

ENCLOSURE 4

Stevenson & Associates Calculation Number C-003, Revision 1

Time History for IPEEE for Palisades Site

9610070068 960930
PDR ADOCK 05000255
P PDR

Client: Consumers Power Company Calculation No. C-003

Title: Time History for IPEEE for Palisades Site

Project: IPEEE - Seismic / A46

Method: Using SPECTRA for Response Spectrum to Time History Conversions.

Acceptance Criteria: SRP 3.7.1 and Engineering Practice

Remarks: Three statistically independent time histories are generated in Rev. 1.

REVISIONS

No.	Description	By	Date	Chk.	Date	App.	Date
0	Initial Issue	MSLj	11/11/93	TMT	11/14/93	WJL	11/15/93
1	Three Time Histories	MSLj	1/6/94	TMT	1/6/94	WD	1/17/94



CALCULATION
COVER
SHEET

FIGURE 1.3

CONTRACT NO.
92C 2750

S&A	JOB NO. 92C2750	SHEET #1
	SUBJECT: Consumer Power Co. IPEEE/A46	OF 12
STEVENSON & ASSOCIATES a structural-mechanical consulting engineering firm	Time History for IPEEE C-003	Revision 1
		By MSL 1/6/94
		Chk. TMT 1/6/94

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S&A STEVENSON & ASSOCIATES a structural-mechanical consulting engineering firm	JOB NO. 92C2750	SHEET #2
	SUBJECT: Consumer Power Co. IPEEE/A46	OF 12
	Time History for IPEEE C-003	Revision 1
		By MSJ: 1/6/94
		Chk. TMT 1/6/94

1. Introduction

This calculation documents the generation of ground motion time histories for use in the Consumers Power Company IPEEE activity. The input motions will be used for the Reactor Building and Auxiliary Building at the Palisades Site.

The Revised Lawrence Livermore National Laboratory (LLNL) site specific ground response spectra (GRS) define in Ref. 1:

P. Sobel, "Revised Livermore Seismic Hazard Estimates for 69 Nuclear Power Plant Sites East of the Rocky Mountains," Draft Report for Comment NUREG-1488, October 1993.

is selected as the IPEEE free field horizontal input motion. Per the FSAR of Palisades Plant [4], the vertical ground motion is taken as two-thirds of the corresponding horizontal ground motion. Artificial time histories consistent with these RS are generated using S&A's SPECTRA program [7]. These time histories have been checked to be statistically independent.

2. IPEEE Input Motion Spectrum Shape

According to the requirement of [2], Section 3.1.1.2 Hazard Selection, the PRA should be performed using the higher of the mean (arithmetic) hazard estimates from Lawrence Livermore National Laboratory (LLNL) [1] and the Electric Power Research Institute (EPRI) [3]. Since there is no seismic hazard curve provided for Palisades site in the EPRI report [3], the revised LLNL curves will be used in the subsequent analysis as the IPEEE free field input motion.

As explained in Appendix D, Question and Answer 7.47 of [2], the input ground response spectrum shape should be based on the median spectral shape for a 10,000-year return period. The spectral shapes of the revised LLNL hazard curve are listed in Appendix B of Ref. 1 and converted to acceleration units G as shown in the following table. The shape is 5 percent damped. To complete the spectral shape, the median PGA value of 0.06809G is interpolated from Ref. 1, the 50% data of Appendix A.

Freq. (Hz)	1	2.5	5	10	25	ZPA
Accel. (G)	0.02357	0.07302	0.10280	0.11721	0.11241	0.06809

Table 1 - Revised LLNL 10,000-year Response Spectra 50% Probability for the Palisades Site

Per the FSAR of Palisades Plant [4], the vertical ground motion is taken as two-thirds of the corresponding horizontal ground motion. The spectral shape is shown as the solid curve in Figure 1 and 2 with a ZPA level of 0.06809G for horizontal motion and in Figure 3 with a ZPA level of 0.04539G for vertical motion. The ZPA is assumed to start at 40 Hz. The target RS are saved in the RLLNLH.RS and RLLNLV.RS for horizontal and vertical motions, respectively.

S&A STEVENSON & ASSOCIATES a structural-mechanical consulting engineering firm	JOB NO. 92C2750	SHEET #3
	SUBJECT: Consumer Power Co. IPEEE/A46	OF 12
	Time History for IPEEE C-003	Revision 1
		By NSL 1/6/94
		Chk. TMT 1/6/94

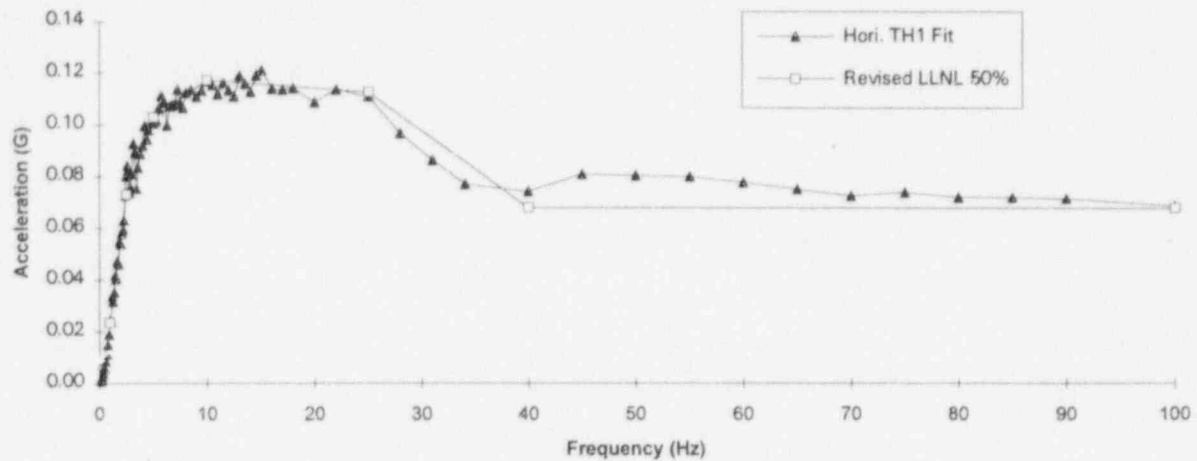


Figure 1 - IPEEE Response Spectrum and the First Time History Fit for the Palisades Site Based on 10,000-year Revised LLNL 50% Probability for Horizontal Motion

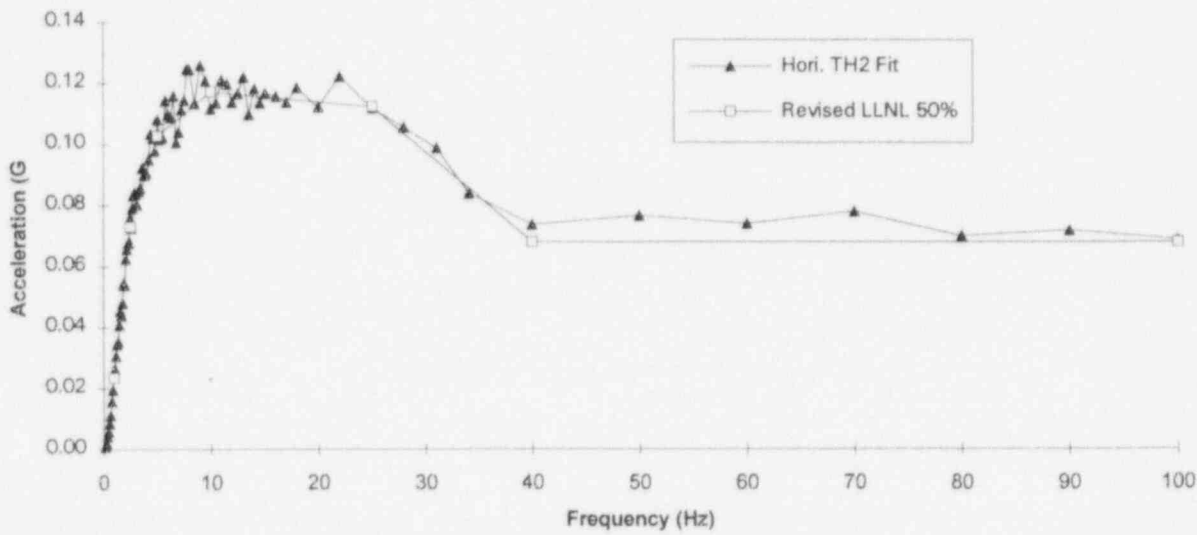


Figure 2 - IPEEE Response Spectrum and the Second Time History Fit for the Palisades Site Based on 10,000-year Revised LLNL 50% Probability for Horizontal Motion

S&A	JOB NO. 92C2750	SHEET #4
	SUBJECT: Consumer Power Co. IPEEE/A46	OF 12
STEVENSON & ASSOCIATES a structural-mechanical consulting engineering firm	Time History for IPEEE C-003	Revision 1
		By MSL 1/6/94
		Chk. TMT 1/6/94

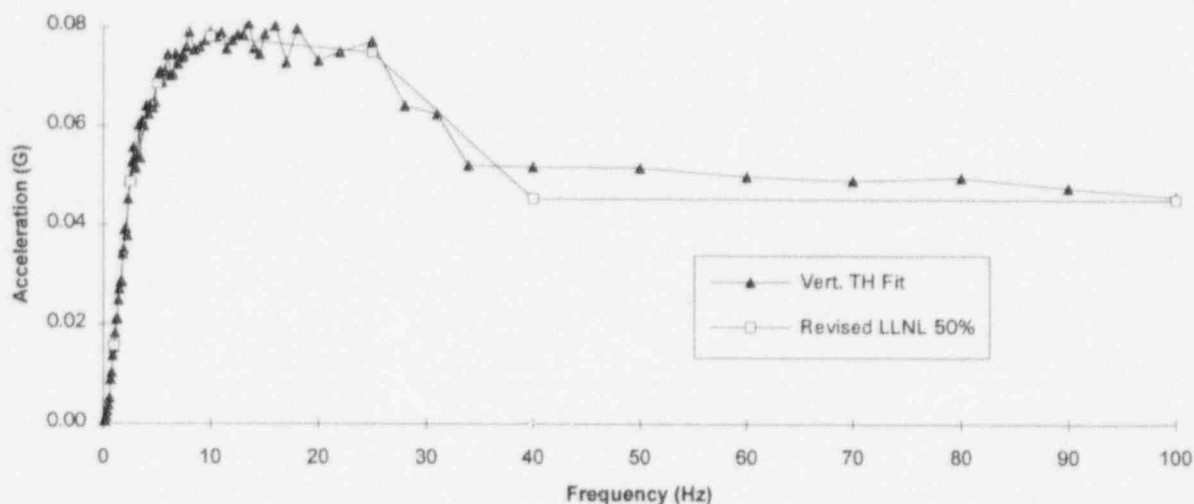


Figure 3 - IPEEE Response Spectrum and the Time History Fit for the Palisades Site
Based on 10,000-year Revised LLNL 50% Probability for Vertical Motion

3. Conversion to Time History

Synthetic time histories are generated from the ground response spectrum using S&A's computer program SPECTRA [7]. The SPECTRA program is capable of converting between different forms of excitation, namely, time histories, response spectra, and power spectra.

First, the RS is imported to the SPECTRA program and stored in the SPECTRA database PASSI. Then SPECTRA is used to convert the response spectrum into time history. The conversion process is straightforward. The parameters used in the conversion are summarized as follows:

Duration	10.24 sec
Rise time	2 sec
Steady state duration	6 sec
Δt	0.01 sec
Random seed	324516 for the First Horizontal Time History 452762 for the Second Horizontal Time History 332165 for the Vertical Time History

The tri-linear envelope option in SPECTRA is used to generate synthetic time histories (TH), which include a rise time to a constant maximum steady state, and a final decay time equals (Duration - Rise Time - Steady State). The total and steady state duration of all time histories are with the range specified on page 3.7.1-5 of the SRP [5].

The SPECTRA program always synthesizes time histories that envelope the target RS conforming to the SRP 3.7.1 [5]. However, for the IPEEE, following the spirit of Seismic Margin Analysis (SMA) or PRA, the conservatism of enveloping is unnecessary. As a result, the TH is scaled down by trial and error to fit the required RS while maintaining the peak of the time history constant. It follows the following procedure

S&A	JOB NO. 92C2750	SHEET #5
	SUBJECT: Consumer Power Co. IPEEE/A46	OF 12
STEVENSON & ASSOCIATES a structural-mechanical consulting engineering firm	Time History for IPEEE C-003	Revision 1
		By MQ 1/6/94
		Chk. TMT 1/6/94

1. The time history is exported to file *U.TH
2. Run the SCALE1.EXE program with a scale factor. The SCALE1 program scales a TH by multiplying the TH by a scale factor but keeps the peak value unchanged. The scales TH file is *S.TH.
3. Import the scaled TH back into SPECTRA and convert to RS.
4. Plot the resulting RS against the target. The results verify itself.

The scale factors are 0.93 for the first horizontal time history, 0.95 for the second horizontal time history and 0.94 for the vertical time history. The time histories obtained by this process are shown in the Figure 4 to 6 for the first and second horizontal and vertical time histories, respectively. The fit of these RS to their target RS have been illustrated in Figure 1 to 3. Table 1 lists the original and scaled file names of time history.

File Name	First Horizontal Time History	Second Horizontal Time History	Vertical Time History
original	RLLNLH1U.TH	RLLNLH2U.TH	RLLNLVU.TH
Scaled	RLLNLH1S.TH	RLLNLH2S.TH	RLLNLVS.TH

Table 1 - List of File Name of original and Scaled Time Histories

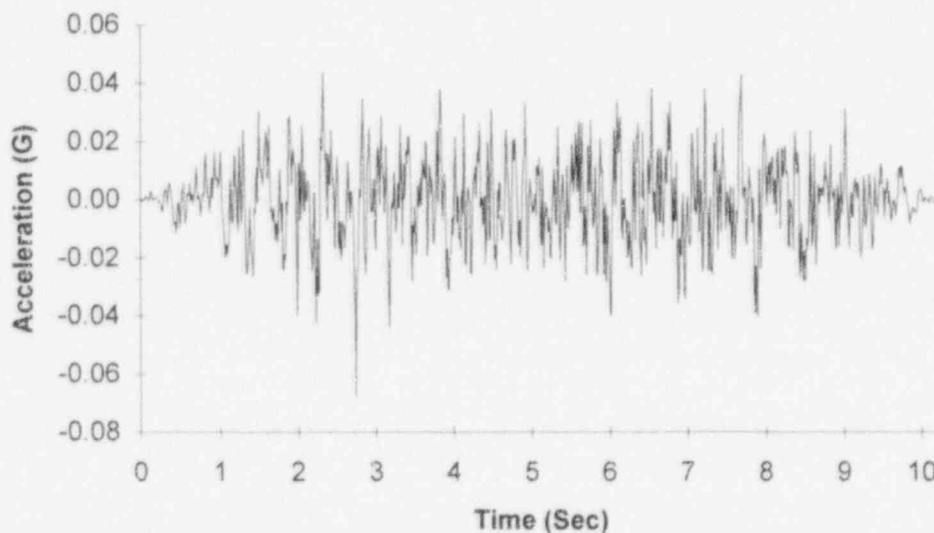


Figure 4 - IPEEE First Horizontal Ground Acceleration Time History for the Palisades Site Based on 10000-year Revised LLNL 50% Response Spectrum Shape

S&A	JOB NO. 92C2750	SHEET #6
	SUBJECT: Consumer Power Co. IPEEE/A46	OF 12
STEVENSON & ASSOCIATES a structural-mechanical consulting engineering firm	Time History for IPEEE C-003	Revision 1
		By MSJ 1/6/94
		Chk. TMT 1/6/94

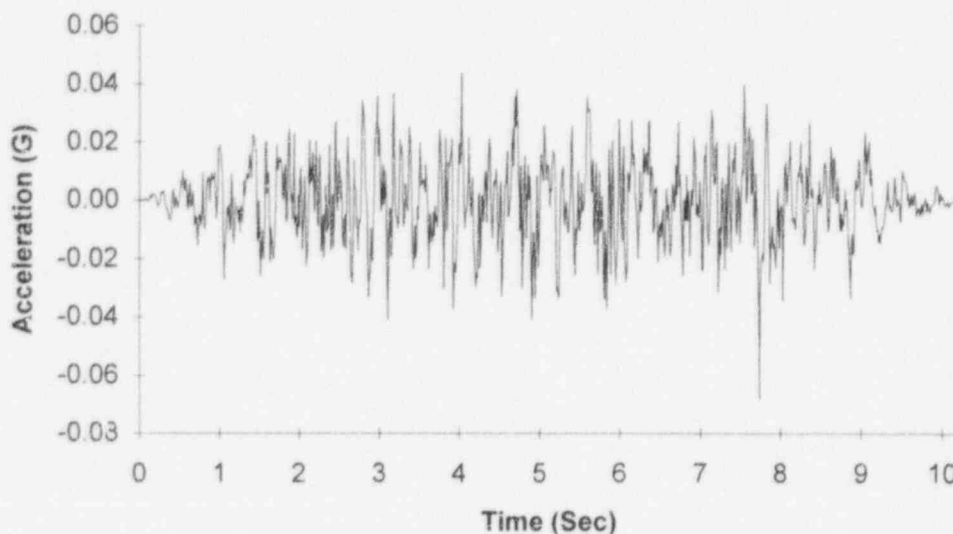


Figure 5 - IPEEE Second Horizontal Ground Acceleration Time History for the Palisades Site Based on 10000-year Revised LLNL 50% Response Spectrum Shape

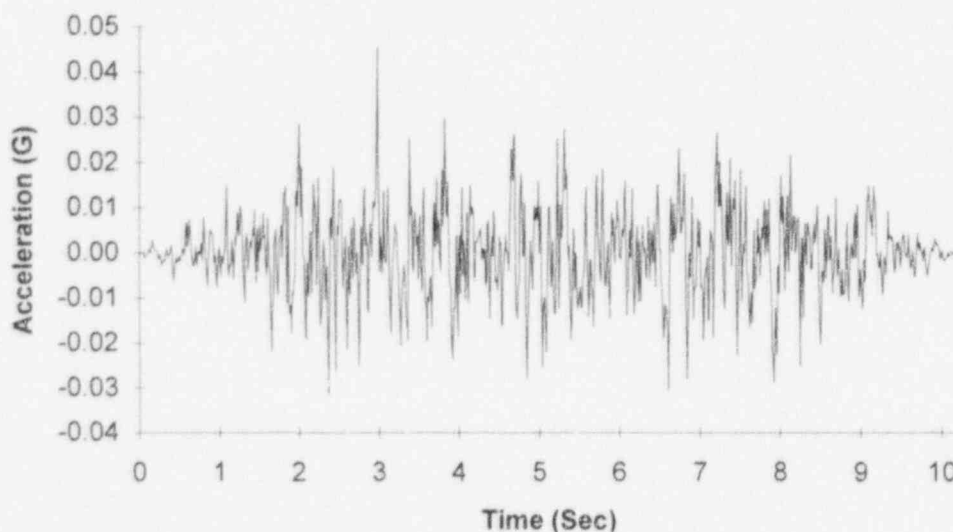


Figure 6 - IPEEE Vertical Ground Acceleration Time History for the Palisades Site Based on 10000-year Revised LLNL 50% Response Spectrum Shape

S&A	JOB NO. 92C2750	SHEET #7
	SUBJECT: Consumer Power Co. IPEEE/A46	OF 12
STEVENSON & ASSOCIATES a structural-mechanical consulting engineering firm	Time History for IPEEE C-003	Revision 1
		By MSL 1/6/94
		Chk.

Page of 3.7.1-5 of the SRP [5] requires that time histories be statistically independent. Per ASCE standard [6], time histories whose normalized cross correlation function has a peak value below 0.3 will be considered statistically independent. Table 2 shows the maximum of the normalized cross correlation function for any two original time histories is below 0.3, which is acceptable. Utility program CORRL.EXE is used to compute correlation function for pairs of time histories. Source code of program CORRL.C and the input and output files, CORRLRL.LIS and CORRLRL.CHK, are stored in diskette. Further information about the program CORRL.EXE can be found in Ref. 8.

Time History	RLLNLH1S.TH	RLLNLH2S.TH	RLLNLVS.TH
RLLNLH1S.TH	1.000	0.157	0.135
RLLNLH2S.TH		1.000	0.161
RLLNLVS.TH			1.000

Table 12 - Maximum of Normalized Cross Correlation Function of Time Histories

S&A STEVENSON & ASSOCIATES a structural-mechanical consulting engineering firm	JOB NO. 92C2750	SHEET #8
	SUBJECT: Consumer Power Co. IPEEE/A46	OF 12
	Time History for IPEEE C-003	Revision 1
		By MSL 1/6/94
		Chk. TMT 1/6/94

Reference

1. P. Sobel, "Revised Livermore Seismic Hazard Estimates for 69 Nuclear Power Plant Sites East of the Rocky Mountains," Draft Report for Comment NUREG-1488, October 1993.
2. U. S. Nuclear Regulatory Commission, "Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities", Final Report, NUREG-1407, June 1991.
3. Risk Engineering, "Probabilistic Seismic Hazard Evaluations at Nuclear Plant Sites in the Central and Eastern United States: Resolution of the Charleston Earthquake Issue," EPRI NP-6395-D, April 1989.
4. Consumers Power Company, "Final Safety Analysis Report Update of Palisades Plant", Rev. 15, April 1993.
5. U.S. Nuclear Regulatory Commission, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants", NUREG-0800, Section 3.7.1, August 1989.
6. ASCE Standard, "Seismic Analysis of Safety-Related Nuclear Structures and Commentary on Standard for Seismic Analysis of Safety Related Nuclear Structures", ASCE 4-86, September 1986.
7. Stevenson & Associates, "SPECTRA - Users Manual," Version 1.1, 1992.
8. Stevenson & Associates, "Generation of Artificial Time Histories", Project No. 91C2690, Calculation C-001, Rev. 1, May 1992.


S&A	JOB NO. 92C2750	SHEET #9
	SUBJECT: Consumer Power Co. IPEEE/A46	OF 12
STEVENSON & ASSOCIATES a structural-mechanical consulting engineering firm	Time History for IPEEE C-003	Revision 1
		By <i>MSL 1/6/94</i>
		Chk. <i>TMT 1/6/94</i>

Appendix A -- List of Program SCALE1.BAS

```

DEFINT I-N
DIM th(4096)
PRINT "This program scales a TH (EDASP format) while keeping the ZPA independently to another value"
INPUT "Enter the input TH file name"; ti$
INPUT "Enter the output TH file name"; to$
OPEN ti$ FOR INPUT AS #1
INPUT #1, n, dt
FOR i = 1 TO n: INPUT #1, th(i): NEXT i
CLOSE 1
'Find the maximum of the TH
xmas = 0
k = 0
FOR i = 1 TO n
  IF ABS(th(i)) > xmas THEN
    xmas = ABS(th(i))
    k = i
  END IF
NEXT i
INPUT "Enter the scale factor"; scal
scal = ABS(scal)
PRINT "Enter the correct ZPA value ("; xmas; ")"; : INPUT zpa
IF zpa = 0 THEN zpa = xmas ELSE zpa = ABS(zpa)
FOR i = 1 TO n
  IF i = k THEN
    th(i) = SGN(th(i)) * zpa
  ELSE
    th(i) = th(i) * scal
  END IF
NEXT i
OPEN to$ FOR OUTPUT AS #1
PRINT #1, n, dt
FOR i = 1 TO n: PRINT #1, th(i): NEXT i
CLOSE 1
END

```

DESCRIPTION OF ANALYSIS: <u>Response Spectrum to Time History Conversion.</u>				
COMPUTER CODE: <u>SPECTRA</u> VERSION: <u>1.1</u>				
RELEASE DATE: <u>Nov. 92</u> AUTHOR/VENDOR: <u>S & A</u>				
COMPUTER TYPE/SYSTEM: <u>IBM Compatible</u>				
PROGRAM STATUS: <input type="checkbox"/> Project Specific <input checked="" type="checkbox"/> General Use/QA Approved				
VERIFICATION/VALIDATION DOCUMENTATION: <input type="checkbox"/> Attached <input checked="" type="checkbox"/> On File				
RUN NUMBER: 				
	ORIGINATOR	DATE	CHECKER	DATE
INPUT REPRODUCED ON LISTING	MSL	1/6/94	TMT	1/6/94
MODEL VALID AND ASSUMPTIONS DOCUMENTED	N/A	—	—	—
PROGRAM APPROPRIATE AND ADEQUATE	MSL	1/6/94	TMT	1/6/94
MODEL BEHAVES REASONABLE	MSL	1/6/94	TMT	1/6/94
RESULTS PROPERLY INTERPRETED	MSL	1/6/94	TMT	1/6/94
REMARKS: _____ _____ _____ _____ _____				
	COMPUTER PROGRAM COVER SHEET FIGURE 2.8		CONTRACT NO. 92C2750	

Job #92C2750
C-003 (REV.1)
Sheet 11/12

DESCRIPTION OF ANALYSIS: Scale a TH by multiply the TH by a
scale factor but keeps the Peak Value unchanged

COMPUTER CODE: SCALE1.EXE VERSION: 1.0

RELEASE DATE: Sept. 92 AUTHOR/VENDOR: S & A

COMPUTER TYPE/SYSTEM: IBM Compatible

PROGRAM STATUS: ☒ Project Specific ☐ General Use/QA Approved

VERIFICATION/VALIDATION DOCUMENTATION: ☒ Attached ☐ On File
(see remarks)

RUN NUMBER:

	ORIGINATOR	DATE	CHECKER	DATE
INPUT REPRODUCED ON LISTING	MSL:	1/6/94	TMT	1/6/94
MODEL VALID AND ASSUMPTIONS DOCUMENTED	N/A	—	—	—
PROGRAM APPROPRIATE AND ADEQUATE	MSL:	1/6/94	TMT	1/6/94
MODEL BEHAVES REASONABLE	MSL:	1/6/94	TMT	1/6/94
RESULTS PROPERLY INTERPRETED	MSL:	1/6/94	TMT	1/6/94

REMARKS: Program was verified by line-by-line check.



COMPUTER
PROGRAM
COVER SHEET

FIGURE 2.8

CONTRACT NO.
92C2750

DESCRIPTION OF ANALYSIS: Compute Correlation Function for Pairs of Time Histories.

COMPUTER CODE: CORRL.EXE VERSION: 1.0

RELEASE DATE: Nov. 91 AUTHOR/VENDOR: SDA

COMPUTER TYPE/SYSTEM: IBM Compatible

PROGRAM STATUS: ☒ Project Specific ☐ General Use/QA Approved

VERIFICATION/VALIDATION DOCUMENTATION: ☐ Attached ☒ On File
(see remarks)

RUN NUMBER:

	ORIGINATOR	DATE	CHECKER	DATE
INPUT REPRODUCED ON LISTING	MSLi	1/6/94	TMT	1/6/94
MODEL VALID AND ASSUMPTIONS DOCUMENTED	N/A	—	—	—
PROGRAM APPROPRIATE AND ADEQUATE	MSLi	1/6/94	TMT	1/6/94
MODEL BEHAVES REASONABLE	MSLi	1/6/94	TMT	1/6/94
RESULTS PROPERLY INTERPRETED	MSLi	1/6/94	TMT	1/6/94

REMARKS: Program was verified in Project 91C2690, C-001.
Rev. 1. (All conditions are the same as those specified in
Project 91C2690)



COMPUTER
PROGRAM
COVER SHEET

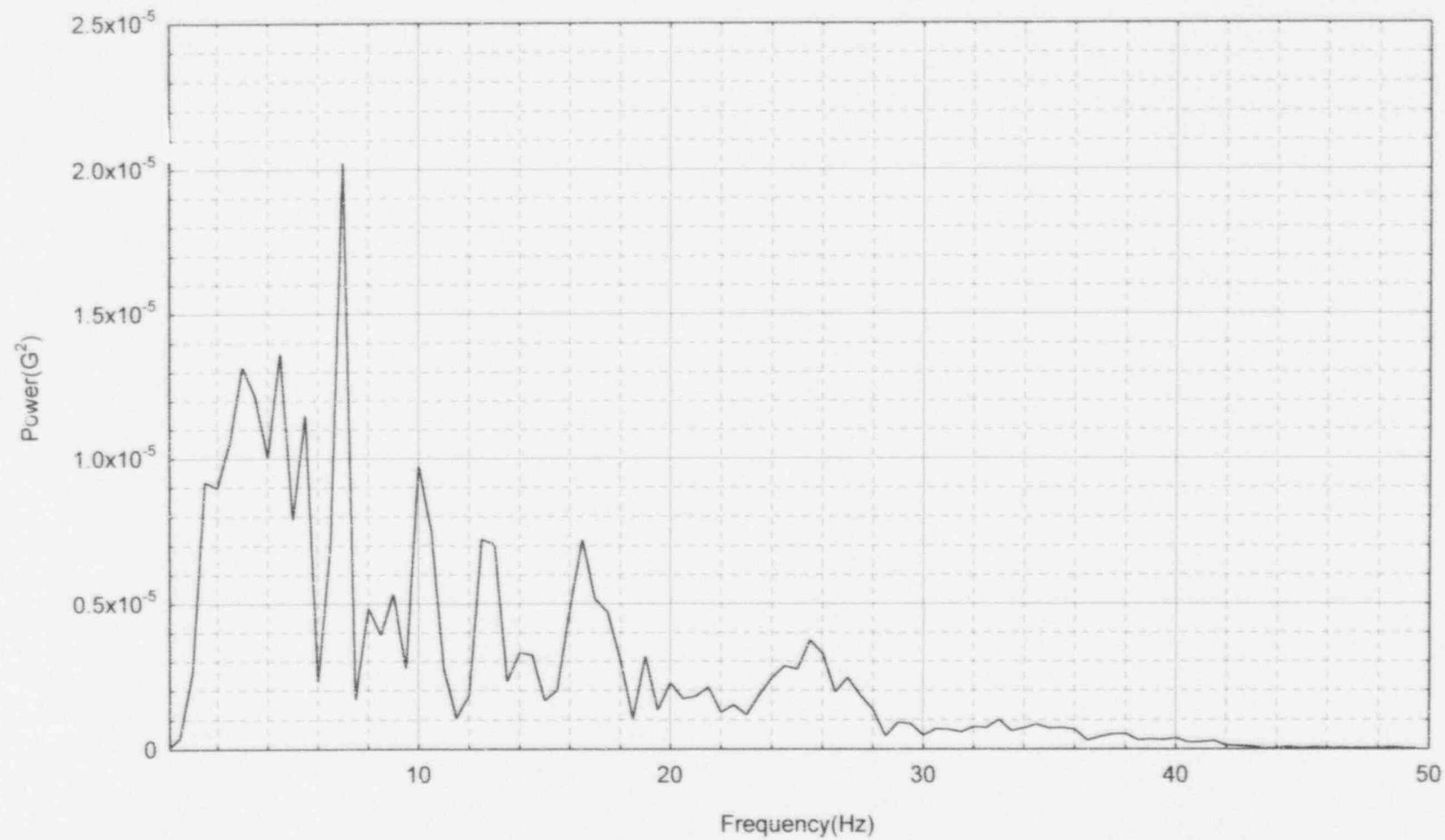
FIGURE 2.8

CONTRACT NO.

92C2750

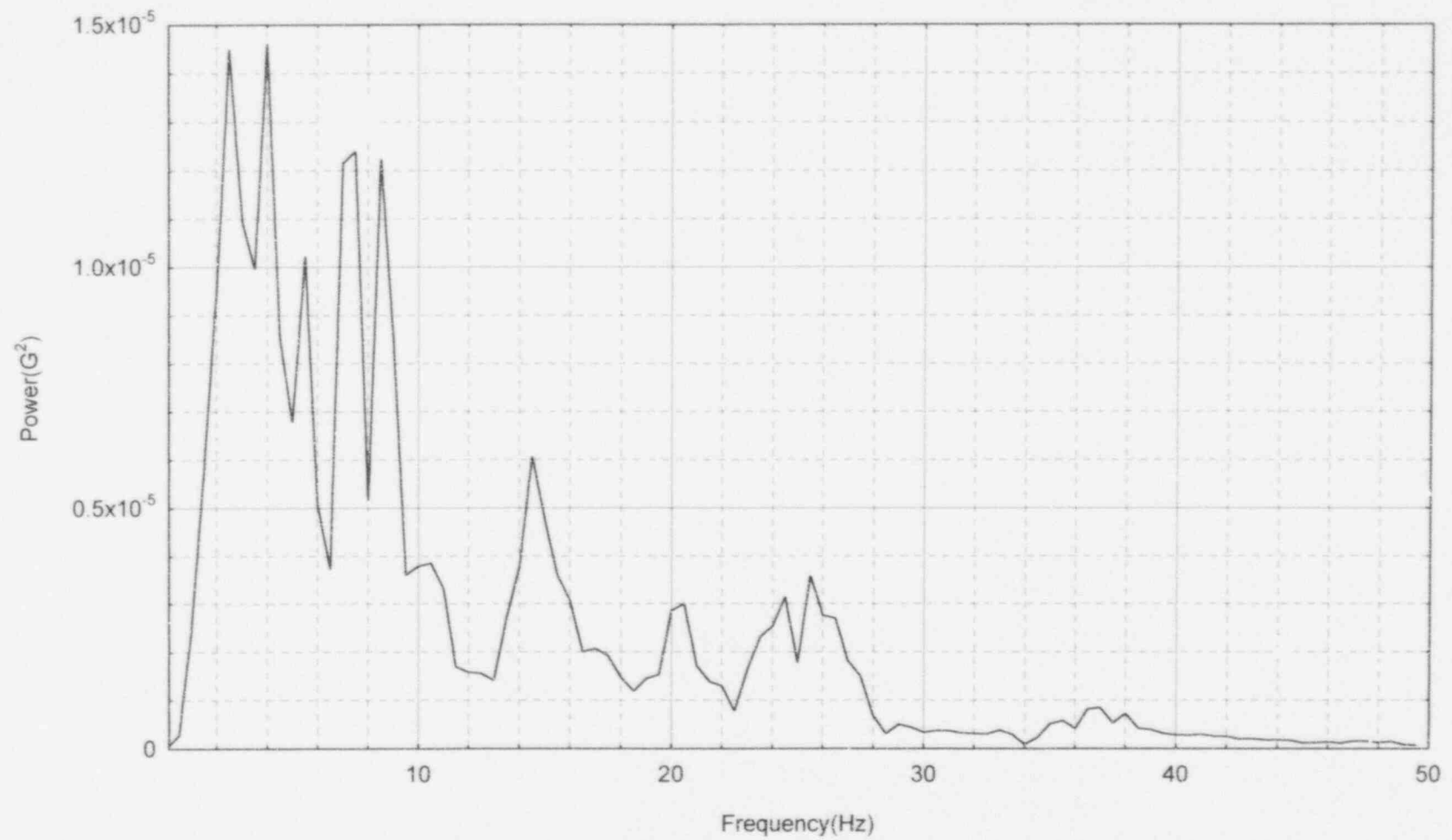
Consumers Power Company
Palisades Nuclear Plant
Power Spectrum of IPEEE Time History

BUILDING : OUTDOOR
ELEVATION : GROUND
DIRECTION : HORI1
MOTION : RLLNL50%S



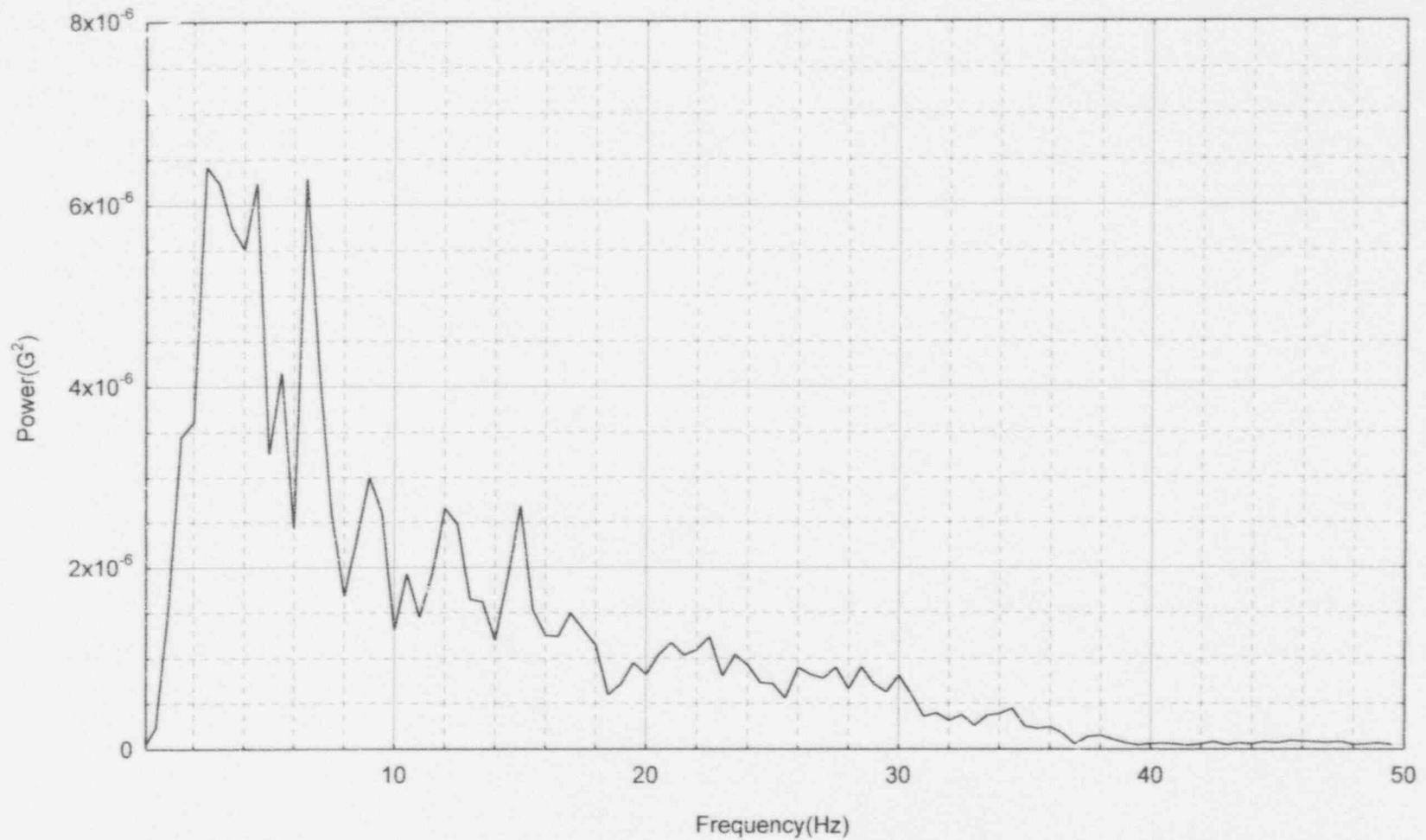
Consumers Power Company
Palisades Nuclear Plant
Power Spectrum of IPEEE Time History

BUILDING : OUTDOOR
ELEVATION : GROUND
DIRECTION : HORI2
MOTION : R.LNL50%S



Consumers Power Company
Palisades Nuclear Plant
Power Spectrum of IPEEE Time History

BUILDING : OUTDOOR
ELEVATION : GROUND
DIRECTION : VERT
MOTION : RLLNL50%S



ENCLOSURE 5

Supporting Documentation for Selected Components

Palisades IPEEE

PALISADES NUCLEAR PLANT		GIP Rev 2, Corrected 2/14/92	
OUTLIER SEISMIC VERIFICATION SHEET (OSVS)		Sheet 1 of 1	
ID: T-2 (Rev. 0)	Class: 21 Tanks and Heat Exchangers		
Description: CONDENSATE STORAGE TANK			
Building: TB	Floor El.: 590.00		
Room, Row/Col: OUTSIDE	Base El.: 590.00		

1. OUTLIER ISSUE DEFINITION - Tanks and Heat Exchangers

- a. Identify all the screening guidelines which are not met. (Check more than one if several guidelines could not be satisfied.)

Shell Buckling	
Anchor Bolts and Embedment	
Anchorage Connections	
Flexibility of Attached Piping	
Other	X

- b. Describe all the reasons for the outlier (i.e., if all the listed outlier issues were resolved, then the signatories would consider this item of equipment to be verified for seismic adequacy).

A ring-type foundation is used to support a large, flat-bottom, vertical tank.

2. PROPOSED METHOD OF OUTLIER RESOLUTION (Optional)

- a. Defined proposed method(s) for resolving outlier.

--

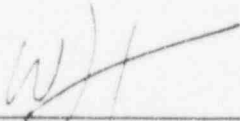
- b. Provide information needed to implement proposed method(s) for resolving outlier (e.g., estimate of fundamental frequency).

--

3. COMMENTS**4. CERTIFICATION:**

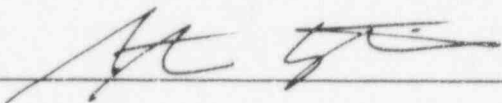
The information on this OSVS is, to the best of our knowledge and belief, correct and accurate, and resolution of the outlier issues listed above will satisfy the requirements for this item of equipment to be verified for seismic adequacy.

Approved by:



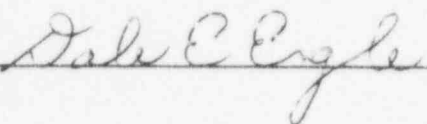
Date:

4/24/95



4/24/95

Owner's Review:



Date:

4/23/95

PALISADES NUCLEAR PLANT SCREENING EVALUATION WORK SHEET (SEWS)		GIP Rev 2, Corrected, 2/14/92 Status: No Sheet 1 of 4
ID : T-2 (Rev. 0)	Class : 21 - Tanks and Heat Exchangers	
Description : CONDENSATE STORAGE TANK		
Building : TB	Floor El. : 590.00	Room, Row/Col : OUTSIDE
Manufacturer, Model, Etc. :		

BASIS : External analysis

1. The buckling capacity of the shell of a large, flat-bottom, vertical tank is equal to or greater than the demand.	Unk
2. The capacity of the anchor bolts and their embedments is equal to or greater than the demand.	Unk
3. The capacity of connections between the anchor bolts and the tank shell is equal to or greater than the demand.	Unk
4. Attached piping has adequate flexibility to accommodate the motion of a large, flat-bottom, vertical tank.	Yes
5. A ring-type foundation is not used to support a large, flat-bottom, vertical tank.	No

IS EQUIPMENT SEISMICALLY ADEQUATE?**No****COMMENTS**

SRT: Djordjevic/Anagnostis Date: 7/7/93

REF 1: CPCo Drwg. # C-18-1-2, Rev. 1.

REF 2: CPCo Drwg. # C-18, Sh. 41, Rev. 3.

REF 3: CPCo Drwg. # C-37, Rev. 4.

REF 4: CPCo Drwg. # C-38, Rev. 5.

Photo: 5-14 shows typical anchor bolt.

Photo: 5-18 shows typical anchor bolt for T-81

Anchorage: 12 2" anchors in a 14 anchor pattern - 2 anchors not installed due to valve pit. See markup of REF 1 for bolt chairs. REFs 3 & 4 indicate that the tank is on a ring foundation. See document for ultrasonic testing of bolt embedment.

Interaction hazard: Tank T-81 is about 3' away. Same height, somewhat smaller diameter, anchored with only 6 3/4" anchors.

Outlier due to a ring-type foundation used to support a large, flat bottom, vertical tank.

Preliminary analysis performed (S&A Calculation # C009, Rev. 0 or CPCo engineering analysis # EA-POC0007899-T2).

Major Assumptions:

1. Bolt tension allowable = $0.24 \times \text{Bolt capacity} = 25.63 \text{ kips}$.

Minor Assumptions:

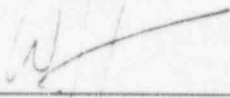
1. Height of fluid at the maximum level = $0.93 \times \text{tank shell height}$ (actual maximum level = $0.84 \times \text{tank shell height}$).

Revised analysis should be performed based on the new available information:

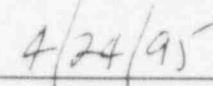
PALISADES NUCLEAR PLANT SCREENING EVALUATION WORK SHEET (SEWS)		GIP Rev 2, Corrected, 2/14/92 Status: No Sheet 2 of 4
ID : T-2 (Rev. 0)	Class : 21 - Tanks and Heat Exchangers	
Description : CONDENSATE STORAGE TANK		
Building : TB	Floor El. : 590.00	Room, Row/Col : OUTSIDE
Manufacturer, Model, Etc. :		

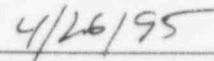
1. Maximum water level.
2. Bolt embedment.
3. New soil horizontal and vertical stiffnesses.

Evaluated by:

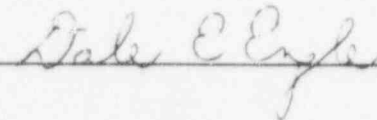


Date:

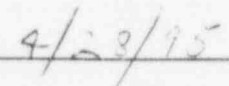




Owner's Review:



Date:



Attachment: Pictures

Attachment: T-2: Ultrasonic Testing of Anchor Bolts

PALISADES NUCLEAR PLANT		GIP Rev 2, Corrected, 2/14/92
SCREENING EVALUATION WORK SHEET (SEWS)		Status: No
		Sheet 3 of 4
ID : T-2 (Rev. 0)	Class : 21 - Tanks and Heat Exchangers	
Description : CONDENSATE STORAGE TANK		
Building : TB	Floor El. : 590.00	Room, Row/Col : OUTSIDE
Manufacturer, Model, Etc. :		

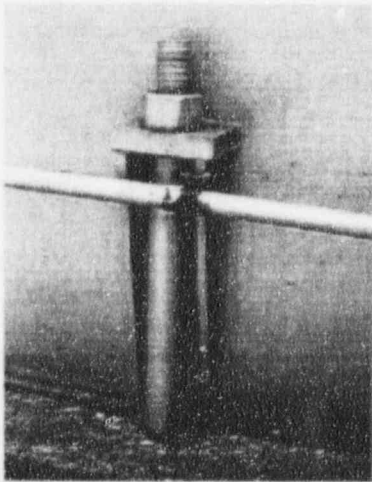
PICTURES

Figure 1: T-2 Bolt and Bolt Chair Detail

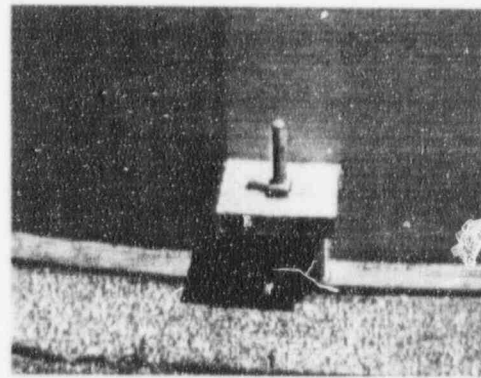


Figure 2: T-81 Bolt and Bolt Chair Detail

PALISADES NUCLEAR PLANT **SCREENING EVALUATION WORK SHEET (SEWS)**

GIP Rev 2, Corrected, 2/14/92
 Status: No
 Sheet 4 of 4

ID: T-2 (Rev. 0)

Class: 21 - Tanks and Heat Exchangers

Description: CONDENSATE STORAGE TANK

Building: TB

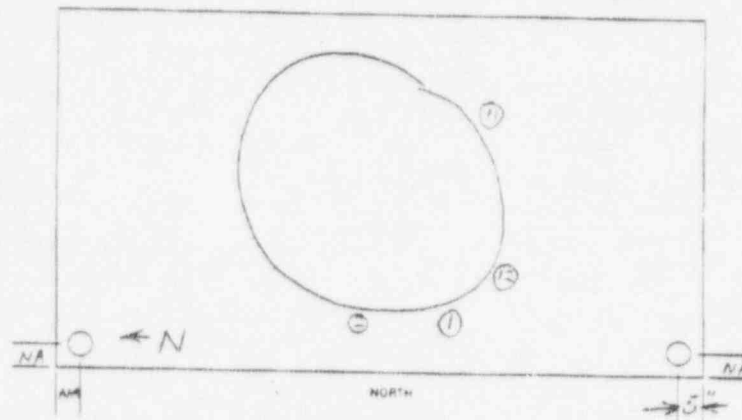
Floor El.: 590.00

Room, Row/Col: OUTSIDE

Manufacturer, Model, Etc.:

T-2: Ultrasonic Testing of Anchor Bolts

Ultrasonic testing of Anchor Bolts for the SQUG Program



Equip ID: T-2 Number of Anchor bolts: 12

A. Bolt Location

	1	2	3	4	5	6	7	8	9	10	11	12
B. Bolt dia.	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"
C. Total Bolt Length	41	41	40 1/2	41	40 1/2	40 1/2	41	41	41	41	41	41
D. Bolt dist. above floor	24	24	24	24	24	24	24	24	24	24	24	24
E. embedment length (c-d-e)	17	17	16 1/2	17	16 1/2	16 1/2	17	17	17	17	17	17

B. Bolt dia. 2" 2" 2" 2" 2" 2" 2" 2" 2" 2" 2" 2"

C. Total Bolt Length 41 41 40 1/2 41 40 1/2 40 1/2 41 41 41 41 41 41

D. Bolt dist. above floor 24 24 24 24 24 24 24 24 24 24 24 24

E. embedment length (c-d-e) 17 17 16 1/2 17 16 1/2 16 1/2 17 17 17 17 17 17

Data taken by Steve Poyda Date 1/17/95

Ultrasonic testing performed by Brian Levine Date 1/17/95

Ultrasonic tester serial number 000355

T-2 - Condensate Storage Tank