QA Record

SITE ENGINEERING CALCULATIONS

QA RECORD Sheet i

TITLE: VERIFICATION OF ANCHORAGE FOR PANEL 3-25-31 TO RESOLVE THE OUTLIER IDENTIFIED BY USI A46 EVALUATION (SSEL #39204).			PLANT/UNIT: BFN/3
PREPARING ORGANIZATION SITE ENGINEERING - CIVIL		KEY NOUNS (Consult RIMS DESCRIPTOR LIST) SEISMIC QUAL, EQPT, PANELS	
BRANCH/PROJECT IDENTIFIERS CD-Q3071-960089		Each time these calculations are issued, preparers must ensure that the original (R0) RIMS accession number is filled in. REV (for RIMS use)	RIMS accession number
	R 0	R1	960807 104
APPLICABLE DESIGN DOCUMENT(S) BFN-50-C-7100	R___	19	
	R___		
SAR SECTION(S) N/A / UNID SYSTEM(S) 071	R___		

REVISION 0	R___	R___	R___	Safety-related? Yes ■ No □
DCN No. (or indicate Not Applicable) T39817A				Statement of Problem:
Prepared: S. S. HAIDER Syed S. Haider				VERIFY ANCHORAGE ADEQUACY FOR PANEL 3-25-31 TO RESOLVE THE OUTLIER IDENTIFIED BY USI A46 AS NOTED IN SSEL # 39204.
Checked:				
Reviewed:				ORIGINAL
Approved: J. VALENTE J. Valente				
Date: 6 Aug 96				LEGIBILITY EVALUATED and ACCEPTED for issue.
List all pages added by this revision				
List all pages deleted by this revision				
List all pages changed by this revision				
Calculation revision: (A) Entire Calc; (P) Selected Pages				JR Glass 8/6/96 Signature Date

Abstract

These calculations contain an unverified assumption(s) that must be verified later? Yes □ No ■

THIS CALCULATION DOCUMENTS THE ADEQUACY OF ANCHORAGE FOR PANEL 3-25-31 TO RESOLVE THE OUTLIER IDENTIFIED BY USI A46 EVALUATION FOR SSEL # 39204.

MICROFILM AND RETURN CALCULATION TO:

cc: RIMS, SL 26 C-K

TVA

TLE:

VERIFICATION OF ANCHORAGE FOR PANEL 3-25-31 TO RESOLVE THE OUTLIER IDENTIFIED BY USI A46 EVALUATION.

REVISION LOG

CD-Q3071-960089

NO.	DESCRIPTION	DATE APPROVED
0	INITIAL ISSUE PER DCN T39817A TOTAL NUMBER OF SHEETS = 19	6 Aug 98

CALCULATION DESIGN VERIFICATION (INDEPENDENT REVIEW) FORM (PER NEP-3.1)

Branch/Project Identifier: CD-Q3071-960089 Revision No. 0

Method of design verification (independent review) used (check method used):

1. Design Review X
2. Alternate Calculation
3. Qualification Test

The referenced calculation was independently reviewed for revision level indicated above and found to be adequate based on accepted sound engineering methods.

Design Verifier
(Independent Reviewer)

7-24-96
Date

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Computed SSH Date 7/22/96

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5.1 PURPOSE:

USI A46 EVALUATION FOR SSEL # 39204 IDENTIFIED THAT THE OVERALL ANCHORAGE SCHEME OF THE PANEL'S PEDESTAL TO THE EMBED PLATE IN THE FLOOR CAN NOT BE VERIFIED. THIS CALCULATION WILL VERIFY THE ADEQUACY OF THE ANCHORAGE OF THE PANEL.

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5.2 ASSUMPTIONS:

THERE ARE NO UNVERIFIED ASSUMPTIONS IN THIS CALCULATION.

5.3 SPECIAL REQUIREMENTS/LIMITING CONDITIONS:

THIS CALCULATION DOES NOT GENERATE ANY SPECIAL REQUIREMENTS OR LIMITING CONDITIONS WHICH LIMIT SYSTEM OR PLANT OPERATION FROM THAT CURRENTLY DOCUMENTED IN THE DESIGN, OR PLACE SPECIAL REQUIREMENTS ON THE PHYSICAL CONFIGURATION THAT ARE GENERALLY OUTSIDE THE STATED PURPOSE OF THE CALCULATION.

5.4 DATA:

1. ATTACHMENT - A

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5.5 REFERENCES:

1. DCN T39817A
2. Drawing 0-45N370
3. Drawing 48N922
4. GENERIC IMPLEMENTATION PROCEDURE FOR SEISMIC VERIFICATION OF NUCLEAR PLANT EQUIPMENT. (RIMS # R92 930730 001)
5. MARS REPORT CEB 88-05-C R1
6. DESIGN CRITERIA BFN-50-C-7100
7. DESIGN CRITERIA BFN-50-C-7105

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5.6 COMPUTATIONS:

ATTACHMENT-A STATES THAT THE WELD BETWEEN PANEL'S SIL-CHANNEL AND EMBED PL. CAN NOT BE VERIFIED, NOR THERE IS ANY DRAWING THAT SHOWS THE PANEL ANCHORAGE DETAIL. ATTACHMENT-A ALSO STATED THAT THE WELD IN QUESTION IS VISIBLE IN PANEL 2-25-31, HENCE UNIT-2 PANEL DOES NOT HAVE AN OUTLIER. UPON VISUAL INSPECTION, IT APPEARS THAT PANEL 25-31 IN ALL 3 UNITS HAVE SIMILAR ANCHORAGE SCHEME.

THE PREPARER AND REVIEWER OF THIS CALCULATION, WITH THE HELP OF A PAINTER SCRAPED THE PAINT AROUND THE PANEL BASE AND DISCOVERED THAT ON THE EAST SIDE OF THE PANEL, THERE IS INTERMITTENT WELD SIMILAR TO UNIT-2 PANEL. ON THE WEST SIDE OF THE PANEL, THE OUTER EDGE OF THE EMB. PL. IS ABOUT 7/8" INSIDE THE PANEL PEDESTAL, HOWEVER, ON THE SOUTH WEST CORNER THERE IS ABOUT 3" LONG WELD. ALL WELDS ARE ESTIMATED AS 3/16" FILLET. BY COMPARISON TO UNIT-2 PANEL, THE WELD ON THE EAST SIDE IS ESTIMATED AS 2"@12".

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COMPUTATIONS (CONT'D.):

FOR SIMPLICITY OF CALC, CONSERVATIVELY CONSIDER BASE OF PANNEL AS THAT OF PANEL SIZE, ie 30"x96".

PER ATTACH. A, WEIGHT OF PANEL =

= 1.5 x HOUSING WEIGHT; THICKNESS OF PANEL = 1/8", THICKNESS OF DOORS = 3/32".

CONSERVATIVELY, CONSIDER WHOLE PANEL AS 1/8" THICK.

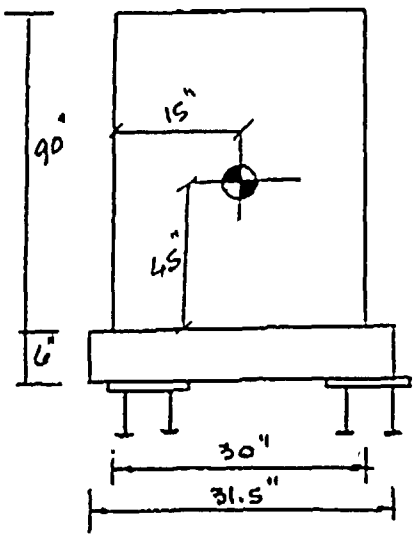
∴ HOUSING WEIGHT =

$[(2\times30\times90)+(2\times96\times90)+(30\times96)](\frac{1}{8})(0.284)$

= 908 LBS.

∴ PANEL + CONTENT WT = 1.5 x 908 = 1362 LBS.

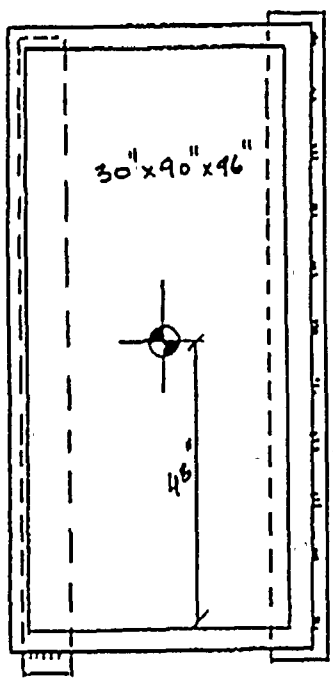
SAY 1400 LBS.



LKG. NORTH

CRITICAL CASE : FORCE TOWARDS EAST

CONSERVATIVELY CONSIDER C.G. OF PANEL AS SHOWN ON SKETCH AT RIGHT.



PLAN

PER REF. 5, EL. 621'-3", 5% DAMPING, PEAK SSE ACCEL. COEFF. W/AMPL. FACTOR OF 1.5 =>

$g_h = 1.5\times2\times1.0731 = 3.22g$

$g_v = 1.5\times2\times0.3285 = 0.99 \approx 1.0$ ← CANCELS OUT W/GRAVITY.

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COMPUTATIONS (CONT'D.):

WELD PROPERTIES :

$L = 2\times9 + 3 = 21$ in

WELD C.G : $\bar{x} = \frac{3\times27.5}{21} = 3.93''$

$\bar{z} = \frac{2\times9\times48}{21} = 41.4''$

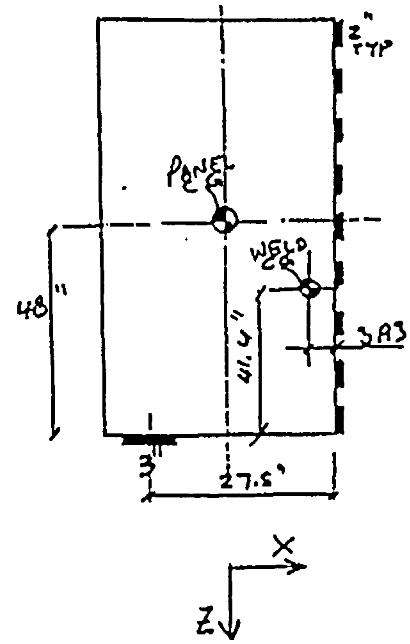
$I_x = \frac{(9)(2)^3}{12} + (2\times9)(6.6)^2 + (3)(41.4)^2 = 5932.0 \text{ in}^3$

$I_z = \frac{(3)^3}{12} + (3)(27.5-3.93)^2 + (2\times9)(3.93)^2 = 1947.0 \text{ in}^3$

$J_W = I_x + I_z = 7879.0 \text{ in}^3$

$S_x = \frac{5932}{(96-41.4)} = 108.6 \text{ in}^2$

$S_z = \frac{1947}{(29-3.93)} = 77.7 \text{ in}^2$



$P_x = 1.4\times3.22 = 4.5^k$

$M_z = 4.5^k\times51'' = 230''^k$

$M_y = 4.5^k(48''-41.4'') = 29.7''^k$

REACTION AT WELD :

$F_w^x = \frac{4.5}{21} + \frac{29.7(96-41.4)}{7879} = 0.42^k$

$F_w^z = \frac{29.7(29-3.93)}{7879} = 0.1^k$

$F_w^Y = \frac{230}{77.7} = 2.96^k$

$[(\ldots)^2 + (\ldots)^2 + (2.96)^2]^{1/2} = \ldots^k$

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COMPUTATIONS (CONT'D.):

CAPACITY OF 3/16" FILLET WELD = $\frac{3}{16} \times 0.4 \times 36 = 2.7^{k}$

I.R. = $2.95/2.7 = 1.09 < 10\%$ OVER DESIGN ALLOWABLE.

IT IS ACCEPTABLE BASED ON SEVERAL CONSERVATIVE ASSUMPTIONS MADE IN THE CALC.

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5.7 SUMMARY AND CONCLUSIONS:

THIS CALCULATION DOCUMENTS THE ADEQUACY OF THE ANCHORAGE OF THE PANEL TO RESOLVE THE OUTLIER IDENTIFIED BY USI A46 EVALUATION FOR SSEL # 39204.

ATTACHMENT: +1

SHEET 1 OF ...
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INTENT

SSEL Line No. 39204 Status Y N (U)

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 2

Equip. ID No. 3-PNLA-925-0031 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description LOCAL PANEL 25-31

Location: Bldg. U3 RB Floor El. 621'-3" Room, Row/Col Q,R20

Manufacturer, Model, Etc. (optional but recommended) GE

SEISMIC CAPACITY VS DEMAND

1. Elevation where equipment receives seismic input — 621'-3"
2. Elevation of seismic input below about 40' from grade — Y (N) U (grade @ 565')
3. Equipment has fundamental frequency above about 8 Hz — (Y) N U N/A (1), (4)*
4. Capacity based on: Existing Documentation — DOC
   Bounding Spectrum — BS
   1.5 x Bounding Spectrum — (1.5BS)
   GERS — GERS
5. Demand based on: Ground Response Spectrum — GRS
   1.5 x Ground Response Spectrum — 1.5GS
   Conserv. Des. In-Str. Resp. Spec. — CRS
   Realistic M-Ctr. In-Str. Resp. Spec. — (RRS)

Does capacity exceed demand? (Indicate at right (*) and in COMMENTS if a special exception to enveloping of seismic demand spectrum is invoked per Section 4.2 of the GIP.) — (Y) N U (2)*

CAVEATS - BOUNDING SPECTRUM (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1. Equipment is included in earthquake experience equipment class — (Y) N U N/A
2. No computers or programmable controllers — (Y) N U N/A
3. No strip chart recorders — (Y) N U N/A (4), (4)
4. Steel frame and sheet metal structurally adequate — (Y) N U N/A (4), (8)
5. Adjacent cabinets or panels which are close enough to impact, or sections of multi-bay cabinets or panels, are bolted together if they contain essential relays — (Y) N U N/A (10)
6. Drawers and equipment on slides restrained from falling out — (Y) N U N/A (6)
7. All doors secured by latch or fastener (door latches locks, judged ok) — (Y) N U N/A
8. Attached lines have adequate flexibility — (Y) N U N/A (7)
9. Anchorage adequate (See checklist below for details) — Y N (U) N/A (12)
10. Relays mounted on equipment evaluated AP = 4.5 — (Y) N U N/A (1), (8)
11. Have you looked for and found no other adverse concerns? — (Y) N U N/A

the intent of all the caveats met for Bounding Spectrum? — Y N (U) N/A (1

ANCHORAGE

1. Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation) — (Y) N U N/A (3), (4)
2. Type of anchorage covered by GIP welded base to sill, sill to concrete (unknown) — Y N (U) N/A (12)
3. Sizes and locations of anchors determined — Y N (U) N/A (12)

ATTACHMENT: A

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SSEL Line No. 39204

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 24

Equip. ID No. 3-PNLA-925-0031 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description LOCAL PANEL 25-31

ANCHORAGE (Cont'd)		
4. Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness visible with 0 panel to fill interval	(Y) N U N/A	
5. Factors affecting anchorage capacity or margin of safety considered: embedment length, anchor spacing, free-edge distance, concrete strength/condition, and concrete cracking	(Y) N U N/A	
6. For bolted anchorages, gap under base less than 1/4-inch	Y N U (N/A)	
7. Factors affecting essential relays considered: gap under base, capacity reduction for expansion anchors	(Y) N U N/A	
8. Base has adequate stiffness and effect of prying action on anchors considered	(Y) N U N/A	
9. Strength of equipment base and load path to CG adequate	(Y) N U N/A	
10. Embedded steel, grout pad or large concrete pad adequacy evaluated	Y N (U) N/A (12)	
Are anchorage requirements met?	Y N (U) (12)	
INTERACTION EFFECTS		
1. Soft targets free from impact by nearby equipment or structures	(Y) N U N/A (5),(11)	
2. If equipment contains sensitive relays, equipment free from all impact by nearby equipment or structures	(Y) N U N/A	
3. Attached lines have adequate flexibility	(Y) N U N/A (7)	
4. Overhead equipment or distribution systems are not likely to collapse	(Y) N U N/A	
5. Have you looked for and found no other adverse concerns?	(Y) N U N/A	
Is equipment free of interaction effects?	(Y) N U	
IS EQUIPMENT SEISMICALLY ADEQUATE?	Y (N) U (12)	

COMMENTS

- For notes 1 & 2 see notes 7 & 8 on SEW for 3-LPNL-925-0031 (SSEL 9074).
- See page 3 & 4 for notes 3-12.

Evaluated by: Fanjie Bair Date: 9/6/95
John O. Dizon 9/14/95

ATTACHMENT: A

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EQE INTERNATIONAL

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JOB NO. 50147 JOB TVA/BFNP A-46/IOEE BY TDe DATE 7/16/96
CALC. NO. N/A SUBJECT Attach. to SEWS for [illegible] CHK'D [illegible] DATE 7/16/96

SSEL No.: 39204

Component ID: 3-PNLA-925-007

3) Panel closure: only use .5 x nominal wt for overturning evaluation

4) Size: 96" x 30" x 10", door thickness: 3/32" panel thickness = 1/8"

5) Internal fluorescent lights: one in rear part of the panel. No potential interaction. ok

6) Equipment on slides (strip charts & recorders), have adequate support and locking mechanism. ok

7) 1" conduit @ top has adequate flexibility.

8) Front face of the panel where the equipment (e.g., relays) are mounted is stiffened w/ 1/4" x 2" SS rear plates. Typical in-cabinet amplification factor for this type of panel is 4.5

9) stripcharts are in bay 3 and are cantilevered. They are properly mounted. Their frequency may not be greater than 4 Hz. However, since bay 3 is independent of bay 1 which has relays, the effect of stripcharts on the relay sensitivity is insignificant. Also, the stripcharts are low in the cabinet and its effect on the overall frequency of the cabinet is minimal/unaffected. ok

10) Bays 1 & 2 are bolted together.

11) Miscellaneous items nearby are empty plastic barrels, garbage can, SLC Dram w/ locked wheels; are 5'-10" away from the panel. potential interaction is judged not credible. ok

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ATTACHMENT: A

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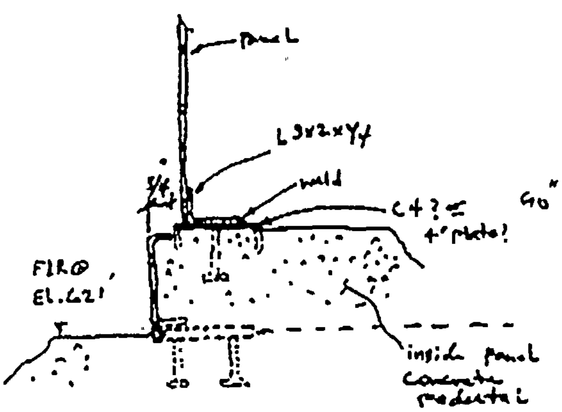
EQE INTERNATIONAL

SHEET NO. 4

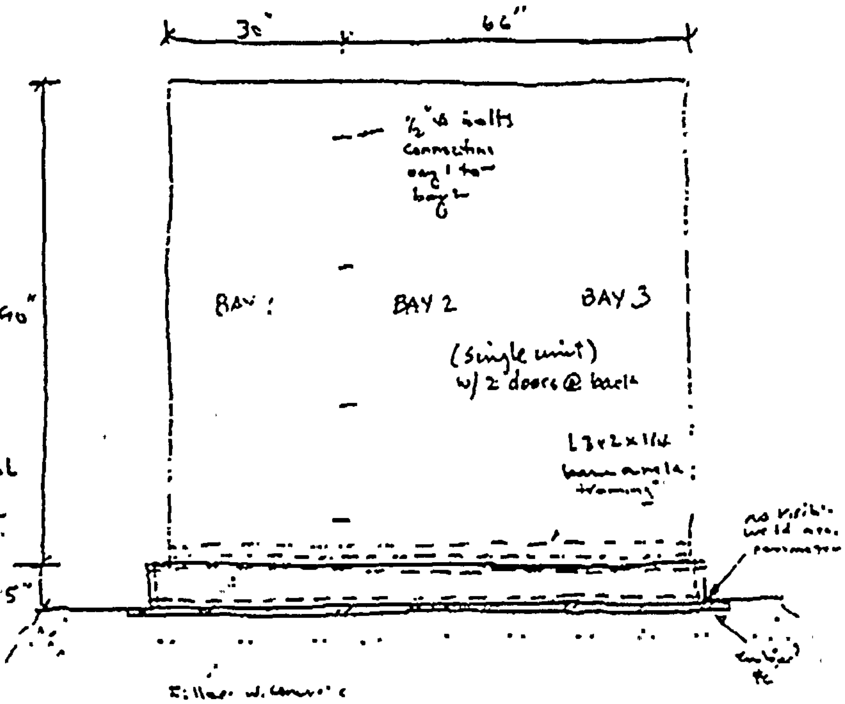
JOB NO. 50147 JOB TVA/BFNP A-46 /IPEEE BY
DATE 9-16-
CALC. NO. N/A SUBJECT Attach. to SEWS for ... (SSEL ...) CHK'D DATE 9/16/

SSEL: 39204 (cont'd)

12) This panel is similar to panel 2-925-2 (SSEL 9074), except that it is not clear as to how the ... concrete pedestal, that this panel is sitting on, is connected to the floor (@ EL. 621). [The Unit 2 panel's pedestal has a perimeter 1.5" channel that is welded to an embed plate.] The connection of the panel to the metal framing around the pedestal (sill channel) is adequate by comparison to panel 2-925-2. Since the overall anchorage scheme of the panel's pedestal to the concrete floor or the embedded plate in the floor can not be verified, This panel is called an outlier OSVS-39204 w.r.t. its anchorage.



dotted lines indicate assumed potential configuration which can not be verified.
(If it could be verified that the pedestal is anchored to the floor by dowels/re bars then the anchorage config. of this panel is adequate.)



Elevation

(See SEWS for SSEL 9074, for plan of the base anchorage to the pedestal)

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SSEL Line No. 39204

Status Y N (U)

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IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 3-PNLA-925-0031 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description LOCAL PANEL 25-31

RELAY WALKDOWN

1. Does spot check of essential relays indicate relays present and properly mounted? (Y) N U N/A

2. Are essential relays required to function during earthquake screened out? Y N U (N/A)

   If no, attach list of relays with locations in cabinet and general dimensions, thicknesses and details of mounting plates that support relays for later analysis.

3. No other relay concerns? Y N (U) N/A

Requirements for relays satisfied? Y N (U) (1)

SYSTEM INTERACTION EFFECTS

1. No potential sources could flood or spill onto cabinet? (Y) N U N/A

DESCRIBE POTENTIAL PROBLEMS INDICATED BY NO OR UNSATISFACTORY (Use additional sheets if necessary)

1) Anchorage of the 6" concrete pedestal to the floor is unknown (see outlier OSVS-39204)

EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES___ NO✓ (see note 1 above)

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES✓ NO___

Evaluated by: Farzin Bag Date: 9/16/95

Evaluated by: Julio D. Diaz Date: 9/16/95

ATTACHMENT: A

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SSEL Line No. 39204

OSVS-39204

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 3-PNLA-925-002: Equipment Class 20-Instr. & control panels

Equipment Location: Bldg. RB3 Floor Elevation 621'-5"

Room or Row/Column Q, R20 Base Elevation 621'-8"

Equipment Description Local panel 25-31 : RCIC Backup Control Panel

2. OUTLIER ISSUE DEFINITION

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

Mechanical and Electrical Equipment		**Tanks and Heat Exchangers**	
Capacity vs. Demand	___	Shell Buckling*	___
Caveats	___	Anchor Bolts and Embedment	___
Anchorage	✓	Anchorage Connections	___
Seismic Interaction	___	Flexibility of Attached Piping*	___
Other	___	Other	___
			___
Essential Relays		**Cable and Conduit Raceways**	
Capacity vs. Demand	___	Inclusion Rules	___
Mounting, Type, Location	___	Other Seismic Performance Concerns	___
Other	___	Limited Analytical Review	___
	___	Other	___
			___

* Shell buckling and flexibility of attached piping only apply to large, flat-bottom, vertical tanks.

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):

The anchorage of the 5" high concrete pedestal under this panel to the concrete floor can not be verified.

Sheet 2 of 2 ATTACHMENT: A

SSEL Line No. 39204

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 3-PNLA-[illegible]

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3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

a. Define proposed method(s) for resolving outlier.

- Provide adequate weld to connect the perimeter "Sill Channel" to the concrete slab.
- or alternatively determine the anchorage capacity of the pedestal to concrete through an extensive drawing search.

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

N/A

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 on the previous page will satisfy the requirements for this item of equipment to be verified for seismic adequacy:

Approved by: (For Equipment Classes #0 - #22, all the Seismic Capability Engineers on the Seismic Review Team (SRT) should sign; there should be at least two on the SRT. One signatory should be a licensed professional engineer. For Relays, the Lead Relay Reviewer should sign.)

Print or Type Name	Signature	Date
FARZIN R BEIGI	Farzin R. Beigi	9-16-95
JOHN O. DIZON, PE	John O. Dizon	9/16/95