. 2RT-301-93
PAGE 2 OF 4
DATE 7/5/93

MO/CWO/WORK ORDER # 93061686	OTHER DOCUMENT DCP 2 6742.07		ITEM INSPECTED SA-1418-MTHDB8	
MATERIAL SURFACE CONDITION AS WELDED	WELD THICKNESS 3/16"	PIPE SCHEDULE N/A	PLATE THICKNESS	OTHERS N/A
ISOTOPE TYPE IR - 192	ISOTOPE STRENGTH 83.12 CI	ISOTOPE SIZE .148 INCH	CAMERA MAKE/MODEL/SERIAL NUMBER AMERTEST 660A/#A4338	
PENETRAMETER MATERIAL SS	PENETRAMETER TYPE ASME	PENETRAMETER DESIGNATION 12/15	NO. PENETRAMETER USED 1 min.	PENETRAMETER LOCATION SOURCE SIDE
SHIM MATERIAL N/A	SHIM THICKNESS N/A	FILM BRAND/TYPE KODAK/M	NO. OF FILM USED 14	FILM SIZE 5X7"
EXPOSURE TECHNIQUE SINGLE WALL	DEVELOPMENT METHOD AUTOMATIC	DEV. TIME 11 MIN	DEV. TEMP 82 Deg	SCREEN SIZE FRONT .010 INCH / SCREEN SIZE BACK .010 INCH / SCREEN TYPE LEAD FOIL

GEOMETRIC UNSHARPNESS (Ug)

$$UG = \frac{F \times t}{D}$$

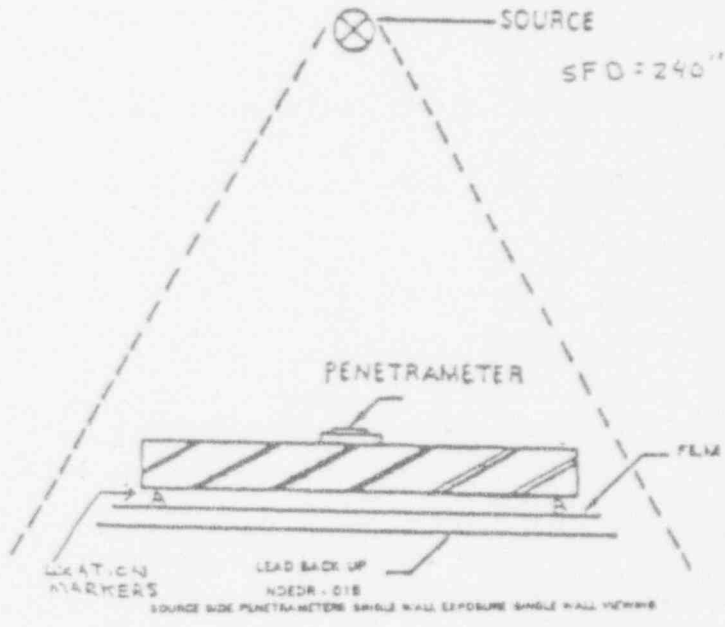
F = Source Size

t = Specimen thickness (including all gaps between specimen and film)

D = Source to Specimen Distance

SOURCE SIZE	.148	IN. (F)
SPECIMEN THICKNESS	.3125	IN. (T)
SOURCE TO SPECIMEN DISTANCE	239.6875	IN. (D)

Ug = 0.00019" INCH



SOURCE SIDE PENETRAMETERS SINGLE WALL EXPOSURE SINGLE WALL VIEWING

COMMENTS/REMARKS

Source Placed in center of tank for exposure

RADIOGRAPHER Jim Bonn LEVEL II DATE

REVIEWED BY N/A LEVEL N/A DATE N/A

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

NDEDR-011 R1

REPORT # 2RT-301-93

PG 3 of 4

DATE 7/5/93

PO/CWO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP.2.6742.07 93061686	First Level Vert. Seams SA 1415 MT 056

DEFECT CODES: C-CRACK; IF-INCOMPLETE FUSION; IP-INADQUATE PENETRATION; SL-SLAG LINE; SI-SLAG INCLUSION; TI-TUNGSTEN INCLUSION; BT-BURN THROUGH; M-MISMATCH; DT-DROP THROUGH; UC-UNDERCUT; OX-OXDIZED ROOT; CV-ROOT CONCAVITY; CX-ROOT CONVEXITY; P-POROSITY; FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY AREA OF INTEREST (-15% +30%)	DENSITY PENETRAMETER
R1 V-1	x		P .050 .053 .050	A	2.58
A-B	x		MC 1/16 x 1/32		
R1 V-2	x		MC 1/16 x 1/32, 1/16 x 1/32, 1/16 x 1/32, 3/32 x 1/32, 1/32 x 1/32	A	2.65
A-B			1/8 x 1/32, 1/8 x 1/16, 1/16 x 1/32, 3/32 x 1/32, 1/16 x 1/32, 1/16 x 1/32		
			P .063 - .070 .057		
	x		SI 3/32 x 1/16		
		x	SI 5/16 x 3/32		
		x	IF 3/16 x 1/16		
R1-V3	x		MC 1/16 x 1/32, 1/16 x 1/16, 3/32 x 1/32, 1/16 x 1/32	A	2.75
A-B		x	MC 5/16 x 1/32		
	x		SI 1/16 x 1/32, 3/32 x 1/16, 1/16 x 1/32, 1/16 x 1/32 1/16 x 1/32		
	x		SI 1/16 x 1/32 1/16 x 1/32, 3/16 x 1/16		
		x	SI 3/16 x 3/32		
		x	SL 3/16 x 1/32		
		x	IF 3/16 x 1/32		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER P. Gordon LEVEL II DATE 7-5-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON
RADIOGRAPHIC EXAMINATION
FILM INTERPERTATION (CON'T SHEET)
NONDESTRUCTIVE EXAMINATION DATA REPORT
NDEDR-011 R9

REPORT # 2RT-301-93
PAGE 4 of 4
DATE 7/5/93

PO/CWO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP-2-6742.07	First Level Vert. Seams SA 1415 MT-056

DEFECT CODES: C-CRACK; IF-INCOMPLETE FUSION; IP-INADQUATE PENETRATION; SL-SLAG LIKE; SI-SLAG INCLUSION; TI-TUNGSTEN INCLUSION; BT-BURN THROUGH; M-MISMATCH; DT-DROP THROUGH; UC-UNDERCUT; OX-OXDIZED ROOT; CV-ROOT CONCAVITY; CX-ROOT CONVEXITY; P-POROSITY; FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY AREA OF INTEREST -15% to +30%	DENSITY PENETRAMETER
R1V-4	X		P .080 .063 .103	A	2.78
A-B		X	SL 5/8 x 1/32		
R1V-5			UC 1/16 x 1/32, 1/16 x 1/32	A	2.11
A-B	X		SI 3/16 x 1/16, 5/32 x 1/32, 1/8 x 1/32		
R1V-6	X		P .070 .031 .125 .063	A	2.71 2.11
		X	IF 5/16 x 1/32, 3/16 x 1/16, 1/16 x 1/64, 1/8 x 1/32, 1/4 x 1/32		
	X		UC 1/8 x 1/16		
		X	UC 3/16 x 1/32		
R1V-7	X		UC 1/16 x 1/32, 3/32 x 1/64, 3/32 x 1/64,	A	2.74
A-B		X	UC 1/4 x 1/16		
	X		SI 1/16 x 1/32, 3/32 x 1/32		
	X		P .031, .125		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Crayton LEVEL II DATE 7-5-93
ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET

NDER-010 Rev. 1

REPORT NO.	2RT-304-93
PAGE	1 OF 7
DATE	July 6 1993

JOB LOCATION: SONGS	UNIT IDENTIFICATION: UNIT 2	ITEM INSPECTED: SA 1418 MT 058
MO/CWO/WORK ORDER #: 930216BS	OTHER DOCUMENT: DCP 2-8742.07	ITEM LOCATION: UNIT 2 RADWASTE Rm. 107A
INSPECTION PROCEDURE/STANDARD: NDEP-RT-001 REV.2	ACCEPTANCE STANDARD: ASME III 1989 ED. ND 5322	

MATERIAL TYPE: S/S	MATERIAL THICKNESS: IN	WELD PROCESS: SMAW	QUALITY CLASS: 3	CODE CLASS: 3
EXPOSURE DATA: TIME 300 Min. 0 Sec. SFD 240 IN		NUMBER OF EXPOSURE: 1	FILM PER CASSETTE: 2	NUMBER OF FILMS: 28
FILM VIEWING METHOD: SINGLE WALL		VIEWING TECHNIQUE: SINGLE FILM		

FILM INTERPRETATION

DEFECT CODES

BT - BURN THROUGH	FA - FILM ARTIFACT	P - POROSITY
C - CRACK	IF - INCOMPLETE FUSION	SI - SLAG INCLUSION
CV - ROOT CONCAVITY	IP - INADEQUATE PENETRATION	SL - SLAG LINE
CX - ROOT CONVEXITY	M - MISMATCH	TI - TUNGSTEN INCLUSION
DT - DROP THROUGH	OX - OXIDIZED ROOT	U - UNDERCUT

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODE	REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
RIJ-1		X		See page #3		
RIJ-2		X		See page #3		
RIJ-2A		X		See page #3		
RIJ-3		X		See page #4		
RIJ-4		X		See page #4		
RIJ-5		X		See page #4		
RIJ-6		X		See page #5		
RIJ-7		X		See page #5		
G1-3		X		See page #5		
G1-4		X		See page #6		
G1-5		X		See page #6		
G1-6		X		See page #6		
G1-6X	X			See page #6		
G1-7	X			See page #7		

RADIOGRAPHER JPB/BO Jim Boyce LEVEL II DATE 7/6/93

FILM INTERPRETER D. Cardenas LEVEL ~~7-7-93~~ II DATE 7-7-93

SCE LEVEL III _____ DATE _____

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET
NDER-012

REPORT NO.	2RT-304-93
PAGE	2 OF 7
DATE	7/6/93

MO/WO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061688	DCP 2 8742.07	SA141E-MT-058

MATERIAL SURFACE CONDITION	WELD THICKNESS	PIPE SCHEDULE	PLATE THICKNESS	OTHERS
AS WELDED	5/16"	N/A	5/16 - 1/4"	N/A

ISOTOPE TYPE	ISOTOPE STRENGTH	ISOTOPE SIZE	CAMERA MAKE/MODEL/SERIAL NUMBER
IR - 192	82.4 CI	.148 INCH	AMERTEST 660A/#A433B

PENETRAMETER MATERIAL	PENETRAMETER TYPE	PENETRAMETER DESIGNATION	NO. PENETRAMETER USED	PENETRAMETER LOCATION
35	ASME	12	1 min. each weld	SOURCE SIDE

SHIM MATERIAL	SHIM THICKNESS	FILM BRAND/TYPE	NO. OF FILM USED	FILM SIZE
N/A	N/A	KODAK/M	28	5X7"

EXPOSURE TECHNIQUE	DEVELOPMENT METHOD	DEV. TIME	DEV. TEMP	SCREEN SIZE FRONT	SCREEN SIZE BACK	SCREEN TYPE
SINGLE WALL	AUTOMATIC	11 Min	82 Deg	.010 INCH	.010 INCH	LEAD FOIL

GEOMETRIC UNSHARPNESS (Ug)

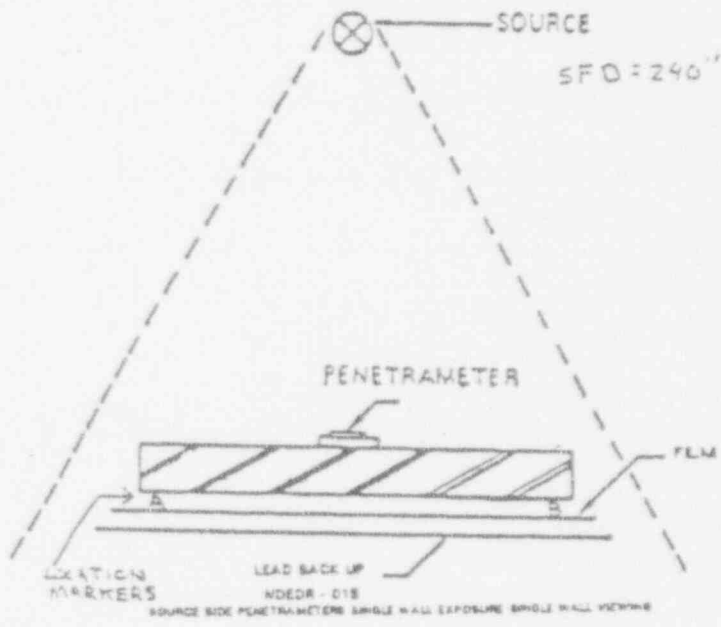
$$UG = \frac{F \times t}{D}$$

F = Source Size

t = Specimen thickness (including all gaps between specimen and film)

D = Source to Specimen Distance

SOURCE SIZE	0.148	IN. (F)
SPECIMEN THICKNESS	.3125	IN. (T)
SOURCE TO SPECIMEN DISTANCE	239.6875	IN. (D)
Ug =	.00019"	INCH



SOURCE SIDE PENETRAMETERS SINGLE WALL EXPOSURE SINGLE WALL VIEWING

COMMENTS/REMARKS

Source Placed in center of Tank. Top Plate 1/4" Bottom Plate 5/16"

RADIOGRAPHER	Jim Beam	LEVEL	II	DATE	
REVIEWED BY	N/A	LEVEL	N/A	DATE	N/A

SOUTHERN CALIFORNIA EDISON
RADIOGRAPHIC EXAMINATION
FILM INTERPERTATION (CON'T SHEET)
NONDESTRUCTIVE EXAMINATION DATA REPORT
NDEDR-011 R1

REPORT # 2RT-304-93
PG 3 of 7
DATE 7/6/93

PO/CMO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP-2-6742.07	SA 1415 MT-056

DEFECT CODES: C-CRACK; DT-DROP THROUGH; IF-INCOMPLETE FUSION; US-UNDERCUT; IP-INADEQUATE PENETRATION; OX-OXIDIZED ROOT; SL-SLAG LINE; CV-ROOT CONCAVITY; SI-SLAG INCLUSION; CX-ROOT CONVEXITY; TI-TUNGSTEN INCLUSION; P-POROSITY; BT-BURN THROUGH; FA-FILM ARTIFACT; M-MISMATCH

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
RIJ-1	x		UC 1/8 x 1/32, 7/16 x 1/16, 3/32 x 1/32, 1/8 x 1/64, 1/8 x 1/64	A	2.09 2.05
1-2			1/2 x 1/64		
		x	UC 1/4 x 1/32 1/2 x 1/16		
		x	CV (sharp) 1/4 x 1/32, 1/4 x 1/32		
	x		CV (sharp) 5/16 x 1/32		
	x		P .05D.		
	x		SI 1/16 x 1/32		
RIJ-2A		x	IF 3/32, 3/32, 7/16, 3/16 (linear)	A	2.07 2.23
A-B	x		UC 1/8 x 1/32, 1/8 x 1/32, 1/16 x 1/16, 1/8 x 1/16, 1/16 x 1/32, 1/8 1/32		
	x		CV		
RIJ-2	x		UC 1/16 x 1/32, 1/8 x 1/32, 5/32 x 1/32, 3/16 x 1/32, 3/32 x 1/32	A	2.05 2.09
1-2	x		UC 3/32 x 1/32, 1/8 x 1/16, 3/16 x 1/16		
		x	SL 3/32 x 1/32, 3/16 x 1/32, 3/16 x 1/32		
	x		SI 3/16 x 1/32		
	x		CV (sharp) 3/16, 1/8, 1/8		
		x	IF 1/4 x 1/16, 3/32 x 1/16		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Condon LEVEL II DATE 7-7-93

ANII REVIEW _____ DATE _____

DC

SOUTHERN CALIFORNIA EDISON
RADIOGRAPHIC EXAMINATION
FILM INTERPERTATION (CON'T SHEET)
NONDESTRUCTIVE EXAMINATION DATA REPORT
NDEDR-011 R1

REPORT # 2RT-304-93
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DATE 7/6/93

PO/ECG/WORK ORDER # 93061686
OTHER DOCUMENT DCP-2-6742.07
ITEM INSPECTED SA 1415 MT-056

DEFECT CODES: C-CRACK; IF-INCOMPLETE FUSION; IP-INADEQUATE PENETRATION; SL-SLAG LINE; SI-SLAG INCLUSION; TI-TUNGSTEN INCLUSION; BT-BURN THROUGH; M-MISMATCH; DT-DROP THROUGH; UC-UNDERCUT; OX-OXIDIZED ROOT; CV-ROOT CONCAVITY; CX-ROOT CONVEXITY; P-POROSITY; FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY AREA OF INTEREST -15% +30%	DENSITY PENETRAMETER
RIJ-3		X	CV (sharp) 1" x 1/16	A	2.17 2.07
A-B	X		LIC 1/8 x 1/32 5/32 x 1/32 1/8 x 1/32 (root)		
	X		P .040 .025" .031		
	X		SI 3/32 x 1/16		
		X	IF 1/8 x 1/32 1/16 x 1/32 1/16 x 1/32 5/32 x 1/32 1/8 x 1/32 3/16 x 1/32		
	X		LIC (root) 1/8 x 1/16 5/32 x 1/32		
RIJ-4		X	IF 1/8 x 1/32 1/16 x 1/32 1/8 x 1/32 1 3/16 x 1/16 5/32 x 1/32	A	2.82 2.03
1-2	X		LIC 1/8 x 1/32 1/8 x 1/32 1/8 x 1/32 3/16 x 1/32 3/16 x 1/16 3/32 x 1/32		
	X		LIC 3/32 x 1/32 1/8 x 1/32 3/16 x 1/32 3/16 x 1/32		
		X	C 1/4"		
RIJ-5		X	LIC 1/4 x 1/16 1/16 x 1/32	A	2.86 2.12
1-2	X		LIC 3/32 x 1/16 1/8 x 1/32 3/32 x 1/32		
		X	CV (sharp) 1/32 x 1/32 1/16 x 1/32 1/4 x 1/32		
	X		P .120 .080		
	X		CV		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Cantrell LEVEL II DATE 7-7-93
ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

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REPORT # 2RT-304-93

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DATE 7/6/93

PO/CWO/WORK ORDER # 93061686

OTHER DOCUMENT DCP-2-6742.07

ITEM INSPECTED SA 1415 MT-056

DEFECT CODES

C-CRACK
IF-INCOMPLETE FUSION
IP-INADQUATE PENETRATION
SL-SLAG LINE
SI-SLAG INCLUSION
TI-TUNGSTEN INCLUSION
BT-BURN THROUGH
M-MISMATCH
DT-DROP THROUGH
UC-UNDERCUT
OX-OXDIZED ROOT
CV-ROOT CONCAVITY
CX-ROOT CONVEXITY
P-POROSITY
FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY: AREA OF INTEREST -15% +0 +30%	DENSITY: PENETRAMETER
RIJ-6		X	IC 5/32 x 1/2	A	3.24 2.55
A-B	X		UC 1/2-1 1/2 1/4 x 3/32 3/16 x 3/32, 1/4 x 1/2, 1/2 x 3/32		
	X		UC 1/2 x 1/32, 1/2 x 3/32, 1/4 x 1/2, 3/4 x 1/16, 1/4 x 1/16, 1/4 x 1/2		
	X		SI 1/2 x 1/32, 1/2 x 1/32, 1/2 x 1/32		
		X	SL 1/2 x 1/2, 1/4 x 1/2, 1/2 x 1/32, 3/32 x 1/32		
		X	IF 1/4 x 1/32		
		X	CV (sharp) 1/2" - 3/4"		
	X		CV (sharp) 1/4"		
RIJ-7	X		SI- 1/2 x 1/32, 3/32 x 1/2	A	3.24 2.55
A-B		X	IF 1" x 1/16, 1/2 x 1/2, 1/2 x 1/32		
	X		CV		
	X		P .040, .040		
-1-3		X	CV (sharp) 1/4 x 1/32, 1 1/2 x 3/32	A	3.24 2.55
A-B	X		UC 3/16 x 1/2, 3/32 x 1/32, 3/16 x 3/32, 3/32 x 1/16, 1/2 x 1/16		
	X		UC 1/2 x 1/16		
		X	IF 3/4 x 1/32, 1/2 x 1/64, 1/2 x 1/32		
	X		P .025, .040, .040, .040, .040, .050		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Cambron LEVEL = DATE 7-7-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

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REPORT # 2RT-304-93

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DATE 7/6/93

PO/SO/WORK ORDER # 93061686

OTHER DOCUMENT DCP-2-6742.07

ITEM INSPECTED SA 1415 MT-056

DEFECT CODES

C-CRACK
IF-INCOMPLETE FUSION
IP-INADQUATE PENETRATION
SL-SLAG LINE
SI-SLAG INCLUSION
TI-TUNGSTEN INCLUSION
BT-BURN THROUGH
M-MISMATCH
DT-DROP THROUGH
UC-UNDERCUT
OX-OXDIZED ROOT
CV-ROOT CONCAVITY
CX-ROOT CONVEXITY
P-POROSITY
FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY AREA OF INTEREST -15% +30% +50%	DENSITY PENETRAMETER
G-1-4	X		UC 1/8x1/4, 1/16x1/4, 3/32x1/4, 1/16x1/4, 1/16x3/32, 1/8x3/32	A	2.54 2.67
A-B	X		UC 1/8x3/32, 1/8x1/16, 1/8x3/32, 3/32x3/32, 1/8x3/32		
	X		P .052, .044, .070, .042, .031		
		X	CV (sharp) 1 1/2 x 1/32, 3/8x3/32, 3/8x1/16		
	X		CV (sharp) 3/16x1/32, 3/16x3/32		
G1-5	X		UC 3/16x1/32, 1/2x3/32, 1/8x3/32, 3/32x1/16	A	2.73 2.67
A-B	X		P .057, .042, .042		
		X	C 5/8		
	X		CV-Sha... 1/32		
G1-6X	X		UC 3/16x1/16, 1/16x1/64, 1/8x3/32	A	2.78
A-B	X		P .094		
	X		CV		
G-1-6		X	CV (sharp) 5/8x1/32	A	3.03
1-2	X		CV (sharp) 1/8x3/32, 5/32x1/16, 1/8x1/32, 1/8x3/32, 3/16x3/32	A	3.25
	X		UC 1/16x3/32, 1/16x1/64, 1/8x3/32, 1/16x3/32, 3/32x3/32		
	X		UC 3/32x1/32, 3/32x3/32, 1/8x3/32, 3/32x1/16, 1/8x3/32, 1/16x1/64		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D Condon LEVEL II DATE 7-7-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

WDEDR-011 R1

REPORT # 2RT-304-93

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DATE 7/6/93

PO/CO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP. 2-6742.07	SA 1415 MT-056

DEFECT CODES: C-CRACK; IF-INCOMPLETE FUSION; IP-INADEQUATE PENETRATION; SL-SLAG LINE; SI-SLAG INCLUSION; TI-TUNGSTEN INCLUSION; BT-BURN THROUGH; M-MISMATCH; DT-DROP THROUGH; UC-UNDERCUT; OX-OXIDIZED ROOT; CV-ROOT CONCAVITY; CX-ROOT CONVEXITY; P-POROSITY; FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY: AREA OF INTEREST +15% +30%	DENSITY: PENETRAMETER
G1-1	X		SI 1/4 x 1/16	A	3.03
1-2	X		P .125		3.25
G1-7	X		CU(sharp) 1/4 x 1/32 3/16 x 1/32	A	3.54 3.11
A-5	X		P .025		
	X		SI 3/16 x 1/32 1/16 x 1/32		
	X		UC 1/4 x 1/32 1/4 x 1/32		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D Cumbaa LEVEL II DATE 7-7-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET

NDER-010 Rev. 1

REPORT NO.	2RT-313-93
PAGE	1 OF 3
DATE	July 7 1993

JOB LOCATION: SONGS	UNIT IDENTIFICATION: UNIT 2	ITEM INSPECTED: Second Level Vert. Welds SA 1415 MT 068
MO/CWO/WORK ORDER #: 93061888	OTHER DOCUMENT: DCP 2-5742.07	ITEM LOCATION: UNIT 2 RADWASTE Rm. 127A
INSPECTION PROCEDURE/STANDARD: NDEP-RT-001 REV.2		ACCEPTANCE STANDARD: ASME III 1989 ED. ND 5322

MATERIAL TYPE	MATERIAL THICKNESS	WELD PROCESS	QUALITY CLASS	CODE CLASS
S/S	1/4" IN	SMAW	3	3

EXPOSURE DATA: TIME	NUMBER OF EXPOSURE	FILM PER CASSETTE	NUMBER OF FILMS
300 Min. 0 Sec. SFD 240 IN	1	2	10

FILM VIEWING METHOD:	VIEWING TECHNIQUE
SINGLE WALL	SINGLE FILM

FILM INTERPRETATION

DEFECT CODES: BT - BURN THROUGH; C - CRACK; CV - ROOT CONCAVITY; CX - ROOT CONVEXITY; DT - DROP THROUGH; FA - FILM ARTIFACT; IF - INCOMPLETE FUSION; IP - INADEQUATE PENETRATION; M - MISMATCH; OX - OXIDIZED ROOT; P - POROSITY; SI - SLAG INCLUSION; SL - SLAG LINE; TI - TUNGSTEN INCLUSION; U - UNDERCUT

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODE	REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
R2V-2						
1-2		X	IF	1/4 x 1/32, 1/8 x 1/4, 3/8 x 1/32, 3/32 x 1/32 1/4 x 1/16	A	2-2T 2-4T
		X	IF	1/16 x 1/32 5/16 x 1/16 3/32 x 1/16		
		X	SI	5/16 x 1/16		
	X		SI	3/16 x 1/16 1/16 x 1/32		
	X		UC	1/8 x 1/32, 3/32 x 1/32, 1/16 x 1/32, 1/16 x 1/32		
	X		UC	1/16 x 1/32, 1/8 x 1/32 3/32 x 1/32 1/32 1/32 1/8 x 1/32 1/16 x 1/32		
R2V-4	X		UC	1/16 x 1/32 3/32 x 1/16 3/32 x 1/32 3/32 x 1/16 3/32 x 1/32	A	2-2T 2-4T
A-B	X		UC	1/16 x 1/32 1/16 x 1/16 1/8 x 1/32, 1/8 x 1/32 1/16 x 1/32		
	X		UC	3/32 x 1/32, 1/16 x 1/32 1/16 1/16		
	X		SI	1/16 x 1/32, 1/16 x 1/32, 1/16 x 1/16 1/16 x 1/16		
	X		P	.031		
R2V-5		X	SI (aligned)	3/16 x 1/16 3/16 x 1/16, 1/16 x 1/32	A	2-2T 2-4T
A-B	X		UC	1/8 x 1/16 3/32 x 1/16 1/16 x 1/32, 1/16 x 1/32		
				Arc Strike in base metal 3/32 x 5/32 .030 DEEP		

RADIOGRAPHER JPB/60 [signature] LEVEL II DATE 7/7/93

FILM INTERPRETER [signature] LEVEL II DATE 7-8-93

SCE LEVEL III _____ DATE _____

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

KDEDR-011 RT

REPORT # 2RT-313-93

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DATE 7/7/93

FO/CM3/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP-2-6742.07	SA 1415 MT-056

DEFECT CODES: C-CRACK; IF-INCOMPLETE FUSION; IP-INADQUATE PENETRATION; SL-SLAG LINE; SI-SLAG INCLUSION; TI-TUNGSTEN INCLUSION; BT-BURN THROUGH; M-MISMATCH; DT-DROP THROUGH; UC-UNDERCUT; OX-OXIDIZED ROOT; CV-ROOT CONCAVITY; CX-ROOT CONVEXITY; P-POROSITY; FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY: AREA OF INTEREST -15% +30%	DENSITY: PENETRAMETER
R2V-6	X		MC 3/32 x 1/32, 1/8 x 1/32, 1/8 x 1/16, 1/32 x 1/64	A	3.02 3.25
1-2	X		SI 1/8 x 1/32		
	X		P .070		
	X		CV		
R2V-7	X		MC 1/16 x 1/32, 1/16 x 1/32, 1/16 x 1/32 3/32 x 1/64, 1/16 x 1/32, 3/32 x 1/16	A	3.07 3.13
A-B	X		SI 1/16 x 1/32		
	X		P. .031		
	X		CV		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Cardenas LEVEL II DATE 7-7-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET
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DATE	7/7/93

MO/WO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061688	DCP 2 6742.07	SAFETY INJ.

MATERIAL SURFACE CONDITION	WELD THICKNESS	PIPE SCHEDULE	PLATE THICKNESS	OTHERS
AS WELDED	1/4"	N/A	1/4"	N/A

ISOTOPE TYPE	ISOTOPE STRENGTH	ISOTOPE SIZE	CAMERA MAKE/MODEL/SERIAL NUMBER
IR-192	81.63 CI	.148 INCH	AMERTEST 660A/#A4338

PENETRAMETER MATERIAL	PENETRAMETER TYPE	PENETRAMETER DESIGNATION	NO. PENETRAMETER USED	PENETRAMETER LOCATION
FE	ASME	12	1 min, each end	SOURCE SIDE

SHIM MATERIAL	SHIM THICKNESS	FILM BRAND/TYPE	NO. OF FILM USED	FILM SIZE
N/A	N/A	KODAK/M	10	5X7"

EXPOSURE TECHNIQUE	DEVELOPMENT METHOD	DEV. TIME	DEV. TEMP	SCREEN SIZE FRONT	SCREEN SIZE BACK	SCREEN TYPE
SINGLE WALL	AUTOMATIC	11 Min	82 Deg	.010 INCH	.010 INCH	LEAD FOIL

GEOMETRIC UNSHARPNESS (Ug)

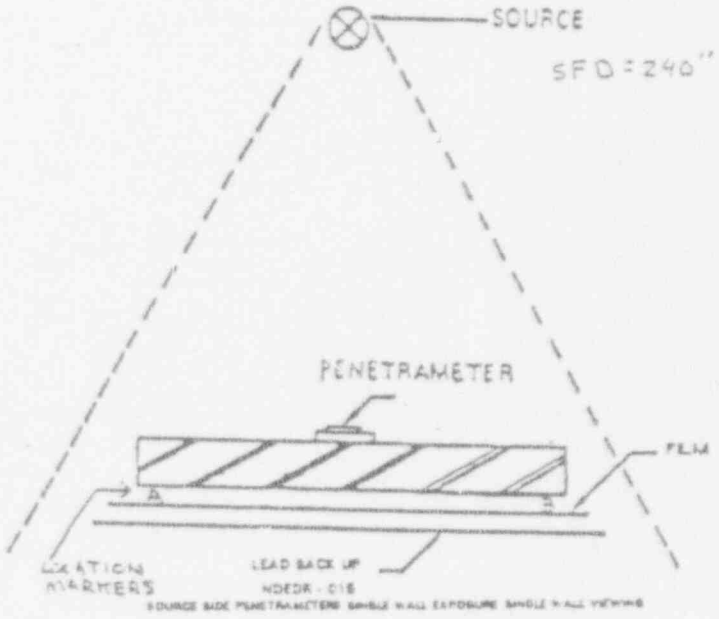
$$UG = \frac{F \times t}{D}$$

F = Source Size

t = Specimen thickness (including all gaps between specimen and film)

D = Source to Specimen Distance

SOURCE SIZE	0.148	IN. (F)
SPECIMEN THICKNESS	.25	IN. (T)
SOURCE TO SPECIMEN DISTANCE	299.75	IN. (D)
Ug =	.000123	INCH



SOURCE SIDE PENETRAMETERS SINGLE WALL EXPOSURE SINGLE WALL VIEWING

COMMENTS/REMARKS

Source Placed in Center of Tank.

RADIOGRAPHER Jim Bemis LEVEL II DATE 7/7/93

REVIEWED BY N/A LEVEL N/A DATE N/A

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET

NDER-010 Rev. 1

REPORT NO. 2RT-314-93

PAGE 1 OF 7

DATE July 8 1993

JOB LOCATION: SONGS	UNIT IDENTIFICATION: UNIT 2	ITEM INSPECTED: SA 1416 MT 068
MO/CWO/WORK ORDER #: 93061688	OTHER DOCUMENT: DCP 2-5742.07	ITEM LOCATION: UNIT 2 RADWASTE Rm. 127A
INSPECTION PROCEDURE/STANDARD: NDEP-RT-001 REV.2	ACCEPTANCE STANDARD: ASME III 1989 ED. NO 5322	

MATERIAL TYPE	MATERIAL THICKNESS	WELD PROCESS	QUALITY CLASS	CODE CLASS
S/S	.25 IN	SMAW	3	3

EXPOSURE DATA: TIME	NUMBER OF EXPOSURE	FILM PER CASSETTE	NUMBER OF FILMS
300 Min. 0 Sec. SFD 240 IN	1	2	28

FILM VIEWING METHOD:	VIEWING TECHNIQUE
SINGLE WALL	SINGLE FILM

FILM INTERPRETATION

DEFECT CODES

BT - BURN THROUGH	FA - FILM ARTIFACT	P - POROSITY
C - CRACK	IF - INCOMPLETE FUSION	SI - SLAG INCLUSION
CV - ROOT CONCAVITY	IP - INADEQUATE PENETRATION	SL - SLAG LINE
CX - ROOT CONVEXITY	M - MISMATCH	TI - TUNGSTEN INCLUSION
DT - DROP THROUGH	OX - OXIDIZED ROOT	U - UNDERCUT

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODE	REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
R3J-1		X		See page #3		
R3J-2		X		See page #3		
R3J-3		X		See page #3		
R3J-4		X		See page #4		
R3J-5		X		See page #4		
R3J-6		X		See page #5		
R3J-7		X		See page #5		
G2-4		X		See Page #7		
G2-5		X		See Page #7		
R3V-1		X		See page #5		
R3V-2		X		See page #6		
R3V-3		X		See page #6		
R3V-4		X		See page #7		
R3V-6		X		See page #6		

RADIOGRAPHER JPS/60 Jim Bent LEVEL II DATE 7/8/93

FILM INTERPRETER D. Cundon LEVEL II DATE 7-9-93

SCE LEVEL III _____ DATE _____

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET
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DATE 7/8/93

MO/WO/WORK ORDER # 93061688	OTHER DOCUMENT DCP 2 6742.07	ITEM INSPECTED SA-14"E-MT-008		
MATERIAL SURFACE CONDITION AS WELDED	WELD THICKNESS 1/4"	PIPE SCHEDULE N/A	PLATE THICKNESS 1/4	OTHERS N/A
ISOTOPE TYPE IR - 192	ISOTOPE STRENGTH 80.87 CI	ISOTOPE SIZE .148 INCH	CAMERA MAKE/MODEL/SERIAL NUMBER AMERTEST 660A/#A4338	
PENETRAMETER MATERIAL SS	PENETRAMETER TYPE ASME	PENETRAMETER DESIGNATION 12	NO. PENETRAMETER USED 1 min. each weld	PENETRAMETER LOCATION SOURCE SIDE
SHIM MATERIAL N/A	SHIM THICKNESS N/A	FILM BRAND/TYPE KODAK M	NO. OF FILM USED 28	FILM SIZE 5X7"
EXPOSURE TECHNIQUE SINGLE WALL	DEVELOPMENT METHOD AUTOMATIC	DEV. TIME 11 Min	DEV. TEMP 82 Deg	SCREEN SIZE FRONT .010 INCH	SCREEN SIZE BACK .010 INCH	SCREEN TYPE LEAD FOIL

GEOMETRIC UNSHARPNESS (Ug)

$$UG = \frac{F \times t}{D}$$

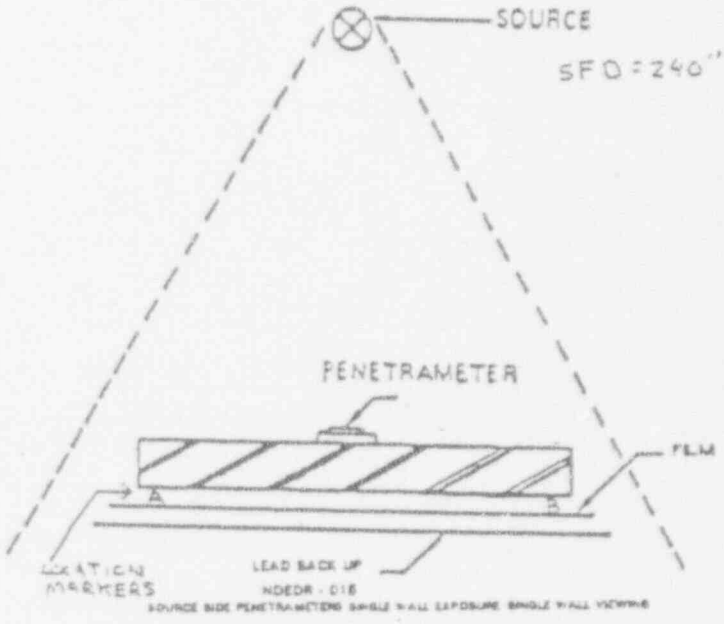
F = Source Size

t = Specimen thickness (including all gaps between specimen and film)

D = Source to Specimen Distance

SOURCE SIZE	0.148	IN. (F)
SPECIMEN THICKNESS	25	IN. (T)
SOURCE TO SPECIMEN DISTANCE	239.75	IN. (D)

Ug = .0001543 INCH



COMMENTS/REMARKS

Source Placed in center of the tank.

RADIOGRAPHER Jim Reno LEVEL II DATE 7/8/93

REVIEWED BY N/A LEVEL N/A DATE N/A

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

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PG 3 OF 7

DATE 7/8/93

MO/CWO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP-2-6742.07	SA 1415 MT-056

DEFECT CODES: C-CRACK; IF-INCOMPLETE FUSION; IP-INADQUATE PENETRATION; SL-SLAG LINE; SI-SLAG INCLUSION; TI-TUNGSTEN INCLUSION; BT-BURN THROUGH; M-MISMATCH; DT-DROP THROUGH; UC-UNDERCUT; OX-OXDIZED ROOT; CV-ROOT CONCAVITY; CX-ROOT CONVEXITY; P-POROSITY; FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
R3J-1	X		UC 5/32 x 1/32, 3/32 x 1/32, 3/32 x 1/32, 1/8 x 1/32	A	308 266
A-B		X	CV (sharp) 3/16 x 1/32		
	X		CV (sharp) 3/32 x 1/32, 5/32 x 1/32		
		X	SL 5/16 x 1/32		
	X		P .040, .040, .040, .031		
	X		SI 3/32 x 1/32		
R3J-2	X		UC 1/8 x 1/16, 1/32 x 1/16, 3/32 x 1/64, 3/32 x 1/32, 3/32 x 1/64, 3/32 x 1/64	A	312 296
1-2	X		UC 3/32 x 1/32, 3/32 x 1/32, 1/8 x 1/16		
		X	IF-1/64 x 1/32, 1/64 x 1/32, 3/16 x 1/32, 3/16 x 1/32, 1/64 1/32, 5/32 x 1/32		
	X		SI 1/8 x 1/32, 1/8 x 1/32, 3/16 x 1/16		
		X	CV (sharp) 1/4 x 1/16		
	X		CV (sharp) 3/16 x 1/16, 1/64 x 1/32, 5/32 x 1/16		
			P .040, .040, .030, .030, .031, .030		
		X	Gouge in base metal (grind scar) 5/8 x 7/32		
		X	IF 1/64 x 1/32, 1/64 x 1/16, 1/64 x 1/16, 3/32 x 1/32		
R3J-3		X	UC 1/16 x 1/32, 1/64 x 1/32, 1/64 x 1/32	A	310 285
A-B	X		UC 3/16 x 1/64, 1/64 x 1/64, 3/16 x 1/32, 3/32 x 1/32, 1/16 x 1/32		
	X		1/32 x 1/32, 1/32 1/32, 5/32 x 1/32, 1/64 x 1/64		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER P. Goodson LEVEL II DATE 7-9-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

NDEDR-011 R1

REPORT # 2RT-314-93

PG 4 of 7

DATE 7/8/93

PO/CWO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
43061686	DCP-2-6742.07	SA 1415 MT-056

DEFECT CODES: C-CRACK; DT-DROP T-ROUGH; IF-INCOMPLETE FUSION; UC-UNDERCUT; IP-INADEQUATE PENETRATION; OX-OXIDIZED ROOT; SL-SLAG LIKE; CV-ROOT CONCAVITY; SI-SLAG INCLUSION; CX-ROOT CONVEXITY; TI-TUNGSTEN INCLUSION; P-POROSITY; BT-BURN THROUGH; FA-FILM ARTIFACT; M-MISMATCH

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY: AREA OF INTEREST -15% +30%	DENSITY: PENETRAMETER
R35-3		X	CV (sharp) 2½ x 1/32, 2½ x 1/32, ¾ x 1/32, 1/4 x 1/32	A	1.76
A-8		X	C ¼ x [illegible], ½ x [illegible], 1/32 x [illegible], ½ x [illegible] [illegible]		
		X	IF 7/16 x 1/64		
	X		P .031, .025, .025, .043, .025, .025		
R35-4	X		UC ½ x 1/32, 3/32 x 1/64, ⅛ x 1/16, ½ x 1/32		
A-3		X	UC (slight) ⅛ x 1/32, ½ x 1/32, ½ x 1/32	A	2.43 2.46
		X	IF 3/16 x 1/16, ¾ x 1/32, 3/32 x 1/32		
	X		SI 1/16 x 1/32, 2/32 x 1/32, 3/16 x 1/16		
	X		P .043, .050, .070, .080		
		X	Gouge in base metal (grind scar) 5/16 x 5/32		
R35-5	X		UC ½ x 1/32, 3/16 x 1/32, 3/16 x 1/64, 5/32 x 1/32, ⅛ x 1/64	A	2.64
1-2			⅛ x 1/32, 1/16 x 1/64, ½ x 1/32, 1/16 x 1/64		2.45
		X	UC 1/16 x 1/32		
		X	IF 3/16 x 1/64, 3/16 x 1/16, 3/16 x 1/32, ¼ x 1/64, ⅛ x 1/64		
		X	IF ¼ x 1/64, 3/16 x 1/64, 3/32 x 1/64		
	X		P .070		
	X		SI 1/16 x 1/32, 1/16 x 1/32, 1/16 x 1/32		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Crandall LEVEL II DATE 7-9-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON
RADIOGRAPHIC EXAMINATION
FILM INTERPERTATION (CON'T SHEET)
NONDESTRUCTIVE INATION DATA REPORT
NDEM .11 R1

REPORT # 2RT-314-93
PG 5 of 7
DATE 7/8/93

PO/EWO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP-2-6742.07	SA 1415 MT-056

DEFECT CODES: C-CRACK; IF-INCOMPLETE FUSION; IP-INADEQUATE PENETRATION; SL-SLAG LINE; SI-SLAG INCLUSION; TI-TUNGSTEN INCLUSION; BT-BURN THROUGH; M-MISMATCH; DT-DROP THROUGH; UC-UNDERCUT; OX-OXIDIZED ROOT; CV-ROOT CONCAVITY; CX-ROOT CONVEXITY; P-POROSITY; FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
R35-6	X		UC 5/32 x 1/16, 1/16 x 1/32, 3/32 x 1/32, 3/32 x 1/16	A	2.72
A-B		X	I= 1/16 x 1/32, 3/32 x 1/32, 3/32 x 1/32, 1/32 x 1/32, 3/16 x 1/32		
		X	I= 3/32 x 1/64, 3/16 x 1/64, 1/8 x 1/64, 1/4 x 1/32		
	X		P .031		
R35-7				A	2.74
A-B	X		UC 1/4 x 1/32, 3/32 x 1/64, 3/32 x 1/32		
		X	IP 1/4 x 1/32, 3/32 x 1/32, 1/4 x 1/32, 5/32 x 1/32		
	X		CV		
	X		SI- 1/16 x 1/32, 1/16 x 1/32		
	X		P .028, .031, .025		
R3V-1	X		UC 3/32 x 1/32, 3/32 x 1/32	A	3.27
A-B	X		SI 1/4 x 1/32, 3/32 x 1/64, 1/16 x 1/32, 1/32 x 1/64, 1/16 x 1/32, 1/32 x 1/64		
		X	SI (aligned) 1/8 x 3/32, 1/8 x 1/16, 3/32 x 1/16		
	X		P .030, .025, .040, .040, .040		
		X	C 3/32, 1/16, 3/32		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Cranham LEVEL II DATE 7-8-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

NDECR-011 R1

REPORT # 2RT-314-93

PG 6 OF 7

DATE 7/8/93

PO/DWO/WORK ORDER # 93061686

OTHER DOCUMENT DCP-2-6742.07

ITEM INSPECTED SA 1415 MT-056

DEFECT CODES

C-CRACK
IF-INCOMPLETE FUSION
IP-INADEQUATE PENETRATION
SL-SLAG LINE
SI-SLAG INCLUSION
TI-TUNGSTEN INCLUSION
BT-BURN THROUGH
M-MISMATCH
DT-DROP THROUGH
UC-UNDERCUT
CX-OXIDIZED ROOT
CV-ROOT CONCAVITY
CX-ROOT CONVEXITY
P-POROSITY
FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY AREA OF INTEREST -15% +30%	DENSITY PENETRAMETER
R3V-2	X		UC 1/4 x 1/32, 3/32 x 1/64, 1/4 x 1/32, 3/32 x 1/64, 3/32 x 1/32	A	2.03
1-2		X	I= 3/32 x 1/16, 5/32 x 1/32, 1/4 x 1/64, 3/32 x 1/64, 3/8 x 1/64		
		X	I= 1/4 x 1/16, 1/4 x 1/32, 3/32 x 3/32, 3/32 x 3/32, 1/4 x 1/32		
		X	I= 1/2 x 1/32, 1/4 x 1/64, 3/32 x 3/32, 3/32 x 1/64		
		X	C 3/4		
	X		P .025, .020, .031, .081		
R3V-3	X		UC 1/16 x 1/64, 1/8 x 1/64, 1/4 x 1/32	A	3.11
1-3	X		I= 1/4 x 1/2, 1/8 x 3/32		
		X	I= 3/16 x 1/32, 1 x 3/32		
	X		P .040, .031, .025		
		X	C 1/4		
R3V-4	X		UC 3/32 x 1/32	A	3.10
1-2		X	I= 5/32		
	X		P .050		
	X		C V		
	X		Area Stringer .125 Dia		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Condon LEVEL II DATE 7-9-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

NDEDR-011 R1

REPORT # 2RT-314-93

PG 7 OF 7

DATE 7/8/93

FO, CWO, WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP. 2.6742.07	SA 1415 MT.056

DEFECT CODES: C-CRACK; IF-INCOMPLETE FUSION; IP-INADQUATE PENETRATION; SL-SLAG LINE; SI-SLAG INCLUSION; TI-TUNGSTEN INCLUSION; BT-BURN THROUGH; M-MISMATCH; DT-DROP THROUGH; UC-UNDERCUT; CX-OXDIZED ROOT; CV-ROOT CONCAVITY; CX-ROOT CONVEXITY; P-POROSITY; FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY: AREA OF INTEREST -15% +30%	DENSITY: PENETRAMETER
R3 V-4	X		UC 3/32 x 1/32, 3/16 x 1/32	A	2.60
1-2		X	IF 2 1/2 x 1/4", 1/16 x 1/32, 5/32 x 3/32, 3/32 x 1/32		
	X		P .050, .053		
G2-4	X		UC 3/32 x 1/32, 1/32 x 1/64, 3/32 x 1/16, 1/32 x 1/32, 1/64 x 1/32	A	2.31
A-B	X		UC 3/16 x 1/32, 1/32 x 1/32, 3/32 x 1/32, 1/32 x 1/32, 1/64 x 1/16		
	X		UC 3/16 x 1/32		
		X	CV (sharp) 1 5/8 x 1/16, 5/16 x 1/16		
	X		CV (sharp) 3/16 x 1/16, 5/32 x 1/32		
	X		CV		
	X		P .020, .15D		
G2-5		X	ID 1", 3/32, 5/16, 5/16	A	2.66
1-2	X		CV		
	X		UC 1/8 x 1/32, 3/32 x 1/64, 1/8 x 1/64, 1/8 x 1/64		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER R. Cardenas LEVEL II DATE 7-9-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET

NDER-010 Rev. 1

REPORT NO. 2RT-316-93

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DATE July 9 1993

JOB LOCATION: SONGS	UNIT IDENTIFICATION: UNIT 2	ITEM INSPECTED: SA 1415 MT 068
MO/CWO/WORK ORDER #: 93061688	OTHER DOCUMENT: DCP 2-8742.07	ITEM LOCATION: UNIT 2 RADWASTE Rm. 127A
INSPECTION PROCEDURE/STANDARD: NDEP-RT-001 REV.2		ACCEPTANCE STANDARD: ASME III 1989 ED. ND 5322

MATERIAL TYPE	MATERIAL THICKNESS	WELD PROCESS	QUALITY CLASS	CODE CLASS
S/S	IN	SMAW	3	3

EXPOSURE DATA: TIME	NUMBER OF EXPOSURE	FILM PER CASSETTE	NUMBER OF FILMS
315 Min. 0 Sec. SFD 240 IN	1	2	26

FILM VIEWING METHOD:	VIEWING TECHNIQUE
SINGLE WALL	SINGLE FILM

FILM INTERPRETATION

DEFECT CODES: BT - BURN THROUGH; C - CRACK; CV - ROOT CONCAVITY; CX - ROOT CONVEXITY; DT - DROP THROUGH; FA - FILM ARTIFACT; IF - INCOMPLETE FUSION; IP - INADEQUATE PENETRATION; M - MISMATCH; OX - OXIDIZED ROOT; P - POROSITY; SI - SLAG INCLUSION; SL - SLAG LINE; TI - TUNGSTEN INCLUSION; U - UNDERCUT

WELD I. D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODE	REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
R4J-1		X		See Page #3		
R4J-2		X		See Page #3		
R4J-4		X		See Page #4		
R4J-6		X		See Page #4		
R4J-7		X		See Page #5		
R4V-1		X		See Page #5		
R4V-2		X		See Page #6		
R4V-3		X		See Page #6		
R4V-4		X		See Page #6		
R4V-5		X		See Page #6		
R4V-6		X		See Page #7		
R4V-7		X		See Page #7		
G4-5		X		See Page #7		

RADIOGRAPHER SEO/07 [signature] LEVEL II DATE 7/9/93

FILM INTERPRETER D. Crandall LEVEL II DATE 7-10-93

SCE LEVEL III _____ DATE _____

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

NONDESTRUCTIVE EXAMINATION DATA REPORT
RADIOGRAPHIC EXAMINATION TECHNIQUE SHEET
NDER-012

REPORT NO.	
	2RT-316-93
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DATE	7/9/93

MO/WO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061688	DCP 2 6742.07	SA-14"S-WT-058

MATERIAL SURFACE CONDITION	WELD THICKNESS	PIPE SCHEDULE	PLATE THICKNESS	OTHERS
AS WELDED	.25"	N/A	.25"	N/A

ISOTOPE TYPE	ISOTOPE STRENGTH	ISOTOPE SIZE	CAMERA MAKE/MODEL/SERIAL NUMBER
IR - 192	80.12 CI	.148 INCH	AMERTEST 660A/#A4338

PENETRAMETER MATERIAL	PENETRAMETER TYPE	PENETRAMETER DESIGNATION	NO. PENETRAMETER USED	PENETRAMETER LOCATION
FE	ASME	12	1 min. on each weld	SOURCE SIDE

SHIM MATERIAL	SHIM THICKNESS	FILM BRAND/TYPE	NO. OF FILM USED	FILM SIZE
N/A	N/A	KODAK T/A	26	5X7"

EXPOSURE TECHNIQUE	DEVELOPEMENT METHOD	DEV. TIME	DEV. TEMP	SCREEN SIZE FRONT	SCREEN SIZE BACK	SCREEN TYPE
SINGLE WALL	AUTOMATIC	11 Min	82 Deg	.010 INCH	.010 INCH	LEAD FOIL

GEOMETRIC UNSHARPNESS (Ug)

$$UG = \frac{F \times t}{D}$$

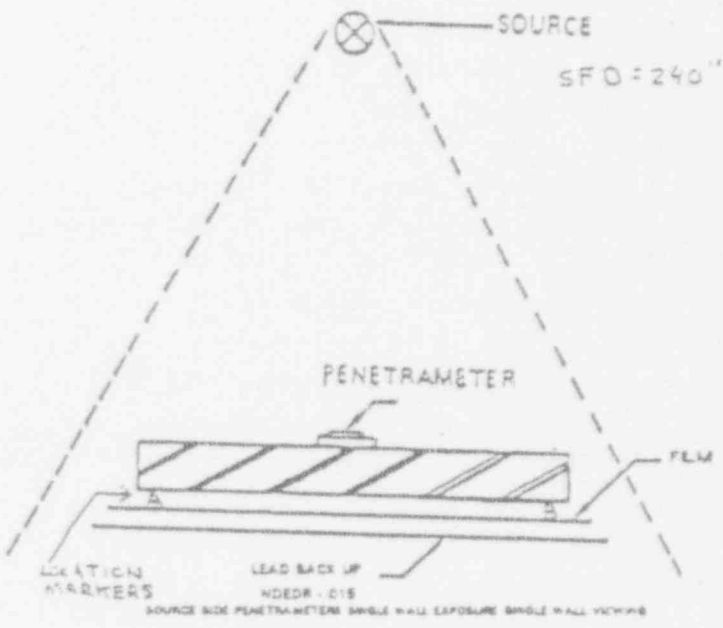
F = Source Size

t = Specimen thickness (including all gaps between specimen and film)

D = Source to Specimen Distance

SOURCE SIZE	.0148	IN. (F)
SPECIMEN THICKNESS	.25	IN. (T)
SOURCE TO SPECIMEN DISTANCE	237.75	IN. (D)

Ug = .0001543 INCH



SOURCE SIDE PENETRAMETERS SINGLE WALL EXPOSURE SINGLE WALL VIEWING

COMMENTS/REMARKS

RADIOGRAPHER [signature] LEVEL II DATE 7/9/93

REVIEWED BY N/A LEVEL N/A DATE N/A

SOUTHERN CALIFORNIA EDISON
RADIOGRAPHIC EXAMINATION
FILM INTERPERTATION (CON'T SHEET)
NONDESTRUCTIVE EXAMINATION DATA REPORT
ADEDR-011 R1

REPORT # 2RT-316-93
PG 3 of 8
DATE 7/9/93

PO/CAC/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP-2-6742.07	SA 1415 MT-056

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY: AREA OF INTEREST -15% +30%	DENSITY: PENETRAMETER
			C-CRACK; IF-INCOMPLETE FUSION; IP-INADEQUATE PENETRATION; SL-SLAG LINE; SI-SLAG INCLUSION; TI-TUNGSTEN INCLUSION; BT-BURN THROUGH; M-MISMATCH; DT-DROP THROUGH; UC-UNDERCUT; OX-OXIDIZED ROOT; CV-ROOT CONCAVITY; CX-ROOT CONVEXITY; P-POROSITY; FA-FILM ARTIFACT		
R4 J-1	X		UC 3/32 x 1/16, 1/32 x 1/32, 1/8 x 1/32, 1/16 x 1/4, 3/32 x 1/32	A	2.50 2.39
A-B		X	IF 1/8 x 1/16, 7/32 x 1/32, 3/32 x 1/16, 1/16 x 1/16, 3/32 x 1/16, 7/32		
		X	CV (sharp) 1/2 x 1/16, 3/8 x 1/4, 1/2 x 1/16, 3/32 x 1/16		
		X	CV (sharp) 5/16 x 1/16, 3/8 x 1/16, 3/4 x 1/16		
	X		P .043		
R4 J-2		X	IF (3/8 x 3/16, 3/32 x 1/4-3	A	2.57 2.76
1-2	X		UC 3/32 x 1/32, 3/16 x 1/32, 5/16 x 1/32, 1/16 x 1/64, 3/16 x 1/64		
	X		UC 1/16 x 1/64, 1/16 x 1/64, 3/32 x 1/64, 5/32 x 1/64, 3/32 x 1/32		
	X		UC 1/16 x 1/32, 1/16 x 1/32, 3/16 x 1/32, 1/8 x 1/16		
		X	IF 1/4 x 1/32		
	X		SI 1/16 x 1/32		
	X		P .065, .040, .040, .071		
		X	CV sharp 1" x 1/32, 3/16 x 1/32		
		X	Arc Strike 1/16 x 1/4		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Cowden LEVEL II DATE 7-10-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON
RADIOGRAPHIC EXAMINATION
FILM INTERPERTATION (CON'T SHEET)
NONDESTRUCTIVE EXAMINATION DATA REPORT
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REPORT # 2RT-316-93
PG 4 of 8
DATE 7/9/93

PO/SO/WORK ORDER # 93061686
OTHER DOCUMENT DCP-2-6742.07
ITEM INSPECTED SA 1415 MT-056

DEFECT CODES: C-CRACK; IF-INCOMPLETE FUSION; IP-INADEQUATE PENETRATION; SL-SLAG LINE; SI-SLAG INCLUSION; TI-TUNGSTEN INCLUSION; BT-BURN THROUGH; M-MISMATCH; DT-DROP THROUGH; UC-UNDERCUT; OX-OXIDIZED ROOT; CV-ROOT CONCAVITY; CX-ROOT CONVEXITY; P-POROSITY; FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY: AREA OF INTEREST -15% TO +30%	DENSITY: PENETRAMETER
R4J-1	X		UC 1/8 x 1/32, 1/8 x 1/16, 1/8 x 1/10 1/8 x 1/2 1/16 x 1/32 3/32 x 1/32	A	2.48 2.55
1-2	X		UC 1/16 x 1/64 1/8 x 1/32 1/8 x 1/2, 3/32 x 1/32 3/32 x 1/32		
	X		UC 1/8 x 1/32, 3/32 x 1/32		
		X	UC 3/16 x 1/32		
	X		CV (Large) 5/32 x 1/32		
		X	IF 1/32 3/32 1/2 x 1/64 5/32 x 1/16		
	X		P .025" .070 .047		
		X	SI 5/8 x 3/16, 1/8 x 3/32		
R4J-6		X	UC 1/4 x 1/32 1/4 x 1/16, 1/4 x 1/32, 3/4 x 3/32 1/4 x 1/16	A	2.68
	X		UC 1/8 x 1/32, 1/16 x 1/32, 3/32 x 1/32 3/32 x 1/32 1/8 x 1/32		
	X		UC 1/16 x 1/32 1/16 x 1/32 1/8 x 1/32 3/32 x 1/32		
		X	IF 1/16 x 1/32, 5/32 x 1/32, 5/16 x 1/32		
	X		P .047, .057 .057		
		X	Gouge in Base metal (Ground Smo) 5/16 x 3/32		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Cranham LEVEL II DATE 7-12-93
ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

NDEDR-011 R1

REPORT # 2RT-316-93

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DATE 7/7/93

PO/CWO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP-2-6742.07	SA 1415 MT-056

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY: AREA OF INTEREST	DENSITY: PENETRAMETER
			C-CRACK; DT-DROP THROUGH; IF-INCOMPLETE FUSION; UC-UNDERCUT; IP-INADQUATE PENETRATION; OX-OXIDIZED ROOT; SL-SLAG LINE; CV-ROOT CONCAVITY; SI-SLAG INCLUSION; CX-ROOT CONVEXITY; TI-TUNGSTEN INCLUSION; P-POROSITY; BT-BURN THROUGH; FA-FILM ARTIFACT; M-MISMATCH	+15% -0% +20% -0%	
R4J-7		X	UC 1/4 x 1/32	A	2.75 2.88
A-13	X		UC 1/8 x 1/32, 1/16 x 1/32, 3/32 x 1/32, 5/32 x 1/32, 3/16 x 1/32		
	X		UC 1/8 x 1/64, 1/8 x 1/32, 3/32 x 1/32, 1/8 x 1/16, 1/8 x 1/4		
	X		UC 1/8 x 1/64, 1/8 x 1/32, 1/16 x 1/32, 1/16 x 1/32, 1/32 x 1/64, 3/32 x 1/64		
		X	IF 1/4 x 1/32, 3/32 x 1/32, 3/16 x 1/32		
		X	CV (shrunken) 1" x 1/32, 5/8 x 1/16, 3/8 x 1/16, 5/16 x 1/16		
	X		S .040, .031, .031, .031, .031		
	X		TI 3/32 x 1/32		
	X		Gouge in base metal Grind Sm 1/8 x 3/32		
R4V-1	X		UC 3/32 x 1/64, 3/32 x 1/64	A	2.61
		X	IF 3/8 x 1/16, 3/32 x 1/32, 3/32 x 1/32, 5/32 x 1/16		
		X	IF 1 1/32 x 1/16, 5/32 x 1/16, 3/32 x 1/32, 1/16 x 1/32		
		X	IF 1/16 x 1/64, 5/32 x 1/32, 1/8 x 1/64, 3/8 x 1/16, 3/32 x 1/16		
		X	IF 1/8 x 1/32, 1/8 x 1/16, 3/32 x 1/16, 1/2 x 1/16, 1/8 x 1/32		
		X	IF 1/8 x 1/64, 5/8 x 1/16		
	X		P .031, .031, .040, .040, .050		
	X		CV		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Cambron LEVEL II DATE 7-10-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

NDEDR-011 R1

REPORT # 2RT-316-93

PG 6 of 8

DATE 7/7/93

PO/DCC/WORK ORDER # 93061686

OTHER DOCUMENT DCP-2-6742.07

ITEM INSPECTED SA 1415 MT-056

DEFECT CODES: C-CRACK; IF-INCOMPLETE FUSION; IP-INADEQUATE PENETRATION; SL-SLAG LINE; SI-SLAG INCLUSION; TI-TUNGSTEN INCLUSION; BT-BURN THROUGH; M-MISMATCH; DT-DROP THROUGH; UC-UNDERCUT; OX-OXIDIZED ROOT; CV-ROOT CONCAVITY; CX-ROOT CONVEXITY; P-POROSITY; FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY AREA OF INTEREST -15% +30%	DENSITY PENETRAMETER
R4V-2	X		UC 3/16 x 1/64, 1/16 x 1/32, 3/32 x 1/32, 3/32 x 1/16	A	249
A-B		X	IF 1/8 x 1/32 3/16 x 1/4		
		X	IP 3/32		
			P .040 .020		
	X		CV		
R-1V-3	X		UC 1/16 x 1/32, 1/16 x 1/64, 1/8 x "64, 1/16 x 1/64	A	360
A-B		X	IF 3/16 x 3/16, 1/8 x 3/32 1/4 x 1/16 1/16 x 1/32 1/4 x 1/32		
	X		P .040, .050 .050, .063, .040		
	X		CV ---- ----		
R4V-4	X		UC 5/32 x 1/32, 1/16 x 1/32, 1/16 x 1/32, 1/16 x 1/32	A	254
1-2		X	IF 1/16 x 1/32, 3/32 x 1/32, 3/4 x 1/8, 1/8 x 1/32		
	X		P .031 .031 .025 .025, .063, .094		
R4V-5	X		UC 1/8 x 1/32	A	320
A-B		X	IF 1/16 x 1/32, 3/32 x 1/32, 1/16 x 1/32, 1/16 x 1/32		
	X		P .031 .025, .031		
	X		CV, FA		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST." PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Coulson LEVEL II DATE 7-10-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON

RADIOGRAPHIC EXAMINATION

FILM INTERPERTATION (CON'T SHEET)

NONDESTRUCTIVE EXAMINATION DATA REPORT

NDECR-011 #1

REPORT # 2RT-316-93

PG 7 of 8

DATE 7/9/93

PO/CCC/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP-2-6742.07	SA 1415 MT-056

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY AREA OF INTEREST -15% +30%	DENSITY PENETRAMETER
			C-CRACK; DT-DROP THROUGH; IF-INCOMPLETE FUSION; UC-UNDERCUT; IP-INADEQUATE PENETRATION; OX-OXIDIZED ROOT; SL-SLAG LINE; CV-ROOT CONCAVITY; SI-SLAG INCLUSION; CX-ROOT CONVEXITY; TI-TUNGSTEN INCLUSION; P-POROSITY; BT-BURN THROUGH; FA-FILM ARTIFACT; M-MISMATCH		
R4U-4	X		UC 5/32 x 1/32, 1/16 x 1/32, 1/16 x 1/32, 1/16 x 1/32	A	2.54
1-2		X	IF 1/16 x 1/32, 3/32 x 1/32, 3/16 x 1/8, 1/8 x 1/32		
	X		P .031, .021, .025, .025, .013, .014		
	X		CV grinds extend over 1-R4J		
R4V-6		X	IF 5/16 x 1/16, 1/4 x 1/8, 1/16 x 1/32, 1/8 x 1/32, 1/16 x 1/32	A	3.72
A-B		X	IF 5/32 x 3/32, 1/4" x 1/64"		
	X		UC 1/8 x 1/16		
	X		P .029, .025, .031		
	X		SL: 1/16 x 1/32, 1/16 x 1/64		
R4V-7	X		UC 3/32 x 1/16, 1/8 x 1/32, 1/8 x 1/64	A	2.60
		X	IF 3/16 x 1/4, 3/32 x 1/16, 1/16 x 1/32, 5/32 x 1/16,		
		X	IF 3/32 x 3/32, 3/16 x 3/32, 1/32 x 3/32		
	X		CV		
G4-5		X	UC (in line) 3/16 x 1/32 + 3/32 x 1/16, 3/16 x 1/16 + 1/8 x 1/32	A	3.64
A-B			1/4 x 1/16 + 1/4 x 3/16 + 3/16 x 3/32 + 5/32 x 3/32 + 3/16 x 1/32		
	X		UC 1/8 x 1/32, 1/16 x 1/32, 1/8 x 1/32, 1/8 x 1/64, 1/8 x 1/64, 1/16 x 1/64		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Cranham LEVEL II DATE 7-10-93

ANII REVIEW _____ DATE _____

SOUTHERN CALIFORNIA EDISON
RADIOGRAPHIC EXAMINATION
FILM INTERPERTATION (CON'T SHEET)
NONDESTRUCTIVE EXAMINATION DATA REPORT
NDECR-011 R1

REPORT # 2RT-311-93
PG 6 OF 8
DATE 7-9-93

PO/CO/WORK ORDER #	OTHER DOCUMENT	ITEM INSPECTED
93061686	DCP 2-6742.07	SA 1415 MT-057

DEFECT CODES

C-CRACK
IF-INCOMPLETE FUSION
IP-INADEQUATE PENETRATION
SL-SLAG LINE
SI-SLAG INCLUSION
TI-TUNGSTEN INCLUSION
BT-BURN THROUGH
M-MISMATCH
DT-DROP THROUGH
UC-UNDERCUT
CR-CRACKED ROOT
CV-ROOT CONCAVITY
CX-ROOT CONVEXITY
P-POROSITY
FA-FILM ARTIFACT

WELD I.D. AND LOCATION MARKERS	ACCEPT	REJECT	DEFECT CODES / REMARKS	DENSITY AREA OF INTEREST -15% +30%	DENSITY PENETRAMETER
C-4-5		X	CV (sharp) 1/4 x 1/2, 3/8 x 1/2, 3/4 x 3/4, 1 3/8 x 1/2, 1 1/2 x 1/16	A	3.64
A-B	X		SI 1/8 x 1/16		
			P .25D		

DENSITY BLOCK: MARK ACCEPT (A) or REJECT (R) TO INDICATE IF DENSITIES FALL WITHIN SPECIFIED RANGE OF "AREA OF INTEREST". PENETRAMETER BLOCK: ENTER ACTUAL MEASURED DENSITY FROM THE BODY OF THE PENETRAMETER.

FILM INTERPRETER D. Gardner LEVEL II DATE 7-10-93

ANII REVIEW _____ DATE _____