TITLE: QUALIFICATION OFCABLE TRAY AND CONDUIT SYSTEMS BY A46 PROGRAM	PLANT/UNIT: BFN Unit 0
PREPARING ORGANIZATION: NE-Civil	KEY NOUNS (Consult RIMS DESCRIPTORS LIST): CABLE TRAY, CONDUIT, SEISMIC, A46 OUTLIER
BRANCH/PROJECT IDENTIFIERS: CD-Q0000-931227	Each time these calculations are issued, preparers must ensure that the original (R0) RIMS accession number is filled in.
APPLICABLE DESIGN DOCUMENTS: BFN-50-C-7104	SAR SECTION(S): N/A; UNID SYSTEM(S): 000

Rev	(for RIMS' use)	RIMS accession number
R0	940415B0016	R14 94 0131 111
R4	960131B0029	R14 '96 0124 107
R5		R14 '96 0220 118
R6		R14 '96 0415 102

Revision 0	R4	R5	R6
DCN No. (or indicate N/A)	N/A	N/A	N/A
Prepared: P. S. Ghosal	ACR.	ACR	G.E. HAIDER
Checked: A. C. Relwani			ACR
Reviewed: A. C. Relwani			ACR.
Approved: R. D. Cutsinger			
Date	1-31-94	24 Jan 96	26 Feb 96
List all pages added by this revision	SEE REVISION LOG	SEE Rev LOG	SEE REV LOG
List all pages deleted by this revision			
List all pages changed by this revision			
Calculation revision (A) Entire calculation (P) Selected pages	P	P	P

Safety-related? Yes ☒ No ☐

Statement of Problem

RESOLUTION OF OUTLIERS FOR A46 WALKDOWNS FOR RACEWAY SYSTEM. THIS CALCULATION IS PREPARED IN RESPONSE TO NRC UNRESOLVED SAFETY ISSUE, USI A-46

ORIGINAL

Abstract

These calculations contain unverified assumptions that must be verified later. Yes ☐ No ☒

These calculations contain special requirements and/or limiting conditions Yes ☐ No ☒

Revision 4: THIS CALCULATION ADDRESSES THE LIMITED ANALYTICAL REVIEW CASES AND OTHER OUTLIERS FROM A-46 WALKDOWN. CALCULATIONS ARE BASED ON GUIDELINES GIVEN IN GENERIC IMPLEMENTATION PROCEDURE (GIP) FOR SEISMIC VERIFICATION OF NUCLEAR PLANT EQUIPMENT

REV. 5: NO CHANGE TO ABSTRACT

REV. 5: TOTAL PAGE COUNT = 556

REV. 5: MICROFILM ONLY THE REVISED, ADDED, OR REPLACED PAGES.

REV. 6: NO CHANGE TO ABSTRACT - TOTAL PAGE COUNT = 566

REV. 6: MICROFILM ONLY THE REVISED & ADDED PAGES.

Rev. 4 Microfilm only the Revised, Added and Replaced pages.

Rev. 4 Total No. of pages: 549

☐ Microfilm and store calculations in RIMS Service Center. ☐ Microfilm and destroy

☒ Microfilm and return calculations to: ENGINEERING RECORDS PROCESSING CALCULATION CONTROL EDB ANNEX C BFN

9810020153.

QA Record

DNE CALCULATIONS

SHEET. 1

TITLE: QUALIFICATION OF CABLE TRAY AND CONDUIT SYSTEM BY A46 PROGRAM	PLANT/UNIT BFN Unit 0
PR[illegible]ING ORGANIZATION [illegible]Civil	KEY NOUNS (Consult RIMS DESCRIPTORS LIST) CONDUIT, CABLE TRAY, SEISMIC, A46 OUTLIER

BRAN[illegible]/PROJECT IDENTIFIERS: CD-Q0000-931227

APPLICABLE DESIGN DOCUMENTS: GIP FOR SEISMIC VERIFICATION OF NUCLEAR PLANT EQUIPMENT AND BFN-50-C-7104

SAR SECTION(S)	UNID SYSTEM(S)
N.A	361 & 362

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
R0	940415B0016	R14 '94 0131 111
R1	940915D0007	R14 '94 0901 107
R2	950615A0018	R14 '95 0608 103
R3	951019C0019	R14 '95 1010 116

Revision 0	R1	R2	R3
DCN No. (or indicate N/A) DCN W22555A	DCN W22555A	WDP-CEB-011-018	W17424, W33940
Prepared P.S. Ghosal PARTHA S. GHOSAL	C.W. Andrews	S.S.HAIDER	ACR.
Checked Anand C. Rehwani	P. Kosal	S.N. SIL	CJP
Reviewed Anand C. Rehwani	[signature]	L.E. Davis	CJP
Approved R. D. Cutsinger R.D.CUTSINGER	[signature] 8-31-94	[signature] for JRG	[signature]
Date 6-31-94	8-31-94	6-8-95	10-10-95
L[illegible] pages added by th[illegible]vision	SEE	SEE	SEE
List all pages deleted by this revision	REV	REV	REV.
List all pages changed by this revision	LOG	LOG	LOG.

Safety-related? Yes ☒ No ☐

Statement of Problem

RESOLUTION OF OUTLIERS FOR A46 WALKDOWN FOR RACEWAY SYSTEM. THIS CALCULATION IS PREPARED IN RESPONSE TO NRC UNRESOLVED SAFETY ISSUE, USI A-46.

ORIGINAL

Abstract

These calculations contain unverified assumptions that must be verified later. Yes ☐ No ☒

These calculations contain special requirements and/or limiting conditions. Yes ☐ No ☒

This calculation addresses the limited Analytical Review cases and other outliers from A-46 walkdown. Calculations are based on guidelines given in Generic Implementation Procedure (GIP) for seismic verification of Nuclear Plant Equipment.

The abstract remains unchanged for Revision 1. |R1

THE ABSTRACT REMAINS UNCHANGED FOR REVISION 2. |R2

THE ABSTRACT REMAINS UNCHANGED FOR REVISION 3.

TOTAL PAGE COUNT REV. 3 = 542

ENGINEERING RECORDS PROCESSING
CALCULATION CONTROL
EDB 1B-BFN

☐ Microfilm and store calculations in RIMS Service Center.

☒ Microfilm and return calculations to:

Microfilm and destroy. ☐

Address:

Title: QUALIFICATION OF CABLE TRAY AND CONDUIT SYSTEM BY A46 PROGRAM.	REVISION LOG CD-Q0000-931227

Revision No.	DESCRIPTION OF REVISION	Date Approved
0	Original issue Total pages: 444	1-31-94
1	Revised to incorporate FDCNs F-31259A, F-31672A, F-31658A, and F-31869A for DCN W22555A. Shts Revised: 1, 4, 9, 24, 47, 184, 240, 187-190, 209, 2 Shts Added: 3a, App. C (C1-C3) Shts Replaced: 25, 55, 191, 210, 185 Shts DELETED: NONE Legibility evaluated and accepted for issue. 8/30/94 Signature Date Shts 25, 55, 191, 210, 185 and App. C (C2 & C3) Total pages 448	8-31-94
2	REVISED TO INCORPORATE WDP-CEB-011-018 PAGES ADDED: 3b, APP. D (D1-D5) PAGES REVISED: 1, 2, 4, 16 PAGES DELETED: NONE. Total sheets: 454	6-8-95
3	REVISED TO INCORPORATE WALKDOWN & OUTLIERS FOR DRYWELL. REVISED PG.NO: 1, 2, 4, 9, 172, 175, 235 TO 238, APPENDIX A, PG A135. REPLACED PG.NO:- 5 TO 8, 10 THRU 13, 170, 229 TO 234, 240, APPENDIX A, PG A2 THRU A5 ADDED PG.NO:- 3C, 8.1, 11.1, 11.2, 177.1 TO 177.23, 233.1, 239.1 TO 239.4, APPENDIX A- PG A5.1, A64.1 TO A64.3, A92.1, A92.2, A135.1, A192 TO A223; APPENDIX B, PG B14 THRU B16, APPENDIX D- PG D6 THRU D13, APPENDIX E- PG E1 THRU E6 (ONLY PAGES CHANGED OR ADDED SHOULD BE RIMSED)	10-10-95

Title: QUALIFICATION OF CABLE TRAY AND CONDUIT SYSTEMS BY A-46 PROGRAM	REVISION LOG CD-Q0000-931227

Revision No.	DESCRIPTION OF REVISION	Date
4	Revised to incorporate additional walkdowns with NRC and minor clarifications. Revised pages: 197, 222, 240, Appendix D, page D6 Added pages: 1a, 2a, 3d, Appendix D, page D14, D15, D16, D17 Replaced pages: 177.23, 229, A92.1 Deleted pages: None **Microfilm only the Revised, Added and Replaced pages**	24 Jan 96
5	REVISED TO MAKE MINOR CLARIFICATIONS & CORRECT MINOR OMMISSIONS REVISED PG NO:- 1a, 2a, APPENDIX A, SHT A11, A53, A76 A117, A128, A135-1, A145, A146, A147, A151, A167, A168 ADDED PG NO:- 3e, 94.1 THRU 94.6 REPLACED PG. NO:- A148, A156 DELETED PG. NO: NONE MICROFILM ONLY THE REVISED, ADDED OR REPLACED PAGES.	26 Feb 96
6	REVISED TO DOCUMENT ADDITIONAL QUALIFICATION OF 3 OUTLIERS DUE TO DIFFICULTY OF MAINTENANCE. REVISED SHT NO. 1a, 2a, 6, 7, 8, 8.1, 231, 232, 233, 233.1, A67, A125, A136, A147, A152, A176 ADDED SHT. NO. 3f, 220a thru 220f, A67-1, A152-1, A177-1 DELETED SHT. NO. NONE MICROFILM ONLY THE REVISED OR ADDED PAGES.	17 Apr 96
	THIS SHEET ADDED BY REV. 4	

CALCULATION DESIGN VERIFICATION (INDEPENDENT REVIEW) FORM

CD-00000-931227 — Calculation No.

0 — Revision

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

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

Comments:

This revision of the calculation has been found to be technically adequate in that computations, judgements, assumptions, and logic are based on accepted engineering methods.

Anand C. Rehsi — Design Verifier (Independent Reviewer)

1/28/94 — Date

CALCULATION DESIGN VERIFICATION (INDEPENDENT REVIEW) FORM

CD-Q0000-931227 — 1
Calculation No. — Revision

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

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

Justification (explain below):

Method 1: In the design review method, justify the technical adequacy of the calculation and explain how the adequacy was verified (calculation is similiar to another, based on accepted handbook methods, appropriate sensitivity studies included for confidence, etc.).

Method 2: In the alternate calculation method, identify the pages where the alternate calculation has been included in the calculation package and explain why this method is adequate.

Method 3: In the qualification test method, identify the QA documented source(s) where testing adequately demonstrates the adequacy of this calculation and explain.

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

Paul Kalt — 8-31-94
Design Verifier (Independent Reviewer) — Date

This Sht. Added at Rev. 1

CALCULATION DESIGN VERIFICATION FORM (INDEPENDENT REVIEW)

CD-Q0000-931227 Calculation No. 2 Revision

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

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

Justification (explain below):

Method 1: In the design review method, justify the technical adequacy of the calculation and explain how the adequacy was verified (calculation is similar to another, based on accepted handbook methods, appropriate sensitivity studies included for confidence, etc.).

Method 2: In the alternate calculation method, identify the pages where the alternate calculation has been included in the calculation package and explain why this method is adequate.

Method 3: In the qualification test method, identify the QA documented source(s) where testing adequately demonstrates the adequacy of this calculation and explain.

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

Design Verifier (Independent Reviewer) — Date: 6/8/95

Sht. 3C

CALCULATION DESIGN VERIFICATION (INDEPENDENT REVIEW) FORM

Calculation CD-Q0000-931227 R 3

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

- ☑ 1. Design Review
- ☐ 2. Alternate Calculation
- ☐ 3. Qualification Test

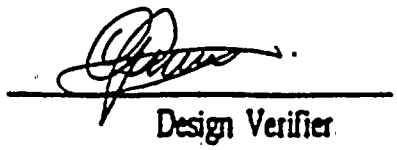
Justification (explain below):

Method 1: In the design review method, justify the technical adequacy of the calculation and explain how the adequacy was verified (calculation is similar to another, based on accepted handbook methods, appropriate sensitivity studies included for confidence, etc.).

Method 2: In the alternate calculation method, identify the pages where the alternate calculation has been included in the calculation package and explain why this method is adequate.

Method 3: In the qualification test method, identify the QA documented source(s) where testing adequately demonstrates the adequacy of this calculation and explain.

The above calculation revision so noted has been reviewed by the Design Review Methodology and has been determined to be technically adequate based on the design input information contained herein using accepted handbook and/or computer applications and sound engineering practices and techniques.



Design Verifier (Independent Reviewer) — Date: 10-10-95

This sheet added by Revision 3

____ CALCULATION DESIGN VERIFICATION (INDEPENDENT REVIEW) FORM

Calculation CD - Q0000-931227 Rev. 4

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

✓ 1. Design Review

____ 2. Alternate Calculation

____ 3. Qualification Test

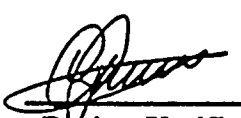
Justification (explain below):

Method 1: In the design review method, justify the technical adequacy of the calculation and explain how the adequacy was verified (calculation is similar to another, based on accepted handbook methods, appropriate sensitivity studies included for confidence, etc).

Method 2: In the alternate calculation method, identify the pages where the alternate calculation has been included in the calculation package and explain why this method is adequate.

Method 3: In the qualification test method, identify the QA documented source(s) where testing adequately demonstrates the adequacy of this calculation and explain.

The above calculation revision so noted has been reviewed by the Design Review Methodology and has been determined to be technically adequate based on the design input information contained herein using accepted handbook and/or computer applications and sound engineering practices and techniques.



Design Verifier 01-23-96 Date

This sheet added by Revision 4

____ CALCULATION DESIGN VERIFICATION (INDEPENDENT REVIEW) FORM

Calculation CD -Q0000-931227 Rev. 5

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

✓ 1. Design Review

____ 2. Alternate Calculation

____ 3. Qualification Test

Justification (explain below):

Method 1: In the design review method, justify the technical adequacy of the calculation and explain how the adequacy was verified (calculation is similar to another, based on accepted handbook methods, appropriate sensitivity studies included for confidence, etc).

Method 2: In the alternate calculation method, identify the pages where the alternate calculation has been included in the calculation package and explain why this method is adequate.

Method 3: In the qualification test method, identify the QA documented source(s) where testing adequately demonstrates the adequacy of this calculation and explain.

The above calculation revision so noted has been reviewed by the Design Review Methodology and has been determined to be technically adequate based on the design input information contained herein using accepted handbook and/or computer applications and sound engineering practices and techniques.

Design Verifier

02-15-96
Date

This sheet added by Revision 5

____ CALCULATION DESIGN VERIFICATION (INDEPENDENT REVIEW) FORM

Calculation CD - Q0000-931227 Rev. 6

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

✓ 1. Design Review

____ 2. Alternate Calculation

____ 3. Qualification Test

Justification (explain below):

Method 1: In the design review method, justify the technical adequacy of the calculation and explain how the adequacy was verified (calculation is similar to another, based on accepted handbook methods, appropriate sensitivity studies included for confidence, etc).

Method 2: In the alternate calculation method, identify the pages where the alternate calculation has been included in the calculation package and explain why this method is adequate.

Method 3: In the qualification test method, identify the QA documented source(s) where testing adequately demonstrates the adequacy of this calculation and explain.

The above calculation revision so noted has been reviewed by the Design Review Methodology and has been determined to be technically adequate based on the design input information contained herein using accepted handbook and/or computer applications and sound engineering practices and techniques.

Anand C. Relwani 4-15-96

Design Verifier Date

This sheet added by Revision 6

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REV 6 ORIGINATOR SSH DATE 4/9/9.
CHECKER ACR DATE 4.15.9

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24 REACTOR U3 El 639'	24-01		A117
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REV	Prepared By: DDL Date 3.23.96 Checked By: ACR Date 3-22-96
6	

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REV 6 Prepared By: Date 3.22.96 Checked By: ACR Date 3-22-96

R6

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IR6

THIS PAGE ADDED BY REV. 3

REV	
6	ORIGINATOR SSH DATE 4/11/96 CHECKER ACR DATE 4.15.96

REV	
3	Prepared By ACR Date 10-6-95 Checked By WP Date 10-10-95

1.0 PURPOSE:

Purpose of this calculation is to qualify existing cable tray and conduit supports by A46 program. Field walkdown for A46 program was performed for all cable tray and conduit supports located in Reactor Building unit 3 ~~(except Drywell)~~, Control Bay Area for all three units, unit 3 Diesel Generator building, Standby Gas Treatment Building, Cable Tunnel and Pump House. ~~The A46 program review for drywell shall be done under a seperate DCN.~~ Outliers were identified as per GIP walkdown procedure. Few Analytical samples were selected in the field based on major different types of raceway support configurations in the plant and most heavily loaded support for each configuration. *Revision 1 to this calculation provides evaluations for FDCNs F31259A, F31672A, F31658A, & F31869A.* R3 R.
The purpose of the calculations is not to estimate actual seismic response and system performance during an earthquake. Rather, the purpose of the calculations is to show that cable tray and conduit supports are at least as rugged as those that performed well as evidenced by past experience.

2.0 ASSUMPTIONS:

No unverified assumptions made in this calculation. Any assumption made are within the GIP guideline or design criteria BFN-50-C-7104.

REV.	
1	Prepared By CAK Date 8/30/94 Checked By RLK Date 8-30-94

3.0 REFERENCES:

1) Generic Implementation Procedure (GIP) for seismic verification of nuclear plant equipment by SQUG.

2) AISC Steel Construction Manual 8th Edition.

3) EPRI Report NP-7151, "Cable Tray and Conduit System seismic evaluation guidelines," EPRI, March 1991.

4) EPRI Report NP-5228, Revision 1, "Seismic Verification of Nuclear Plant Equipment Anchorage," EPRI, June 1991.

5) EPRI Report NP-7150, "The Performance of Raceway Systems in Strong Motion Earthquakes," EPRI, March 1991.

6) EPRI Report NP-7152, "Seismic Evaluation of Rod Hanger Supports for Electrical Raceway Systems," EPRI, March 1991.

7) P-W Industries catalog for cable tray system.

8) NEMA Standard VE 1-1984, "Metallic Cable Tray Systems"

9) BFN MARS Report

10) Civil Design Standard DS-C1.7.1

11) Design of Welded Structures by Blodgett

12) UNISTRUT - Nuclear Power Engineering Catalog

13) DCN W22555A

14) Work Request No.C314988, C069712 & C165048 | R3

15) Design Criteria BFN-50-C-7104

16) Work Request # C165050 & # C030297

17) TVA calc. # CD-Q0000-940339 - calculation of basic parameters for A-46 and individual plant examination of external events (IPEEE) seismic program. | R3

18) TVA calc. # CD-Q0999-940356- Concrete Anchors for USI-A46 and IPEEE review.

REPLACED
THIS PAGE ~~ADDED~~ BY REV. 3

DESIGN INPUT DATA:

1. CABLE TRAY WEIGHT INCLUDING 4" OF CABLE AND FLAMASTIC FILL EQUALS 25 PSF.

2. CABLE TRAY: STANDARD LADDER TYPE, SYSTEM NO. 1402, RUNGS SPACED AT 6".

3. STRUCTURAL STEEL MAT'L = A36 UNLESS OTHERWISE NOTED.

4. WELDING ELECTRODE = E70XX.

5. CONCRETE f'c = 3000 PSI.

6. GIP BOUNDING SPECTRUM VS SSE GROUND RESPONSE SPECTRUM ANCHORED TO 0.2g AT 5% DAMPING. SINCE BOUNDING SPECTRUM COMPLETELY ENVELOPES SITE SPECTRUM, THE FINDINGS OF EXPERIENCE DATABASE ARE VALID FOR THIS SITE (REFER SHEET 11.2).

7. REACTOR BUILDING SEISMIC RESPONSE SPECTRA FROM MARS REPORT (REF. 9), SUPERIMPOSED ON ROD FATIGUE BOUNDING SPECTRA ANCHORED TO 0.33g, 0.50g, & 0.75g. THIS INFORMATION WILL BE USED FOR ROD FATIGUE EVALUATION (REFER SHEET 13).

8. DIESEL GENERATOR BUILDING SEISMIC RESPONSE SPECTRA FROM MARS REPORT (REF. 9) SUPERIMPOSED ON ROD FATIGUE BOUNDING SPECTRA ANCHORED TO 0.33g, 0.50g, & 0.75g. THIS INFORMATION WILL BE USED FOR ROD FATIGUE EVALUATION (REFER SHEET 12).

9. STRENGTH GAIN OF CONCRETE DUE TO AGING (FROM 3000 PSI TO 3600 PSI) MAY BE CONSIDERED (REF. 10).

10. ANCHORAGE TYPE:

    THE PROMINENT ANCHORAGE TYPE USED FOR THIS PLANT HAS BEEN SELF DRILLING EXPANSION ANCHORS (SSD'S). OTHER TYPES SUCH AS WEDGE BOLTS AND UNDERCUT ANCHORS, WHICH HAVE HIGHER STRENGTHS THAN SSD'S HAVE ALSO BEEN USED. IT IS POSSIBLE, PARTICULARLY IN EARLIER STAGES OF CONSTRUCTION (LATE 60'S AND EARLY 70'S), THAT LEAD CINCH ANCHORS MIGHT HAVE BEEN USED IN SOME PLACES. LEAD ANCHORS PER GIP ARE OUTLIERS AND THEIR ALLOWABLE PULLOUT AND SHEAR VALUES PER REF. 10 ARE LESS THAN THOSE OF SSD'S. HOWEVER GIP DOES NOT REQUIRE THE REMOVAL OF EACH AND EVERY BOLT TO VERIFY THE ANCHOR TYPE AND THEREFORE

REPLACED
THIS PAGE ~~ADDED~~ BY REV. 3

DESIGN INPUT DATA (CON'T):

IN CASES, WHERE THE TYPE OF ANCHOR IS NOT KNOWN, THE ANCHORS WILL BE ASSUMED TO BE SSD'S. NO SIGNIFICANT DEGRADATION OF THE FUNCTIONALITY OF THE SUPPORT IS LIKELY, IF, INFREQUENTLY AND UNKNOWN TO THE ENGINEER, AN INSTALLED LEAD ANCHOR IS EVALUATED USING SSD ALLOWABLES. THE JUSTIFICATION FOR THIS CONCLUSION IS DOCUMENTED IN TVA CALC. AT REF. 18.

IF THE TYPE OF ANCHOR IS KNOWN OR DETERMINED TO BE A LEAD ANCHOR, THE SUPPORT SHALL BE TREATED AS AN OUTLIER AND EVALUATED ACCORDINGLY.

11. EXPANSION ANCHOR CAPACITIES: (Ref 1, Appendix C)

PULLOUT CAPACITY = GIP CAP. x (3600/4000)
= 0.9 x GIP

SHEAR CAPACITY = GIP CAP. x (.65+3000/10000)
= 0.95 x GIP

ANCHOR BOLT SIZE (IN)	PULLOUT CAPACITY (LBS)	SHEAR CAPACITY (LBS)
3/8	0.9 x 1460 = 1314	0.95 x 1420 = 1349
1/2	0.9 x 2290 = 2061	0.95 x 2380 = 2261
5/8	0.9 x 3170 = 2853	0.95 x 3790 = 3600
3/4	0.9 x 4690 = 4221	0.95 x 5480 = 5206

ALLOWABLES FOR SSD'S PER REF.10 ARE MORE CONSERVATIVE AS COMPARED TO THE VALUES CALCULATED ABOVE. IT IS THEREFORE ACCEPTABLE TO ALSO USE ALLOWABLES FOR SSD'S PER REF.10.

THIS PAGE ADDED BY REV. 3

OVERSPAN QUALIFICATION OF OUTLIER NUMBER:

21-03
21-08
21-12
21-13
21-15
21-17
21-26
22-15 R3
23-04
23-05
27-05 R3
29-02
35-01
35-02
39-01 R3
46-01
50-03

THIS PAGE REPLACED BY REV.3

CONDUIT OVERSPAN CALCULATION

SOME OF THE CONDUITS WERE FOUND TO HAVE SPANS MORE THAN MAXIMUM ALLOWED BY GIP. THOSE CASES HAVE BEEN NOTED AS OUTLIER. THIS CALCULATION. TRIES TO QUALIFY THE OVER SPAN CONDITION. BASED ON INDIVIDUAL CONDITION

PROB. NO	CONDUIT DIA.	ALLOWABLE SPAN (FT)	ACTUAL SPAN (FT)	REMARKS.
21-03	3/4"	10	13'-0"	S.S. - ACCEPTABLE
21-12	3/4.		7'	CANTILEVER - ACCEPTABLE
21-13	3/4"	5	6	CATILEVER - ACCEPTABLE
21-15	1"	12	18 FT.	SS - FAILS (COMPARED TO 46-01)
21-17	3"	20	25	S S - ACCEPTABLE
27-05	3/4"	10	13	S.S. ACCEPTABLE | R3.
23-04	1"	12	18'	S.S - FAILS (COMPARED TO 46-01)
23-05	1"	12	18	S.S - FAILS (")
29-02	2"	16	23'-10"	SS - FAILS
35-01	1"	12	15'	SS - ACCEPTABLE
35-02	1"	12	14'-9"	S.S - ACCEPTABLE
39-01	1 1/2	14	17'-6"	S.S - ACCEPTABLE
46-01	1"	12	17'	S.S - FAILS
50-03	3/4	10	13'-9"	S.S - FAILS

S.S - SIMPLY SUPPORTED.

REV	Prepared By ACR Date 10-6-95
3	Checked By [illegible] Date 10-10-95

LOAD CALCULATION:

DEAD LOAD

	STEEL.	AL
3/4" Φ COND WEIGHS -	1.4 #/FT.	0.7 #/FT
1" Φ COND WEIGHS =	2.2 #/FT	1.1 #/FT
1½" Φ COND WEIGHS -	3.6 #/FT	1.8 #/FT
2" Φ COND WEIGHS	5.1 #/FT	2.8 #/FT.
3" Φ COND WEIGHS.	12.8 #/FT	7.9 #/FT

3/4" Φ COND.

$A = 0.333 in^2$

$I = 0.037 in^4$

$S = 0.071 in^3$

$r = 0.334$ in

1" COND

$A = 0.494 in^2$

$I = 0.087 in^4$

$S = 0.133 in^3$

$r = 0.421$ in

1½" COND

$A = 0.799$

$I = 0.310 in^4$

$S = 0.326 in^3$

$r = 0.623$ in

2" Φ COND

$A = 1.07 in^2$

$I = 0.666 in^4$

$S = 0.561 in^3$

$r = 0.787$ in

3" Φ COND

$A = 2.231 in^2$

$I = 3.02 in^4$

$S = 1.72 in^3$

$r = 1.161$ in.

OUTLIER 35-01 & 35-02

LOCATED AT 617 SLAB OF CONTROL BAY

USE:

g_H @ 621 = 0.8683 x 2 = 1.74 (REF. J-E.W-5.7)

g_V @ 621 = 0.2556x2 = 0.51 (REF J-V-5.7)

DIAMETER OF ROD = 1"

SPAN = 15'-0"

WEIGHT = 2.2#/FT. (0.183 #/IN) FOR STEEL → STEEL GOVERNS
1.1#/FT FOR ALUMINIUM

S = 0.133

I = 0.087

MOMENT (VERT) = $\frac{2.2 \times 1.51 \times (15)^2}{8}$ = 93.43 FT.LBS

$f_{b_1} = \frac{M}{S} = \frac{93.43 \times 12}{0.133}$ = 8430 psi.

$\Delta_1 = \frac{5}{384} \times \frac{0.183 \times 1.51 \times (180)^4}{29 \times 10^6 \times 0.087} = 1.497"$

MOMENT. (HORZ) = $2.2 \times \frac{1.74 \times (15)^2}{8}$ = 107.66 FT LBS

$f_{b_2} = \frac{M}{S} = \frac{107.66 \times 12}{0.133}$ = 9713 psi

$\Delta_2 = \frac{5}{384} \times \frac{0.183 \times 1.74 \times (180)^4}{29 \times 10^6 \times .087}$ = 1.725 IN.

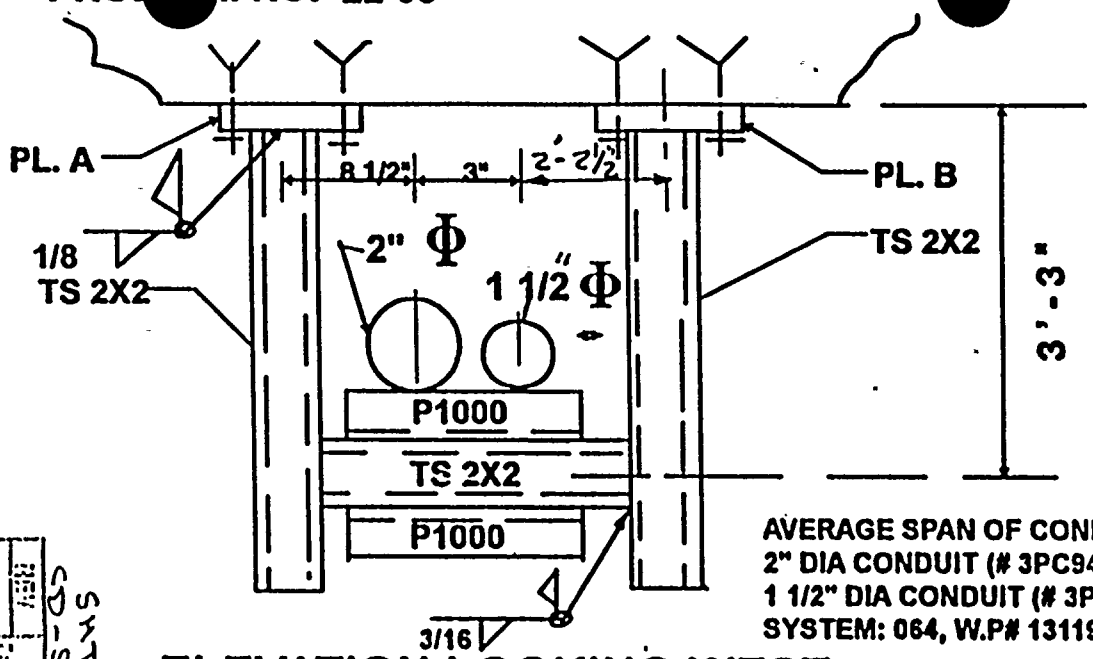
$f_b = \left[(f_{b_1})^2 + (f_{b_2})^2\right]^{1/2} = \left[(8430)^2 + (9713)^2\right]^{1/2}$ = 12861 < 14500 psi OK

$\Delta = (\Delta_1^2 + \Delta_2^2)^{1/2} = \left[(1.497)^2 + (1.725)^2\right]^{1/2}$ = 2.284" (L/79)

Δ FOR D.L. ONLY = $\frac{1.497}{1.51}$ = 0.991" (L/181) < $\frac{L}{120}$ O.K.

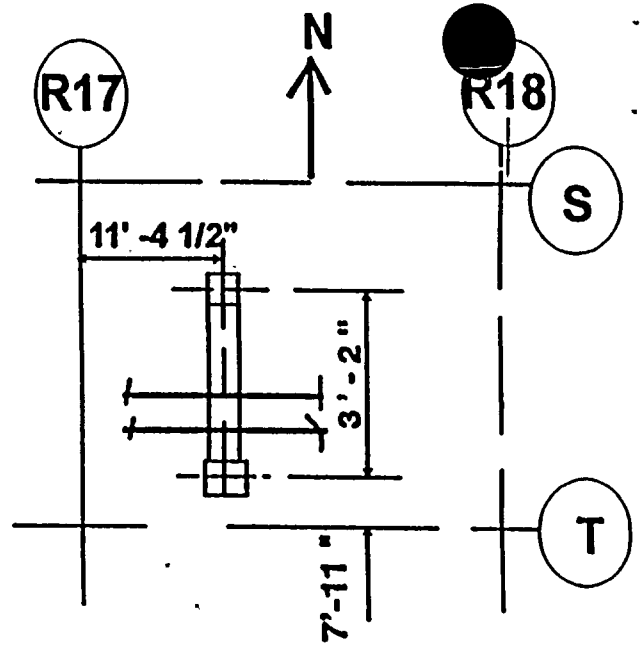
PROBLEM NO 22-03

PROBLEM NO. 22-03 AREA NO. 22



AVERAGE SPAN OF CONDUIT = 12'-6"
2" DIA CONDUIT (# 3PC944-J)
1 1/2" DIA CONDUIT (# 3PC931-J)
SYSTEM: 064, W.P# 13119

ELEVATION LOOKING WEST



PLAN

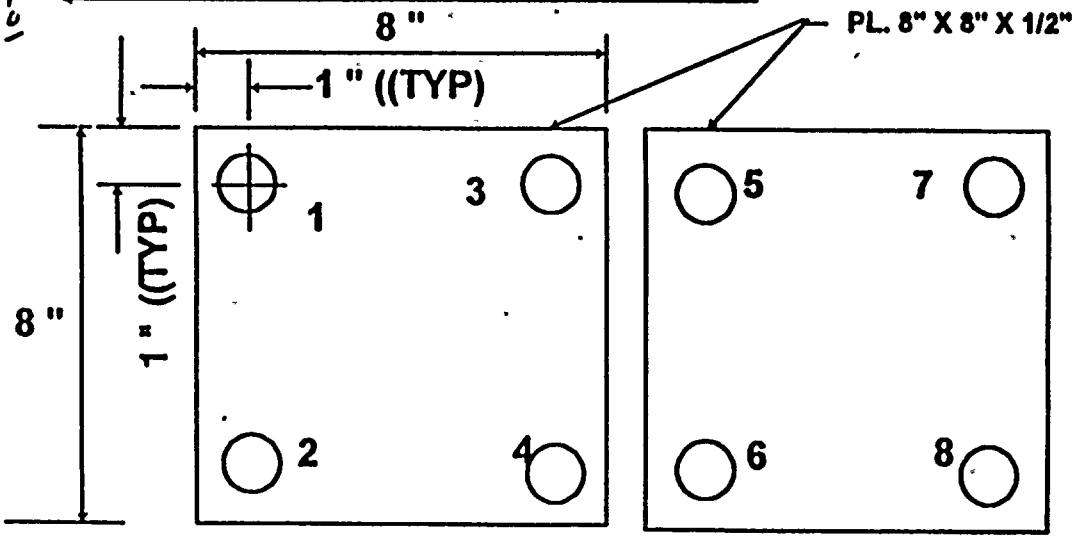


PLATE A PLATE B

ALL BOLTS ARE 1/2" Φ W.B.

BOLT DETAIL	
BOLT NO	DESCRIPTION
1	NUT FLUSH WITH END OF BOLT
2	PROJ. OF 5/8" FROM NUT AND 1 3/8" FROM PLATE
3	BOLT HANGING LOOSE
4	5 RECT. WASHER AND 1 ROUND WASHER. TOTAL PROJ. 3 1/4" FROM PLATE SURFACE. LOOSE NUT.
5	O.K
6	PROJ. OF 1 5/8" FROM PLATE AND 5/8" FROM NUT. HAS 3 WASHERS.
7	O.K
8	PROJ OF 1 1/8" FROM PLATE AND 1/2" FROM NUT

PREPARED BY

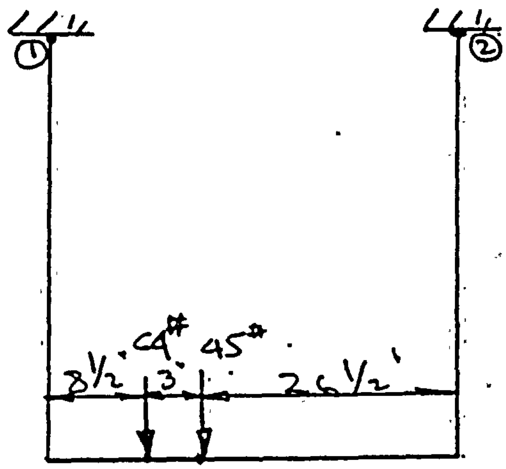
REVIEWED BY

PROB. No 22-03

DEAD WEIGHT CALCULATION.

2" Φ COND, SPAN 12'-6" = 5.1×12.5 = 64#.

1½" Φ COND, SPAN 12'-6" = 3.6×12.5 = 45#.



REACTION

@ JT.① = 64×29.5/38 + 45×26.5/38
= 50 + 32
= 82#.

@ JT ② = (64+45) − 82
= 27#

SELF WT.: T.S 2×2 — WT 5.41×11' = 60#.
Ploo0 — WT. 1.9×5' = 10#
PL. ½"×8"×8" — WT. 13.6×8/12×2 = 18#.
TOTAL 88#.

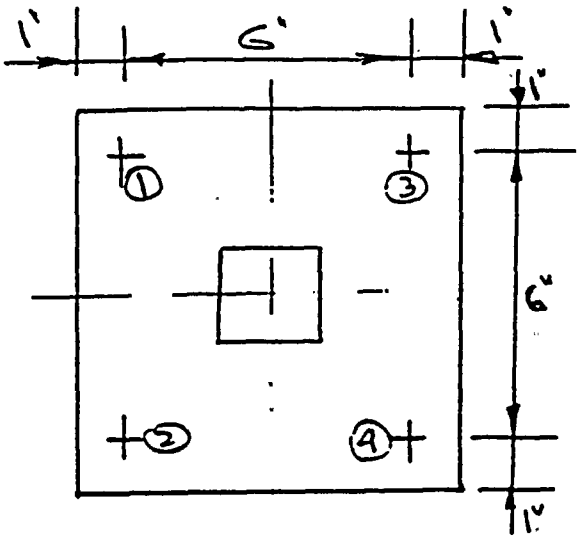
SELF WT AT EACH JOINT = 88/2 = 44#.

∴ LOAD AT JT.① 82+44 = 126#.
" " JT. ② 27+44 = 71#.

PROB NO 22-03

SO FOR 3 TIMES DEAD LOAD

LOAD AT ST.1 = 126 x 3 = 378 #



BOLT 3 IS HANGING LOOSE AND IS NOT CONSIDERED FOR ANALYSIS PURPOSES

BOLT 4 IS PROJECTING OUT 3¼" AND NUT IS LOOSE, SO BOLT IS NOT CONSIDERED FOR ANALYSIS PURPOSES.

$F_Y = 378$

$M_z = 378 \times 3 = 1134^{\#in}$

$$\text{TENSION/BOLT} = \frac{378}{2} + \frac{1134}{2 \times 1.5} = 567^{\#}$$

CAPACITY OF ½" Φ WEDGE BOLT. (REF. GIP PG C.2-2)

PULLOUT CAPACITY = 2290#

SHEAR CAPACITY = 2380#

REDUCTION FACTOR FOR CONCRETE STRENGTH = 0.75

$$\therefore \text{BOLT INTERACTION} = \frac{567}{2290 \times 0.75} = 0.33$$

PROB NO 22-03.

PLATE STRESS.

$S = \frac{1}{6} \times b t^2 = \frac{1}{6} \times 8 \times (\frac{1}{2})^2 = 0.333 \text{ in}^3$

$M = 1134 \text{ \#in}$

$f_b = \frac{M}{S} = \frac{1134}{0.333} = 3402 \text{ PSI} < 27 \text{ KSI OK.}$

SO SUPPORT IS ACCEPTABLE IN AS IS CONDITION.

BROWNS FERRY UNIT 3
OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

PROBLEM NO. 22-03

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

BUILDING REACTOR AREA NO. 22

ROOM OR ROW/COLUMN R17-R18/ S-T FLOOR EL. 593

ITEM (CIRCLE ONE) CABLE TRAY (CONDUIT)

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.)

Cable and Conduit Raceways

Inclusion Rules ____
Other Seismic Performance Concerns X
Limited Analytical Review ____
Other ____

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 to be verified for seismic adequacy):

Conduit support vertical member TS 2X2 attached to base plate at ceiling. Out of the four bolts on South side base plate, one bolt is hanging loose and another bolt's nut is loose. See attached sketch and photos for detail.
Three adjacent supports have problems for anchor embedments. Support sketch shown is for the worst case.

3. METHOD OF OUTLIER RESOLUTION (OPTIONAL)

SEE CALCULATION CD-Q0000-931227 FOR RESOLUTION. NO MODIFICATION INVOLVED. NO FURTHER ACTION REQUIRED.

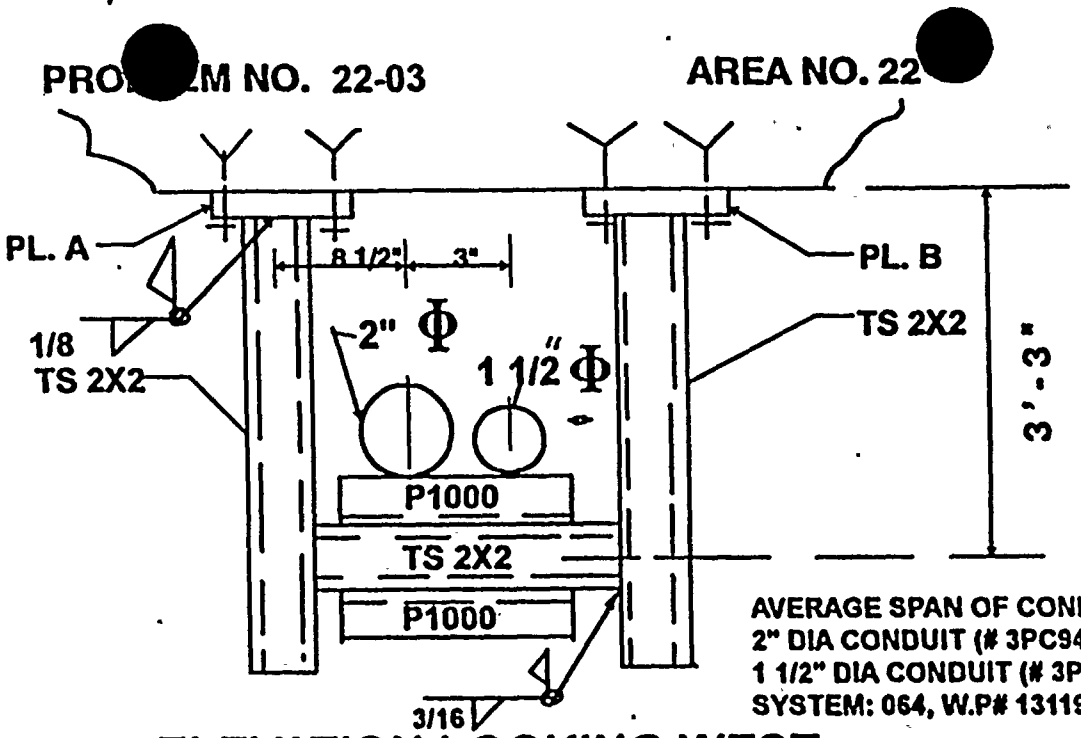
4. CERTIFICATION:
The information on this OSVS is, to the best of our knowledge and belief, correct and accurate, and resolution of the outlier issues listed on this page will satisfy the requirements for this item to be verified for seismic adequacy:

Approved by:

PRINT OR TYPE NAME	SIGNATURE	DATE
PARTHA S. GHOSAL	P. S. Ghosal	12-10-93
ANAND RELWANI	Anand C. Relwani	12-10-93

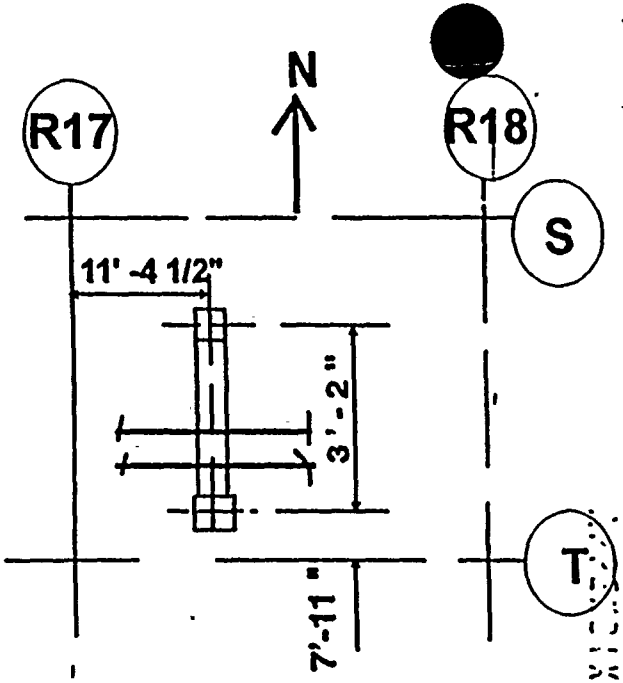
PRO[illegible]M NO. 22-03

AREA NO. 22



AVERAGE SPAN OF CONDUIT = 12'-6"
2" DIA CONDUIT (# 3PC944-[illegible])
1 1/2" DIA CONDUIT (# 3PC931-[illegible])
SYSTEM: 064, W.P# 13119

ELEVATION LOOKING WEST



PLAN

SHEET A69

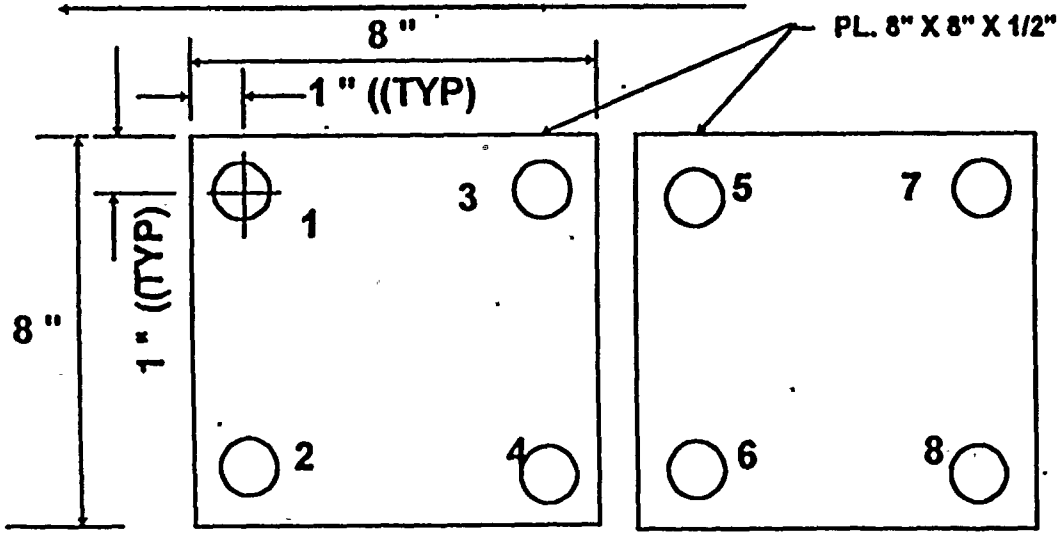


PLATE A

PLATE B

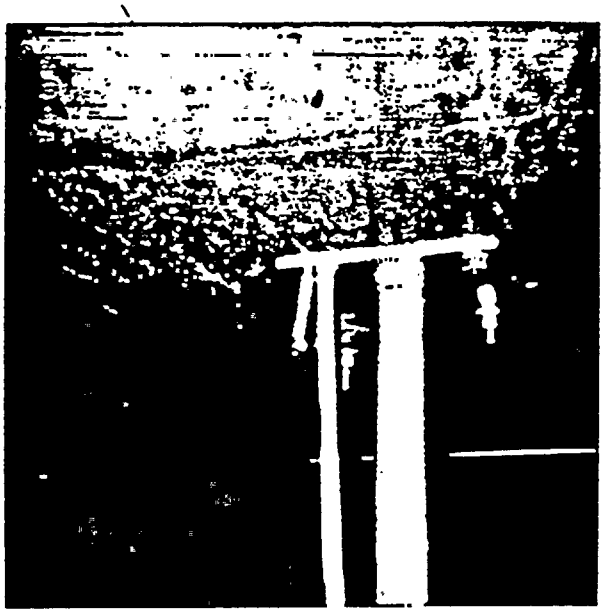
PREPARED BY

REVIEWED BY

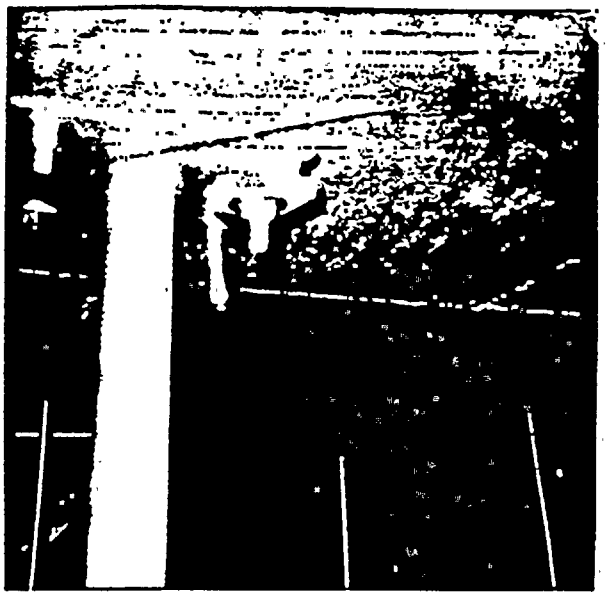
BOLT DETAIL

BOLT NO	DESCRIPTION
1	NUT FLUSH WITH END OF BOLT
2	PROJ. OF 5/8" FROM NUT AND 1 3/8" FROM PLATE
3	BOLT HANGING LOOSE
4	5 RECT. WASHER AND 1 ROUND WASHER. TOTAL PROJ. 3 1/4" FROM PLATE SURFACE. LOOSE NUT.
5	O.K
6	PROJ. OF 1 5/8" FROM PLATE AND 5/8" FROM NUT. HAS 3 WASHERS.
7	O.K
8	PROJ OF 1 1/8" FROM PLATE AND 1/2" FROM NUT

CD0000-931227

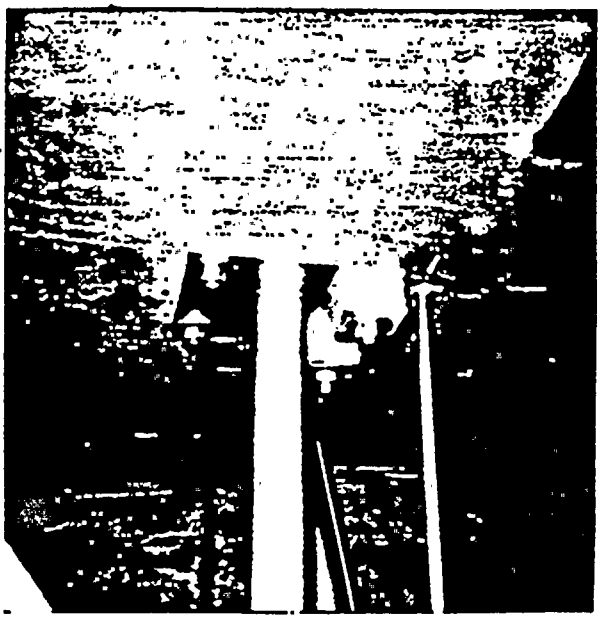


(3)A LKG EAST
SOUTH PLATE



(3A) LKG NORTH
-SOUTH PLATE

(3B) LKG WEST - SOUTH PL



(3C) LKG, North

22-03.

BROWNS FERRY UNIT 3
OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

SHEET A149
APPENDIX A

CD0000-931227

PROBLEM NO. 35-01

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

BUILDING CONTROL BAY AREA NO. 35

ROOM OR ROW/COLUMN SPREADING ROOM FLOOR EL. 606

ITEM (CIRCLE ONE) CABLE TRAY (CONDUIT)

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.)

Cable and Conduit Raceways

Inclusion Rules X
Other Seismic Performance Concerns ____
Limited Analytical Review ____
Other ____

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 to be verified for seismic adequacy):

1" Diameter conduit (R435) running vertically by face of R21 wall, has a span of 15'-0" (against allowable of 12'-0"). Also a 2" diameter conduit by its side (MRA 792889) has a span of 15'-0" (against allowable of 14'-0").

3. METHOD OF OUTLIER RESOLUTION (OPTIONAL)

This support qualified by calculation CD-Q3999-890678. For conduit qualification see calc. CD-Q0000-931227. Over span acceptable.

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 this page will satisfy the requirements for this item to be verified for seismic adequacy:

Approved by:

PRINT OR TYPE NAME	SIGNATURE	DATE
ANAND C. RELWANI	Anand C. Relwani	12-10-93.
PARTHA S. GHOSAL	P. S. Ghosal	12-10-93

TVA 10697 (DNE-6-86) **DNE CALCULATIONS** SHEET 1 OF 7 **QA Record**

TITLE SEISMIC QUALIFICATION OF CONDUIT AND SUPPORTS		PLANT/UNIT BFN/3	
PREPARING ORGANIZATION BFEPC8	KEY NOUNS (Consult RIMS DESCRIPTORS LIST) CONDUIT SUPPORTS		
BRANCH/PROJECT IDENTIFIERS 31850D ~~BFEPC803223~~ CD-Q3999-890678	Each time these calculations are issued, preparers must ensure that the original (RO) RIMS accession number is filled in.		
	Rev	(for RIMS' use)	RIMS accession number
	R0	860804B0037	B22 '860729 112
APPLICABLE DESIGN DOCUMENT(S) BFN-50-723 RO	R1	861218E0036	(9) B22 '861126 151
	R2	870223C0020	(9) B22 '870219 106
SAR SECTION(S) / UNID SYSTEM(S)	R3	890620F0039	(12) BC4 '89 0614 227

Revision 0	R1	R2	R3
ECN No. (or indicate Not Applicable) P0864	P0864	P0864	P0864
Prepared Ralph Kegg	S. Ejantkar	M. Doctor	B.R. Sanders
Checked Jeffery L. Campbell	M. Doctor	S. Brunetto	C.P. Jones
Reviewed R. D. Cutsinger	R.D. Cutsinger	R.D. Cutsinger	A.L. Reuscher for JHR
Approved J. Bratton	J. Bratton	J. Bratton	M.K. Perry for JRR
Date 7-28-86	11-26-86	2-19-87	6/12/89
List all pages added by this revision.			i, iii & 2a
List all pages deleted by this revision.			NA
List all pages changed by this revision.	2, 3	3	i, 1a, 3

(Use form TVA 10534 if more space required.)

Safety-related? Yes ☑ No ☐

Statement of Problem

EVALUATION OF A CONDUIT AND/OR CONDUIT SUPPORT RESULTING FROM A DISCREPANCY DISCOVERED BY FIELD INSPECTION.

ORIGINAL

Abstract

These calculations contain an unverified assumption(s) that must be verified later. Yes ☒ No ☒ BRS 5-11-89 ~~P1115 & P1117 clamp capacity~~ | R3

THE FOLLOWING CALCULATIONS DESIGN/DETAIL CONDUIT SUPPORT 48B810-167 . A DRAWING WITH THE SAME DESIGNATION WILL BE ISSUED CONCURRENTLY WITH THIS CALCULATION. THIS ISSUE CORRECTS DISCREPANCY NO. 27-002 DISCOVERED DURING A FIELD INSPECTION.

REMOVED UNVERIFIED ASSUMPTION, SEE SHEET 2a | R3

☐ Microfilm and store calculations in RIMS Service Center.
☒ Microfilm and return calculations to: 31850D ~~R.D. CUTSINGER~~

CALCULATION LIBRARY EDB F3 BFN

Microfilm and destroy. ☐
Address: ~~BFN, ENGR TRAILER COMPLEX, TRLR-#4~~

cc: RIMS, SL 26 C-K

SHEET: i

TVA

Title: CONDUIT SUPPORT 48B810-167

REVISION LO
CD-Q3999-89067
~~BFEPC8 0333~~
CPJ 5-12-89

Revision No.	DESCRIPTION OF REVISION	Date Approv
1	Incorporated FCR 86-631R0	11-26-86
2	INCORPORATED FCR 87-113R0	2-19-8
3	REMOVED UNVERIFIED ASSUMPTION, SEE SHEET 2a	6-12-8

TVA 10534 (EN DES-4-78)

CALCULATION DESIGN VERIFICATION (INDEPENDENT REVIEW) FORM

CDQ3999890678 — Calculation No.

R3 — Revision

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

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

Justification (explain below):

Method 1: In the design review method, justify the technical adequacy of the calculation and explain how the adequacy was verified (calculation is similar to another, based on accepted handbook methods, appropriate sensitivity studies included for confidence, etc.).

Method 2: In the alternate calculation method, identify the pages where the alternate calculation has been included in the calculation package and explain why this method is adequate.

Method 3: In the qualification test method, identify the QA documented source(s) where testing adequately demonstrates the adequacy of this calculation and explain.

The subject calculation at the revision level noted above has been found to be technically adequate in that computations, judgements, assumptions, and logic are in accordance with generally accepted methods.

This review is limited to information which is germane to the removal of the unverified assumption regarding the capacity of P1100 series conduit clamps.

Charles Paul Gonia — Design Verifier (Independent Reviewer)

5-12-89 — Date

CONDUIT SUPPORT
RESOLUTION OF UVA (CDQ3999890678) PROJ: BFN / UNIT 3

COMPUTED BRS DATE 5-11-89
CHECKED CPJ DATE 5-12-89

TABLE OF CONTENTS

CONDUIT SUPPORT DWG. 48B810-167 BFN/UNIT 3

CALC. ID BFEPC80323
DISCREPANCY NO.: 27-002

COMPUTED REK DATE 6-12-8
CHECKED JLC DATE 6-19-8

Purpose: Design Support for [(1) 2"ϕ AL, (1) 1½"ϕ AL, (1) 1"ϕ AL] Conduit Lines

Assumptions;
SSE Conditions
~~Conduit Clamp is Adequate BRS 5.11-89~~
~~Per Dynamic Load Test Done at Wyle Lab.~~ ~~P1113, P1115 & P1117 CLAMPS~~ R3
E70 XX Electrodes
SEE SHEET 2a
CPJ 5-12-89

References:
BFN-50-723
AISC Manual 8th Edition
Unistrut Cat. 10R
Blodgett 'Design of Welded Structures'
DS-C1.6.9 (TABLE 1C)
CEB 840124007

R3
CPB 5-12-89

Conclusion:
Calculations Show This Support To Be Adequate
And Meets All Criteria

2219A

(WM-7 75)

CONDUIT SUPPORT

DWG 42B810-167

CALC ID BFEPC20323

DYCR. 27-002

BFN UNIT 3

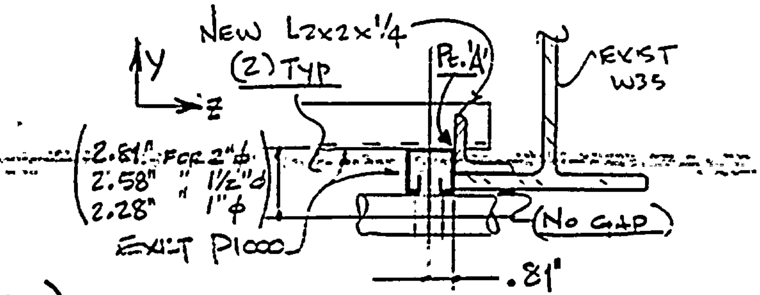
COMPUTED Rek DATE 6-12-86

CHECKED JLC DATE 6-19-86

CONDUIT SUPPORT FOR

- (1) 2"ϕ ALUM. CONDUIT, 16 ft SPAN, 2-WAY
- (1) 1½"ϕ " ", 10 ft SPAN, 3-WAY
- (1) 1"ϕ " ", 19 ft SPAN, 3-WAY (19 ft IS MAX SPAN 1"ϕ)

SUPPORT GEOMETRY:



SEE LOADS: (REF BFN-50-723)

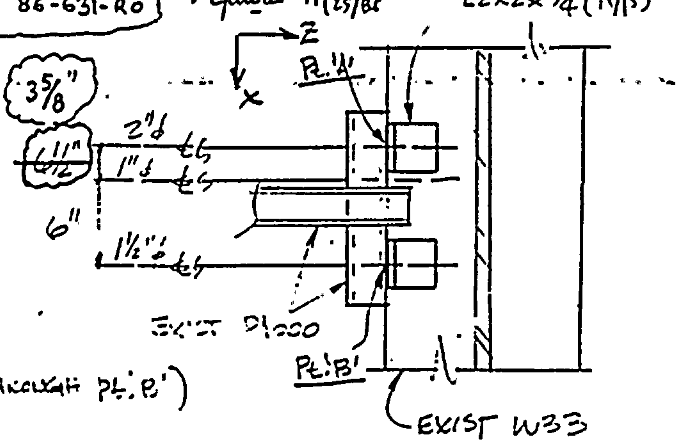
2"ϕ	1½"ϕ	1"ϕ
$F_x = 93^{\#}$	$F_x = 16^{\#}$	$F_x = 35^{\#}$
$F_y = 65^{\#}$	$F_y = 25^{\#}$	$F_y = 31^{\#}$
$F_z = 22^{\#}$	$F_z = 9^{\#}$	$F_z = 10^{\#}$
(TABLE A2-2B-1)	(TABLE A2-1B-4)	(TABLE A2-1B-3)

STIFFNESS: — SUPPORT STIFFNESS IS RIGID BY ENGINEERING JUDGEMENT AND MEETS STIFFNESS CRITERIA

AS PER FCR 86-631-R0 (M. Doston 11/25/86, S. Ejaunu 11/25/86)

LOADS @ PL. 'A'

— THERE WILL BE NO M_z OR M_y FROM THE 2"ϕ OR 1½"ϕ. M_z & M_y FROM 1"ϕ WILL BE VERY SMALL BY ENGINEERING JUDGEMENT.



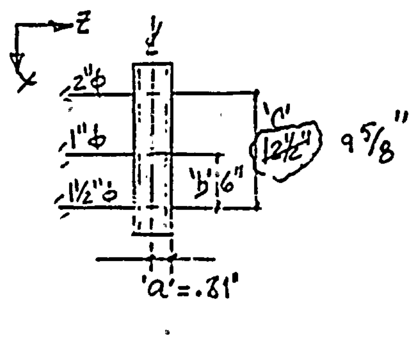
$F_x = 93^{\#} + 35^{\#} = 128^{\#}$ (F (1½"ϕ) TRANSFERS THROUGH PL.'B')

$F_y = 65^{\#} + 31^{\#} = 96^{\#}$ "

$F_z = 22 + 10^{\#} = 32^{\#}$ "

$M_x = a\left(F_{y_{2"\phi}} + \frac{b}{c} F_{y_{1"\phi}}\right)$

~~$= .81"\left(65^{\#} + \frac{6}{12.5}(31^{\#})\right) = 65^{"\#}$~~



$M_x = .81\left(65 + \frac{6}{9.625} \times 31\right) = 68 \text{ IN \#}$

CONDUIT SUPPORT — SHEET 2a OF 7

RESOLUTION OF UVA — BFN/UNIT 3

CDQ3999890678 (BFPC80323)

COMPUTED BRS DATE 5/11/8[illegible]

CHECKED CPJ DATE 5-12-89

1" φ AL — P1113 CLAMP

TABLE A2-1B-3	CEB840124007
F_x = 35 = LAT	F_1 = 225
F_y = 31 = VERT	F_2 = 958
F_z = 10 = AXIAL	F_3 = 208

$$\frac{35}{225} + \frac{31}{958} + \frac{10}{208} = .24 < 1.0$$

∴ P1113 CLAMPS ARE ADEQUATE

1½" φ AL — P1115 CLAMP

TABLE A2-1B-4	DS-C1.6.9 (TABLE 1C)
F_x = 16 = LAT	F_1 = 285
F_y = 25 = VERT	F_2 = 1240
F_z = 9 = AXIAL	F_3 = 83

$$16/285 + 25/1240 + 9/83 = .18 < 1.0$$

∴ P1115 CLAMPS ARE ADEQUA[TE]

2" φ AL — P1117 CLAMP

TABLE A2-2B-1	DS-C1.6.9 (TABLE 1C)
F_x = 93 = LAT	F_1 = 380
F_y = 65 = VERT	F_2 = 1660
F_z = 22 = AXIAL	F_3 = 200

$$93/380 + 65/1660 + 22/200 = .39 < 1.0$$

∴ P1117 CLAMPS ARE ADEQUA[TE]

TS 110.30 (WM-7-75)

CONDUIT SUPPORT — SHEET 3 OF 7

DWG 48B810-167 — BFN UNIT 3

CALC ID BFEPC60323

DISCR, 27-002 — COMPUTED REK DATE 6-12-86

CHECKED JLC DATE 6-19-86

— P1000 — CONSIDERING THE SMALL LOADS AND SHORT LENGTH OF P1000, THE P1000 IS ADEQUATE BY ENGINEERING JUDGEMENT. USE P1000.

MJD 2/12/87 JAS 2/12/87 △ "Existing" Unistrut Described in PG 6 & 7 will be replaced with New Material per FCR 87-013 R0, because existing is Damaged. DEWG 48B810-530 will detail Removal.

— L2x2x1/4 — CONSIDERING THE SMALL LOADS, THE L2x2x1/4" IS ADEQUATE BY ENGINEERING JUDGEMENT. USE L2x2x1/4.

— 2"ϕ P1117 CLAMP, 1 1/2"ϕ P1115 CLAMP, 1"ϕ P1113 CLAMP — ~~ASSUMED ADEQUATE, SUBJECT TO VERIFICATION OF WYLE LABS TESTING~~, SEE SHEET 2a. BRS 5-11-89

USE P1113, P1115 & P1117 CLAMPS. — R3 CPJ 5-12-

NOTE: — FCR - 86-631 - R0

LOAD AT PT. A

$$f_w = \left[\left(\frac{32}{3.75} + \frac{68}{.177}\right)^2 + \left(\frac{96}{.75}\right)^2 + \left(\frac{128}{3}\right)^2\right]^{1/2} = 415 \ \#/in$$

$$\frac{415}{0.4 \times 33000} = 0.032 < 1/8" \therefore \text{ WELD IS O.K.}$$

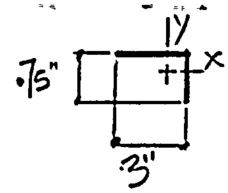
FCR - 86-631 - R0 IS ACCEPTABLE

M Docton 11/25/86 S. Ejankan 11/25/86

— WELDS

(1) WELD P1000 TO L2x2x1/4

WELD PATTERN:



A = 3.75
S_x = .177

~~USE LOADS AT PT 'A' (SEE SH. 2)~~

~~$$f_w = \left[\left(\frac{32}{3.75} + \frac{65}{.177}\right)^2 + \left(\frac{96}{.75}\right)^2 + \left(\frac{128}{3}\right)^2\right]^{1/2} = 399 \ \#/in$$~~

~~$$\frac{399}{(.4)(33000 \text{ psi})} = .03" < 1/8"$$, USE 1/8" FILLET WELD.~~

(2) WELD L2x2x1/4 TO EXIST W33 FLANGE: ADEQUATE BY COMPARISON TO THE WELD CALC ABOVE. USE 1/4" FILLET WELD (MIN AISC)

— THIS SUPPORT IS ADEQUATE & MEETS ALL CRITERIA.

TVA 11030 (WM-7-75)

FORM 6.3

DISCREPANCY RESOLUTION

SHEET SHT OF 1 of 1
BFN UNIT ___ SYS ___
BFEPC8 ___
DESIGN ___ DATE ___
CKD ___ DATE ___

DISCREPANCY NO. 27-002

LOCATION Vol 27 - U3 Cable spreading Rm El 606

SEISMIC INTEGRITY EVALUATION CATEGORY 4

DESCRIPTION OF DISCREPANCY:

2"Ø Conduit ES3875-I has an overspan condition, and a support that is not adequate to carry conduit loads.

SHEET 4 OF 7
BFN UNIT 3 SYS 27
BFEPC8 0323
DESIGN REK DATE 6-12-86
CKD JLC DATE 6-19-86

INFORMATION ONLY

RECOMMENDED ACTION:

Add support and modify existing support as detailed on attached shts.

Rev. 1 SEE SHT. #4 FOR MODIFICATION.

H.L. Thompson 6-9-86
H.B. Patel 6-09-86.

DESIGNER H. L. Peterson

CHECKER R.H. Radloff

OE COORDINATOR

SHEET 5 OF 7 SHEET 4 OF 4

CONDUIT SUPPORT

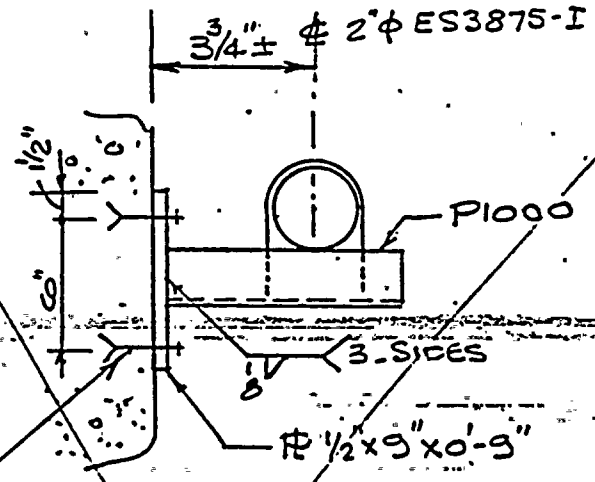
BFN UNIT 3 SYS 27

BFEPC8 0323

DESIGN RK DATE 6-12-86 COMPUTED BK DATE 1-29-86

CKD JLC DATE 6-19-86 CHECKED HLP DATE 2-7-86

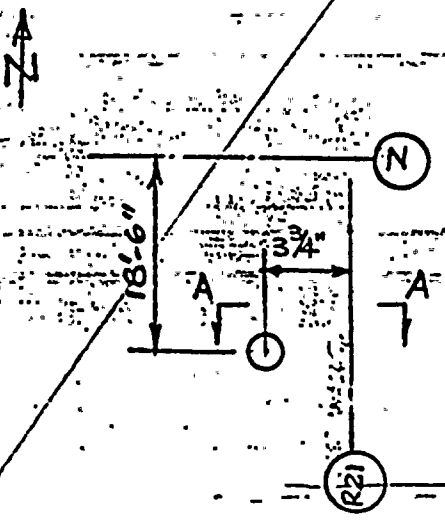
ES 3875-I
(ALUMINUM)



SECTION A-A @ EL. 611'-4"

NO LONGER REQ'D
SEE SHT 4/4 FOR
MODIFICATION TO EXIST.
SUPPORT.

1 MLJ 6-9-86
H.B. Palet 6-09-86.



LOCATION PLAN

INFORMATION ONLY

VA 11030 (WM-7-75)

CONDUIT SUPPORT

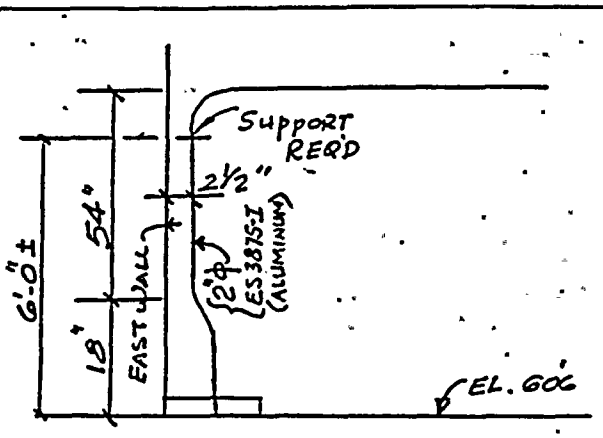
SHEET 6 OF 7 SHEET 3 OF 4

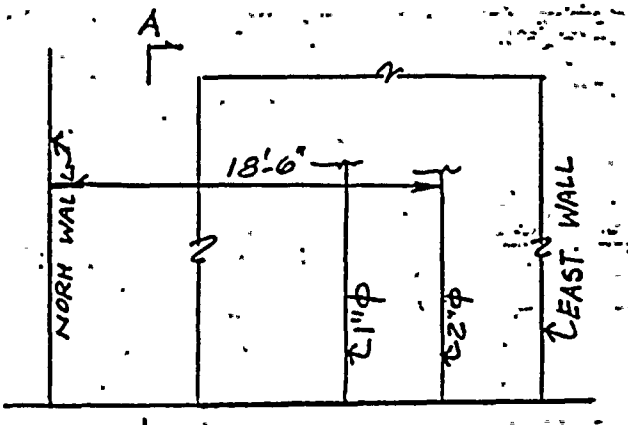
BFN UNIT 3 SYS 27 BFNP --- UNIT 2

ES3875-I BFEPC8 0323

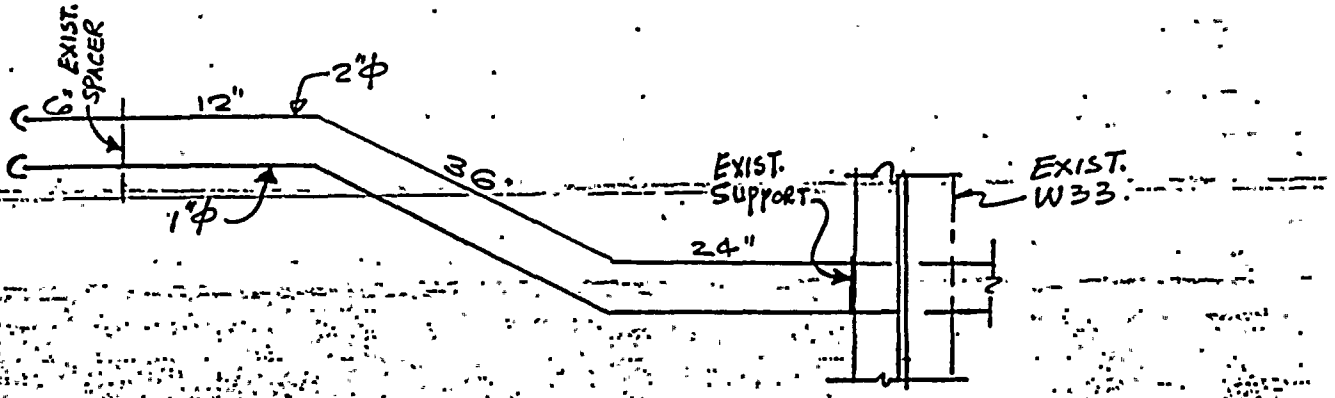
DN 27-00 DESIGN REK DATE 6-12-86 COMPUTED BK DATE 1-15-86

CKD JLC DATE 6-19-86 CHECKED HLP DATE 2-7-86



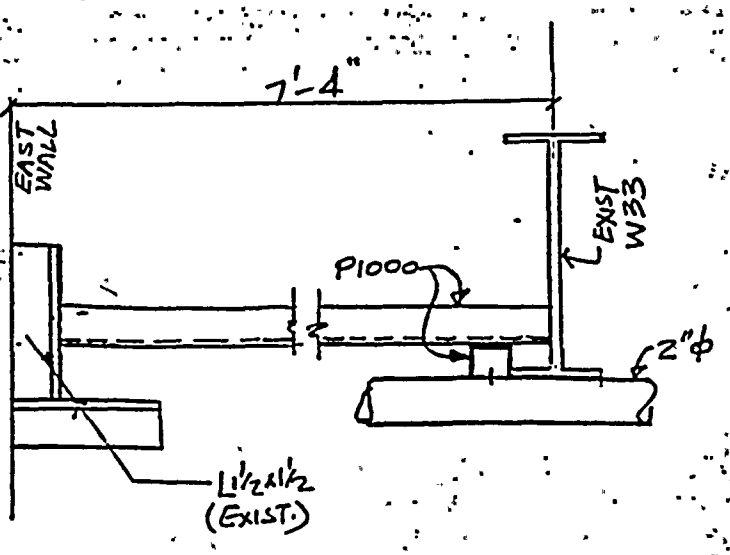


SECTION A-A
(LKG. SOUTH)



PLAN

INFORMATION ONLY



SECTION AT SUPPORT
(LKG. SOUTH)

TVA 11030 (WM-7-75)

SHEET 1 OF 1 SHEET 4 - OF 4

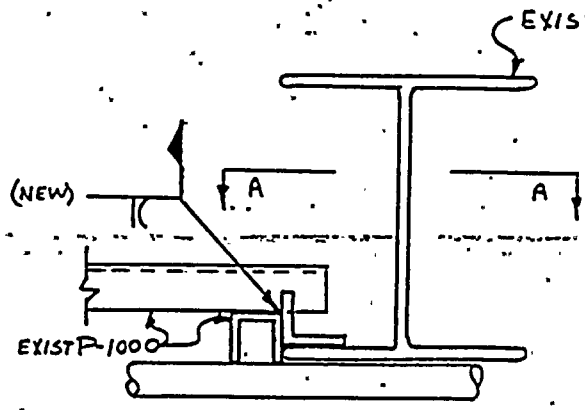
BFN UNIT 3 SYS 27

DISC 27-002

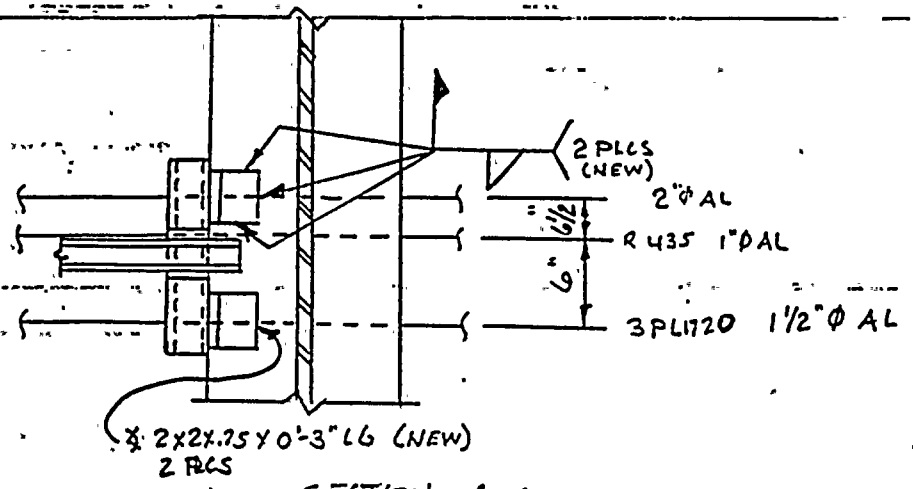
BEEPC8 0323

DESIGN RCK DATE 6-12-86 COMPUTED MRS DATE 6-9-86

CKD JLC DATE 6-19-86 CHECKED H. B. Pettit DATE 6-09-86



ELEV LKG SOUTH



SECTION A-A

DESIGN SPANS

2"ϕ AL 16' 3 DIRECTIONS

1"ϕ AL MAY. 3 DIRECTIONS

1 1/2"ϕ AL 10' SPAN 3 DIRECTIONS

INFORMATION ONLY

TVA 11030 (WM-7-75)

ATTACHMENT 10

SSEL LINE No. 1018
4I

Revision 2, Corrected, 6/28/91
Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 2 7

Equip. ID No. 2-FI-74-50 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description RHR/LOOP I FLOW INDICATOR

Location: Bldg. CB Floor El. 617 Room, Row/Col _____

Manufacturer, Model, Etc. (optional) _____

SEISMIC CAPACITY VS DEMAND

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

Does capacity exceed demand? Y N U

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.	Steel frame and sheet metal structurally adequate	Y N U	N/A
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
6.	Drawers and equipment on slides restrained from falling out	Y N U	N/A
7.	All doors secured by latch or fastener	Y N U	N/A
8.	Attached lines have adequate flexibility	Y N U	N/A
9.	Anchorage adequate (See checklist below for details)	Y N U	N/A
10.	Relays mounted on equipment evaluated	Y N U	N/A
11.	Have you looked for and found no other adverse concerns?	Y N U	N/A

Is the intent of all the caveats met for Bounding Spectrum? Y N U N/A

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	Y N U	N/A
2.	Type of anchorage covered by GIP	Y N U	N/A
3.	Sizes and locations of anchors determined	Y N U	N/A

Equip. ID No. 2-FE-74-50 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description RHR/Loop I Flow Diagram

ANCHORAGE (Cont'd)

4.	Adequacy of anchorage installation evaluated (weld quality and length, nuts and washers, expansion anchor tightness, etc.)	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
Are anchorage requirements met?				Y	N U

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
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
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

COMMENTS

1. SEE THE FOLLOWING PAGES FOR THE SCHEMATIC DIAGRAMS FOR SSEL LINE NOS 1018, 1019, 1046, 1047, 31018, 31019, 31043 AND 31044
2. SEE SSEL #s 9040 & 9041 FOR THE EVALUATION OF THIS COMPONENT. QUALIFIED BY "RULE OF THE BOX"

Evaluated by: J.R. Lisle Date: 10/17/95

10-17-95

EQE INTERNATIONAL

JOB NO. 50147 JOB BFNP A46 / IPEEE BY [illegible] SHEET NO. 3/7 DATE 8-25-95

CALC. NO. ____ SUBJECT RHR FLOW INSTRUMENTATION CHK'D JRD DATE 8/25/95

REF. DRWGS: 47E2610-74-1, 2

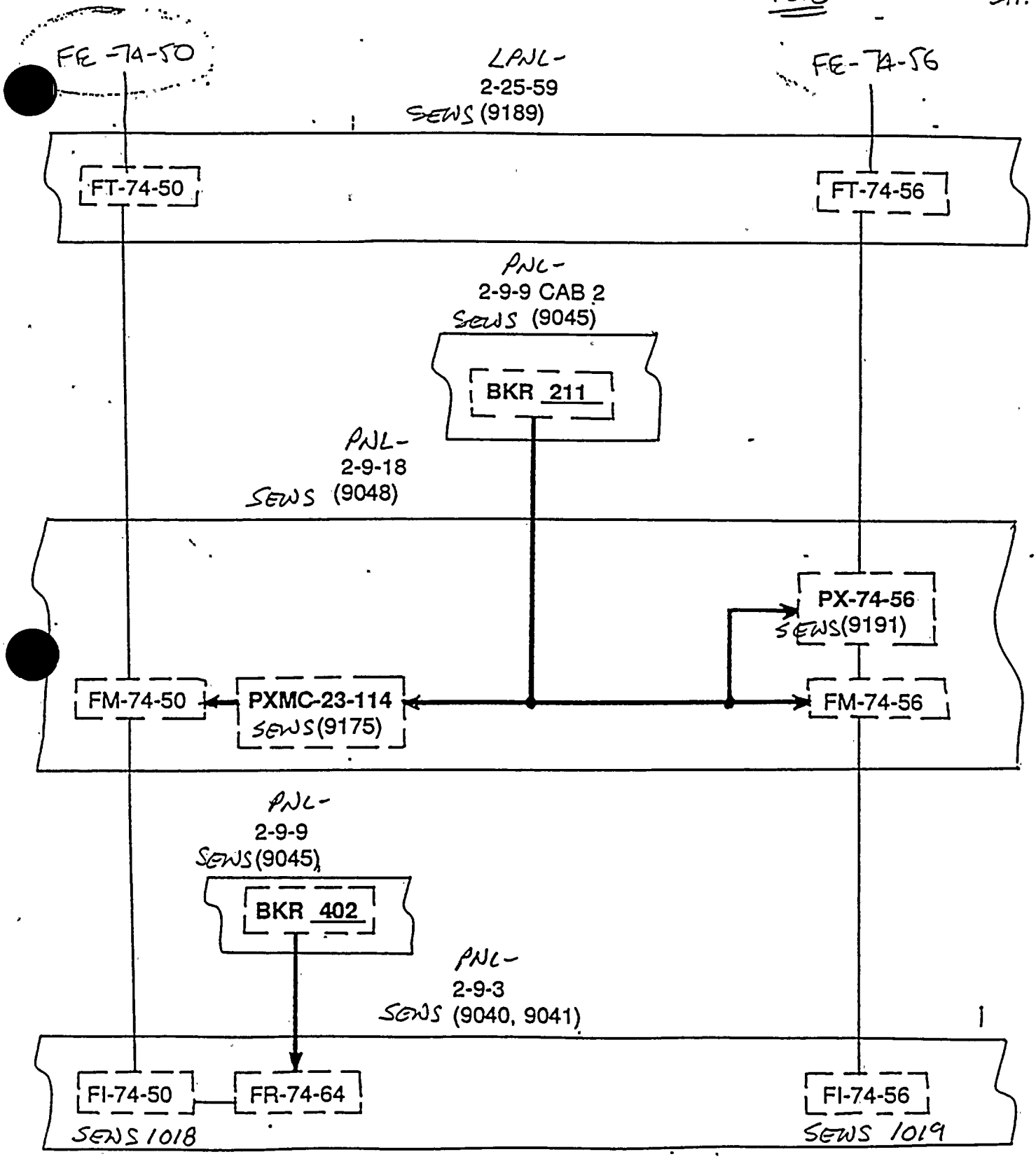
THE FOLLOWING ARE THE INSTRUMENTS WHICH CONSTITUTE THE RHR FLOW INSTRUMENTATION LOOPS; (TYP UNITS 2 & 3)

	NOTE ① MOUNTED ON PIPE	NOTE ② MOUNTED ON RACK	NOTE ③ MOUNTED ON CONTROL RM PANEL	
SOUTHWEST CORNER ROOM	FE-74-50	FT-74-50 FS-74-50	FM-74-50 FI-74-50 FR-74-64	PANEL 9-3, 9-18
			BKR-211, 402	PANEL 9-9
	FE-74-56	FT-74-56	PX-74-56 FM-74-56 FI-74-56 PXMC-23-114	PANEL 9-3, 9-18
SOUTHEAST CORNER ROOM	FE-74-70	FT-74-70	PX-74-70 FM-74-70 FI-74-70	PANEL 9-3, 9-19
			BKR-322, 402	PANEL 9-9
	FE-74-64	FT-74-64 FS-74-64	PXMC-23-115 FM-74-64 FI-74-64 FR-74-64	PANEL 9-3, 9-19

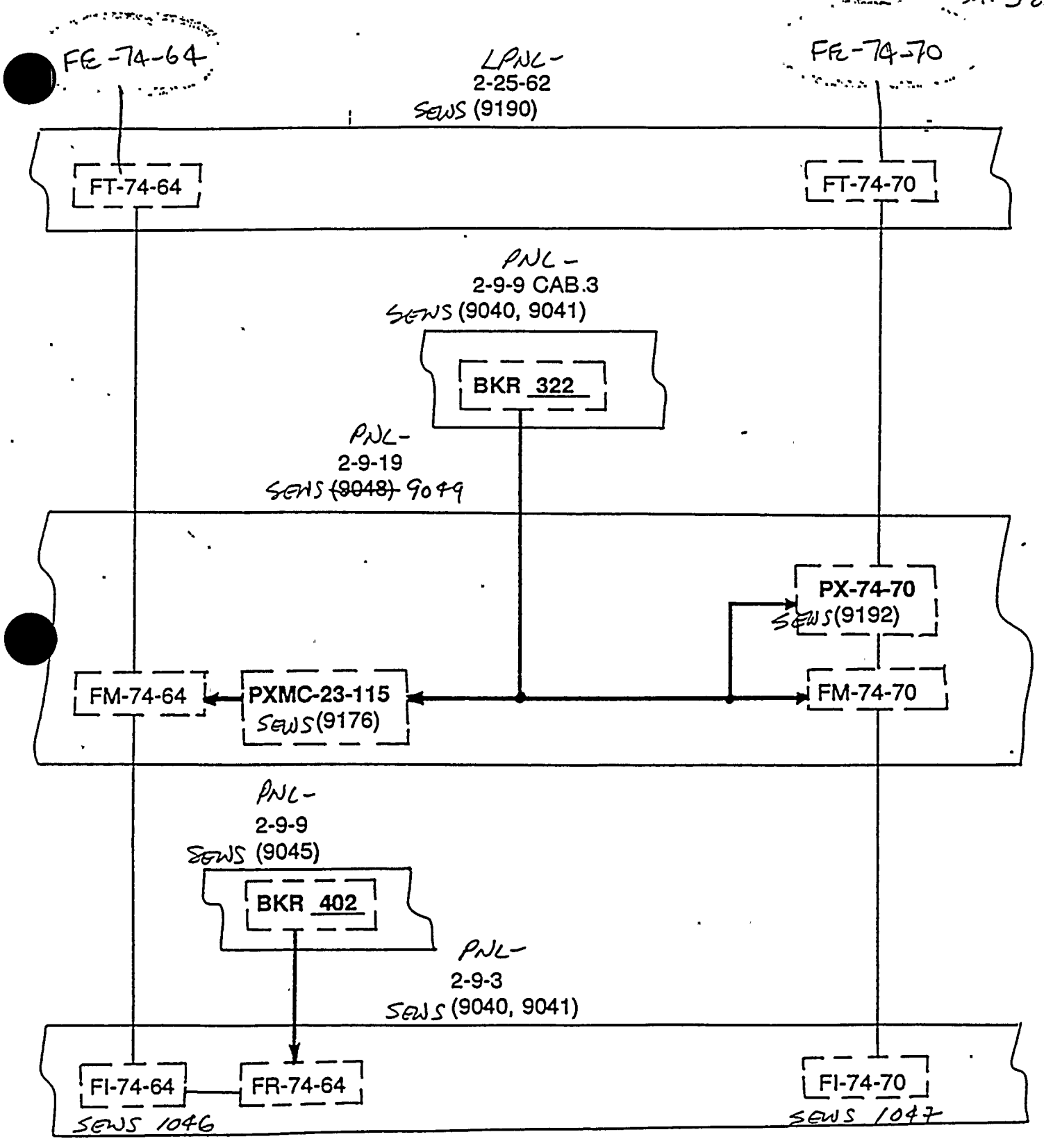
NOTE ①: THESE ARE PASSIVE IN-LINE COMPONENTS OF RUGGED CONSTRUCTION ∴ SEISMICALLY ADEQUATE.

NOTE ②: SEISMICALLY QUALIFIED BY SEWS EVALUATION FOR SSEL #s 9189 & 9190 (UNIT 2) AND 39200 & 39201 (UNIT 3) - (SEE PAGES 5-8). QUALIFIED BY "RULE OF THE BOX"

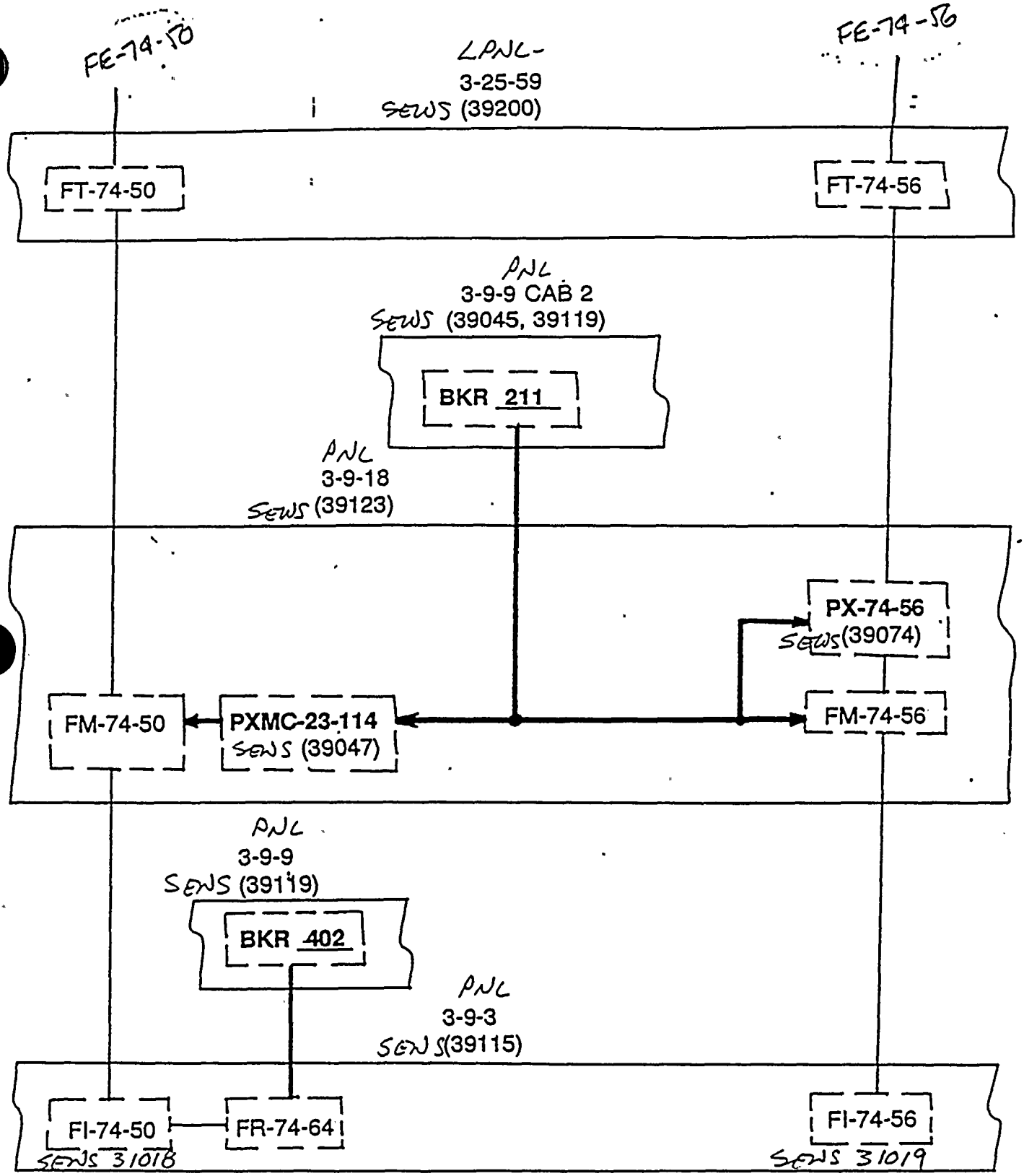
NOTE ③: SEISMICALLY QUALIFIED BY "RULE OF THE BOX" BY THE EVALUATION FOR THE RESPECTIVE CONTROL ROOM PANEL OR THE INDIVIDUAL COMPONENT SEWS FORM (SEE PAGES 4-7)



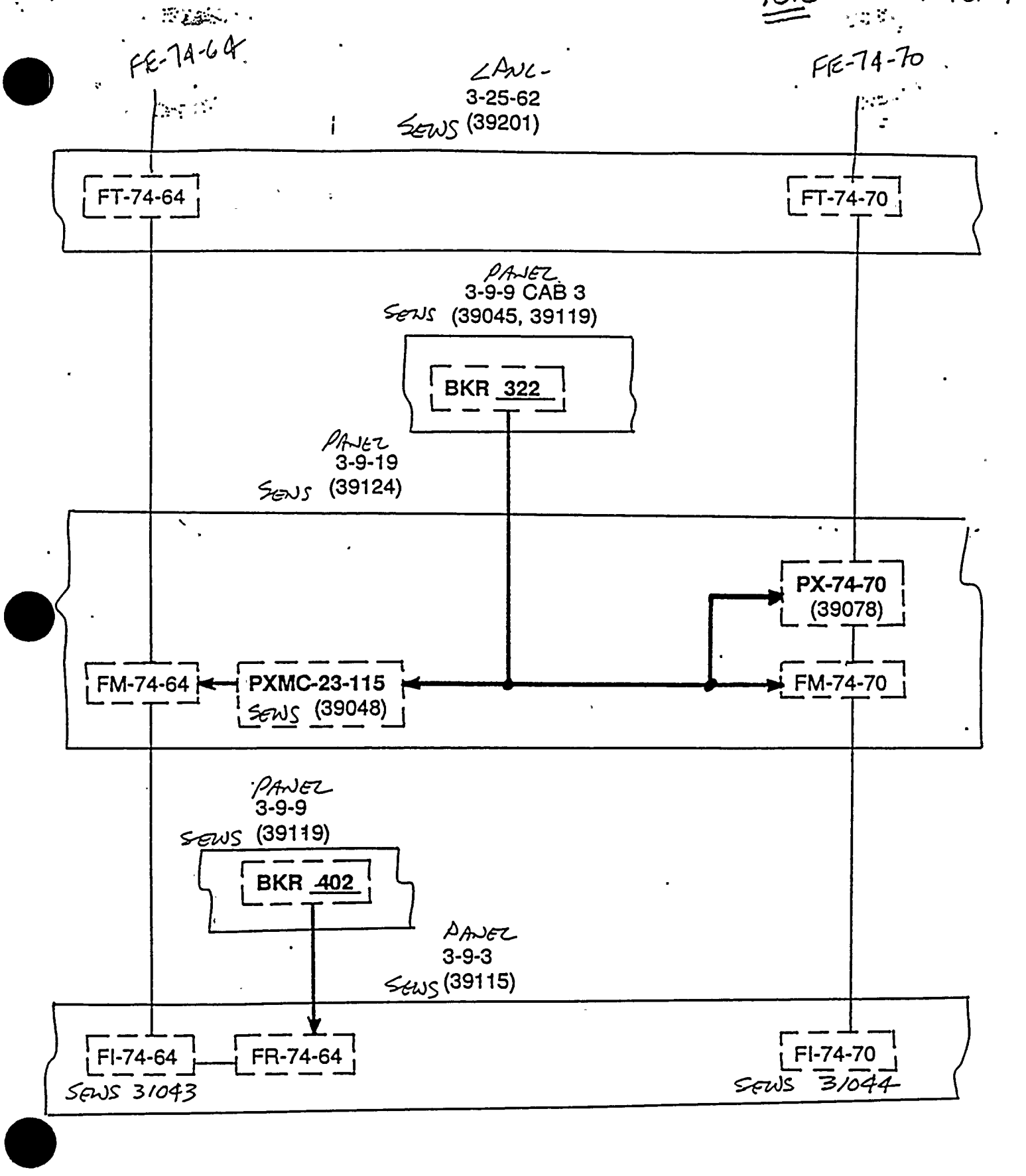
2-FI-74-50 AND 2-FI-74-56



2-FI-74-64 AND 2-FI-74-70



3-FI-74-50 AND 3-FI-74-56



3-FI-74-64 AND 3-FI-74-70

SEL Line No. 1618 Status Ⓨ N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

quip. ID No. 2-FI-74-50 Equip. Class 20

quipment Description _____

ELAY 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.

[redacted] other relay concerns? Y N U N/A

equirements for relays satisfied? Y N U

YSTEM INTERACTION EFFECTS

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

SCRIBE POTENTIAL PROBLEMS INDICATED BY NO OR UNSATISFACTORY (Use additional eets if necessary)

SEE THE SEWS FOR SSEL # 9040/9041 FOR THE EVALUATION OF THIS COMPONENT

EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
[redacted] S / NO ___

EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES / NO ___

aluated by: J.R. Disser Date: 10/20/95

aluated by: John O. Dizon Date: 10/20/95

SSEL # 7187

Revision 2, Corrected, 6/28/91
Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS)

Sheet 1 of 34

Equip. ID No. 2-LPNL-925-0059 Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-59

Location: Bldg. RB Floor El. 519 Room, Row/Col T, R3

Manufacturer, Model, Etc. (optional) _____

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input	519	
2.	Elevation of seismic input below about 40' from grade	(Y) N U	
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A	Note 1
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	(BS)	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	(GRS)	
	1.5 x Bounding Spectrum	ABS	
	Conserv. Des. In-Str. Resp. Spec.	CRS	
	Realistic M-Ctr. In-Str. Resp. Spec.	RRS	

Does capacity exceed demand? (Y) N U

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.	Steel frame and sheet metal structurally adequate	(Y) N U N/A	Note 2, 4
4.	Adjacent racks which are close enough to impact or sections of multi-bay racks are bolted together if they contain essential relays	Y N U (N/A)	
5.	Natural frequency relative to 8 Hz limit considered	(Y) N U N/A	Note 1
6.	Attached lines have adequate flexibility	(Y) N U N/A	
7.	Anchorage adequate (See checklist below for details)	(Y) N U N/A	Note 4
8.	Relays mounted on equipment evaluated	Y N U (N/A)	
9.	Have you looked for and found no other adverse concerns?	(Y) N U N/A	

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

CAVEATS - GERS

(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 the generic seismic testing equipment class	Y N U (N/A)
2.	Meets all Bounding Spectrum caveats	Y N U (N/A)
3.	Component is a pressure, temperature, level or flow transmitter	Y N U (N/A)

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No 2-LPNL-925-0059 Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-59

CAVEATS - GERS (Cont'd)

4.	Component is one of the specific makes and models tested, as listed in Appendix B	Y N U (N/A)
5.	Necessary function of component not sensitive to seismically induced system perturbations (e.g., sloshing)	Y N U (N/A)
6.	No vacuum tubes	Y N U (N/A)
7.	All external mounting bolts in place	Y N U (N/A)
8.	Demand based on amplified portion of 3% damped floor response spectrum if estimated natural frequency of rack less than 33 Hz	Y N U (N/A)
9.	Rack capable of structurally transferring GERS level seismic loads to anchorage	Y N U (N/A)

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A
2.	Type of anchorage covered by GIP	(Y) N U N/A
3.	Sizes and locations of anchors determined	(Y) N U N/A
4.	Adequacy of anchorage installation evaluated (weld quality and length, nuts and washers, expansion anchor tightness, etc.)	(Y) N U N/A NOTE 3
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)

Are anchorage requirements met? (Y) N U

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
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

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. Z-CPNL-925-0059 Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-59

INTERACTION EFFECTS (Cont'd)

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

COMMENTS

1) As the panel is well braced, it is judged to respond > 8 Hz.

2) Panel is well constructed of steel channels. Framing judged to be seismically adequate.

3) Using the Reduced Inspection Alternative at Appendix C of the GIP, neglecting 1/3 of the anchor bolts, the rack anchorage is still judged to be seismically adequate. Therefore anchor bolt tightness testing is not required.

Evaluated by: [signature] Date: 9-18-95

[signature] 9-19-95

PHOTO 24 13:14

EQE INTERNATIONAL

JOB NO. 50147 JOB BENP A&C/IDEEE BY JVB DATE 8-25-97 SHEET NO. 4 OF 4

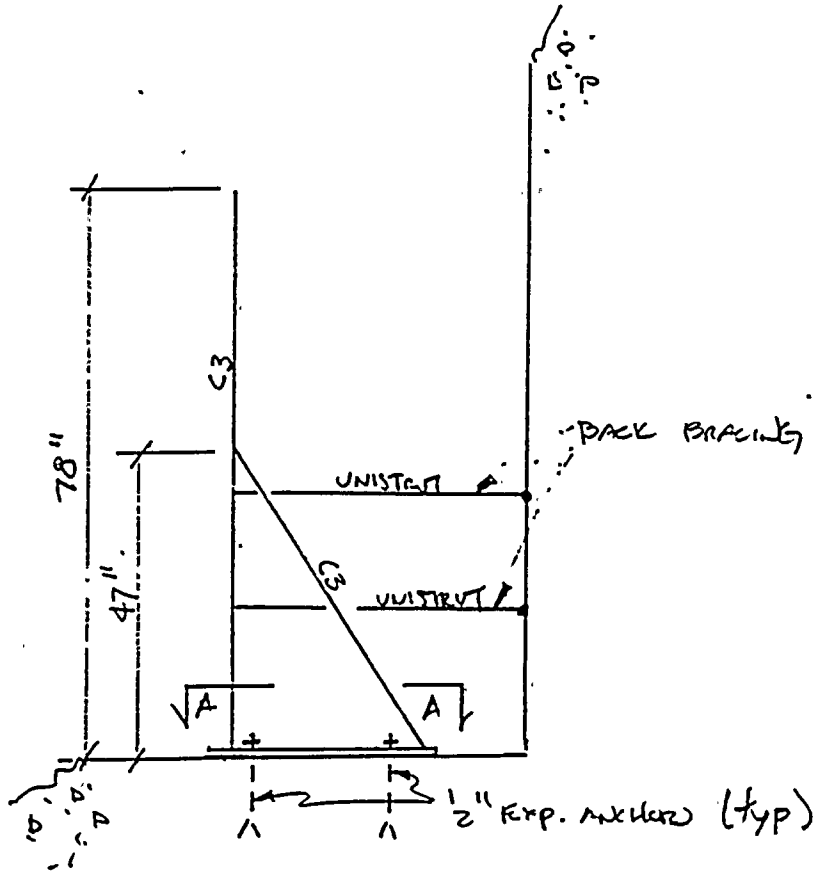
CALC. NO. _____ SUBJECT RHR FLOW INSTRUMENTATION CHKD JRD DATE 8/25/97

WALKDOWN INFO

RACK # 25-59

UNIT 2, SW CORNER ROOM (SE CORNER ROOM RACK 25-57 SIMILAR) 62 (9190)

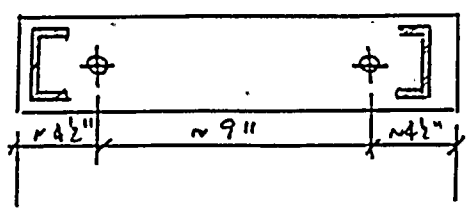
UNIT 3, SW & SE CORNER ROOM RACKS ARE SIMILAR EXCEPT BACK BRACING IS DIFFERENT, BUT STRONGER STRUCTURALLY.



ELEVATION

NOTE (4): RACKS & ANCHORAGE ARE ADEQUATE DUE TO:

a) LOW SEISMIC DEMAND AT ELEV. 519.
b) RACKS ARE LIGHTLY LOADED
c) RACKS ARE BACK BRACED
d) INCOMING TUBING & CONDUIT PROVIDES SOME TOP BRACING
e) RACKS ARE WELL DETAILED & WELL BUILT.



SECT. A-A

SSEL Line No. 9189 Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-LPNL-925-0059 Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-59

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: _____ Date: 9-19-95

Evaluated by: R.D. Augusto Date: 9-19-95

SSEL Line No. 9045 Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 2

Equip. ID No. 2-PNLA-009-0009 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-9

Location: Bldg. CB Floor El. 617 Room, Row/Col U2 MCR

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		617
2.	Elevation of seismic input below about 40' from grade		Y (N) U (grade @ 550')
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (1)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	BS
		1.5 x Bounding Spectrum	(ABS)
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	GRS
		1.5 x Ground Response Spectrum	AGS
		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 (=)*

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.	Steel frame and sheet metal structurally adequate	(Y) N U N/A
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
6.	Drawers and equipment on slides restrained from falling out	(Y) N U N/A
7.	All doors secured by latch or fastener	(Y) N U N/A (6)
8.	Attached lines have adequate flexibility	(Y) N U N/A
9.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (5)
10.	Relays mounted on equipment evaluated AF=4.5	(Y) N U N/A (3)
11.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A
2.	Type of anchorage covered by GIP	(Y) N U N/A
3.	Sizes and locations of anchors determined	(Y) N U N/A

SSEL Line No. 9045

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 2

Equip. ID No. 2-PNLA-009-0009 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-9

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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

Are anchorage requirements met? (Y) N U (5)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A (4)
2.	If equipment contains sensitive relays, equipment free from all impact by nearby equipment or structures	Y (N) U N/A (7), (9)
3.	Attached lines have adequate flexibility	(Y) N U N/A (10)
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 (8)

Is equipment free of interaction effects? Y (N) U (7)

IS EQUIPMENT SEISMICALLY ADEQUATE? Y (N) U (7)

outlier OSVS-9045

COMMENTS

- For notes 1 thru 7 see SEWS for 3-PNLA-009-0009 (SSEL 39119).

8) Blockwall @ front of the panel qualified per IEB 80-11 program (Ref. DHG-2-4N-1202-1, wall #

9) Breathing apparatus boxes are stacked up @ about 5' away from this panel. It is judged that these boxes are far enough not to cause any interaction with this panel in a DBE. ok

10) Flex conduit @ top ok

Evaluated by: Fangi Bei / John O. Diaz Date: 11/16/95 / 11/17/95

SSEL Line No. 9045 Status Y (N) U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-PNLA-009-0009 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-9

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

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)

i) The frame of the entry door to the area where this panel is located is attached to south side of cabinet of this panel. The door itself does not have any latches to secure the door. The banging of the door to the frame in a DBE may potentially cause relay chatter.

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ___ NO ✓ (see note i) above

Evaluated by: Farzi Beig Date: 11-16-95

Evaluated by: John O. Dunn Date: 11/17/95

SSEL Line No. 9045

OSVS-9045

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 2-PNLA-019-0009 Equipment Class 20 - Instr. & Control Panels

Equipment Location: Bldg. CB Floor Elevation 617'

Room or Row/Column MCR U2 Base Elevation 617'

Equipment Description PNL 9-9

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 area entry door @ south end of this panel is attached to cabinet 1 of this panel. The door latch is broken. In a DBE the impact of the door to its frame may cause relay chatter inside this panel.

SSEL Line No. 9045

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 2-PNLA-009-0009

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

Provide latch or positively restrain this door from impacting its frame; OR alternatively if it could be shown that this panel does not contain any essential relays then the outlier could be resolved as-is.

There are no essential relays in panel 2-9-9. See attached informal memo. KHG 9-16-96 [signature] 9-16-96

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	11-16-95
JOHN O. DIZON, P.E.	John O. Dizon	11/17/95

INFORMAL

September 16, 1996

REVIEW FOR ESSENTIAL RELAYS IN PANELS 2-PNLA-009-0003A, 2-PNLA-009-0003B, 2-PNLA-009-0004, 2-PNLA-009-0009, 2-PNLA-009-0020, AND 2-PNLA-009-0021.

Modifications to panels 2-PNLA-009-0003A (SSEL No. 9040), 2-PNLA-009-0003B (SSEL No. 9041), 2-PNLA-009-0004 (SSEL No. 9042), 2-PNLA-009-0009 (SSEL No. 9045), 2-PNLA-009-0020, and 2-PNLA-009-0021 (SSEL No. 9050) were determined to possibly be required under the USI A-46 program, resulting from outliers OSVS-9040-2, OSVS-9045, and OSVS-9050, if these panels contain essential relays. A review of the Browns Ferry Nuclear Plant USI A-46 Seismic Evaluation Report, May 1996, Revision 0, Appendix A determined that there are no essential relays installed in these panels. This review resolves outliers OSVS-9040-2, OSVS-9045, and OSVS-9050. Note that modifications may be required resulting from other outliers on these panels.

Review performed by _____ K. H. Gromek _____ 9-16-96 date

Verified by _____ B. M. Pedroso _____ 9-16-96 date

SSEL Line No. 39119 Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 24

Equip. ID No. 3-PNLA-009-0009 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PNL 9-9 (I&C CONT PWR, CAB 2&3)

Location: Bldg. CB Floor El. ~~621~~ 617 Room, Row/Col U3 MCR

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		617'
2.	Elevation of seismic input below about 40' from grade		Y (N) U (grade @ 563')
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (1)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	BS
		1.5 x Bounding Spectrum	(ABS)
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	GRS
		1.5 x Ground Response Spectrum	AGS
		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.	Steel frame and sheet metal structurally adequate	(Y) N U N/A
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
6.	Drawers and equipment on slides restrained from falling out	(Y) N U N/A
7.	All doors secured by latch or fastener	(Y) N U N/A (6)
8.	Attached lines have adequate flexibility	(Y) N U N/A
9.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (5)
10.	Relays mounted on equipment evaluated AF=4.5	(Y) N U N/A (3)
11.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A. See sketch on p 4)
2.	Type of anchorage covered by GIP	(Y) N U N/A
3.	Sizes and locations of anchors determined	(Y) N U N/A

SSEL Line No. 39119

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 24

Equip. ID No. 3-PNLA-009-0009 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PNL 9-9 (I&C CONT PWR, CAB 2&3)

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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
Are anchorage requirements met?		(Y) N U (5)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A (4)
2.	If equipment contains sensitive relays, equipment free from all impact by nearby equipment or structures	Y (N) U N/A (7), (8)
3.	Attached lines have adequate flexibility	(Y) N U N/A
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 9)
Is equipment free of interaction effects?		Y (N) U (7), (8)

IS EQUIPMENT SEISMICALLY ADEQUATE? Y (N) U (7), (8)

COMMENTS

- For notes 1 thru 6 see page 3 of 4.

note 7) The frame of the entry door to this area is connected to the south side of this panel. The door latch is broken and the door may impact the frame in a DBE and may cause relay chatter in this panel. outlier OSVS-39119

note 8) Unanchored bookshelf, chairs and desk in front of the panel as well as unanchored printer, computer and storage cabinet in the back of the panel are too close and may cause seismic interaction. outlier OSVS-39119

Evaluated by: Farzin Beig Date: 11/16/15

W. J. Dixon 1/17/15

note 9) Blockwall near this panel is qualified per DWG. 3-41N-1203-1, Rev. 2 (Wall 49) as part of IEB 80-11 program.

JOB NO. 50147 JOB TVA / BFNP A-46 / IPEEE BY JBeiji DATE 11-16-95

CALC. NO. N/A SUBJECT Attach. to SEWS for Panel 3-9-9 (SSEL 39119) CHK'D J.D.Di DATE 11/17/95

NOTES:

1) The panel 3-9-9 is part of a long line up of panels (3-9-9 + 3-9-25 + 3-9-46 + 3-9-47 + 3-9-44). All these panels are bolted to their adjacent panels by 1/2"ϕ to 5/8"ϕ bolts along the height of the panels @ front and back sides. The panels are heavily welded to their sill channel by 1"x1"x 3½" steel bars as shown on the sketch on the next page. The panels are constructed of 3/32" sheet metal and are reinforced with "4 corner posts (L3x3x1/4") as well as "base and top" framing angles. The internal components are rigidly mounted and heavy cantilevered controllers are also supported rigidly at their cantilevered end. The lowest natural frequency of this panel is judged to be greater than 7 HZ. Additionally, a simple but conservative frequency estimation calculation performed for a similar panel (see SEWS for panel 3-9-54, SSEL 39133), showed the overall panel mode frequency is about 11.4 HZ. (see also GE seismic qualification of electrical equipment Report NEDO-10678, CEB-CQS-82-4 which shows that the frequency of similar panels and internal components are about or greater than 8 HZ from the results of shake table tests and resonant frequency search tests)

2) Per "Calc." CD-Q 0000-940339, the in-structure response spectra @ EL.621' of the RB (seismic Demand) exceeds the 1.5xB.S. (seismic Capacity) in the frequency range of 5 to 7 HZ. Since the lowest frequency of this panel is greater than 7 HZ the intent of the seismic capacity vs. demand criteria of the GIP is met.

3) Panel sides are continuous and are reinforced by the mounting bars/plates or Unistrut channels. An in-cabinet amplification factor of 4.5 is reasonable and consistent with the recommendation provided in EPRI NP-7148SL for this type of panel.

4) Fluorescent lights inside the panels have wire mesh cage around them ok

5) welds at anchorage points are ok by reference to Calculation no. CD-Q0009-871685, "Mounting Details for Control Room Panels," Rev.5.

6) Slight door rattling @ closed position judged acceptable and not to cause relay chatter.

EQE INTERNATIONAL

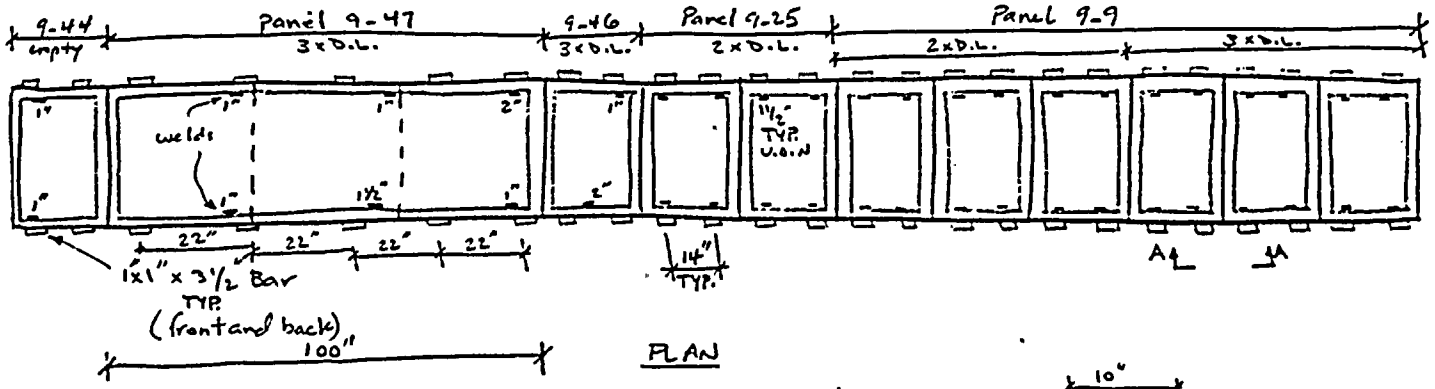
SHEET NO. 4 of 4

JOB NO. 50147 JOB TVA / BFNP A-46 / IPEEE BY JBeig DATE 11-15-95

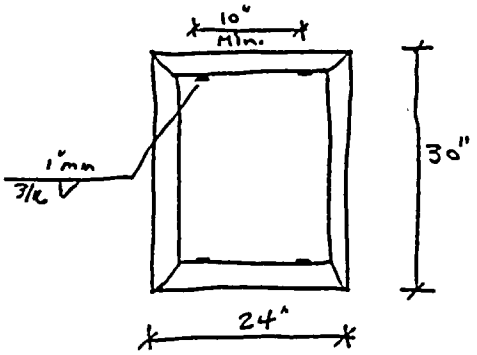
CALC. NO. N/A SUBJECT Attach. to SEWS for Panel 3-9-9 (SSEL. 39119) CHK'D J.D.Diz DATE 11/17/95

Panel height = 98½"

thickness = 3/32"

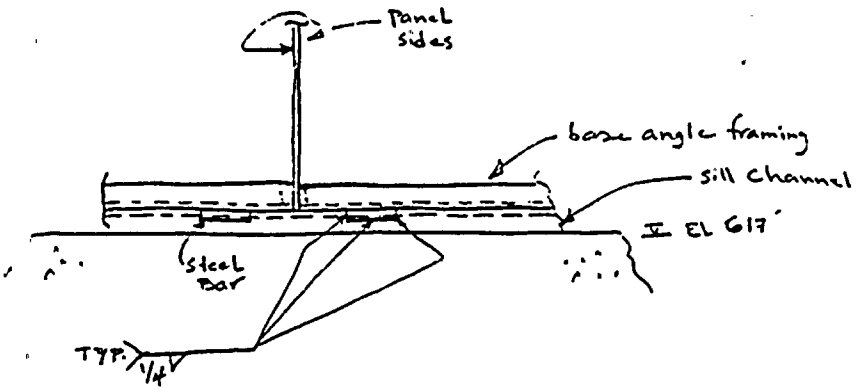


PLAN

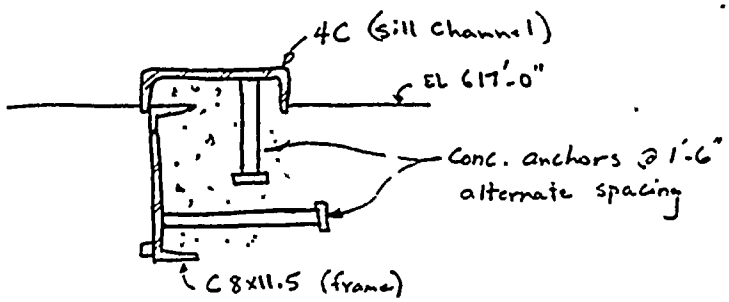


PLan

Typical weld config. of the panel base angle to sill channel



A - A



Detail of sill channel connection to the concrete floor (Obtained from DWG. 48N933, SEL. Q-Q)

SSEL Line No. 39119

Status Y (N) U

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 3-PNLA-009-0009 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PNL 9-9 (I&C CONT PWR, CAB 2&3)

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) unanchored bookshelf, chairs, desk, computer, printer and storage cabinet either in front or the back of this panel may cause seismic interaction in a DBE and chatter relays inside this panel. See outlier OSVS-39119

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

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

Evaluated by: [signature] Date: 11-16-95

Evaluated by: [signature] Date: 11/17/95

SSEL Line No. 39119

OSVS - 39119

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 3-PNL-A-009-0009 Equipment Class 20-Instr. & Control panels

Equipment Location: Bldg. CB Floor Elevation 617'

Room or Row/Column U3 MCR Base Elevation 617'

Equipment Description PNL 9-9 (I&C PWR, CAB 2 & 3)

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):

1) The area entry door @ South end of this panel (door frame is attached to this panel) has broken latch and its impact in a DBE may cause relay chatter inside this panel.

2) Unanchored bookshelf, chair, desk in front of this panel, as well as unanchored computer, printer and storage cabinet in the back panel area are too close to this panel and may cause seismic interaction with this panel in a DBE. This interaction may cause relay chatter inside this panel.

SSEL Line No. 39119

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 3-PNLA-009-0009

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

1) Provide latch or positively restrain the door

2) Provide anchorage for the said misc. items or remove them from the area

Alternatively, if it is shown that there are no essential relays in this panel then the outlier is resolved as is and no further action is req'd.

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

REVIEW OF THE ESSENTIAL RELAY LIST INDICATED THAT NO ESSENTIAL RELAYS ARE PRESENT IN PANEL 3-PNLA-009-0009. THEREFORE, OSVS-39119 IS RESOLVED

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	11-16-95
JOHN O. DIZON, PE.	John O. Dizon	11/17/95

2.23.97

2.23.97

SSEL Line No. ~~3065~~ 3053 Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 76

Equip. ID No. 2-LI-3-58A Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description RPV LEVEL INSTRUMENT

Location: Bldg. CR Floor El. _____ Room, Row/Col _____

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		
2.	Elevation of seismic input below about 40' from grade	Y N U	
3.	Equipment has fundamental frequency above about 8 Hz	Y N U	N/A
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	BS	
	1.5 x Bounding Spectrum	ABS	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	GRS	
	1.5 x Ground Response Spectrum	AGS	
	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

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.	Steel frame and sheet metal structurally adequate	Y N U	N/A
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
6.	Drawers and equipment on slides restrained from falling out	Y N U	N/A
7.	All doors secured by latch or fastener	Y N U	N/A
8.	Attached lines have adequate flexibility	Y N U	N/A
9.	Anchorage adequate (See checklist below for details)	Y N U	N/A
10.	Relays mounted on equipment evaluated	Y N U	N/A
11.	Have you looked for and found no other adverse concerns?	Y N U	N/A

Is the intent of all the caveats met for Bounding Spectrum? Y N U N/A

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	Y N U	N/A
2.	Type of anchorage covered by GIP	Y N U	N/A
3.	Sizes and locations of anchors determined	Y N U	N/A

SSEL Line No. ~~3065~~ 3053

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 76

Equip. ID No. 2-LI-3-58A Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description RPV LEVEL INSTRUMENT

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers; expansion anchor tightness	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

re anchorage requirements met? Y N U

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
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
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

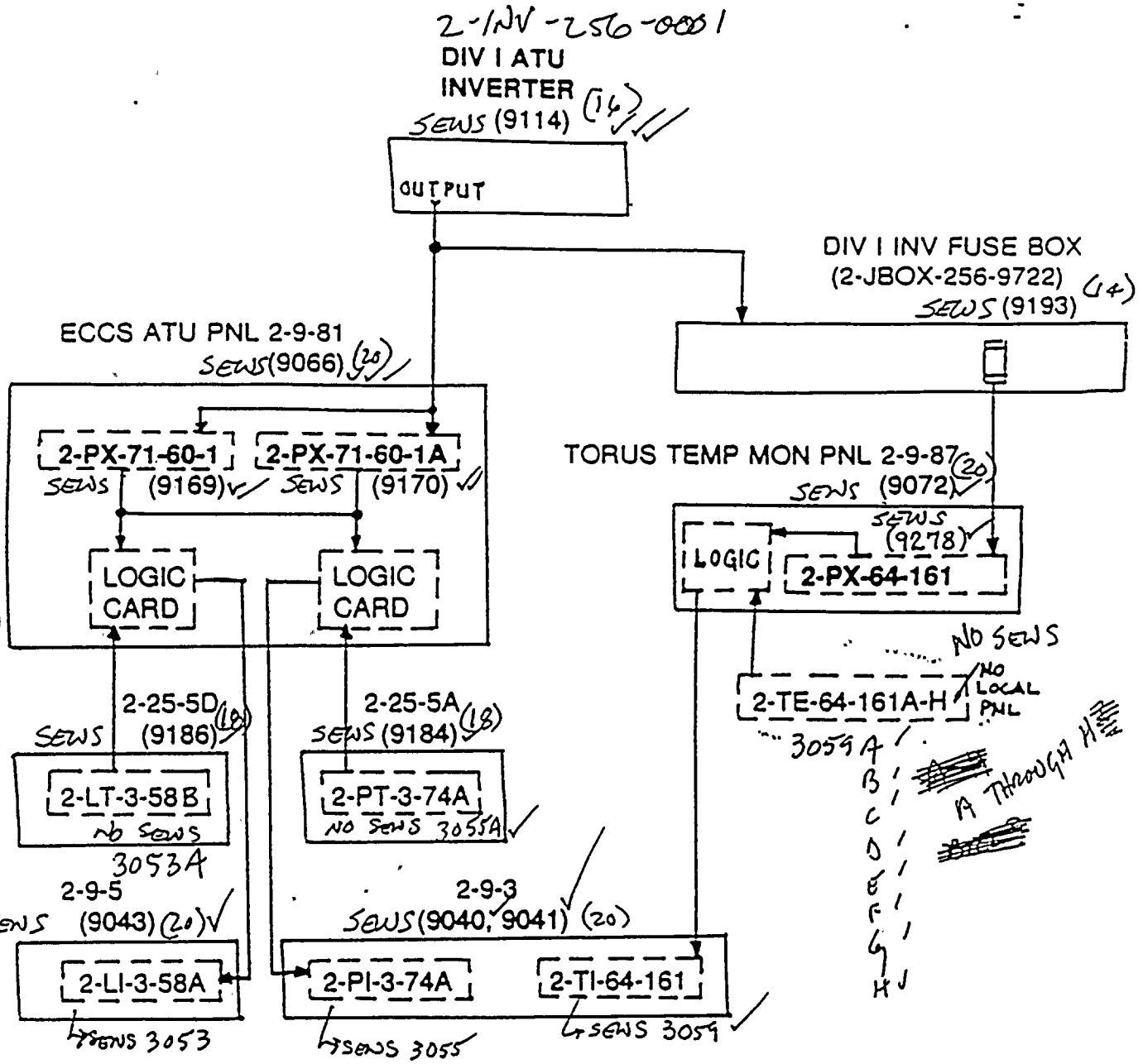
COMMENTS

1. FOR SCHEMATIC OF THE INSTRUMENTATION LOOP SEE PAGES C-9, ALL COMPONENTS IN THE LOOP ARE QUALIFIED BY THE SEWS OF THE RACK OR PANEL ON WHICH THEY ARE MOUNTED OR THE SEWS FOR THE INDIVIDUAL COMPONENT.
2. TE-64-161A-H AND TE-64-162A-H ARE QUALIFIED IN THE SEWS FOR SSEL # 3059 AND 3060 (UNIT 2), AND 33057 AND 33058 (UNIT 3).

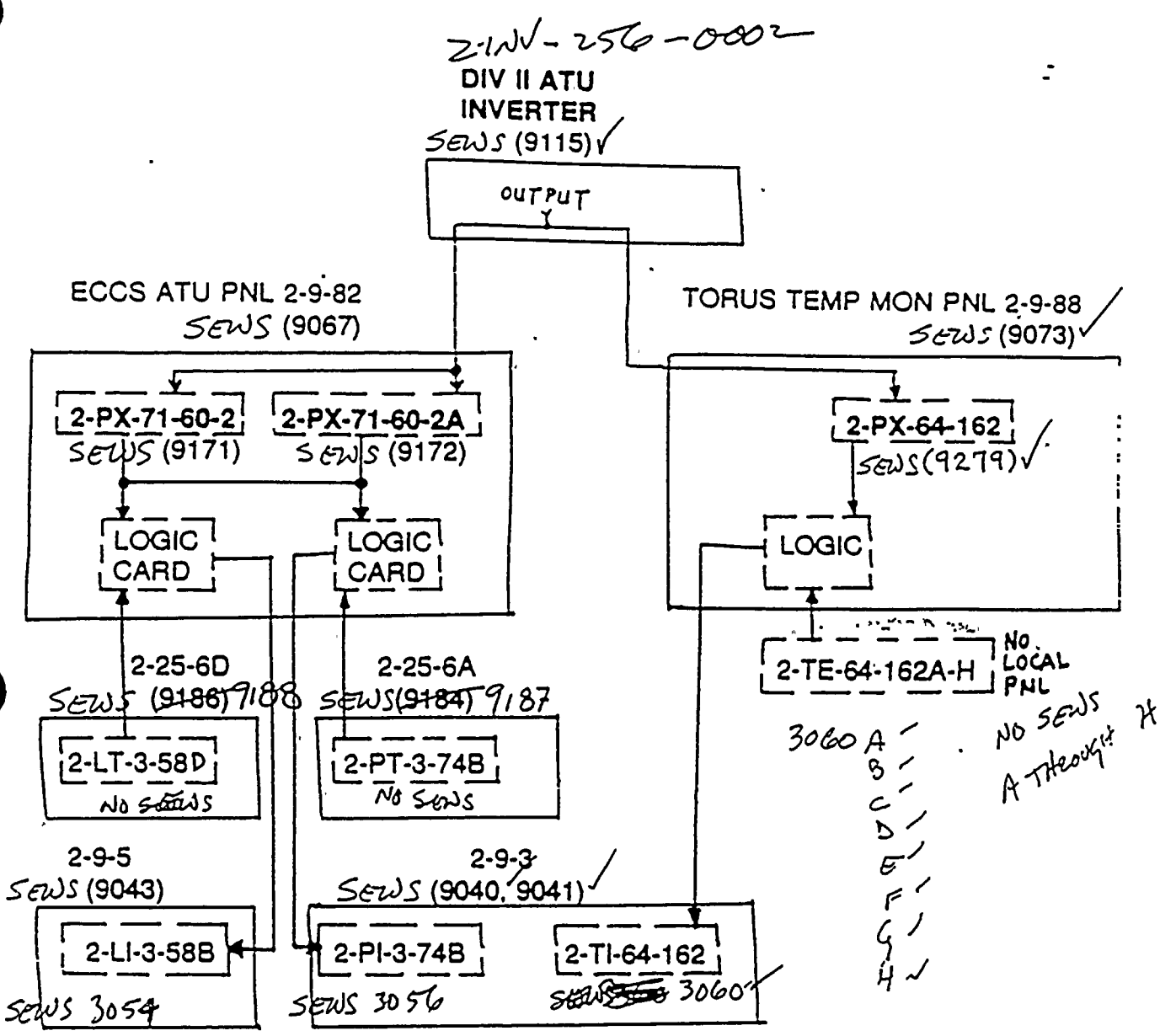
Evaluated by: J.R. Nisser Date: 10/17/95

10-17-95

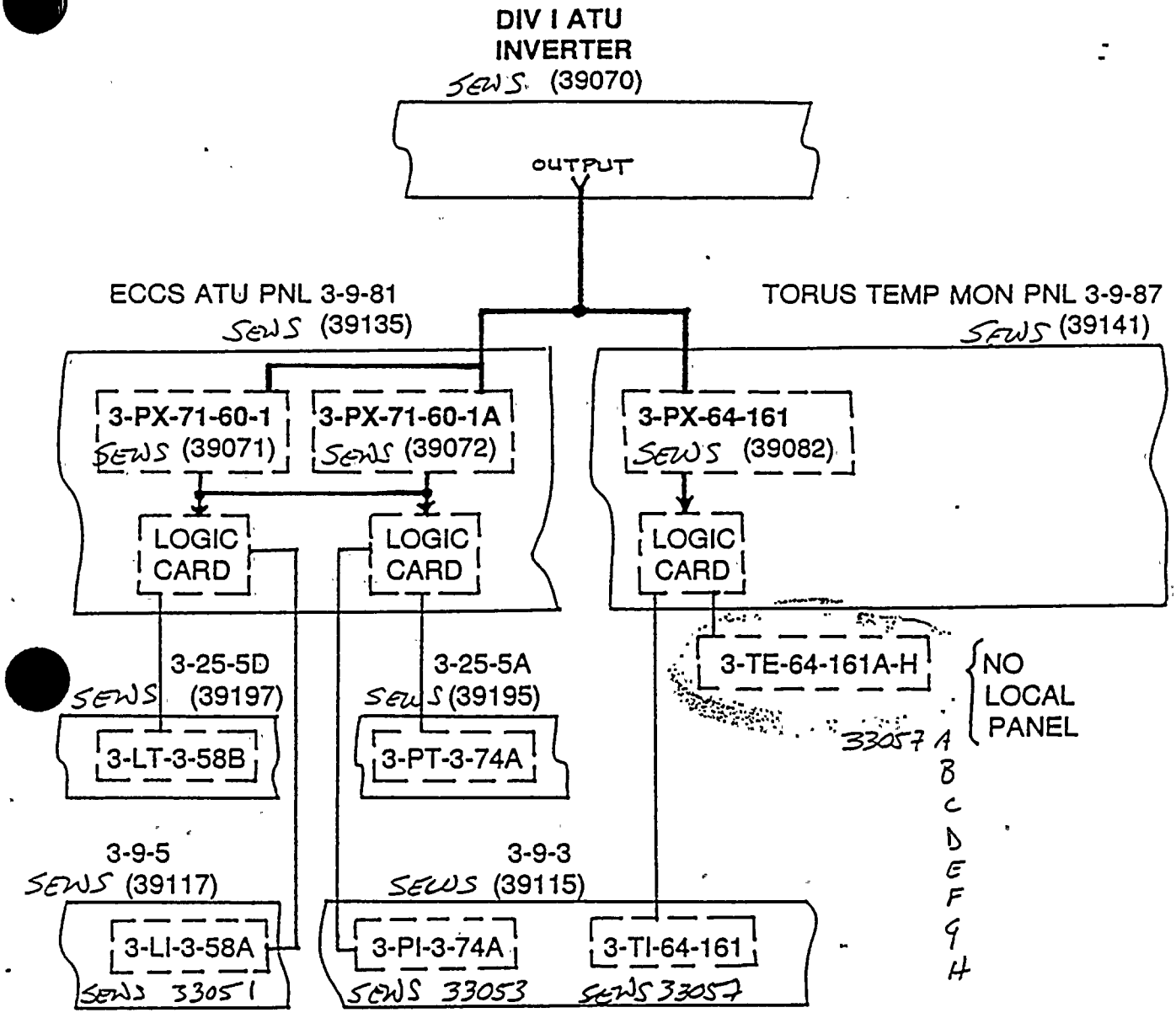
3. FOR THE EVALUATION OF THIS COMPONENT, SEE SSEL # 9043, QUALIFIED BY "RULE OF THE BOX".



UNIT 2 : DIV I ATU INVERTER AND POWER SUPPLIES

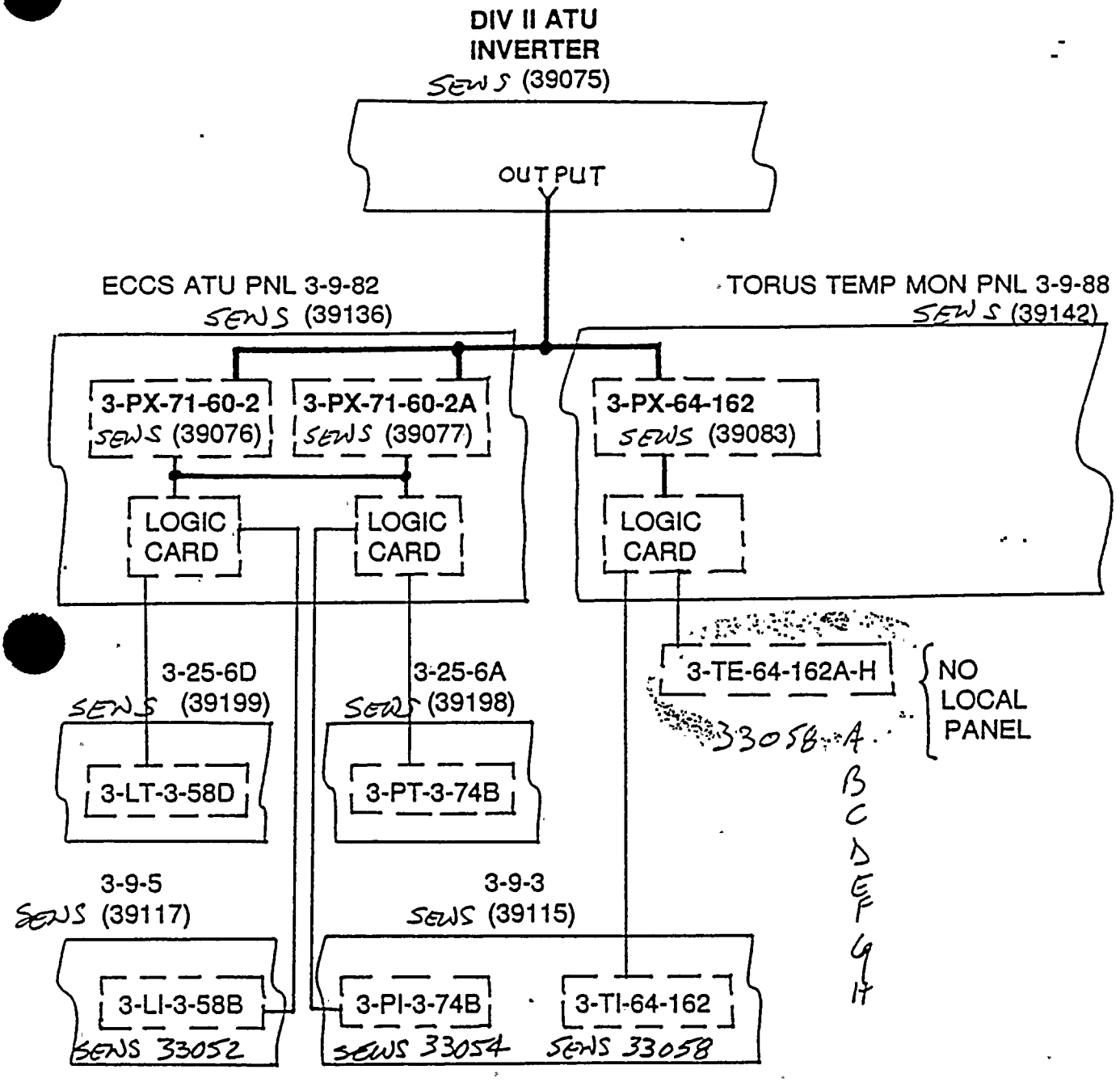


UNIT 2 : DIV I I ATU INVERTER AND POWER SUPPLIES



UNIT 3 : DIV I ATU INVERTER AND POWER SUPPLIES

3053 Sh 6 of 6



UNIT 3 : DIV II ATU INVERTER AND POWER SUPPLIES

EL Line No. 3053 Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

uip. ID No. 2-LI-3-58A Equip. Class 20

uipment Description

LAY WALKDOWN

. Does spot check of essential relays indicate relays present and properly mounted?	Y	N	U	N/A
. 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.				
. No other relay concerns?	Y	N	U	N/A

qu ents for relays satisfied? Y N U

STEM INTERACTION EFFECTS

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

SCRIBE POTENTIAL PROBLEMS INDICATED BY NO OR UNSATISFACTORY (Use additional eets if necessary)

SEE THE SEWS FOR SSEL # 9043
FOR THE EVALUATION OF THIS COMPONENT

EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
S / NO

EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES / NO

aluated by: J.R. Dissen Date: 10/20/95

aluated by: John O. Dizon Date: 10/20/95

SSEL # 9136

Revision 2, Corrected, 6/28/91
Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 3

Equip. ID No. 2-LPNL-925-005D Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-5D

Location: Bldg. RB Floor El. 593 Room, Row/Col S, R10

Manufacturer, Model, Etc. (optional) _____

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input	593	
2.	Elevation of seismic input below (about) 40' from grade	(Y) N U	
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A	Note 1
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	(BS)	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	(GRS)	
	1.5 x Bounding Spectrum	ABS	
	Conserv. Des. In-Str. Resp. Spec.	CRS	
	Realistic M-Ctr. In-Str. Resp. Spec.	RRS	

Does capacity exceed demand? (Y) N U

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.	Steel frame and sheet metal structurally adequate	(Y) N U N/A	Note 2
4.	Adjacent racks which are close enough to impact or sections of multi-bay racks are bolted together if they contain essential relays	Y N U (N/A)	
5.	Natural frequency relative to 8 Hz limit considered	(Y) N U N/A	Notes 1 & 2
6.	Attached lines have adequate flexibility	(Y) N U N/A	
7.	Anchorage adequate (See checklist below for details)	(Y) N U N/A	Note 2
8.	Relays mounted on equipment evaluated	Y N U (N/A)	
9.	Have you looked for and found no other adverse concerns?	(Y) N U N/A	

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

CAVEATS - GERS (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 the generic seismic testing equipment class	Y N U (N/A)
2.	Meets all Bounding Spectrum caveats	Y N U (N/A)
3.	Component is a pressure, temperature, level or flow transmitter	Y N U (N/A)

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-LPNL-925-005D Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-5D

CAVEATS - GERS (Cont'd)

4.	Component is one of the specific makes and models tested, as listed in Appendix B	Y N U (N/A)
5.	Necessary function of component not sensitive to seismically induced system perturbations (e.g., sloshing)	Y N U (N/A)
6.	No vacuum tubes	Y N U (N/A)
7.	All external mounting bolts in place	Y N U (N/A)
8.	Demand based on amplified portion of 3% damped floor response spectrum if estimated natural frequency of rack less than 33 Hz	Y N U (N/A)
9.	Rack capable of structurally transferring GERS level seismic loads to anchorage	Y N U (N/A)

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A
2.	Type of anchorage covered by GIP	(Y) N U N/A
	Sizes and locations of anchors determined	(Y) N U N/A
	Adequacy of anchorage installation evaluated (weld quality and length, nuts and washers, expansion anchor tightness, etc.)	(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)

Are anchorage requirements met? (Y) N U

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
2.	If equipment contains sensitive relays, equipment free from all impact by nearby equipment or structures	Y N U (N/A)
	Attached lines have adequate flexibility	(Y) N U N/A

FLEX OK for all components

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-LPNL-925-005D Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-5D

INTERACTION EFFECTS (Cont'd)

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

COMMENTS

For notes see 2-LPNL-925-6D

PHOTO 13-11:41

Evaluated by: E.D. Augustine Date: 9-18-95

9-19-95

SSEL Line No. 9186 Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-LPNL-925-005D Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-5D

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: _____ Date: 9-19-95

Evaluated by: _____ Date: 9-19-95

SSEL #9188

Revision 2, Corrected, 6/28/91
Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS)

Sheet 1 of 3

Equip. ID No. 2-LPNL-925-006D Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-6D

Location: Bldg. RB Floor El. 593 Room, Row/Col P, R12

Manufacturer, Model, Etc. (optional) _____

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input	593	
2.	Elevation of seismic input below (about) 40' from grade	(Y) N U	
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A	Note 1
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	(BS)	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	(GRS)	
	1.5 x Bounding Spectrum	ABS	
	Conserv. Des. In-Str. Resp. Spec.	CRS	
	Realistic M-Ctr. In-Str. Resp. Spec.	RRS	

Does capacity exceed demand? (Y) N U

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.	Steel frame and sheet metal structurally adequate	(Y) N U N/A	Note 2
4.	Adjacent racks which are close enough to impact or sections of multi-bay racks are bolted together if they contain essential relays	Y N U (N/A)	
5.	Natural frequency relative to 8 Hz limit considered	(Y) N U N/A	Note 1&2
6.	Attached lines have adequate flexibility	(Y) N U N/A	
7.	Anchorage adequate (See checklist below for details)	(Y) N U N/A	Note 2
8.	Relays mounted on equipment evaluated	Y N U (N/A)	
9.	Have you looked for and found no other adverse concerns?	(Y) N U N/A	

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

CAVEATS - GERS

(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 the generic seismic testing equipment class	Y N U (N/A)
2.	Meets all Bounding Spectrum caveats	Y N U (N/A)
3.	Component is a pressure, temperature, level or flow transmitter	Y N U (N/A)

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-LPNL-925-006D Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-6D

CAVEATS - GERS (Cont'd)

4. Component is one of the specific makes and models tested, as listed in Appendix B — Y N U (N/A)
5. Necessary function of component not sensitive to seismically induced system perturbations (e.g., sloshing) — Y N U (N/A)
6. No vacuum tubes — Y N U (N/A)
7. All external mounting bolts in place — Y N U (N/A)
8. Demand based on amplified portion of 3% damped floor response spectrum if estimated natural frequency of rack less than 33 Hz — Y N U (N/A)
9. Rack capable of structurally transferring GERS level seismic loads to anchorage — Y N U (N/A)

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1. Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation) — (Y) N U N/A
2. Type of anchorage covered by GIP — (Y) N U N/A
3. Sizes and locations of anchors determined — (Y) N U N/A
4. Adequacy of anchorage installation evaluated (weld quality and length, nuts and washers, expansion anchor tightness, etc.) — (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)

Are anchorage requirements met? (Y) N U

INTERACTION EFFECTS

1. Soft targets free from impact by nearby equipment or structures — (Y) N U N/A Note 3
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

Flex OK for all components

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-LPNL-925-006D Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-6D

INTERACTION EFFECTS (Cont'd)

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

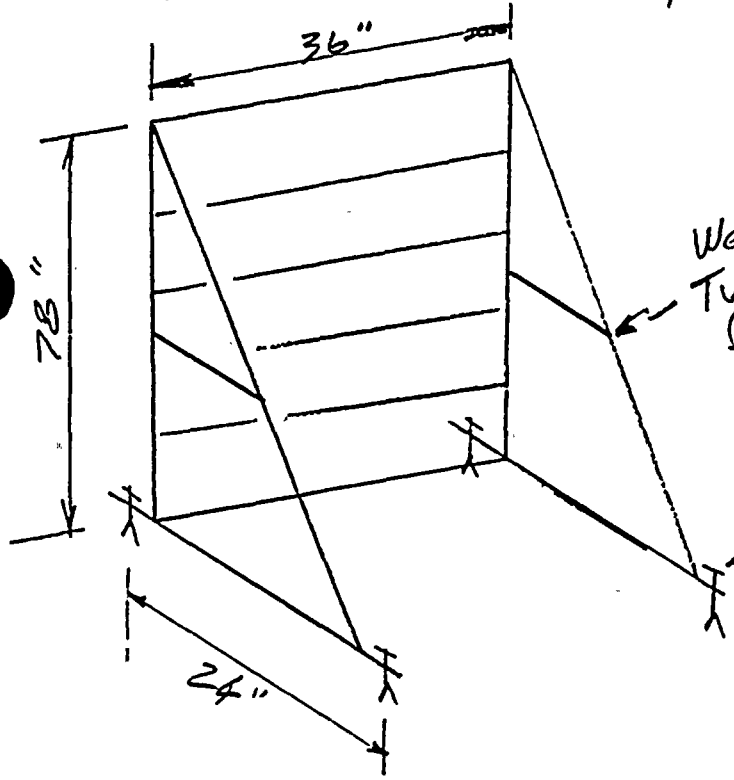
Is equipment free of interaction effects? (Y) N U

IS EQUIPMENT SEISMICALLY ADEQUATE? (Y) N U

COMMENTS

1. Panel is well braced. Judged to respond > 8 Hz.

2.



- Rack is very lightly loaded
- due to lightweight of components, anchorage of rack judged to be seismically adequate.

3. Nearby fire extinguisher judged adequately supported.

Evaluated by: G.D. Augustine Date: 9-18-95

9-19-95

G.18-3

Photo: 18-11

SSEL Line No. 9188 Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-LPNL-925-006D Equip. Class 18 - Instruments on Racks

Equipment Description LOCAL PANEL 25-6D

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE ~~OF~~ NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: [signature] Date: 9-19-95

Evaluated by: [signature] Date: 9-19-95

SSEL Line no. 3065

Note: This is a duplicate of Electrical SSEL Line Item # 9399

Revision 2A
Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 2

Equip. ID No. 2-NM-92-7/41A Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description Channel "A" IRM Indicator

Location: Bldg. CB Floor El. 617' Room, Row/Col Unit 2 MCR

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

SEISMIC CAPACITY VS DEMAND

			617'
1.	Elevation where equipment receives seismic input		Y N U N/A
2.	Elevation of seismic input below about 40' from grade		Y N U N/A
3.	Equipment has fundamental frequency above about 8 Hz		Y N U N/A
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	BS
		1.5 x Bounding Spectrum	ABS
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	GRS
		1.5 x Ground Response Spectrum	AGS
		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

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.	Steel frame and sheet metal structurally adequate	Y N U N/A
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
6.	Drawers and equipment on slides restrained from falling out	Y N U N/A
7.	All doors secured by latch or fastener	Y N U N/A
8.	Attached lines have adequate flexibility	Y N U N/A
9.	Anchorage adequate (See checklist below for details)	Y N U N/A
10.	Relays mounted on equipment evaluated	Y N U N/A
11.	Have you looked for and found no other adverse concerns?	Y N U N/A

Is the intent of all the caveats met for Bounding Spectrum? Y N U N/A

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	Y N U N/A
2.	Type of anchorage covered by GIP	Y N U N/A
3.	Sizes and locations of anchors determined	Y N U N/A

SSEL Line no. 3065

Revision 2A
Sheet 2 of 2

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-NM-92-7/41A Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description Channel "A" IRM Indicator

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	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

Are anchorage requirements met? Y N U

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
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
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

COMMENTS

The above equipment item is adequately mounted on Panel 2-9-12 (SSEL # 9403) and is evaluated by the rule of the box per GIP. Refer to SEWS for SSEL # 9403 for detailed evaluation of the control panel.

Evaluated by: John O. Dizon Date: 4/18/96

J.R. DISSER 4/19/96

SSEL Line No. 3065 Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-NM-92-7/41A Equip. Class 20 - Instr. & Control Panels + Cabinets

Equipment Description Channel "A" IRM Indicator

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

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)

Refer to the SEWS package for Panel 2-9-12 (SSEL #9403)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER? YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: John O. Dinn Date: 4/18/96

Evaluated by: J.R. DISSER Date: 4/19/96

[INTENT]

SSEL # 9403

Revision 2A
Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 2

Equip. ID No. 2-PNLA-009-012 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description Panel 2-9-12

Location: Bldg. CB Floor El. 617' Room, Row/Col MCR

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input	617'	
2.	Elevation of seismic input below about 40' from grade	Y (N) U N/A	
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A	(1)
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	BS	
	1.5 x Bounding Spectrum	(ABS)	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	GRS	
	1.5 x Ground Response Spectrum	AGS	
	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.	Steel frame and sheet metal structurally adequate	(Y) N U N/A	
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	
6.	Drawers and equipment on slides restrained from falling out	(Y) N U N/A	
7.	All doors secured by latch or fastener	Y (N) U N/A	(6)
8.	Attached lines have adequate flexibility	(Y) N U N/A	
9.	Anchorage adequate (See checklist below for details)	(Y) N U N/A	(5)
10.	Relays mounted on equipment evaluated AF = 4.5	(Y) N U N/A	(3)
11.	Have you looked for and found no other adverse concerns?	(Y) N U N/A	

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

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A
2.	Type of anchorage covered by GIP	(Y) N U N/A
3.	Sizes and locations of anchors determined	(Y) N U N/A

SSEL # 9403

SCREENING EVALUATION WORK SHEET (SEWS)

Revision 2A
Sheet 2 of 2

Equip. ID No. 2-PNLA-009-012 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description Panel 2-9-12

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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 welds	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 (5)

Are anchorage requirements met? (Y) N U

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A (4)
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
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

COMMENTS

- For notes 1-5, refer to the SEWS package for Panel 3-9-9 (SSEL # 39119) based on similar configuration.

6. Latches to the doors are loose and may cause relay chatter during a seismic event.

Evaluated by: John O. Disser Date: 4/19/96

J.R. DISSER 4/19/96

SSEL Line No. 9403
AI

Status Y (N) U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-PNLA-009-012 Equip. Class 20 - I&C Panels + Cabinets

Equipment Description Panel 2-9-12

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. See outlier OSVS # 9403 for potential relay chatter concerns.

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ___ NO ✓ (1)

Evaluated by: John O. Dizon Date: 4/19/96

Evaluated by: [signature] Date: 4/19/96

SSEL # 9403

Revision 2
Corrected, 6/28/91

OSVS # 9403

Exhibit 5-1

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 2-PNLA-009-012 Equipment Class 20

Equipment Location: Building CB Floor Elevation 617'

Room or Row/Column MCR Base Elevation 617'

Equipment Description Panel 2-9-12

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[1]	___
Caveats	✓	Anchor Bolts and Embedment	___
Anchorage	___	Anchorage Connections	___
Seismic Interaction	___	Flexibility of Attached Piping[1]	___
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	___

1 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):

Latches to the doors of this panel are loose and could potentially cause chatter to essential relays housed in the panel during a seismic event.

SSEL #. 9403

Revision 2
Corrected, 6/28/91

OSVS # 9403

Exhibit 5-1 (Cont'd)

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 2-PNLA-009-012

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

Repair loose latches or verify that there are no essential relay in the cabinet

There are no essential relays in panel 2-9-12. See attached informal memo dated 9-17-96. KHG

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

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
JOHN O. DIZON, PE	John O. Dizon	4/19/96
JAMES R. DISSER		4/19/96

INFORMAL

September 17, 1996

REVIEW FOR ESSENTIAL RELAYS IN PANELS 2-PNLA-009-0012 and 2-PNLA-009-0036A

Modifications or repair to panels 2-PNLA-009-0012 (SSEL No. 9403) and 2-PNLA-009-0036A (SSEL No. 9307) were determined to possibly be required under the USI A-46 program, resulting from outliers OSVS-9403, OSVS-9307-1, and OSVS-9307-2, if these panels contain essential relays. A review of the Browns Ferry Nuclear Plant USI A-46 Seismic Evaluation Report, May 1996, Revision 0 (R92 960624 850), Appendix A determined that there are no essential relays in these panels. This review resolves outliers OSVS-9403, OSVS-9307-1, and OSVS-9307-2.

Review performed by Kenneth H. Gromek — K. H. Gromek — 9-17-96 — date

Verified by Anand C. Relwani — A. C. Relwani — 9-17-96 — date

SSEL Line No. 9168 Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 1

Equip. ID No. 2-PX-64-67B Equip. Class 00 -

Equipment Description POWER SUPPLY (PNL 2-9-19 ; SUPPORTS 2-PI-64-67B)

Location: Bldg. CB Floor El. 593 Room, Row/Col U2 AIR

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

*** ~~THE EQUIPMENT CLASS FOR THIS PIECE OF EQUIPMENT HAS NOT BEEN DETERMINED~~ ***

This equipment is housed in Panel 2-9-19.
See SEWS for 2-PNLA-009-0019 (SSEL No. 9049)
for evaluation.

Evaluated by: Fawzi Beji Date: 7-21-95

John O. Dizon 7/21/95

SSEL Line No. 9168 Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-PX-64-67B Equip. Class 00 -

Equipment Description POWER SUPPLY (PNL 2-9-19 ; SUPPORTS 2-PI-64-67B)

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 (N/A) (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) 2-PX-64-67B is housed in panel 2-9-19 (SSEL #9049). Any essential relays within this panel will be evaluated separately in the A-46 relay review program.

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: Faraj Reji Date: 7-21-95

Evaluated by: John O. Dixon Date: 7/21/95

SSEL Line No. 9049 Status · (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 2

Equip. ID No. 2-PNLA-009-0019 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-19

Location: Bldg. CB Floor El. 593 Room, Row/Col U2 AIR

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		593
2.	Elevation of seismic input below about 40' from grade		(Y) N U grade @ 550'
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (1)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	(BS)
		1.5 x Bounding Spectrum	ABS
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	(GRS)
		1.5 x Ground Response Spectrum	AGS
		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 (Ref. calc. CD-Q0000-940339)

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 ok	(Y) N U N/A (11)
3.	No strip chart recorders	(Y) N U N/A
4.	Steel frame and sheet metal structurally adequate	(Y) N U N/A
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 (3), (10)
6.	Drawers and equipment on slides restrained from falling out	(Y) N U N/A
7.	All doors secured by latch or fastener	(Y) N U N/A
8.	Attached lines have adequate flexibility	(Y) N U N/A
9.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (6)
10.	Relays mounted on equipment evaluated AF = 4.5	(Y) N U N/A (2)
11.	Have you looked for and found no other adverse concerns?	(Y) N U N/A (12)

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

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A (4)
2.	Type of anchorage covered by GIP	(Y) N U N/A (2,5)
3.	Sizes and locations of anchors determined	(Y) N U N/A 1

SSEL Line No. 9049

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 2

Equip. ID No. 2-PNLA-009-0019 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-19

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(Y) N U N/A (2)
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 (2)
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)

Are anchorage requirements met? (Y) N U (2)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
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 (6)
4.	Overhead equipment or distribution systems are not likely to collapse	(Y) N U N/A (7)
5.	Have you looked for and found no other adverse concerns?	(Y) N U N/A (9)

Is equipment free of interaction effects? (Y) N U

IS EQUIPMENT SEISMICALLY ADEQUATE? (Y) N U

COMMENTS

For notes 1 thru 12 see notes 1-12 on SEWS for 2-PNLA-009-0018 (SSEL No. 9048).

Evaluated by: Fanzi Beij Date: 9-15-95

John O. Dizon 9/15/95

SSEL Line No. 9049 Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-PNLA-009-0019 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-19

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES / NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES / NO ___

Evaluated by: Farzi Bari Date: 9-15-95

Evaluated by: John O. Dunn Date: 9/15/95

SSEL Line No. 9048 Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 27

Equip. ID No. 2-PNLA-009-0018 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-18

Location: Bldg. CB Floor El. 593 Room, Row/Col U2 AIR

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		593'
2.	Elevation of seismic input below about 40' from grade		(Y) N U grade @ 550'
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (1)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	(BS)
		1.5 x Bounding Spectrum	ABS
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	(GRS)
		1.5 x Ground Response Spectrum	AGS
		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 (Ref. calc. CD-90000-940339)

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 ok	(Y) N U N/A (11)
3.	No strip chart recorders	(Y) N U N/A
4.	Steel frame and sheet metal structurally adequate	(Y) N U N/A
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 (3), (10)
6.	Drawers and equipment on slides restrained from falling out	(Y) N U N/A
7.	All doors secured by latch or fastener	(Y) N U N/A
8.	Attached lines have adequate flexibility	(Y) N U N/A (6)
9.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (2)
10.	Relays mounted on equipment evaluated AF=4.5	(Y) N U N/A (12)
11.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A (4)
2.	Type of anchorage covered by GIP	(Y) N U N/A (2,5)
3.	Sizes and locations of anchors determined	(Y) N U N/A !

SSEL Line No. 9048

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 27

Equip. ID No. 2-PNLA-009-0018 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-18

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(Y) N U N/A (2)
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 (2)
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)

Are anchorage requirements met? (Y) N U (2)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
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 (6)
4.	Overhead equipment or distribution systems are not likely to collapse	(Y) N U N/A (7)
5.	Have you looked for and found no other adverse concerns?	(Y) N U N/A (9)

Is equipment free of interaction effects? (Y) N U

IS EQUIPMENT SEISMICALLY ADEQUATE? (Y) N U

COMMENTS

For notes 1 thru 10 see pages 3 thru 7 of this SEWS.

Note 11) when Programable controllers are present in the ATR panels, they are either mounted on the front face of the panels and their rear is independently supported by a member that spans the panel in the back or they have their own rigid support system inside the panels.

Note 12) By referring to notes 1 and 10, and EPRI Report NP-7148-SL, an in-cabinet amplification factor of 4.5 is appropriate for these panels.

Evaluated by: Fazil Bajwa Date: 9-15-95

John O. Dizon 9/15/95

EQE INTERNATIONAL

SHEET NO. 3 of 7

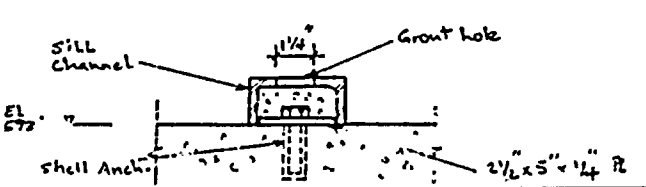
JOB NO. 50147 JOB TVA / BFNP A-46 / IPEEE BY JRei DATE 9-15-95

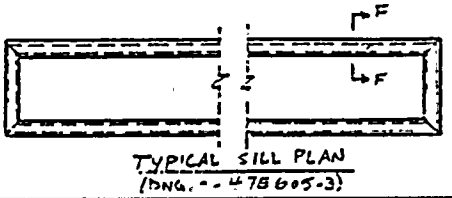
CALC. NO. N/A SUBJECT Attachment to SEWS for 2-PNLA-009-0018 (SSEL 9048) CHK'D J.D. Dizon DATE 9/15/95

SSEL No. 9048

1) panel is in a row of other similar panels which are all bolted together. These panels (9-19, 9-18, 9-30, 9-38, 9-28, 9-27) are all constructed of heavy gage metal ($t = 3/32"$). The front and sides of these panels where internal components are attached are reinforced. The panels base configuration consist of base angles ($L 2" \times 3" \times 1/4"$) which are welded to the sill channel. There are many top entry conduit with short spans that either span to another set of panels in an adjacent row (~ 4' away) or have independent rigid supports. The depth of these panels is 30". Based on the above discussion it can be judged (single units) that the panel frequency is at least 8 HZ. (Also, similar panels were shake table tested and showed to have fundamental frequency of about 10 HZ. Even though the tested panels are classified as switchboards, the configuration is similar to these panels.)

2) The anchorage of the sill channel to the floor is not visible. The detail shown on DWG. 0-47E605-3 (section F-F) indicates the following anchor configuration for the sill channel. However, the detail does not indicate at what interval this anchorage should be provided for the sill channel. Conservatively, Capacity vs. demand calculation performed on the following sheets (pp. 4&5), determines that a min. of 7 such details are req'd per side (F&B) of channel. Total length of sill channel is 29'/side. This means that @ n=7, one such detail is req'd at about every 5'. The detail is such that the anchor bolts could only be installed at the location of 1 1/4" ϕ grout holes provided on top of the sill channel. Grout holes are typically provided at every 2'-3' (from observations of similar configurations on site). Since the anchors could only be tightened through the grout holes, as the above referenced drawing indicates, it is reasonable to assume that there are anchors at every 2'-3' per sill channel. Therefore, it is judged that there are adequate anchorage for these panels.





2 (cont'd)

Anchorage Evaluation: (Conservatively, ignore top restraint provided by the conduit)

- D.Wt. = $\Big\{4 \times \underbrace{[(30\times30)+2(30\times90)+2(30\times90)]}_{46{,}800} + \underbrace{[(60\times30)+2(60\times90)+2(30\times}_{31320}$ $\underbrace{+3[(24\times30)+2(24\times90)+2(30\times90)]+2[(48\times30)+2(48\times90)+}_{30960}$ $2(30\times90)]\Big\} \times \frac{3}{32}" \times \frac{490}{12^3} \times 3.0 = 10{,}135.^{\#}$ (Conservatively use 3 x Cabinet wt. per GIP. some cabinets are relatively empty).

- @ f=8 Hz

$a_h = 0.6g$ (Ref. HARS Report, RB EL 593, DBE, 5% Damping)

$a_V = 0.16g$ (ZPA)

- $F_h = 10{,}135^{\#} \times 0.6g \times 1.25 = 7601.^{\#}$ ← To account for Hrd. Ctr. Spect.

$F_V = 10{,}135^{\#} \times 0.16g \times 1.25 = 2027.^{\#}$

- $1/2"\phi$ shell anchor bolts

$T_{all} = 2{,}290^{\#} \times 0.75 \times \frac{3600}{4000} = 1546.$ lbs ← Reduction for relays

$V_{all} = 2380^{\#} \times 0.75 = 1785.$ lbs

- $T = \left[\left(\frac{7601 \times 45"}{(30"-3")n}\right)^2 + \left(\frac{2027}{2n}\right)^2\right]^{1/2} - \frac{10135}{2n} \equiv 1546$

where n is the req'd. no. of anchor bolts per sill channel

$$\left(\frac{1.605\times10^8}{n^2} + \frac{1.027\times10^6}{n^2}\right)^{1/2} = \frac{10135 + 3092n}{2n}$$

$$\left(\frac{1.615\times10^8}{n^2}\right)^{1/2} = \frac{10135+3092n}{2n} \Rightarrow \frac{7626x^2}{3092} = n \rightarrow n = 5$$

2 (Cont'd)

- $V = \left(\frac{7601}{2n}\right)\sqrt{2} \equiv 1785$

$\Rightarrow n = 3$

Try $n=5 \rightarrow V = 1075. \rightarrow \frac{V}{V_{all}} = 0.60$

$\rightarrow T = 1528. \rightarrow \frac{T}{T_{all}} = 0.99$

$IR = 0.7(0.99) + 0.6 = 1.3 > 1.0 \longrightarrow$ use 6 anchors per sill channel

- @ $n=6 \rightarrow V = 896^{\#} \rightarrow \frac{V}{V_{all}} = 0.50$

$T = 1274^{\#} \rightarrow \frac{T}{T_{all}} = 0.82$

$IR = 0.7(0.82) + 0.50 = 1.07 > 1.0 \rightarrow$ use $n=7$

- @ $n=7 \rightarrow V = 768^{\#} \rightarrow \frac{V}{V_{all}} = 0.43$

$T = 1092. \rightarrow \frac{T}{T_{all}} = 0.71$

$IR = 0.7(0.71) + 0.43 = 0.93 < 1.0$ ok

∴ min Rigid anchor bolt per sill channel = 7

For typical grout hole spacing of 2'-3', use $n = \frac{29'}{3'} = 9.7 \rightarrow$ use $n=10$

- @ $n=10 \rightarrow V = 537 \rightarrow \frac{V}{V_{all}} = 0.3 \cong .3$ ok

$\rightarrow T = 764. \rightarrow \frac{T}{T_{all}} = 0.49 < 1.0$ ok

Note 2 (Cont'd).

- Evaluation of welds @ panel base to sill channel interface:

The connection of the panel to the sill channel is by providing weld on the inside of the panel base framing. Since, the panel base framing is L 3"x2"x 1/4" it is judged that the base is rigid enough to adequately transfer the load from the panel sides to the welds, and as such the weld configuration (w.r.t welding on the inside edge of the angle) is adequate.

Total length of weld per sill channel = @ Back : 26"

@ Front : 29.5"

use $\frac{26"}{2} = 13"$ ← conservative, to account for some deficient welds and overall weld positioning and quality

per Table C.6-2 of GIP every inch of a 1/8" weld is equivalent to a 1/2" ϕ expansion anchor bolt. Therefore, by comparison to the req'd no. of 1/2" ϕ Exp. anchors per sill channel (7 total) the welds are not the weak link in the load path and judged ok (13-1/2" ϕ ← conservative. 3/16" could be u

EQE INTERNATIONAL

SHEET NO. 7 of 7

JOB NO. 50147 JOB TVA/BENP A-46/IPEEE BY FBeiji DATE 9-15-95

CALC. NO. N/A SUBJECT Attach to SEWS for 2-PNLA-009-0018 (SSEL 9048) CHK'D J.O.Diaz DATE 9/15/95

Photo: 17 7:48 x 2, 17 7:49

SSEL: 9048, 9049, 9057, 9058

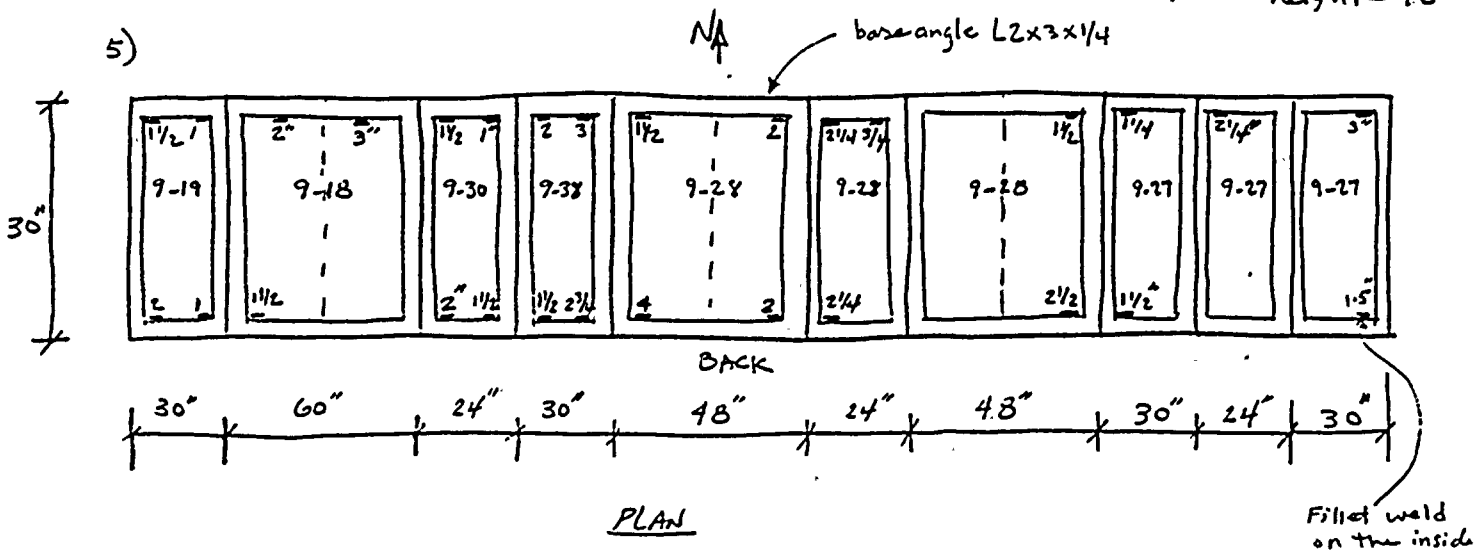
ID: Panels 9-18, 9-19, 9-28, 9-30

3) All adjacent panels are bolted together along their entire height w/ 1/2" ϕ bolts.

4) Use 3.0 x D.L. for wt. Calculation.
CG. @ geometric center of the panels

thickness = 3/32"
height = 90"

5)



PLAN

Fillet weld on the inside edge of base angle. 3/16" thk

6) Flex conduit have adequate flexibility

7) Fluorescent light tubes overhead adequately restrained from falling.

8) Conservatively, ignore any top restraint provided to these panels by top entry short span rigid conduit, in anchorage evaluation.

9) Blockwalls surrounding U2 AIR, i.e., at N, E & W of these panels have been qualified under IEB 80-11 program (Ref. DWG. 41N1202-1, R3) 41N1201-1, R4)

10) Panel 9-27 is butted against blockwall at one side and bolted to panel 9-28 at the other side. The row of panels in E-W direction is very rigid and the deflections at top of panels will be insignificant. It is judged that the relative displacement between these row of panels and the blockwall in the E/W dir. is zero and therefore ok

SSEL Line No. 9048 Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-PNLA-009-0018 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-18

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: Fonzi Deiji Date: 9-15-95

Evaluated by: John O. Dixon Date: 9/15/95

SSEL Line No. 9393 Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 1

Equip. ID No. 2-AMP-092-0007/41A Equip. Class 00 - Other

Equipment Description IRM Ch. "A" Voltage Preamplifier 7-34A

Location: Bldg. RB Floor El. 565 Room, Row/Col S/R10

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

IS EQUIPMENT SEISMICALLY ADEQUATE? (Y) N U

COMMENTS

This component is adequately mounted inside Panel 2-LPNL-925-0027 and is evaluated by rule of the box per GIP. Refer to SEWS package for 2-LPNL-925-0027 (SSEL # 9395) for detailed evaluation of the panel.

Evaluated by: John O. Dizon Date: 4/19/96

J.R. DISSEK 4/19/96

SSEL Line No. 9393
AI

Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-AMP-092-0007/41A Equip. Class 00 - Other

Equipment Description IRM Ch. "A" Voltage Preamplifier 7-34A

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

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)

See SEWS for SSEL #9395

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: John A Disser Date: 4/19/96

Evaluated by: J.R. DISSER Date: 4/19/96

SSEL Line no. 9395

Revision 2A
Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 3

Equip. ID No. 2-LPNL-925-0027 Equip. Class 14 - Distribution Panels

Equipment Description Panel 2-25-27 IRM PREAMP. RPS I

Location: Bldg. RB Floor El. 565 Room, Row/Col S/R10

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input	~570' Eff. Grade 530'	
2.	Elevation of seismic input below about 40' from grade	(Y) N U N/A	
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A	(2)
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	(BS)	
	1.5 x Bounding Spectrum	ABS	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	(GRS)	
	1.5 x Ground Response Spectrum	AGS	
	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

Ref. Calc. CD-Q0000-940339

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.	Contains only circuit breakers and switches	Y N U (N/A)	(1)
3.	All latches and fasteners in door secured	(Y) N U N/A	
4.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	Y N U (N/A)	
5.	Wall- or floor-mounted NEMA-type enclosure	(Y) N U N/A	(1)
6.	Anchorage adequate (See checklist below for details)	(Y) N U N/A	
7.	Relays mounted on equipment evaluated	Y N U (N/A)	
8.	Have you looked for and found no other adverse concerns?	(Y) N U N/A	

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

CAVEATS - GERS (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 the generic seismic testing equipment class	Y N U	(N/A)
2.	Meets all Bounding Spectrum caveats	Y N U	(N/A)
3.	Use panelboard GERS unless unit is free-standing and designated as a switchboard by manufacturer	Y N U	(N/A)
4.	W "Quicklag" Type E circuit breakers are not in distribution panel	Y N U	(N/A)
5.	All adjacent cabinets or sections of multi-bay assemblies bolted together	Y N U	(N/A)

Is the intent of all the caveats met for GERS? Y N U (N/A)

SSEL Line no. 9395

SCREENING EVALUATION WORK SHEET (SEWS) Revision 2A Sheet 2 of 3

Equip. ID No. 2-LPNL-925-0027 Equip. Class 14 - Distribution Panels

Equipment Description Panel 25-27 IRM PREAMP. RPS I

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A
2.	Type of anchorage covered by GIP	(Y) N U N/A
3.	Sizes and locations of anchors determined	(Y) N U N/A
4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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 (3)
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)

Are anchorage requirements met? (Y) N U (4)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
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
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

See next page for walkdown notes

SSEL Line no. 9395

Revision 2A
Sheet 3 of 3

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-LPNL-925-0027 Equip. Class 14 - Distribution Panels

Equipment Description Panel 2-25-27 IRM PREAMP. RPS I

COMMENTS

1 - Typical Hoffman single door enclosure, size: 30"W x 36"H x 16"D (NEMA type, 14 gage). A total of 6 preamplifiers are rigidly mounted to the enclosure back panel. Two pulse preamps. on top row, and 2 voltage preamps. on the middle and bottom rows.

2 - The panel enclosure is rigidly mounted to the wall by 4-1/2"ϕ exp. anchors (2 on top + 2 at the bottom). The preamplifiers are light weight and are rigidly mounted on 1/8" thick plate which is bolted to the back of panel with 4-3/8"ϕ welded studs. Top entry conduit are well supported. Overall frequency is judged to be >8 hz. (Also, per EPRI TR-102180, similar wall-mounted distribution panels exhibited a lowest natural frequency of >12 hz per test results.

3 - Gap between the enclosure and the wall is about 1/2" due to the presence of ground wire behind the panel. Stacks of washers are provided at each of the bolt locations, thus considered adequate.

4 - Panel/anchorage configuration is enveloped by the bounding calculation performed for SSEL # 39051, with large margins.

Evaluated by: John O. Dizon Date: 4/19/96

J.R. DISSER 4/19/96

SSEL Line No. 9395
AI

Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-LPNL-925-0027 Equip. Class 14 - Distribution Panels

Equipment Description Panel 2-25-27 IRM PREAMP RPS I

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: John D. Dizon Date: 4/19/96

Evaluated by: L.P. DISSER Date: 4/19/96

SSEL Line No. 39051 Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 34

Equip. ID No. 3-JBOX-253-7162 Equip. Class 14 - Distribution Panels

Equipment Description I&C BUS 3B BREAKER BOX

Location: Bldg. U3 RB Floor El. 593 Room, Row/Col SD BD RM F

Manufacturer, Model, Etc. (optional but recommended) GE F225 + J600 line circuit breakers

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		599'
2.	Elevation of seismic input below about 40' from grade		(Y) N U grade @ 563
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (2)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	(BS)
		1.5 x Bounding Spectrum	ABS
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	(GRS)
		1.5 x Ground Response Spectrum	AGS
		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 (Rf. Calc CD-Q0000-94079)

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.	Contains only circuit breakers and switches	(Y) N U N/A	
3.	All latches and fasteners in door secured	(Y) N U N/A	
4.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	Y N U (N/A)	
5.	Wall- or floor-mounted NEMA-type enclosure	(Y) N U N/A	(1)
6.	Anchorage adequate (See checklist below for details)	(Y) N U N/A	
7.	Relays mounted on equipment evaluated	Y N U (N/A)	
8.	Have you looked for and found no other adverse concerns?	(Y) N U N/A	

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

CAVEATS - GERS (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 the generic seismic testing equipment class	Y N U (N/A)
2.	Meets all Bounding Spectrum caveats	Y N U (N/A)
3.	Use panelboard GERS unless unit is free-standing and designated as a switchboard by manufacturer	Y N U (N/A)
4.	W "Quicklag" Type E circuit breakers are not in distribution panel	Y N U (N/A)
5.	All adjacent cabinets or sections of multi-bay assemblies bolted together	Y N U (N/A)

Is the intent of all the caveats met for GERS? Y N U (N/A)

SSEL Line No. 39051

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 64

Equip. ID No. 3-JBOX-253-7162 Equip. Class 14 - Distribution Panels

Equipment Description I&C BUS 3B BREAKER BOX

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A (1, 4)
2.	Type of anchorage covered by GIP	(Y) N U N/A
3.	Sizes and locations of anchors determined	(Y) N U N/A
4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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)

Are anchorage requirements met? (Y) N U (4)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
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 (3)
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

See next pages for notes.

SSEL Line No. 39051

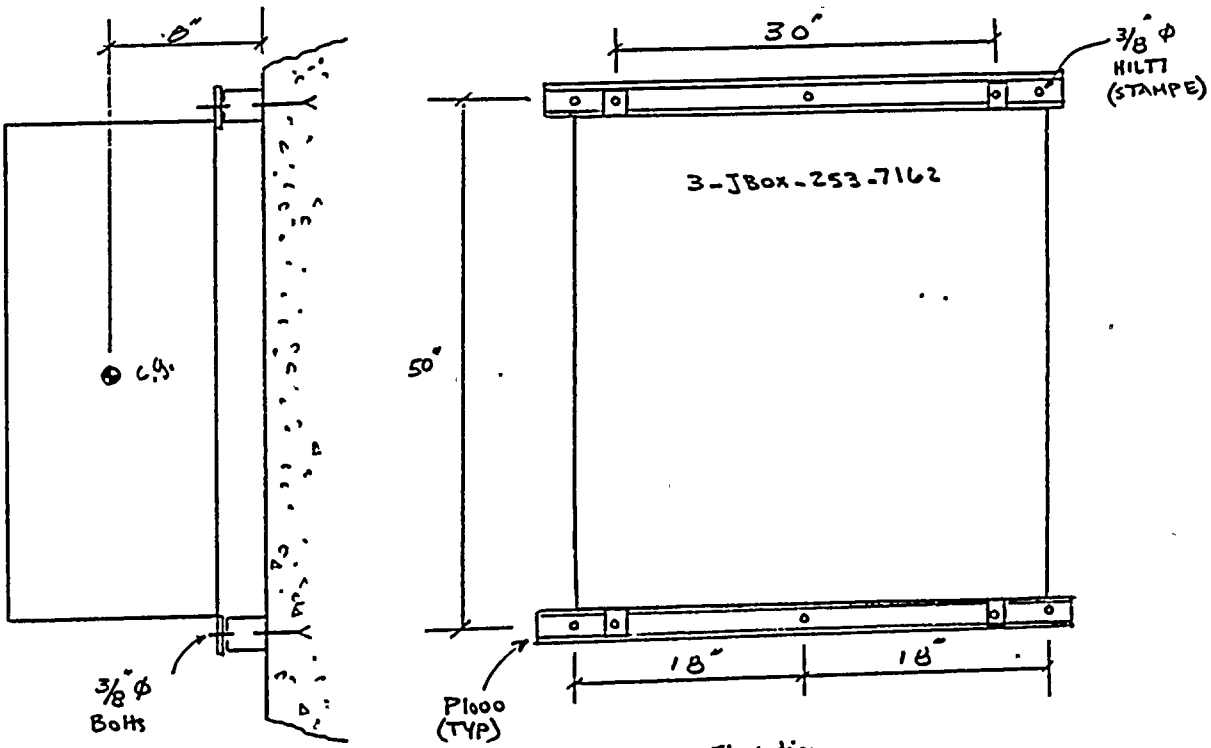
SCREENING EVALUATION WORK SHEET (SEWS) Sheet 3 of ~~3~~ 4

Equip. ID No. 3-JBOX-253-7162 Equip. Class 14 - Distribution Panels

Equipment Description I&C BUS 3B BREAKER BOX

COMMENTS

1) Hoffman box size 44"x36"x12" (NEMA Type 12 single door enclosure) gage 14



Elevation

2) Box is wall-mount and is rigidly supported. Light wt. breakers are mounted on 1/8" thick plate which is bolted to the back of the panel with 8-1/2"ϕ welded studs. → f > 8 HZ

(Also, per EPRI Report TR-102180 the lowest natural frequency of wall-mount distribution panels from test results indicate f > 12 HZ)

3) Flex conduit w/ adequate flexibility. Top entry rigid conduit supported from wall. Relative displacement between the conduit & the box = 0" → flexibility ok

Evaluated by: Fangli Bei Date: 9-18-95

John O. Dizon 9/21/95

4) Anchorage Evaluation:

NEMA Type 12
Typically gage 14 (Hoffman Single door enclosure)

$$Wt. = 3.0 \times \frac{490}{12^3} \times .0785 \times 2\left[(48\times36)+(36\times12)-(48\times12)\right] = 365^{\#}$$

↑ conservative

Conservatively use peak accelerations @ RB, EL. 639' (for bounding purposes)

Factor to account for Med. ctr. spectra

$a_h = 2.48\,g \rightarrow F_h = 2.48g \times 1.25 \times 365^{\#} = 1132.^{\#}$

$a_v = 0.73\,g \rightarrow F_v = 0.73g \times 1.25 \times 365^{\#} = 333.^{\#}$

$$T = \left[\left(\frac{1132}{6}\right)^2 + \left(\frac{1132\times8}{36\times2}\right)^2 + \left(\frac{333\times8}{50\times3}\right)^2\right]^{1/2} + \frac{365\times8}{50\times3}$$

$$= 247^{\#}$$

$$V = \left[\left(\frac{1132}{6}\right)^2 + \left(\frac{333}{6}\right)^2\right]^{1/2} + \frac{365}{6} = 257.^{\#}$$

For 3/8" ϕ HILTI:

Reduction factor for presence of relays, used here for bounding purposes

$$T_{all} = 1.46 \times \frac{3600}{4000} \times 0.75 = 0.986$$

$$V_{all} = 1.42^{K} \times .75 = 1.065^{K} \rightarrow \frac{V}{V_{all}} = \frac{257}{1065} = 0.24 \quad < 0.3 \quad \text{ok}$$

$$\frac{T}{T_{all}} = \frac{247}{986} = 0.25 \quad < 1.0 \quad \text{ok}$$

For 3/8" ϕ Unistrut bolts,

$T' = \left[\left(\frac{1132}{4}\right)^2 + \left(\frac{1132\times8}{30\times2}\right)^2 + \left(\frac{333\times8}{50\times2}\right)^2\right]^{1/2} + \frac{365\times8}{50\times2} = 351^{\#} < T'_{all} = 1000^{\#}$ (Ref. Unistrut Catal. no. 12)

$V' = \frac{1132}{4} = 283^{\#}$ (slip) $< V'_{all} = 800^{\#}$ (Ref. ")

∴ Anchorage adequate

(Also Calc. CD-Q3253-900448, Rev. 1 conservatively qualifies the anchorage Config. of this JBox.)

SSEL Line No. 39051 Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 3-JBOX-253-7162 Equip. Class 14 - Distribution Panels

Equipment Description I&C BUS 3B BREAKER BOX

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER? YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: Fazi Beij Date: 9-18-95

Evaluated by: John O. Dizon Date: 9/21/95

INSTRUMENTATION LOOP

SSEL Line No. 33055 Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of ~~2~~ 5

SEE PANEL 9-3

Equip. ID No. 3-XR-64-159 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description TORUS LEVEL AND DRYWELL PRESSURE INSTRUMENT

Location: Bldg. CB Floor El. 617 Room, Row/Col _____

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		
2.	Elevation of seismic input below about 40' from grade	Y N U	
3.	Equipment has fundamental frequency above about 8 Hz	Y N U	N/A
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	BS	
	1.5 x Bounding Spectrum	ABS	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	GRS	
	1.5 x Ground Response Spectrum	AGS	
	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

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.	Steel frame and sheet metal structurally adequate	Y N U	N/A
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
6.	Drawers and equipment on slides restrained from falling out	Y N U	N/A
7.	All doors secured by latch or fastener	Y N U	N/A
8.	Attached lines have adequate flexibility	Y N U	N/A
9.	Anchorage adequate (See checklist below for details)	Y N U	N/A
10.	Relays mounted on equipment evaluated	Y N U	N/A
11.	Have you looked for and found no other adverse concerns?	Y N U	N/A

Is the intent of all the caveats met for Bounding Spectrum? Y N U N/A

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	Y N U	N/A
2.	Type of anchorage covered by GIP	Y N U	N/A
3.	Sizes and locations of anchors determined	Y N U	N/A

SEL Line No. 33055

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 5

Equip. ID No. 3-XR-64-159 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description TORUS LEVEL AND DRYWELL PRESSURE INSTRUMENT

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	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

re anchorage requirements met? Y N U

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
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
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

COMMENTS

1. SEE SEWS FOR 2-XR-64-159 (SSEL # 3057)
2. FOR EVALUATION OF THIS COMPONENT SEE SSEL # 39115. QUALIFIED BY "RULE OF THE BOX."

Evaluated by: J.R. Disser Date: 10/17/95

10-17-95

33055A

Revision 2, Corrected, 6/28/91
Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet ~~1 of 3~~ 3 OF 5

Equip. ID No. 3-LT-64-159B Equip. Class 18 - Instruments on Racks

Equipment Description TORUS LEVEL TRANSMITTER

Location: Bldg. RB Floor El. 519 Room, Row/Col TORUS ROOM

Manufacturer, Model, Etc. (optional) ROSEMOUNT

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input	~523	
2.	Elevation of seismic input below about 40' from grade	(Y) N U	
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A	
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	(BS)	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	(GRS)	
	1.5 x Bounding Spectrum	ABS	
	Conserv. Des. In-Str. Resp. Spec.	CRS	
	Realistic M-Ctr. In-Str. Resp. Spec.	RRS	

Does capacity exceed demand? (Y) N U

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.	Steel frame and sheet metal structurally adequate	(Y) N U N/A	NOTE (1)
4.	Adjacent racks which are close enough to impact or sections of multi-bay racks are bolted together if they contain essential relays	Y N U (N/A)	
5.	Natural frequency relative to 8 Hz limit considered	(Y) N U N/A	
6.	Attached lines have adequate flexibility	(Y) N U N/A	FLEX OK
7.	Anchorage adequate (See checklist below for details)	(Y) N U N/A	
8.	Relays mounted on equipment evaluated	Y N U (N/A)	
9.	Have you looked for and found no other adverse concerns?	(Y) N U N/A	

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

CAVEATS - GERS (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 the generic seismic testing equipment class	Y N U	(N/A)
2.	Meets all Bounding Spectrum caveats	Y N U	(N/A)
3.	Component is a pressure, temperature, level or flow transmitter	Y N U	(N/A)

SCREENING EVALUATION WORK SHEET (SEWS)

Revision 2, Corrected, 6/28/91
Sheet ~~2 of 3~~ 4 OF 5

Equip. ID No. 3-LT-64-159B Equip. Class 18 - Instruments on Racks

Equipment Description TORUS LEVEL TRANSMITTER

CAVEATS - GERS (Cont'd)

4.	Component is one of the specific makes and models tested, as listed in Appendix B	Y	N	U	N/A
5.	Necessary function of component not sensitive to seismically induced system perturbations (e.g., sloshing)	Y	N	U	N/A
6.	No vacuum tubes	Y	N	U	N/A
7.	All external mounting bolts in place	Y	N	U	N/A
8.	Demand based on amplified portion of 3% damped floor response spectrum if estimated natural frequency of rack less than 33 Hz	Y	N	U	N/A
9.	Rack capable of structurally transferring GERS level seismic loads to anchorage	Y	N	U	N/A

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y)	N	U	N/A
2.	Type of anchorage covered by GIP	(Y)	N	U	N/A
3.	Sizes and locations of anchors determined	(Y)	N	U	N/A
4.	Adequacy of anchorage installation evaluated (weld quality and length, nuts and washers, expansion anchor tightness, etc.)	(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)

Are anchorage requirements met? (Y) N U NOTE (1)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y)	N	U	N/A
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

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 3-LT-64-159B Equip. Class 18 - Instruments on Racks

Equipment Description TORUS LEVEL TRANSMITTER

INTERACTION EFFECTS (Cont'd)

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

COMMENTS

① MOUNTING & ANCHORAGE OK BY TUG TEST LIGHT WEIGHT, WALL MOUNTED.

Evaluated by: J.R. DISSEVE Date: 10/13/95

10-13-95

SSEL Line No. 33055 A

Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

SEE PAGE 9-3

Equip. ID No. 3-XR-64-159 — 3-LT-64-159B

Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description TORUS LEVEL AND DRYWELL PRESSURE INSTRUMENT

THIS FORM APPLIES TO 3-LT-64-159B ONLY.

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: _____ Date: 9-15-95

Evaluated by: _____ Date: 9-15-95

SEL Line No. 33055

Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 3-XR-64-159 Equip. Class 20

Equipment Description _____

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

SYSTEM INTERACTION EFFECTS

4. 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)

SEE THE SEWS FOR SSEL # 39115 FOR THE EVALUATION OF THIS COMPONENT

EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER? YES V NO ___

EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES V NO ___

Evaluated by: J.R. Bisser Date: 10/20/95

Evaluated by: John O. Dizon Date: 10/20/95

INSTRUMENTATION LOOP

3057

SSEL Line No. 3069 Status (Y) N U
I

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 27

SEE PANEL 9-3

Equip. ID No. 2-XR-64-159 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description TORUS LEVEL INSTRUMENT

Location: Bldg. CR Floor El. 617 Room, Row/Col _____

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		
2.	Elevation of seismic input below about 40' from grade		Y N U
3.	Equipment has fundamental frequency above about 8 Hz		Y N U N/A
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	BS
		1.5 x Bounding Spectrum	ABS
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	GRS
		1.5 x Ground Response Spectrum	AGS
		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

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.	Steel frame and sheet metal structurally adequate	Y N U N/A
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
6.	Drawers and equipment on slides restrained from falling out	Y N U N/A
7.	All doors secured by latch or fastener	Y N U N/A
8.	Attached lines have adequate flexibility	Y N U N/A
9.	Anchorage adequate (See checklist below for details)	Y N U N/A
10.	Relays mounted on equipment evaluated	Y N U N/A
11.	Have you looked for and found no other adverse concerns?	Y N U N/A

Is the intent of all the caveats met for Bounding Spectrum? Y N U N/A

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	Y N U N/A
2.	Type of anchorage covered by GIP	Y N U N/A
3.	Sizes and locations of anchors determined	Y N U N/A

SSEL Line No. ~~3069~~ 3057

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 27

Equip. ID No. 2-XR-64-159 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description TORUS LEVEL INSTRUMENT

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	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

Are anchorage requirements met? Y N U

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
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
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

COMMENTS

1. FOR INSTRUMENTATION LOOP SCHEMATIC SEE PAGES 6 & 7. ALL COMPONENTS ARE QUALIFIED BY THE SEWS FOR THEIR SUPPORTING RACK OR PANEL OR BY THE SEWS FOR THE INDIVIDUAL COMPONENTS
2. Z-LT-64-159B IS QUALIFIED ON PAGES 3, 4 & 5 OF THIS SEWS.

Evaluated by: J.R. Sisser Date: 10/17/95

10-17-95

3. FOR THE EVALUATION OF THIS COMPONENT SEE THE SEWS FOR SSEL LINE NOS. 9040/9041. QUALIFIED BY "RULE OF THE BOX".

SSEL # 3057A

Revision 2, Corrected, 6/28/91
Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 3 of 7

Equip. ID No. 2-LT-64-159B Equip. Class 18 - Instruments on Racks

Equipment Description TORUS LEVEL INSTRUMENT (TRANSMITTER)

Location: Bldg. TORUS Floor El. 519 Room, Row/Col _____

Manufacturer, Model, Etc. (optional) ROSEMOUNT

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		523
2.	Elevation of seismic input below about 40' from grade		(Y) N U
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	(BS)
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	(GRS)
		1.5 x Bounding Spectrum	ABS
		Conserv. Des. In-Str. Resp. Spec.	CRS
		Realistic M-Ctr. In-Str. Resp. Spec.	RRS

Does capacity exceed demand? (Y) N U

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.	Steel frame and sheet metal structurally adequate	(Y) N U N/A NOTE (1)
4.	Adjacent racks which are close enough to impact or sections of multi-bay racks are bolted together if they contain essential relays	Y N U (N/A)
5.	Natural frequency relative to 8 Hz limit considered	(Y) N U N/A
6.	Attached lines have adequate flexibility	(Y) N U N/A FLEX OK
7.	Anchorage adequate (See checklist below for details)	(Y) N U N/A
8.	Relays mounted on equipment evaluated	Y N U (N/A)
9.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

CAVEATS - GERS (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 the generic seismic testing equipment class	Y N U N/A
2.	Meets all Bounding Spectrum caveats	Y N U N/A
3.	Component is a pressure, temperature, level or flow transmitter	Y N U N/A

Equip. ID No. 2-CT-L4-159B Equip. Class 18 - Instruments on Racks

Equipment Description TORUS LEVEL TRANSMITTER

CAVEATS - GERS (Cont'd)

4.	Component is one of the specific makes and models tested, as listed in Appendix B	Y	N	U	N/A
5.	Necessary function of component not sensitive to seismically induced system perturbations (e.g., sloshing)	Y	N	U	N/A
6.	No vacuum tubes	Y	N	U	N/A
7.	All external mounting bolts in place	Y	N	U	N/A
8.	Demand based on amplified portion of 3% damped floor response spectrum if estimated natural frequency of rack less than 33 Hz	Y	N	U	N/A
9.	Rack capable of structurally transferring GERS level seismic loads to anchorage	Y	N	U	N/A

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y)	N	U	N/A
2.	Type of anchorage covered by GIP	(Y)	N	U	N/A
3.	Sizes and locations of anchors determined	(Y)	N	U	N/A
4.	Adequacy of anchorage installation evaluated (weld quality and length, nuts and washers, expansion anchor tightness, etc.)	(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)

Are anchorage requirements met? (Y) N U NOTE (1)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y)	N	U	N/A
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

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-LT-64-159B Equip. Class 18 - Instruments on Racks

Equipment Description TORUS LEVEL TRANSMITTER

INTERACTION EFFECTS (Cont'd)

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

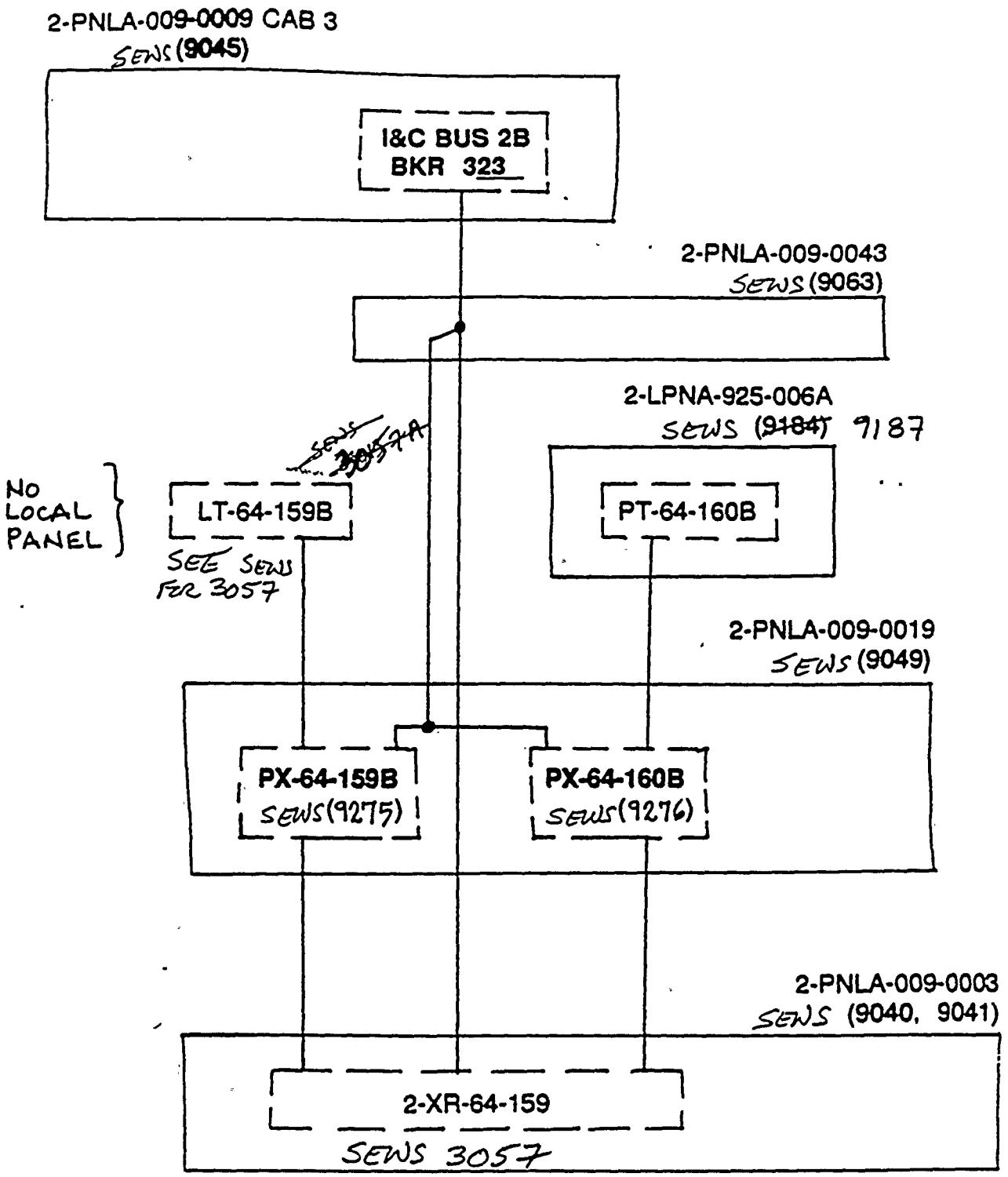
COMMENTS

(1) MOUNTING & ANCHORAGE OK BY TUG TEST; LIGHTWEIGHT, WALL MOUNTED

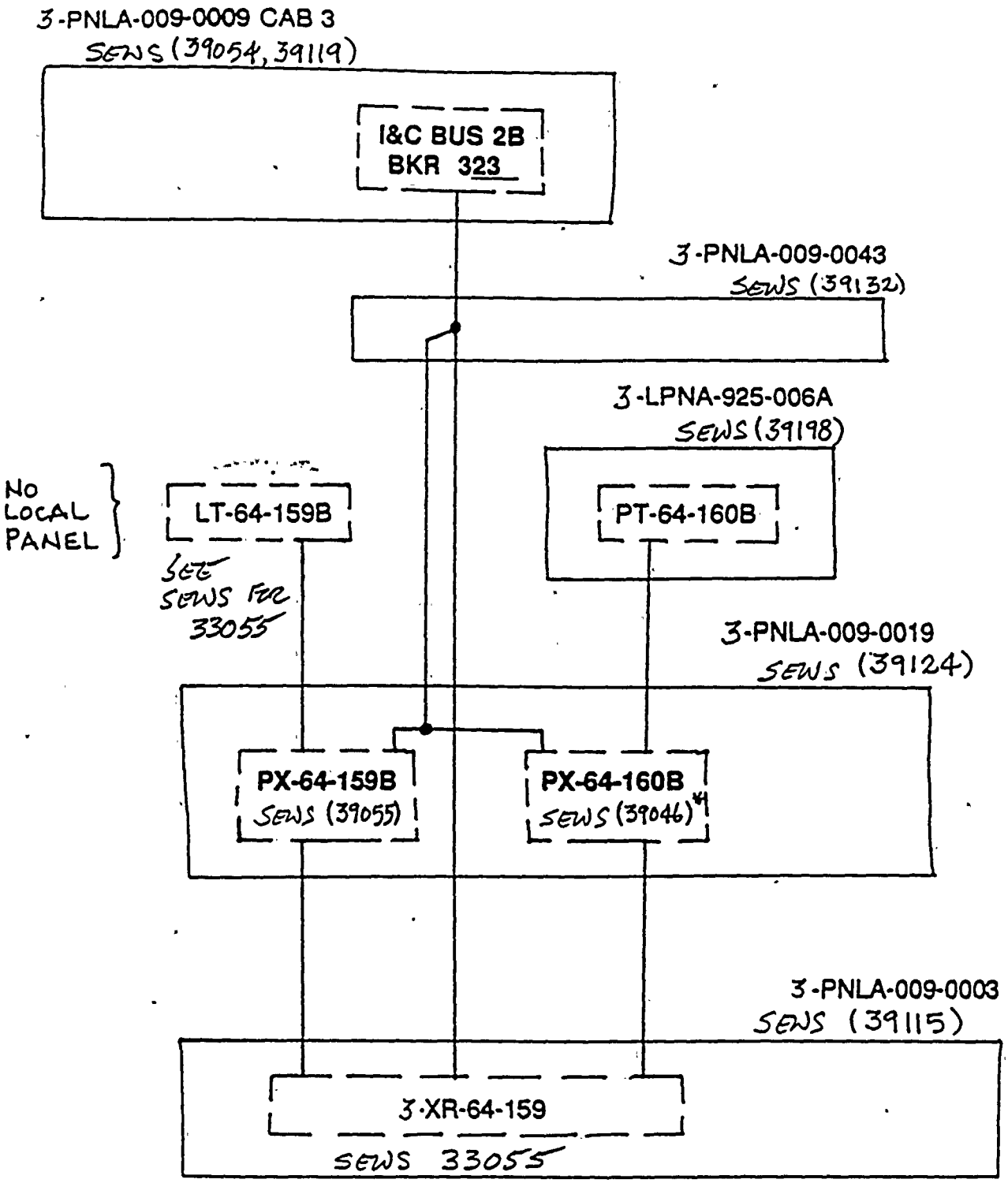
Evaluated by: [signature] Date: 9-14-95

[signature] 9-14-95

PHOTO 14 13:14



UNIT 2 : I&C BUS B POWER SUPPLIES



UNIT 3 : I&C BUS B POWER SUPPLIES

DONE

*.... 39046 IS CURRENTLY ~~ID~~ = 3-PX-64-15
THIS WILL BE REVISED TO 3-PX-64-160
(LOCATION: PNL 9-19)

3057

SSEL Line No. ~~3069~~ Status (Y) N U

I

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

SEE PANEL 93 — 2-LT-64-159B

Equip. ID No. (2-XR-64-159) Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description TORUS LEVEL INSTRUMENTS

THIS FORM APPLIES TO 2-LT-64-159B ONLY.

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: _____ Date: 9-14-95

Evaluated by: R.D. Augusta Date: 9-14-95

SSEL Line No. 3057 Status Y N U
AI

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-XR-64-159 Equip. Class 20

Equipment Description _____

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

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)

SEE THE SEWS FOR SSEL # 9040/9041
FOR THE EVALUATION OF THIS COMPONENT

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES___ NO___

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

Evaluated by: J.R. DISSOR Date: 10/20/95

Evaluated by: John D. Dizon Date: 10/20/95

(INTENT)

SSEL Line No. 39115 Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 2

Equip. ID No. 3-PNLA-009-0003 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description REACTOR SD & CONT. COOLING PNL

Location: Bldg. CB Floor El. 621 Room, Row/Col U3 MCR

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		617'
2.	Elevation of seismic input below about 40' from grade		Y (N) U (Grade @ 563)
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (1)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	BS
		1.5 x Bounding Spectrum	(ABS)
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	GRS
		1.5 x Ground Response Spectrum	AGS
		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 (8)
3.	No strip chart recorders	(Y) N U N/A (8)
4.	Steel frame and sheet metal structurally adequate	(Y) N U N/A (3)
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 (8)
7.	All doors secured by latch or fastener	(Y) N U N/A (5)
8.	Attached lines have adequate flexibility	(Y) N U N/A
9.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (1)
10.	Relays mounted on equipment evaluated AMP F = 4.5	(Y) N U N/A (9)
11.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A (1)
2.	Type of anchorage covered by GIP	(Y) N U N/A
3.	Sizes and locations of anchors determined	(Y) N U N/A

SSEL Line No. 39115

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 2

Equip. ID No. 3-PNLA-009-0003 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description REACTOR SD & CONT. COOLING PNL

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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

Are anchorage requirements met? (Y) N U (1)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A (6)
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
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 (10)

COMMENTS

For Notes 1-3, 5, 6, 8-9 see the corresponding notes on SEWS for 2-PNLA-009-0003A (SSEL 9040)
Notes 4 & 7 not used.

Evaluated by: Farzi Beig Date: 11-27-95

H. O. Dizon 11/28/95

(10) All adjacent bench board panels are bolted together by 1/2"ϕ to 5/8"ϕ bolts. However, between panels 9-3 and 9-2, only one bolt is present (bottom) at the rear. The upper 3 bolts are all missing → Outlier #39115. 4/19/96 JOD 4/19/96

SSEL Line No. 39115 Status Y (N) U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 3-PNLA-009-0003 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description REACTOR SD & CONT. COOLING PNL

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. See: OSVS# 39115 for relay chatter concern JD 4/19/96 4/19/96

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ___ NO ✓ (1)

Evaluated by: Farzi Beig Date: 11-27-95

Evaluated by: John O. Dixon Date: 11/28/95

SSEL Line No. 39115 OSVS # 39115

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 3-PNLA-009-0003 Equipment Class 20

Equipment Location: Bldg. CB Floor Elevation 617'

Room or Row/Column Unit 3 MCR Base Elevation 617'

Equipment Description Panel 3-9-3

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):

At the interface between Panels 3-9-2 and 3-9-3, the upper 3 bolts connecting the two panels are missing in the rear, thus, may cause relay chatter in the event of an earthquake. Only the bottom bolt is present. Panels are connected at top & bottom in front.

SSEL Line No. 39115

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 3-PNLA-009-0003

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

Install a connection bolt at the top rear corner between Panels 3-9-2 & 3-9-3, or verify that there are no essential relays in Panel 3-9-3.

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

REVIEW OF THE ESSENTIAL RELAYS LIST INDICATES NO ESSENTIAL RELAYS ARE PRESENT IN 3-PNLA-009-003. THEREFORE, OSVS 39115 IS RESOLVED.

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
JOHN O. DIZON, PE	John O. Dizon	4/19/96
J. R. DISSER		4/19/96

ATTACHMENT 11

(INTENT)

SSEL Line No. 9028 Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 24

Equip. ID No. 2-BDBB-268-0002E Equip. Class 01 - Motor Control Centers

Equipment Description 480V RMOV BD 2E

Location: Bldg. RB Floor El. 621'-3" Room, Row/Col U-R8

Manufacturer, Model, Etc. (optional but recommended) International Switchboard Corp

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 @ 563')
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (1)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	BS
		1.5 x Bounding Spectrum	(ABS)
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	GRS
		1.5 x Ground Response Spectrum	AGS
		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.	600 V rating or less	(Y) N U N/A
3.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	(Y) N U N/A (4), (12)
4.	Attached weight (except conduit) less than about 100 lbs per cabinet assembly	(Y) N U N/A
5.	Externally attached items rigidly anchored	(Y) N U N/A
6.	General configuration similar to NEMA Standards	(Y) N U N/A
7.	Cutouts in lower half less than 6 in. wide and 12 in. high	(Y) N U N/A
8.	All doors secured by latch or fastener	(Y) N U N/A
9.	Natural frequency relative to 8 Hz limit considered	(Y) N U N/A (7), (11)
10.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (3), (6)
11.	Relays mounted on equipment evaluated AF=3.0	(Y) N U N/A
12.	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

SSEL Line No. 9028

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 34

Equip. ID No. 2-BDBB-268-0002E Equip. Class 01 - Motor Control Centers

Equipment Description 480V RMOV BD 2E

CAVEATS - GERS (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 generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Bounding Spectrum caveats	Y	N	U	N/A
3.	Floor mounted cabinet	Y	N	U	N/A
4.	Maximum weight per section less than 800 pounds	Y	N	U	N/A
5.	Base anchorage utilizing MCC base channels	Y	N	U	N/A
6.	Adequate strength and stiffness in load transfer path from anchorage to base frame (only for "function after" GERS)	Y	N	U	N/A
7.	Essential relays have GERS > 4.5g (only for "function during" GERS)	Y	N	U	N/A
8.	Able to reset starters (only for "function after" GERS)	Y	N	U	N/A
9.	All adjacent cabinets or sections of multi-bay assemblies bolted together	Y	N	U	N/A

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y)	N	U	N/A (6, 7), (14)
2.	Type of anchorage covered by GIP	(Y)	N	U	N/A
3.	Sizes and locations of anchors determined	(Y)	N	U	N/A
4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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

Are anchorage requirements met? (Y) N U (3), (10)

SSEL Line No. 9028

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-BDBB-268-0002E Equip. Class 01 - Motor Control Centers

Equipment Description 480V RMOV BD 2E

INTERACTION EFFECTS

1. Soft targets free from impact by nearby equipment or structures — (Y) N U N/A
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 (13)
4. Overhead equipment or distribution systems are not likely to collapse — (Y) N U N/A (15)
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

COMMENTS

1) This MCC has 5 bays. The two end bays are 20"x 36"(deep) x 90" height and the three middle bays are 20"x20"x90". These bays are all bolted together. The panel sheet metal thickness is 3/32" and the sidepanels are continuous without any cutouts. The base and internal framing members are L1½x1½. Each of the bays are bolted to sill channel by 4-7/8"φ bolts. Eventhough no top bracing is provide it is judged that the lowest frequency of this MCC is greater than 8 HZ due to characteristics listed above.

2) per Calc. CD-Q0000-940339, Figure B.1, the In-structure spectra @ EL.621' of RB exceeds the 1.5X Bounding spectrum (Seismic Capacity) in the frequency Range of 5.0 to 7 HZ. Since the lowest natural frequency of this MCC is greater than 7 HZ (see note1) and there are no exceedances above 7 HZ, the intent of the GIP seismic Capacity vs. demand criteria is met.

- For notes 3, 4, 6, 7, 9, 10 see SEWS for 3-BDBB-268-0003D (SSEL 39016).

- notes 5+8 not used.

Evaluated by: [signature]   Date: 10-10-95

[signature]   10/10/95

EQE INTERNATIONAL

SHEET NO. 4 of 4

JOB NO. 50147 JOB IVA / BENP A-46 / IPEEE BY JBeji DATE 10-10-95

CALC. NO. N/A SUBJECT Attachment to SEWS for 2-BDBB-268-0002E CHK'D J.A.Dizon DATE 10/10/95
(SSEL 9028)

SSEL: 9028
ID: 2-BDBB-268-0002E

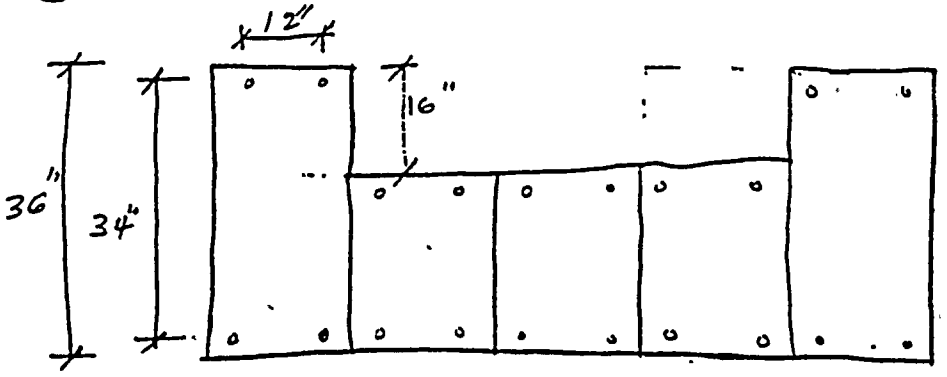
(DWG. 2-45N390-2, and 48N1125-1)

11) only one top entry rigid conduit with a ~12' span to rigid support. → can not provide adequate top restraint

12) 5 bays all bolted together.

13) 1" flex conduit with adequate flexibility. (min. 1" slack @ a 4" ℄ Flex)

14) The base of each bay is made of L1¼ x 1¼ x 3/16 which is then bolted to sill channel by 4-3/8" ϕ bolts. The sill channels are welded all along their front to the embedded plate.



15) Speaker overhead judged to have adequate anchorage. No interaction ok

SSEL Line No. 9028 Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-BDBB-268-0002E Equip. Class 01 - Motor Control Centers

Equipment Description 480V RMOV BD 2E

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: Farzi Beij Date: 10-10-95

Evaluated by: John O. Dizon Date: 10/10/95

SSEL Line No. 39016 Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 3/12

Equip. ID No. 3-BDBB-268-0003D Equip. Class 01 - Motor Control Centers

Equipment Description 480V RMOV BOARD 3D

Location: Bldg. U3-RB Floor El. 593 Room, Row/Col U,R17

Manufacturer, Model, Etc. (optional but recommended) International Switchboard Corp.

SEISMIC CAPACITY VS DEMAND

1	Elevation where equipment receives seismic input		593'
2.	Elevation of seismic input below about 40' from grade		(Y) N U. (grade @ 563')
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (1)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	(BS)
		1.5 x Bounding Spectrum	ABS
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	(GRS)
		1.5 x Ground Response Spectrum	AGS
		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 (Ref. Calc. CD-Q0000-940339)

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.	600 V rating or less	(Y) N U N/A
3.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	(Y) N U N/A (4)
4.	Attached weight (except conduit) less than about 100 lbs per cabinet assembly	(Y) N U N/A
5.	Externally attached items rigidly anchored	(Y) N U N/A
6.	General configuration similar to NEMA Standards	(Y) N U N/A
7.	Cutouts in lower half less than 6 in. wide and 12 in. high	(Y) N U N/A
8.	All doors secured by latch or fastener	(Y) N U N/A
9.	Natural frequency relative to 8 Hz limit considered	(Y) N U N/A (9)
10.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (3), (10)
11.	Relays mounted on equipment evaluated AF = 3.0	(Y) N U N/A
12.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

SSEL Line No. 39016

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 3/12

Equip. ID No. 3-BDBB-268-0003D Equip. Class 01 - Motor Control Centers

Equipment Description 480V RMOV BOARD 3D

CAVEATS - GERS (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 generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Bounding Spectrum caveats	Y	N	U	N/A
3.	Floor mounted cabinet	Y	N	U	N/A
4.	Maximum weight per section less than 800 pounds	Y	N	U	N/A
5.	Base anchorage utilizing MCC base channels	Y	N	U	N/A
6.	Adequate strength and stiffness in load transfer path from anchorage to base frame (only for "function after" GERS)	Y	N	U	N/A
7.	Essential relays have GERS > 4.5g (only for "function during" GERS)	Y	N	U	N/A
8.	Able to reset starters (only for "function after" GERS)	Y	N	U	N/A
9.	All adjacent cabinets or sections of multi-bay assemblies bolted together	Y	N	U	N/A
Is the intent of all the caveats met for GERS?		Y	N	U	(N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y)	N	U	N/A	(6,7)
2.	Type of anchorage covered by GIP	(Y)	N	U	N/A	
3.	Sizes and locations of anchors determined	(Y)	N	U	N/A	
4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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	(11)
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	(11)
Are anchorage requirements met?		(Y)	N	U		(3), (10)

SSEL Line No. 39016

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 3 of 3/12

Equip. ID No. 3-BDBB-268-0003D Equip. Class 01 - Motor Control Centers

Equipment Description 480V RMOV BOARD 3D

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
2.	If equipment contains sensitive relays, equipment free from all impact by nearby equipment or structures	Y (N) U N/A (8)
3.	Attached lines have adequate flexibility	(Y) N U N/A
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 (8)

IS EQUIPMENT SEISMICALLY ADEQUATE? Y (N) U (8)

COMMENTS

1) See note 1 on SEWS for 2-BDBB-268-0002E (SSEL 9028). → f > 8Hz

2) note no. not used.

3) The weak links in the load path to the anchor point are judged to be the 3/8"ϕ bolts connecting the MCC to the sill channel & the 3/4"ϕ Red head anchor bolts @ sill. The welds @ sill to 3/4" PL are less critical. See Note 10 for anchorage evaluation.

- See pages 4-10 for notes 4-10.

11) Some cracks noted on the exterior faces of the tapered grout pad. Judged to be not critical. (See page 11 for bolt bending evaluation)

JDO 2/23/96
JP 2/23/96

Evaluated by: Farzi Beiki Date: 10-10-95

John O. Dizon 10/10/95

SSEL 39016

3-BDBB-268-0003D 480V RMOV BD 3D

(DWG. 3-45N389 and 48N1125-1)

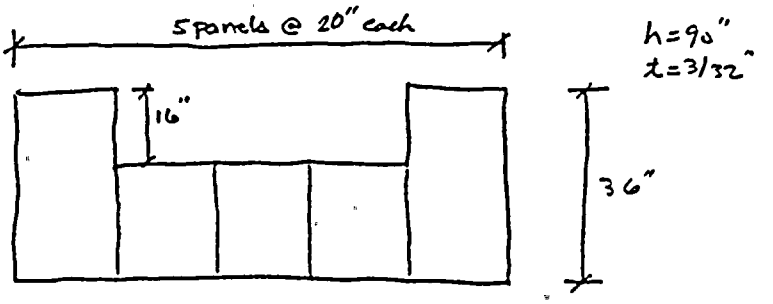
(International Switchboard corporation)

4) 5 bays all bolted together.

5) Top restraint not provided by the top entry conduit (3-2½"ϕ, 8-3"ϕ; Conduit span to the first support ~ 12'

6) Each bay is bolted to the sill channel by 4-3/8" ϕ bolts. The sill channel is welded to embedded plate which is on a 1½" tapered grout pad.

7) The base of each unit consists of L1½ x 1½ x ¼ angles and the internal framing consists of L1½ x 1½ x 3/32 to 1/8 angles and the side panels are continuous (no cutout in the sheet metal between the adjacent bays)



Plan
(Base Config.)

8) Long cable tray vertical riser has about 1½" clearance to this equipment. The cable tray is supported by rod hangers (~ 20' rods) and will swing and impact this equipment. → outlier OSVS-39016
(See sketch on the next pg.)

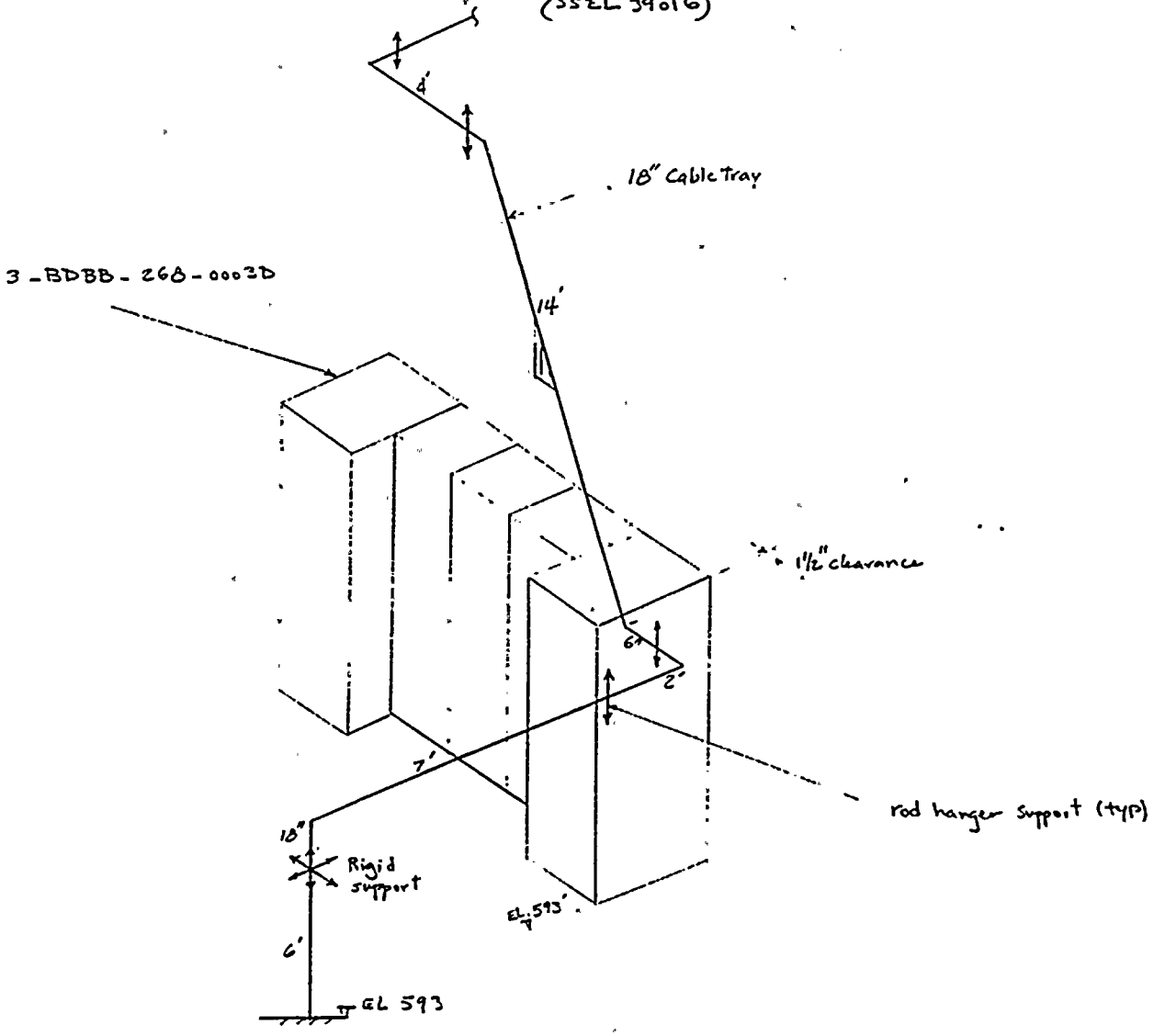
9) Breakers in compartments 1D and 5D are type K-600S (GOULD Manuf.). These breakers are about 12" above the base of the equipment and are mounted on rails which are connected to a rigid "platform" plate 3/32" thk. The primary and secondary contacts are in the "BD" configuration but there is a grounding bar @ about the C.G. of the breaker which will restrain the breaker from side to side movement

EQE INTERNATIONAL

SHEET NO. 5 of 12

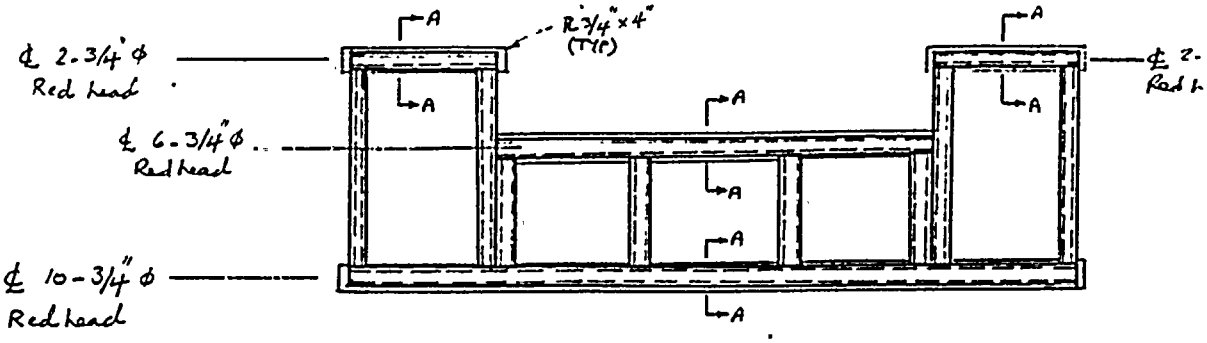
JOB NO. 50147 JOB TVA / BFNP A-46 / IPEEE BY ZBei DATE 10-10-95

CALC. NO. N/A SUBJECT SEWS for 3-BDBB-268-00030 (55EL 39016) CHK'D J.D. Richman DATE 10/10/95

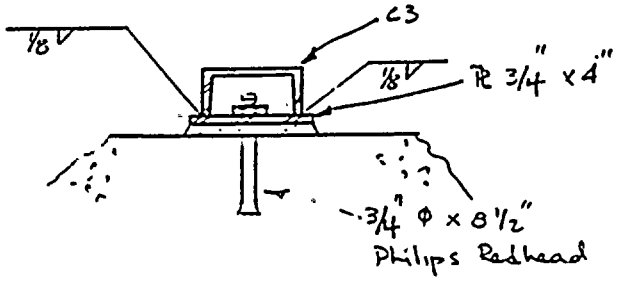


Configuration of the Interaction of the 18" Cable Tray with MCC
(Interaction Documented in Outlier OSVS_39016)

10) Anchorage Evaluation:



SILL PLAN
(DWG. 48N1125-1)



A-A

- Each bay is bolted to the sill channel by 4-3/8" ϕ bolts:

$T_{all_1} = 20 \times 1.7 \times 0.11\ (in^2) = 3.74^k$

$V_{all_1} = 10 \times 1.7 \times 0.11\ (in^2) = 1.870^k$

- Sill channel is anchored by 3/4" ϕ Red heads to the concrete floor:

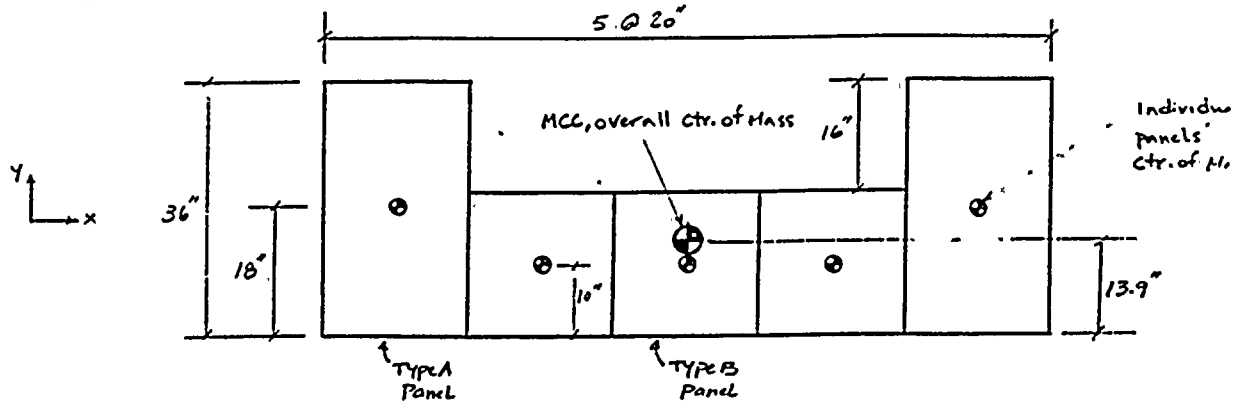
$T_{all_2} = 4.69^k \times \frac{3600}{4000\ f'_c} \times 0.75 = 3.166^k < T_{all_1} = 3.74^k$

(↓ Reduction for presence of welds)

$V_{all_2} = 5.48^k \times 0.75 = 4.11^k > V_{all_1} = 1.87^k$

=> Check both 3/8" ϕ M. bolts and 3/4" ϕ anchor bolts.

Note 10 (cont'd)



Dead wt. of type A panel per App. C of GIP:

$$D.wt._A = 3.0 \times \frac{490}{12^3} \times \frac{3}{32} \times 2\left[(20\times90)+(36\times90)+(36\times20)\right] = 919.^{\#}$$

Dead wt. of type B panel:

$$D.wt._B = 3.0 \times \frac{490}{12^3} \times \frac{3}{32} \times 2\left[(20\times20)+(20\times90)+(20\times90)\right] = 638.^{\#}$$

$$Y_{C.G.} = \frac{(2\times919\times18)+(3\times638\times10)}{(2\times919)+(3\times638)} = 13.9''$$

Overall center of mass @ $(x=50, y=13.9)$

Overall center of rigidity @ $(x = 46''+4'' = 50'',\ y = 12.2''+1'' = 13.2'')$

Eccentricity = $13.9 - 13.2 = 0.7''$ → too small, can be neglected

EQE INTERNATIONAL

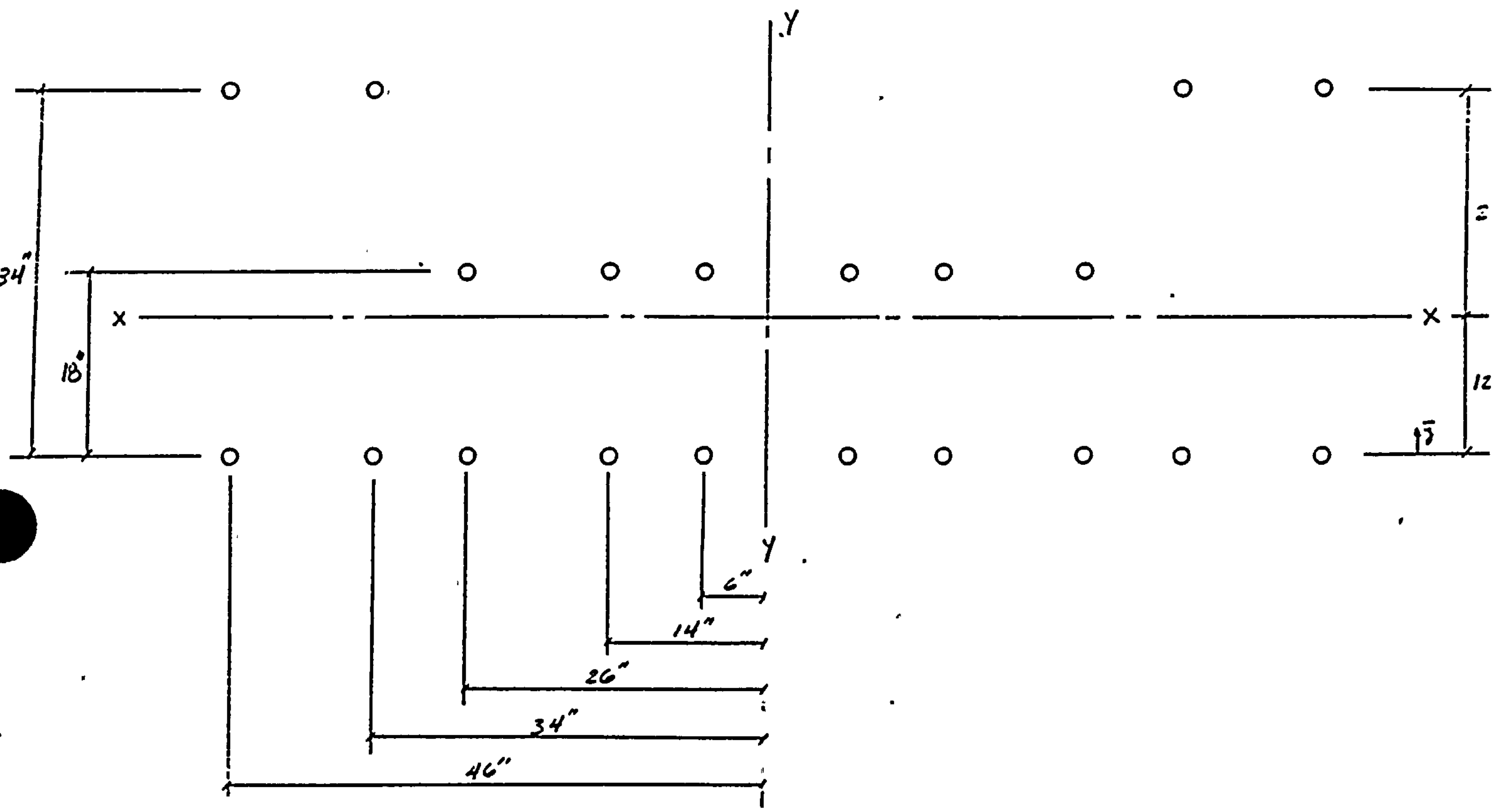
SHEET NO. 8 of 1

JOB NO. 50147 JOB TVA / BFNP A-46 / IPEEE BY ZBcj DATE 10-10-95

CALC. NO. N/A SUBJECT SEWS for 3-BDBB-268-0003D (SSEL 39016) CHK'D J.O. Dizon DATE 10/10/95

Note 10 (cont'd)

- Determination of section modulus of bolt group:



$\bar{Y} = \frac{(6 \times 18) + (4 \times 34)}{20} = 12.2''$

$I_{xx} = 4(21.8)^2 + 4(12.2)^2 + 6(18-12.2)^2 + 6(12.2)^2 = 3591.$ in^2

$S_{xx} = \frac{3591.}{21.8} = 165.$ in (for moments acting out of plane of the bolt group

$I_{yy} = 4(6^2 + 14^2 + 26^2 + 34^2 + 46^2) = 16720.$ in^2

$S_{yy} = \frac{16720}{46} = 363.$ in (for moments acting out of plane of the bolt grou

$I_p = I_{xx} + I_{yy} = 3591 + 16720 = 20,311.$ in^2

$S_p = \frac{20,311}{[(21.8)^2 + (46)^2]^{1/2}} = 399.$ in

JOB NO. 50147 JOB TVA/BFNP A-46/IPEEE BY ZBaj DATE 10-10-95

CALC. NO. N/A SUBJECT SEWS for 3-BDBB-268-0003D (SSEL 39016) CHK'D J.D.Stevenson DATE 10/10/95

Note 10 (cont'd)

-Determine Loads

- Conservatively consider 2-3"ϕ and 1-2½"ϕ rigid conduit, with 6' tributary span @ top of each bay:

$Wt._{cond.} = 5\ bays \times (2 \times 12.8\#/' + 1 \times 8.9\#/') \times 6' = 1035.\#$ (@ 90" above base)

- $Wt._{cable\ tray\ (18")} = 25 \times 1.5 \times (1.5' + 7' + 2' + .5' + 14') \times \frac{2}{3} \times 2.0 = 1250.\#$ (@ 90" above base and only in x-direction)

(Impact factor; ⅔ = conservative estimate of cable fill)

- $Wt._{MCC} = 2 \times 919\# + 3 \times 638\# = 3752\#$ (@ 45" above base)

-Accelerations: (conservatively used for Bounding purposes)

$a_h = 1.0g$ (@ f=8 HZ, RB, EL. 621', DBE, 5%)

$a_v = 0.16g$ (ZPA)

Acceleration to use, including 1.25 increase factor for Med. Centered spectra:

→ $a_h = 1.0g \times 1.25 = 1.25g$

→ $a_v = 0.16g \times 1.25 = 0.20g$

- Seismic Loads:

$F_x = 1250\# + (1035\# \times 1.25g) + (3752\# \times 1.25g) = 7234.\#$

$F_y = (1035\# \times 1.25g) + (3752\# \times 1.25g) = 5984.\#$

$F_z = (1035 + 3752) \times 0.2g = 957.\#$

$M_x = (1035\# \times 1.25g \times 90") + (3752\# \times 1.25g \times 45") = 327,488.\#"$

$M_y = (1250\# \times 90") + (1035\# \times 1.25g \times 90") + (3752\# \times 1.25g \times 45") = 439,988.\#"$

$M_z \approx 0$

JOB NO. 50147 JOB TVA / BFNP A-46 / IPEEE BY ZBeig DATE 10-10-95

CALC. NO. N/A SUBJECT SEWS for 3-BDBB-268-0003D (SSEL 37016) CHK'D [signature] DATE 10/10/95

Note 10 (cont'd)

- Shear per 3/8" ϕ bolt:

$$V = \left[\left(\frac{7234}{5\times4}\right)^2 + \left(\frac{5984}{5\times4}\right)^2\right]^{1/2} = 469\ \#$$

$$f_V = \frac{469\ \#}{0.11\ in^2} = 4.3\ \text{Ksi}$$

Shear - tension interaction:

$$26(1.7) - 1.8(4.3) = 36.5\ \text{ksi} \quad > F_t = 1.7\times 20^{\text{ksi}} = 34^{\text{ksi}}$$

$\rightarrow$ use $F_t = 34.\ \text{ksi}$

- Tension per 3/8" ϕ bolt:

$$T = \sqrt{\left(\frac{327{,}488^{\#''}}{165''}\right)^2 + \left(\frac{439{,}188^{\#'}}{363}\right)^2 + \left(\frac{957}{5\times4}\right)^2} - \frac{1035^{\#} + 3752^{\#}}{5\times4} = 2087.^{\#}$$

$$f_t = \frac{2087^{\#}}{0.11\ in^2} = 19.\ \text{ksi} \quad < F_t = 34\ \text{ksi} \quad \underline{\text{ok}}$$

$$\frac{f_t}{F_t} = 0.56 \quad < 1.0 \quad \underline{\text{ok}}$$

- Check 3/4" ϕ Anchor bolts:

Conservatively, use the same S_{xx} & S_{yy} as for 3/8" ϕ bolts.

Therefore: $V = 469^{\#} < V_{all_2} = 4.11^{K}$, $\frac{V}{V_{all}} = 0.11 < 0.3$ ok

$T = 2087^{\#} < T_{all_2} = 3.166^{K}$, $\frac{T}{T_{all}} = 0.66 < 1.0$ ok

$\therefore$ Anchorage config. Adequate

- Note 11 (Cont'd from page 3)

Evaluation of bolt bending due to crack in the grout pad (e.g., the grout pad, since is cracked, is conservatively assumed to provide no Latteral support to the anchor bolts and there for these bolts will be subject to bending moment)

Demand Tension $\cong 2087^{\#} \times \frac{0.6g}{1.0g} = 1252^{\#}$ $\xrightarrow[\text{actual}]{}$ $1252^{\#}$

Demand shear $\cong 469^{\#} \times \frac{0.6g}{1.0g} = 281^{\#}$ $\xrightarrow[\text{actual}]{}$ $281^{\#}$

(Note: $2087^{\#}$ and $469^{\#}$ were obtained for this equipment (see page 10) using an acceleration value corresponding to EL. 621' of the RB for bounding purposes. This equipment is actually Located @ EL. 593' of RB and the corresponding acceleration value is 0.6g)

The following evaluation is consistent with the EPRI document titled, "Recommen[ded] Approaches for resolving Anchorage outliers,":

$e = 2.5''$ (average grout thickness)

$Z = \frac{d^3}{6} = \frac{.75^3}{6} = .07 \text{ in}^3$ (Plastic Section Modulus of the bolt)

$A = \frac{\pi d^2}{4} = \frac{\pi(.75)^2}{4} = .442 \text{ in}^2$

- $V_T = \frac{Z}{e}\left(F_y - \frac{P}{A}\right)$

$= \frac{.07}{2.5}\left(36 - \frac{1.252}{.442}\right) = 0.93^{k}$ → Shear load corresponding to forming Plastic hinge @ the concrete surface

$\frac{V}{V_T} = \frac{.281}{.93} = 0.30$

- $V_B = \frac{Z(F_y - P/A) + M_c}{e + 2d_b}$

$M_c = 5.4 f_c' d_b^3 = 5.4(3.6)(.75)^3 = 8.2 \text{ K-IN}$

JOB NO. 50147 JOB TVA/BEND A46/IPEEE BY FBaig DATE 2/23/9

CALC. NO. N/A SUBJECT SEWS for 3-BDBB-268-0003D CHK'D J.D. Dizon DATE 2/23/9

(SSEL 39016)

$$V_B = \frac{.07\,(36 - 1.225/.442) + 8.2}{2.5 + 2(.75)}$$

$= 2.63^{k}$ → shear load corresponding to forming plastic hinge in the embedded portion of the bolt

$$\frac{V}{V_B} = \frac{.291}{2.63} = 0.11$$

- Additional pullout load on the anchorage due to bolt bending, P', is negligible. ($<5^{\#}$) per sect. 1.3 of the above referenced EPRI document on resolving anchorage outliers.

∴ As shown above the bolt bending is insignificant, resulting bolt interaction remains same.

SSEL Line No. 39016 Status Y (N) U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 3-BDBB-268-0003D Equip. Class 01 - Motor Control Centers

Equipment Description 480V RMOV BOARD 3D

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 (1)

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

Note 1) A long cable tray vertical riser has about 11½" clearance to this equipment. The cable tray is supported by ~20' long rod hangers, and therefore will swing in a seismic event and impact the MCC. This impact is potentially unacceptable if the MCC includes essential relays. → outlier OSVS-39016

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___ (IPEEE Eval. req'd)

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ___ NO ✓ (see note 1 above)

Evaluated by: Farzi Baig Date: 10-10-95

Evaluated by: John O. Bizon Date: 10/10/95

OSVS-39016

Sheet 1 of 2

SSEL Line No. 39016

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 3-BDBB-268-0003D Equipment Class 01-MCC

Equipment Location: Bldg. U3-RB Floor Elevation 593'

Room or Row/Column U, R17 Base Elevation 593'

Equipment Description 480 V RMOV BOARD 3D

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	___
		Cable and Conduit Raceways	
Essential Relays		Inclusion Rules	___
Capacity vs. Demand	___	Other Seismic Performance Concerns	___
Mounting, Type, Location	___	Limited Analytical Review	___
Other	✓	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):

A long cable tray vertical riser has about 1½" clearance to this equipment. The cable tray is supported by ~20' long rod hangers and therefore will swing in a seismic event and impact the MCC. This impact is potentially unacceptable if the MCC includes essential relays.

OSVS-39016

SSEL Line No. 39016

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 3-BDBB-264-00031

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

Determine if this MCC contains essential relays. IF yes, then the cable tray needs to be rigidly supported to preclude this impacts. If it is determined that the MCC does not contain essential relays then this outlier is resolved.

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

SEE SEWS for this equipment for anchorage evaluation including impact loads from adjacent cable tray.

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	Farzi R. Beigi	10-10-95
JOHN O. DIZON, PE.	John O. Dizon	10/10/95

INTENT

SSEL Line No. 9020 Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 3

Equip. ID No. 2-BDBB-231-0002A Equip. Class 02 - Low Voltage Switchgear

Equipment Description 480V SHDN BD 2A

Location: Bldg. RB Floor El. 621'-3" Room, Row/Col S-R13

Manufacturer, Model, Etc. (optional but recommended) - GE TYPE AKD-5
- Breaker types AK-2A-25-1, AK-6A-25, AK-2A-50S-2

SEISMIC CAPACITY VS DEMAND

			621'-3"
1.	Elevation where equipment receives seismic input		
2.	Elevation of seismic input below about 40' from grade		Y (N) U
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (4)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	BS
		1.5 x Bounding Spectrum	(ABS)
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	GRS
		1.5 x Ground Response Spectrum	AGS
		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 (5)*

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 (1)
2.	600 V rating or less	(Y) N U N/A
3.	Side-to-side restraint of draw-out circuit breakers is provided	(Y) N U N/A (2, 3, 4)
4.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	(Y) N U N/A (9)
5.	Attached weight (except conduit) less than about 100 lbs per cabinet assembly	(Y) N U N/A (8)
6.	Externally attached items rigidly anchored	(Y) N U N/A
7.	General configuration similar to ANSI C37.20 Standards	(Y) N U N/A
8.	Cutouts in lower half of cabinet side sheathing less than 30% of width of side panel wide and less than 60% of width of side panel high excluding bus transfer compartment	(Y) N U N/A
9.	All doors secured by latch or fastener	(Y) N U N/A
10.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (10)
11.	Relays mounted on equipment evaluated AF = 4.5	(Y) N U N/A (12)
12.	Have you looked for and found no other adverse concerns?	Y (N) U N/A (8)

Is the intent of all the caveats met for Bounding Spectrum? Y (N) U N/A (8)

(See outlier OSWC-9020)

SSEL Line No. 9020

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 3

Equip. ID No. 2-BDBB-231-0002A Equip. Class 02 - Low Voltage Switchgear

Equipment Description 480V SHDN BD 2A

CAVEATS - GERS (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 generic seismic testing equipment class	Y	N	U	(N/A)
2.	Meets all Bounding Spectrum caveats	Y	N	U	(N/A)
3.	Floor-mounted enclosure	Y	N	U	(N/A)
4.	Manufactured by major vendor (ITE/Brown Boveri, Westinghouse, or GE)	Y	N	U	(N/A)
5.	Maximum weight per section less than 1600 lbs	Y	N	U	(N/A)
6.	Base anchorage adequate (See checklist below for details)	Y	N	U	(N/A)
7.	Relays used for breaker function are not on "Low Ruggedness Relays" list	Y	N	U	(N/A)
8.	Relay evaluation completed for all relays that are essential to other equipment or cause unacceptable lockout	Y	N	U	(N/A)
9.	For 2.5 g level GERS, vertical restraint prevents breaker uplift	Y	N	U	(N/A)
10.	For 2.5 g level GERS, outside corners of end units are reinforced, if needed	Y	N	U	(N/A)
11.	All adjacent cabinets or sections of multi-bay assemblies bolted together	Y	N	U	(N/A)

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y)	N	U	N/A
2.	Type of anchorage covered by GIP	(Y)	N	U	N/A (6)
3.	Sizes and locations of anchors determined	(Y)	N	U	N/A
4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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

Are anchorage requirements met? (Y) N U (6)

SSEL Line No. 9020

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 3 of 3

Equip. ID No. 2-BDBB-231-0002A Equip. Class 02 - Low Voltage Switchgear

Equipment Description 480V SHDN BD 2A

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
2.	If equipment contains sensitive relays, equipment free from all impact by nearby equipment or structures	Y (N) U N/A (8) OSHS-90
3.	Attached lines have adequate flexibility	(Y) N U N/A (11)
4.	Overhead equipment or distribution systems are not likely to collapse	(Y) N U N/A (10)
5.	Have you looked for and found no other adverse concerns?	(Y) N U N/A (7)

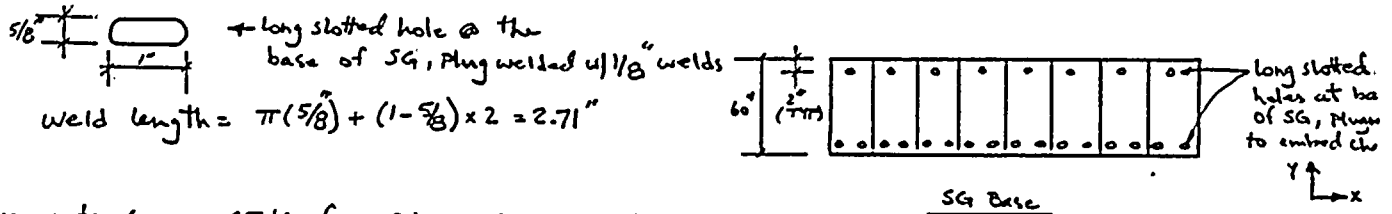
Is equipment free of interaction effects? Y (N) U (8)

IS EQUIPMENT SEISMICALLY ADEQUATE? Y (N) U (9)

COMMENTS

- For Notes 1 thru 5 and 8 thru 12, see SEWS for 1-BDBB-231-0001A (SSEL No. 9018).

e 6) Switchgear is attached to the embeded sill channel by plug welds, as shown below.



Weld length = $\pi(5/8") + (1-5/8)\times 2 = 2.71"$

Per note 6 on SEWS for BD 1A (SSEL 9018), the resultant pull out load per plug weld is $f_{w_{Tension}} = 1.12^{K}$

The shear load per weld is:

$V_x = \frac{14000^{\#}}{24} = 583^{\#} = V_y$ (D.L. = 14K, Ref. SEWS for SSEL # 9018)

$\Rightarrow f_{w_{Shear}} = [583^2 + 583^2]^{1/2} = 824^{\#}$

$F_{W_{tensile}} = \frac{0.707 \times 1/8" \times 2.71"}{4} \times 30.6^{ksi} = 1.832^{K}$ ← Knock down factor for tensile loads

$FW_{shear} = 1.832 \times 4 = 7.329^{K}$ ← No Knock down factor for shear loads (Ref. EPRI NP-5228-SL, Vo

Shear-Tension Interaction:

$\left(\frac{1.12}{1.832}\right)^2 + \left(\frac{.824}{7.329}\right)^2 = 0.39 < 1.0$ ok

Evaluated by: Farzi Beg Date: 9-5-95

John O. Dizon 9/15/95

Note 7) - Blockwalls in the area are qualified per IEB 80-11 program. (Ref. DWG. 41N1202-1, R3; Walls 63 & 64)

SSEL Line No. 9020 Status Y (N) U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-BDBB-231-0002A Equip. Class 02 - Low Voltage Switchgear

Equipment Description 480V SHDN BD 2A

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) Breaker lifting device mounted over one of the bays is not restrained from movement on its rails and would potentially slide and impact the rail stops in a seismic event. This impact could potentially cause relay chatter. → outlier (OSVS-9020)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___ (Candidate for IPEEE Anchorage Evaluation)

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ___ NO ✓ (Note 1 above)

Evaluated by: Fonzi Bazi Date: 9-5-95

Evaluated by: John O. Dizon Date: 9/15/95

SSEL LINE NO. 9020

Revision 2
Corrected, 6/28/91

Exhibit 5-1

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 2-BDBB-231-0002A Equipment Class 02 - LVSG

Equipment Location: Building U2, RB Floor Elevation 621'-3"

Room or Row/Column S-R13 Base Elevation 621'-3"

Equipment Description 480 VOLT SHUTDOWN BOARD 2A

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[1]	___
Caveats	___	Anchor Bolts and Embedment	___
Anchorage	___	Anchorage Connections	___
Seismic Interaction	✓	Flexibility of Attached Piping[1]	___
Other	___	Other	___
		Cable and Conduit Raceways	
Essential Relays		Inclusion Rules	___
Capacity vs. Demand	___	Other Seismic Performance Concerns	___
Mounting, Type, Location	___	Limited Analytical Review	___
Other	___	Other	___

1 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):

Breaker lifting device is mounted over the top of one of the switchgear bays. The lifting device is free to move on its rails. In a seismic event the lifting device would potentially slide and impact the rail stops which would then potentially cause chatter of relays mounted inside this switchgear

SSEL LINE No. 9020

Revision 2
Corrected, 6/28/91

OSVS-9020

Exhibit 5-1 (Cont'd)

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 2-BDBB-231-0002A

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

Provide a positive restraining mechanism for this lifting device so that it will not slide on its rails in a seismic event or when is not in use.
→ Issue Work Request

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

N/A
DRAWING 2-48B900-2160 Rev 0 AND CALCULATION CDQ0999 96 0092 Rev 1 ARE ISSUED BY DCN T39883A TO RESOLVE OUTLIER.

4/4 9-16-96
9-18-96

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	Farzi Beigi	9-5-95
JOHN O. DIZON, P.E.	John O. Dizon	9/15/95

/INTENT/

SSEL Line No. 9018 Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 3 3

Equip. ID No. 1-BDBB-231-0001A Equip. Class 02 - Low Voltage Switchgear

Equipment Description 480V SHDN BD 1A

Location: Bldg. RB Floor El. 621'-3" Room, Row/Col S-R1

Manufacturer, Model, Etc. (optional but recommended) · GE Low Voltage Power CB, Type AK-2A-15-1
· GE TYPE AKD-5 SG

SEISMIC CAPACITY VS DEMAND

			621'-3"
1.	Elevation where equipment receives seismic input		
2.	Elevation of seismic input below about 40' from grade		Y (N) U
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (4)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	BS
		1.5 x Bounding Spectrum	(ABS)
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	GRS
		1.5 x Ground Response Spectrum	AGS
		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 (5)*

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 (1)
2.	600 V rating or less	(Y) N U N/A
3.	Side-to-side restraint of draw-out circuit breakers is provided	(Y) N U N/A (4),(2),(3)
4.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	(Y) N U N/A (9)
5.	Attached weight (except conduit) less than about 100 lbs per cabinet assembly	(Y) N U N/A (8)
6.	Externally attached items rigidly anchored	(Y) N U N/A
7.	General configuration similar to ANSI C37.20 Standards	(Y) N U N/A
8.	Cutouts in lower half of cabinet side sheathing less than 30% of width of side panel wide and less than 60% of width of side panel high excluding bus transfer compartment	(Y) N U N/A
9.	All doors secured by latch or fastener	(Y) N U N/A
10.	Anchorage adequate (See checklist below for details)	Y (N) U N/A (6)
11.	Relays mounted on equipment evaluated AF=7.0	(Y) N U N/A (12)
12.	Have you looked for and found no other adverse concerns?	Y (N) U N/A (8)

Is the intent of all the caveats met for Bounding Spectrum? Y (N) U N/A (6)

SSEL Line No. 9018

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 3/8

Equip. ID No. 1-BDBB-231-0001A Equip. Class 02 - Low Voltage Switchgear

Equipment Description 480V SHDN BD 1A

CAVEATS - GERS (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 generic seismic testing equipment class	Y	N	U	(N/A)
2.	Meets all Bounding Spectrum caveats	Y	N	U	(N/A)
3.	Floor-mounted enclosure	Y	N	U	(N/A)
4.	Manufactured by major vendor (ITE/Brown Boveri, Westinghouse, or GE)	Y	N	U	(N/A)
5.	Maximum weight per section less than 1600 lbs	Y	N	U	(N/A)
6.	Base anchorage adequate (See checklist below for details)	Y	N	U	(N/A)
7.	Relays used for breaker function are not on "Low Ruggedness Relays" list	Y	N	U	(N/A)
8.	Relay evaluation completed for all relays that are essential to other equipment or cause unacceptable lockout	Y	N	U	(N/A)
9.	For 2.5 g level GERS, vertical restraint prevents breaker uplift	Y	N	U	(N/A)
10.	For 2.5 g level GERS, outside corners of end units are reinforced, if needed	Y	N	U	(N/A)
11.	All adjacent cabinets or sections of multi-bay assemblies bolted together	Y	N	U	(N/A)

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y)	N	U	N/A
2.	Type of anchorage covered by GIP	(Y)	N	U	N/A (6)
3.	Sizes and locations of anchors determined	(Y)	N	U	N/A
4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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

Are anchorage requirements met? Y (N) U (6)

SSEL Line No. 9018

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 3 of 38

Equip. ID No. 1-BDBB-231-0001A Equip. Class 02 - Low Voltage Switchgear

Equipment Description 480V SHDN BD 1A

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
2.	If equipment contains sensitive relays, equipment free from all impact by nearby equipment or structures	Y (N) U N/A (8)
3.	Attached lines have adequate flexibility	(Y) N U N/A (11)
4.	Overhead equipment or distribution systems are not likely to collapse	(Y) N U N/A (10)
5.	Have you looked for and found no other adverse concerns?	(Y) N U N/A (7)

Is equipment free of interaction effects? Y (N) U (8)

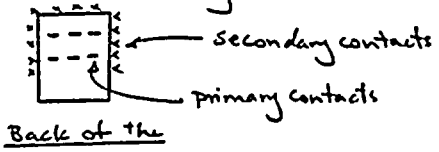
IS EQUIPMENT SEISMICALLY ADEQUATE? Y (N) U (6,8)

COMMENTS

1) Equipment consists of 8 bays. Each bay is 26" to 27" wide, 60" deep and 90" tall, which is within GIP size parameters for low voltage switchgears

2) Circuit breakers are of drawout type and have rail support system from the switchgear sheet metal housing. Each breaker is also restrained by two "Worm Gear" type racking mechanism.

3) Orientation and type of primary and secondary contacts are adequate to prevent damage or disconnection.



Back of the Breaker

4) This switchgear is manufactured by GE and is well represented in the Earthquake experience data base. Per App. B.2 of the GIP this type of switchgear are determined to be seismically rugged based on the EQ database. Due to the aspect ratio of this type of switchgears (overall dimension = 181" x 60" x 90"(h), all bays are adequately bolted together on their sides and attached to each other @ top) the overall flexibility of the SG is due to shear flexibility. Per EPRI Report TR-102180 the lowest natural frequency of typical switchgears with the above dimensions has been shown to be greater than 8 HZ through testing of 2-3 bay units. (Actually, the side-to-side frequency of 2-3 bay units were shown to be less than 8 HZ and the front-to-back to be greater than 8 HZ. However due to the fact that the actual lineup for this switchgear is comprised of 8 bays which are all connected to each other the lowest frequency of side-to-side will be through shear flexibility of the entire unit and therefore greater than 8 HZ)

Evaluated by: Fouzi Beizi Date: 8/30/95

John O. Dizon 9/5/95

Note 4 (cont'd) - the frequency associated with the individual breakers is judged to be greater than 8 HZ due to their rigid mounting inside the SG. cubicle and adequate restraints provided against breaker sliding out or moving side-to-side.

The frequency of a typical heavy panel door is estimated below: (panel edges conservatively, simply supported)

X - Relay, est. wt = 7 lbs

+ - " , " = 3 lbs

o - " , " = 2 lbs

Thickness of the door panel = 12 gage = 0.1"

w = uniform load per SQIN including panel weight

$$= \frac{(6\times 7^{\#} + 7\times 3^{\#} + 13\times 2^{\#})}{27" \times 90"} + 0.283\ {}^{lb}/_{in^3} \times 0.1"$$

$$= 0.0649\ {}^{lb}/_{IN^2}$$

From Ref. Roark & Young, 5th ed., Table 36, Case 16

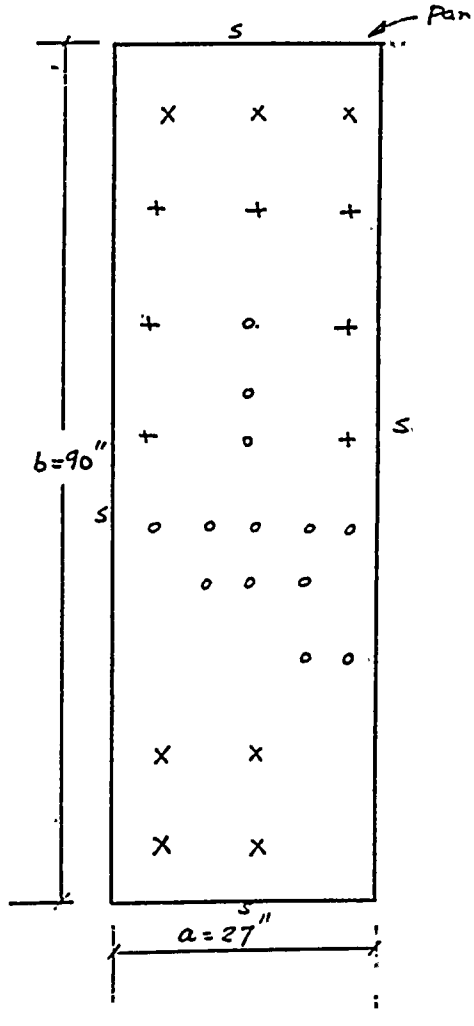
$$a/b = \frac{27}{90} = 0.3 \rightarrow K_1 = 10.9$$

$$f = \frac{K_n}{2\pi}\sqrt{\frac{Dg}{wa^4}}$$

$$D = Et^3/12(1-\nu^2) = 29\times 10^6 \times .1^3/12(1-.3^2) = 2656.$$

$$f = \frac{10.9}{2\pi}\sqrt{\frac{2656\times 386.4}{.0649\times 27^4}} = \underline{\underline{9.5\ HZ}}$$

(This frequency is actually conservative since the additional stiffening of the panel provided by the relay boxes is not considered.)



Typical SG Door with Relays

5) Per Calc. CD-Q0000-940339, the in-structure response spectra at EL. 621' of the RB (@ 5% Damping, DBE) exceed the 1.5x Bounding spectrum in the frequency range of about 5.0 to 6.8 HZ. Since, the lowest natural frequency of this switchgear is greater than 6.8 HZ the intent of the GIP seismic capacity vs. demand criteria is met.

6) Anchorage Evaluation:

- Equipment Wt. = 14000 lbs (Ref. DWG. 1-45N336)
- From MARS Report:

$a_h = 1.0\ g$ (@ EL. 621' of RB, 5%, DBE spectra, @ f=4 HZ)

$a_v = 0.16\ g$ (ZPA)

→ $F_h = 14^k \times 1.0 \times 1.25 = 17.5^k$, $F_v = 14^k \times 0.16 \times 1.25 = 2.8^k$

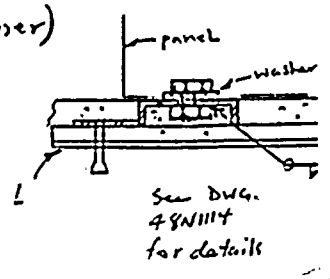
- Pull out per 1/2" ϕ connecting bolt @ base:

$$T = \left[\left(\frac{17.5 \times 90"/2}{58" \times 8}\right)^2 + \left(\frac{2.8^k}{24}\right)^2\right]^{1/2} - \frac{14^k}{24} = 1.12^k$$

Note: The 1/2" ϕ bolt at one location was removed and it was observed that there are 4 to 5 thread showing inside the hole in the embeded channel. The total depth of the 4-5 threads was measured to be at least 1/2". Therefore, it was concluded that there is a welded nut underside of the channel web and that the method of connection is not drill and Tap into channel web (thickness of channel web = 3/16" for C4x5.4 member)

$T_{all} = 0.142 \times 20 \times 1.7 = 4.828^k \gg T = 1.12^k$ ok

(Tensile stress area of 1/2" ϕ Bolt, AISC, 8th ed.)



Note 6 (cont'd) :

- shear per 1/2" ϕ connecting bolt @ base :

since the holes at the base of the switchgear compartments are long slotted holes the connection need to be of friction-type connection which is achieved by the use of high strength bolts (A325 or A490 bolts) with hardened washers. There are no markin on the bolt heads to identify them as high strength bolts and per DWG. 48E1300-1 the bolt material shall conform to A36 or equivalent Therefore, the only shear resistance provided is through the friction between the base of the equipment and the concrete floor, which is not adequate to resist sliding of the equipment under seismic loads. → outlier (OSVS-9018-02)

12) Per EPRI REPORT NP-7148-SL an effective in-cabinet amplification factor of 7 is considered appropriate for this type of switchgear.

EQE INTERNATIONAL

SHEET NO. 7 of 8

JOB NO. 50147.05 JOB TVA/BFNP A-46/IPEEE BY FZei DATE 8-30-95

CALC. NO. N/A SUBJECT Attach. to SENS for 1-BDBB-231-0001A CHK'D [illegible] DATE 9/5/95
(SSEL 9018)

SSEL: 9018, 9019

ID: 1-BDBB-231-0001A, 0001B
(480 V SHD BD 1A & 1B)

GE low voltage power CB, Type: AK-2A-15-1

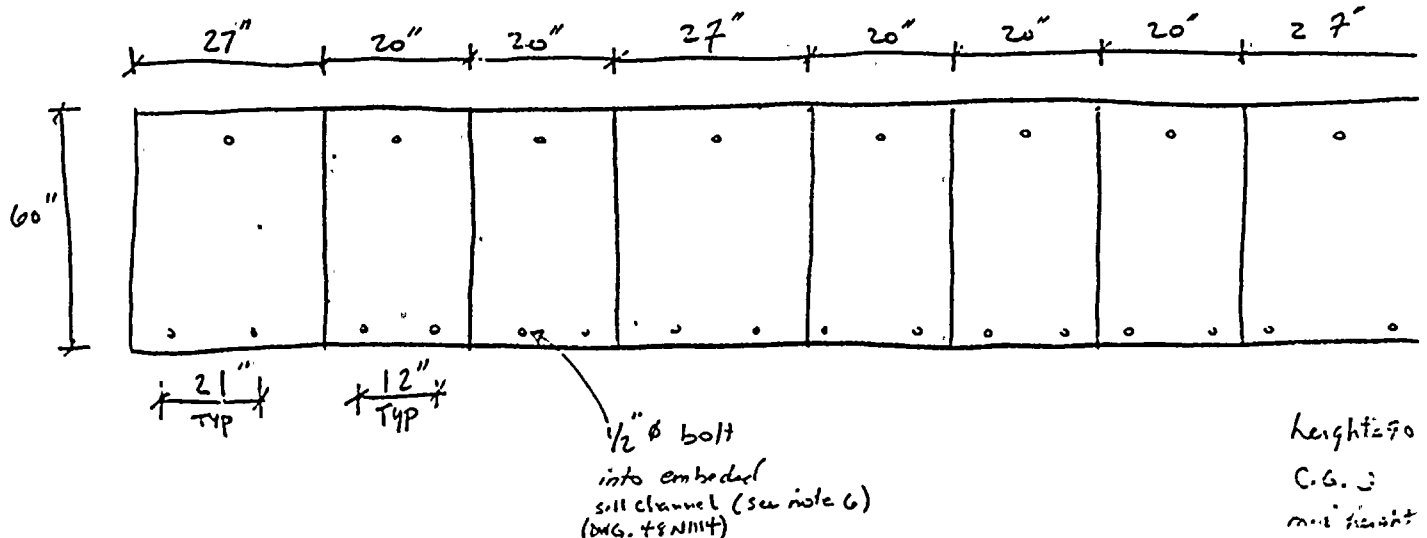
Note 7) Block Walls @ North and east side of the Board 1A and west of Board 1B qualified per IEB 80-11 Program (Ref. Walls 28 & 30, DWG. 4IN1201-1, R4).

Note 8) Lifting device on top of bay No. 1 and 2 is not positively restrained and could move on its rails and impart impact loads to the panels. Since the panels include relays this interaction is a seismic concern. → outlier (OSVS-9018-01) (Wt. ≤ 100#)

Note 9) panels are bolted to their adjacent panels w/ 12-1/4" ϕ bolts @ each side. ok

Note 10) Fluorescent light tubes are of compression fitting type and judged not to become a falling hazard in a seismic event. ok

Note 11) Top entry conduit are mostly rod hung and have adequate flexibility.



EQE INTERNATIONAL

SHEET NO. 8 of 8

JOB NO. 50147.05 JOB TVA / BFNP A-46 / IPEEE BY FRein DATE 8/30/95

CALC. NO. N/A SUBJECT Attach. to SENS for 1-BDBB-231-0001A CHK'D J.D.Kan DATE 9/5/95

(SSEL 9018)

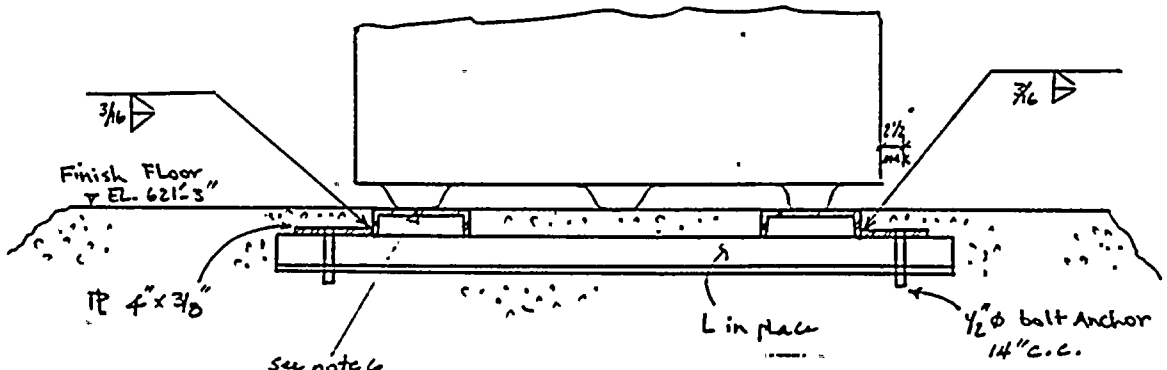
SSEL No. 9018 , 9019 (480V SHDN BD 1A & 1B)

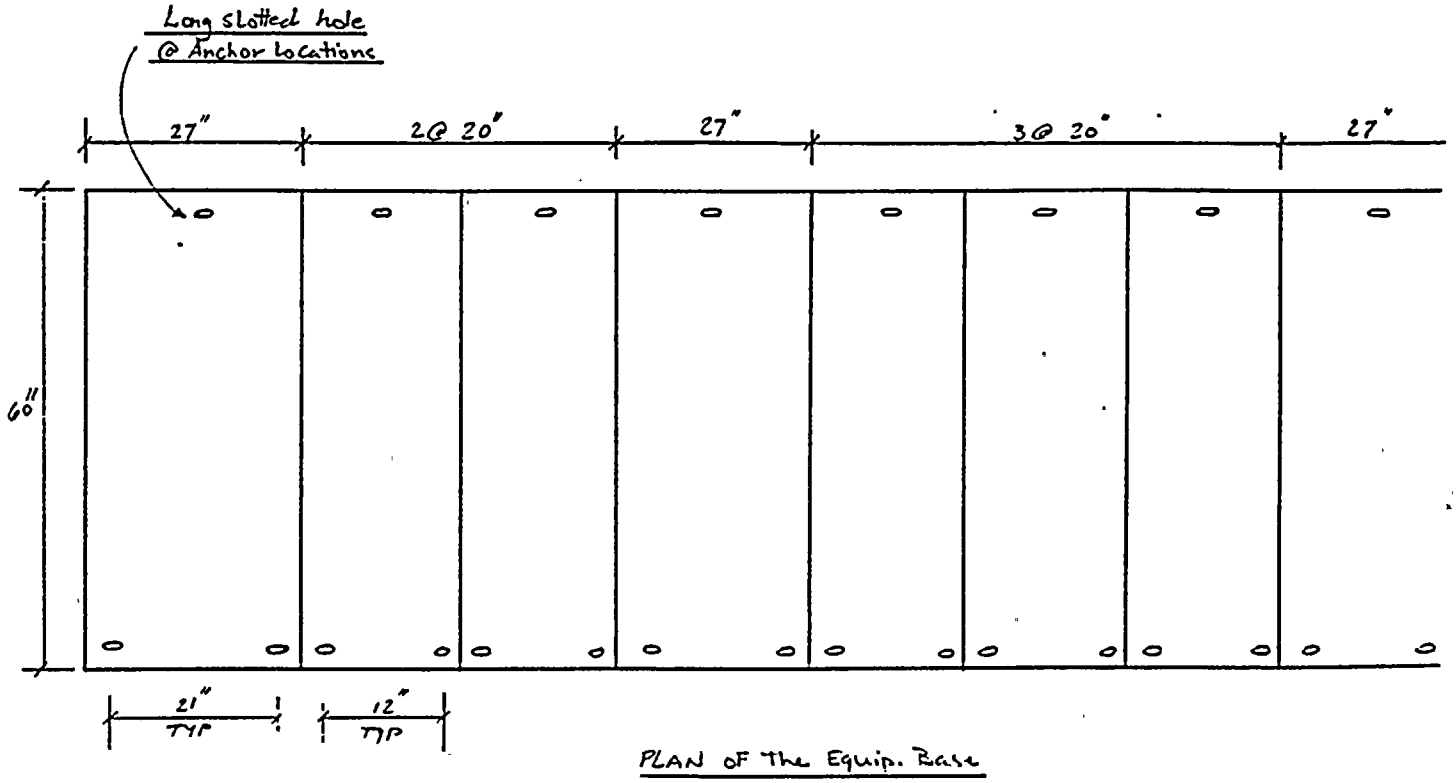
ID 1-BDBB-231-0001A & 1B

General arrangement DWG. 1-45N336 → Wt. = 14000. lbs

Sill Plan DWG. 1-45N367 → sill channel = C4x5.4

Embed ℄ DWG. 48N1114 :





PLAN OF The Equip. Base

SSEL Line No. 9018 Status Y (N) U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 1-BDBB-231-0001A Equip. Class 02 - Low Voltage Switchgear

Equipment Description 480V SHDN BD 1A

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), (2)

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 provided for the equipment is not adequate to resist shear loac caused from lateral seismic loads. → outlier (OSVS-9018-02)

2) Breaker lifting device mounted over one of the bays is not restrained from movement on its rails and would potentially slide and impact the rail stops in a seismic event. This impact could potentially cause relay chatter. → outlier (OSVS-9018-01)

IS 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✓ (see notes 1 & 2 above)

Evaluated by: Fayzi Beyz Date: 8-30-95

Evaluated by: John O. Dizon Date: 9/5/95

SSEL LINE NO. 9018

(OSVS-9018-01)

Revision 2
Corrected, 6/28/91

Exhibit 5-1

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 1-82BB-231-0001A Equipment Class 02 - LVSG

Equipment Location: Building U1, RB Floor Elevation 621'-3"

Room or Row/Column S-R1 Base Elevation 621'-3"

Equipment Description 480 VOLT SHUTDOWN BOARD 1A

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[1]	___
Caveats	___	Anchor Bolts and Embedment	___
Anchorage	___	Anchorage Connections	___
Seismic Interaction	✓	Flexibility of Attached Piping[1]	___
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	___

1 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):

Breaker lifting device is mounted over the top of one of the switchgear bays. The lifting device is free to move on its rail. In a seismic event the lifting device would potentially slide and impact the rail stops which would then potentially cause chatter of relays mounted inside this switchgear.

SSEL LINE NO. 9018

Revision 2
Corrected, 6/28/91

OSVS-9018-1

Exhibit 5-1 (Cont'd)

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 1-BDBB-231-0001A

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

Provide a positive restraining mechanism for this lifting device so that it will not slide on its rails in a seismic event or when is not in use. → Issue Work Request

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 BEIGI	Farzi Beigi	8-30-95
JOHN O. DIXON, PE	John O. Dixon	9/5/95

SSEL LINE NO. 9018

(OSVS-9018-02)

Revision 2
Corrected, 6/28/91

Exhibit 5-1

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 1-BDBB-231-0001A Equipment Class 02 - LVSG

Equipment Location: Building U1; RB Floor Elevation 621'-3"

Room or Row/Column S-R1 Base Elevation 621-3"

Equipment Description 480 VOLT SHUTDOWN BOARD 1A

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[1]	___
Caveats	___	Anchor Bolts and Embedment	___
Anchorage	✓	Anchorage Connections	___
Seismic Interaction	___	Flexibility of Attached Piping[1]	___
Other	___	Other	___
		Cable and Conduit Raceways	
Essential Relays		Inclusion Rules	___
Capacity vs. Demand	___	Other Seismic Performance Concerns	___
Mounting, Type, Location	___	Limited Analytical Review	___
Other	___	Other	___

1 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):

Equipment anchorage does not provide adequate shear resistance for seismic induced lateral loads. (Base anchorage to the embeded channels is provided by ½" ϕ bolts installed in long-slotted holes at equipment base sheet metal)

SSEL LINE No. 9018

Revision 2
Corrected, 6/28/91

Sheet 2 of 2

OSVS-9018-2

Exhibit 5-1 (Cont'd)

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 1-BDBB-231-0001A

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

Provide adequate anchorage for the equipment to resist shear loads. One option is to provide adequate amount of plug welds @ the location of slotted holes in the base of the equipment, similar to low voltage switchgears in Unit 2.

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

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 BEIGI	Farzi Beigi	8-31-95
JOHN A DIZON, PE	John O. Dizon	9/5/95

LINE 1

SEL Line No. 9014 Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 3

Equip. ID No. 0-BDAA-211-0000C Equip. Class 03 - Medium Voltage Switchgear

Equipment Description 4KV SHDN BD C

Location: Bldg. RB Floor El. 621'-3" Room, Row/Col R-R13

Manufacturer, Model, Etc. (optional but recommended) GE, Magne-Blast Circuit Breaker model MAH-476-250HP

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. Table @ EL 550'
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (1)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	BS
		1.5 x Bounding Spectrum	(ABS)
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	GRS
		1.5 x Ground Response Spectrum	AGS
		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 (6)
2.	2.4 KV to 4.16 KV rating	(Y) N U N/A
3.	Internally mounted potential and/or control power transformers are restrained to prevent damage to or disconnection of contacts	(Y) N U N/A
4.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	(Y) N U N/A (5)
5.	Attached weight (excluding conduit) less than about 100 lbs per cabinet bay	(Y) N U N/A (14), (11)
6.	Externally attached items rigidly anchored	(Y) N U N/A (14), (11)
7.	General configuration similar to ANSI C37.20 Standards	(Y) N U N/A
8.	Cutouts in lower half of cabinet sheathing less than 30% of width of side panel wide and less than 60% of width of side panel high excluding bus transfer compartment	(Y) N U N/A
9.	All doors secured by latch or fastener	(Y) N U N/A
10.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (3)
11.	Relays mounted on equipment evaluated AF = 7.0	(Y) N U N/A (15)
12.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

SSEL Line No. 9014

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 3

Equip. ID No. 0-BDAA-211-0000C Equip. Class 03 - Medium Voltage Switchgear

Equipment Description 4KV SHDN BD C

CAVEATS - GERS (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 generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Bounding Spectrum caveats	Y	N	U	N/A
3.	Floor-mounted enclosure	Y	N	U	N/A
4.	The switchgear is not a specially-designed type	Y	N	U	N/A
5.	Circuit breakers are truck-mounted type, not jack-up or vertical-lift	Y	N	U	N/A
6.	Maximum weight per vertical section less than 5000 lbs	Y	N	U	N/A
7.	Base anchorage adequate (See checklist below for details)	Y	N	U	N/A
8.	Relays used for breaker function are not on "Low Ruggedness Relays" list	Y	N	U	N/A
9.	Relay evaluations completed for all relays that are essential to other equipment or cause unacceptable lockout	Y	N	U	N/A
10.	For 2.5g level GERS, vertical restraint prevents circuit breaker uplift	Y	N	U	N/A
11.	For 2.5g level GERS, circuit break arc chutes are restrained horizontally	Y	N	U	N/A
12.	For 2.5g level GERS, a Beaver Type Z relay is not used in Westinghouse MV switchgear for the "Y" anti-pump relay	Y	N	U	N/A
13.	Separate evaluation of breaker racking mechanism completed; seismic positioner or sufficient side-to-side restraints used	Y	N	U	N/A
14.	All adjacent cabinets or sections of multi-bay assemblies bolted together	Y	N	U	N/A

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y)	N	U	N/A	(3, 8)
2.	Type of anchorage covered by GIP	(Y)	N	U	N/A	
3.	Sizes and locations of anchors determined	(Y)	N	U	N/A	(8)
4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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)	

SSEL Line No. 9014

Equip. ID No. 0-BDAA-211-0000C Equip. Class 03 - Medium Voltage Switchgear

Equipment Description 4KV SHDN BD C

ANCHORAGE (Cont'd)

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
	Are anchorage requirements met?	(Y) N U (3)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A (12)
2.	If equipment contains sensitive relays, equipment free from all impact by nearby equipment or structures	(Y) N U N/A (7)
3.	Attached lines have adequate flexibility	(Y) N U N/A (9)
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 (13)
	Is equipment free of interaction effects?	Y (N) U (13)

loosely attached breaker wrench to the bay no. 3 → potential relay chatter concern → outlier (OSVS-9014)

IS EQUIPMENT SEISMICALLY ADEQUATE? Y (N) U (13)

COMMENTS

For notes 1-6 & 8-15 see SEWS for 0-BDAA-211-0000A, (SSEL No. 9012). These two equipment are similar in every respect except that the back side of this equipment is fillet welded to the embed plate by total of approx. 72" of 1/8" weld (24 bays × 2 weld/bay × 1.5"/weld) vs. Board A which has 112" of weld. However, the anchorage evaluation performed in SEWS for Board A (Note #3) considered 32.5" welds in tension, and 130" welds for shear resistance calculation showed a F.S. >11 against weld stress allowables. Also, The plug welds provided in the front holes of this S.G. (SSEL# 9014) do not fully cover the entire slotted hole opening on the bottom of the S.G. base.

Evaluated by: Fazal Baig Date: 9-12-95

John O. Dizon 9/18/95

'This is also accepted in light of large margin and conservative nature of the anchorage calc. performed as referenced above. ok

Note 7) Block walls in the area are qualified per IEB 80-11 program/[illegible] 41N1202-1, R3

SSEL Line No. 9014 Status Y N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. O-BDAA-211-0000C Equip. Class 03 - Medium Voltage Switchgear

Equipment Description 4KV SHDN BD C

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 (1)

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) Breaker wrench is attached loosely to the front of the bay NO 3. In a seismic event this wrench will "bang" into the door and may cause relays in this bay to chatter. → outlier (OSVS-9014).

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ___ NO ✓ (1)

Evaluated by: Faraz Bagi Date: 9-12-95

Evaluated by: John O. Dizon Date: 9/18/95

SSEL Line No. 9014 (OSVS-9014)

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 0-BDAA-211-0000C Equipment Class 03 - MVSG

Equipment Location: Bldg. 112, RB Floor Elevation 621'-3"

Room or Row/Column R-R13 Base Elevation 621'-3"

Equipment Description 4 KV SHDN BD C

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	___
		Cable and Conduit Raceways	
Essential Relays		Inclusion Rules	___
Capacity vs. Demand	___	Other Seismic Performance Concerns	___
Mounting, Type, Location	___	Limited Analytical Review	___
Other	✓	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):

A breaker racking wrench is loosely attached to bay No. 3 of this switchgear. In a seismic event this wrench will interact with the panel it is attached to (it will "bang" into it). This impact by the wrench could chatter relays in this bay.

SSEL Line No. 9014

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 0-BDAA-211-0000C

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

If the relay review identifies this bay to include essential relays, Then the wrench needs to be removed from the bay or positively attached to it such that any interaction would be precluded.

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

↳ Issue Work Request

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 BEIGI	Farzin Beigi	9-12-95
JOHN O. DIZON, PE	John O. Dizon	9/18/95

INTENT

SSEL Line No. 9012 Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 3/9

Equip. ID No. 0-BDAA-211-0000A Equip. Class 03 - Medium Voltage Switchgear

Equipment Description 4KV SHDN BD A

Location: Bldg. RB Floor El. 621'-3" Room, Row/Col R-R2

Manufacturer, Model, Etc. (optional but recommended) GE, Circuit Breaker Type Magne-Blast MAH-4.76-250-15

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 = 561'
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A (1)	
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	BS	
	1.5 x Bounding Spectrum	(ABS)	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	GRS	
	1.5 x Ground Response Spectrum	AGS	
	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 (4)
2.	2.4 KV to 4.16 KV rating	(Y) N U N/A
3.	Internally mounted potential and/or control power transformers are restrained to prevent damage to or disconnection of contacts	(Y) N U N/A
4.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	(Y) N U N/A (5)
5.	Attached weight (excluding conduit) less than about 100 lbs per cabinet bay	(Y) N U N/A (14), (11)
6.	Externally attached items rigidly anchored	(Y) N U N/A (14), (11)
7.	General configuration similar to ANSI C37.20 Standards	(Y) N U N/A
8.	Cutouts in lower half of cabinet sheathing less than 30% of width of side panel wide and less than 60% of width of side panel high excluding bus transfer compartment	(Y) N U N/A
9.	All doors secured by latch or fastener	(Y) N U N/A
10.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (3)
11.	Relays mounted on equipment evaluated AF = 7.0	(Y) N U N/A (15)
12.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

SSEL Line No. 9012

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 8/9

Equip. ID No. 0-BDAA-211-0000A Equip. Class 03 - Medium Voltage Switchgear

Equipment Description 4KV SHDN BD A

CAVEATS - GERS (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 generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Bounding Spectrum caveats	Y	N	U	N/A
3.	Floor-mounted enclosure	Y	N	U	N/A
4.	The switchgear is not a specially-designed type	Y	N	U	N/A
5.	Circuit breakers are truck-mounted type, not jack-up or vertical-lift	Y	N	U	N/A
6.	Maximum weight per vertical section less than 5000 lbs	Y	N	U	N/A
7.	Base anchorage adequate (See checklist below for details)	Y	N	U	N/A
8.	Relays used for breaker function are not on "Low Ruggedness Relays" list	Y	N	U	N/A
9.	Relay evaluations completed for all relays that are essential to other equipment or cause unacceptable lockout	Y	N	U	N/A
10.	For 2.5g level GERS, vertical restraint prevents circuit breaker uplift	Y	N	U	N/A
11.	For 2.5g level GERS, circuit break arc chutes are restrained horizontally	Y	N	U	N/A
12.	For 2.5g level GERS, a Beaver Type Z relay is not used in Westinghouse MV switchgear for the "Y" anti-pump relay	Y	N	U	N/A
13.	Separate evaluation of breaker racking mechanism completed; seismic positioner or sufficient side-to-side restraints used	Y	N	U	N/A
14.	All adjacent cabinets or sections of multi-bay assemblies bolted together	Y	N	U	N/A

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y)	N	U	N/A(8,3)
2.	Type of anchorage covered by GIP (Plug & Fillet welds)	(Y)	N	U	N/A
3.	Sizes and locations of anchors determined	(Y)	N	U	N/A(8)
4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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)

SSEL Line No. 9012

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 3 of 9

Equip. ID No. 0-BDAA-211-0000A Equip. Class 03 - Medium Voltage Switchgear

Equipment Description 4KV SHDN BD A

ANCHORAGE (Cont'd)

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

Are anchorage requirements met? (Y) N U (3)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A (12)
2.	If equipment contains sensitive relays, equipment free from all impact by nearby equipment or structures	(Y) N U N/A (7)
3.	Attached lines have adequate flexibility	(Y) N U N/A (9)
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 (13)

Is equipment free of interaction effects? Y (N) U (13)

IS EQUIPMENT SEISMICALLY ADEQUATE? Y (N) U (13)

COMMENTS

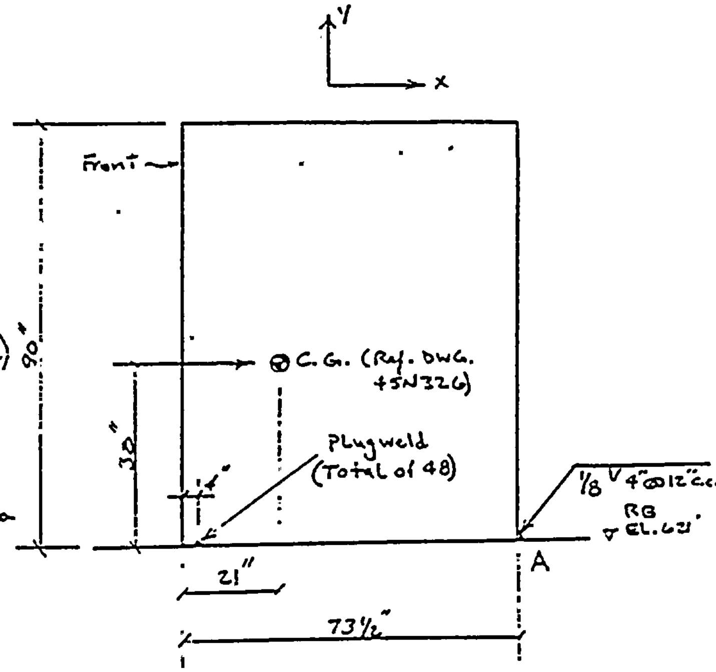
1) The heavy circuit breakers in this med-voltage switchgear are horizontally racked and their weight rests on the floor Mechanical jack screws secure the breakers to the rear of the enclosure. The lowest frequency associated with the rigidity of the breakers in racked-in position is estimated to be 22.9 HZ based on a conservative calculation (Ref Calc. CD-Q0211-890151). Test results of a 2-3 unit sections of switchgear showed that the side-to-side response is often less than 8 HZ, while the front-to-back response is greater than 8 HZ (Ref. EPRI Report TR-102180, March 1993). However, since all individual sections of this switchgear are bolted together, the side-to-side frequency would at least match that of the front-to-back. Therefore, it is concluded that the switchgear lowest fundamental frequency is greater than 8 HZ.

Evaluated by: Fanci Deng Date: 9-12-95

John O. Dizon 9/18/95

2) Per Calc. CD-Q0000-940339, FIG. B.1, the 1.5 x Bounding spectrum is exceeded by the In-structure spectra at EL. 621' of RB in the frequency range of 5.0 HZ to 7 HZ. Since, the lowest natural frequency of this switchgear is greater than 7 HZ, the intent of GIP seismic capacity vs. Demand Criteria is met

3) Anchorage Evaluation:



Wt. = 60^K (Ref. DWG. 45N326)

DBE Horiz. Accel. @ f = 8 HZ

$a_h = 1.0\,g$ (RB, EL. 621', 5% Damping, DBE)

$a_v = 0.16g$ (ZPA)

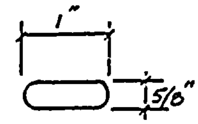
Factor to account for Med. ctr. spectra

$F_h = 60 \times 1.25 \times 1.0g = 75^K$

$F_V = 60 \times 1.25 \times 0.16g = 12^K$

- Weld properties

Perimeter of Hole = $\pi(5/8) + (1 - 5/8) \times 2 = 2.71''$



Long slotted hole @ Base

Equivalent weld length (for shear) @ front = $2.71'' \times 48 = 130''$

Equivalent weld length (for tension, @ front = $\frac{130''}{4} = 32.5''$

knock down factor for poor workmanship, per GIP, App. C

Equivalent weld length @ back = $24 \times 2 \times 4'' = 192''$ (does not govern)

(24 = # of Bays; 2 = # of 4" welds per Bay)

Note 3 (cont'd)

- Weld allowables:

$F_{W_S} = 30.6^{ksi} \times \frac{1}{8}'' \times 0.707 \times 130'' = 352.6^{k}$ (Total allowable weld shear stress for plug welds @ front of S.G.)

$F_{W_T} = 30.6^{ksi} \times \frac{1}{8}'' \times 0.707 \times 32.5'' = 87.9^{k}$ (Total allowable weld Tensile stress for plug welds @ front of S.G.)

- Weld seismic forces (Moment about A)

$OTM = (75^{k} \times 38'') + (12^{k} \times (73\frac{1}{2} - 17)) \div (60 \times (73\frac{1}{2} - 17)) = 138\ k\text{-in}$ (Resisting Moment due to D.L.)

$F_Y = \frac{138^{k''}}{73.5'' - 4''} + \frac{12^{k}}{2} = 8.0^{k}$

$F_X = \frac{75^{k}}{2} = 37.5^{k}$

$F_{Z_1} = F_X = 37.5^{k}$

$F_{Z_2} = \frac{75^{k}(73.5'' - .21'')}{73.5'' - 4''} = 56.7^{k}$

$\Rightarrow F_Z = 37.5 + 56.7 = 94.2^{k}$

- Shear - Tension Interaction:

$$\left(\frac{F_Y}{F_{W_T}}\right)^2 + \left(\frac{(F_{Z_1}^2 + F_{Z_2}^2)^{1/2}}{F_{W_S}}\right)^2 \leq 1.0$$

$$\left(\frac{8^{k}}{87.9^{k}}\right)^2 + \left(\frac{101^{k}}{352.6^{k}}\right)^2 = 0.09 \ll 1.0 \quad \text{ok}$$

∴ Anchorage Adequate

EQE INTERNATIONAL

SHEET NO. 6 of 9

JOB NO. 50147 JOB TVA / BFNP A-46 / IPEEE BY Raj DATE 7-12-95

CALC. NO. N/A SUBJECT Attachment to SEWS for 0-BDAA-211-0000A CHK'D D.J. Dizon DATE 9/18/95
(SSEL NO. 9012)

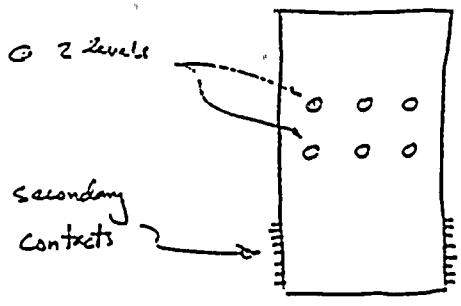
SSEL: 9012

ID: 0-BDAA-211-000A

(4 KV shut down Board)

Breaker Type: GE Magna-blast circuit breaker
Type MAH-476-250-1D

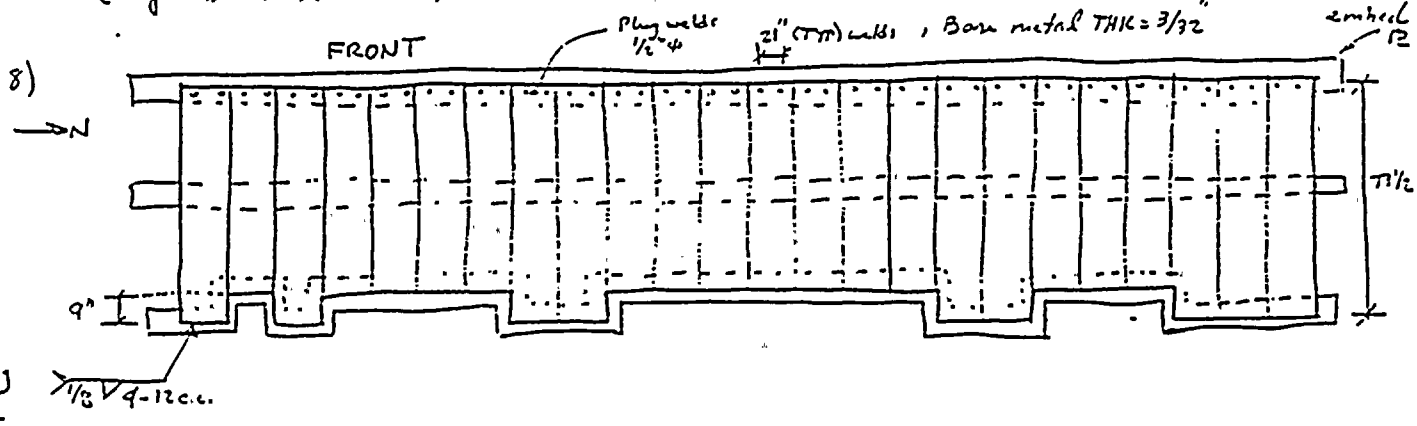
- 4) primary contact: 3 in series (round cross-section) @ 2 levels



- 5) 24 panels, all bolted together, with 5 rows of 1/4" to 1/2" ϕ along the length of each panel (~15" spacing). Also each adjacent panel is bolted to each other @ top by 2" x 3/16" metal strip that are bolted heavily to the panels.
- 6) Size: 73 1/2 (D) x 26 (W) x 90 (H) — @ 9 panels
64 1/2 (D) x 26 (W) x 90 (H) — @ 15 panels

- 7) Blockwalls in the vicinity of Board qualified per IEB 80-11 program (Ref. DWG. 41N1201-1, wall Nos. 28 and 35)

8)



EQE INTERNATIONAL

JOB NO. 50147 JOB TVA/BFN ? A-46/IPEEE BY [illegible] DATE 9-12-95

CALC. NO. N/A SUBJECT Attachment to SEWS for 0-BDAA-211-0000A (SSEL 9012) CHK'D [illegible] DATE 9/12/95

9012 (cont'd)

9) Top entry Conduit are rod hung → adequate flexibility

10) Consider 2-3"φ, 1-2"φ, 1-1½"φ, 1-¾"φ conduit w/ 4' span @ top of each bay.
[2×12.8 + 1×5.1 + 1×3.6 + 1×1.4] × 4' = 143.# ⇒ small enough to ignore in Anchorage Calc.

11) There is a synchronizing panel (24"×17"×10") @ top of bay No. 12.
See note 14 for its estimated weight and frequency calculation.
Load path from the C.G. of this panel to the S.G. is rugged (6-½" φ bolts)
The frequency estimation in Note 14 is based on the determination that the lowest frequency of this panel is attributed to its base flexibility.

12) Fluorescent lights overhead are far enough not to cause seismic interaction, since compression type fittings are used. HVAC ducts & supports in the proximity are rigid. ok
(For SSEL 9013 and 9015, There are 2 Fluorescent fixtures without compress. Fitting → ok since they are far and are located behind the Boards.

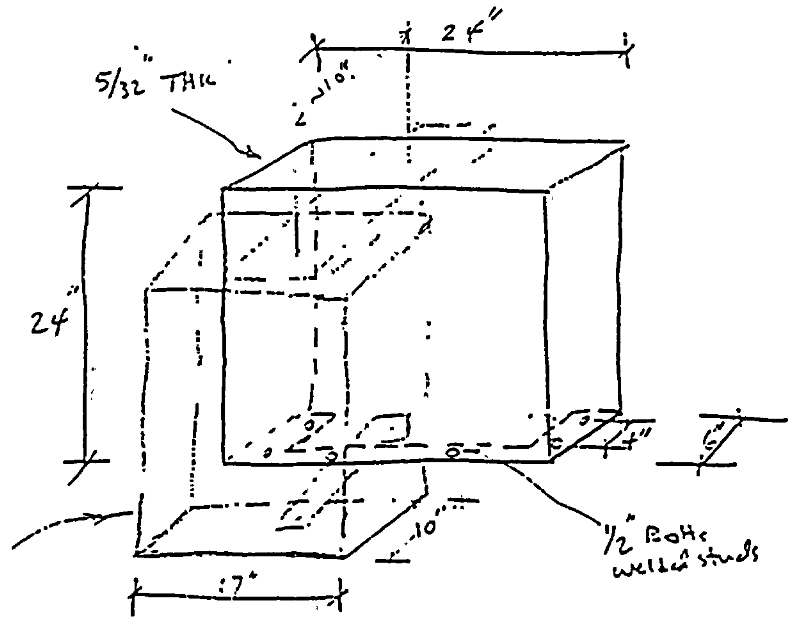
13) There is a racking wrench attached to bay No. 2 which would impact the front of the panel in a seismic event. The upper compartment in this bay has relays and the impact of this wrench to the bottom compartment would potentially chatter these relays. → Outlier (OSVS-9012)

EQE INTERNATIONAL

JOB NO. 50147 JOB TVA / BFNP A-46 / IPEEE BY TBe DATE 5-12-95

CALC. NO. N/A SUBJECT Attachment to SEWS for 0-23AA-211-0000A (SSEL 9012) CHK'D D.D. Ozka DATE 9/18/95

14) Synchronizing panel details:



Synchronizing Panel
3/32" thick housing
17x24x10

weight of housing = $\frac{490}{12^3} \times \frac{3}{32} \times 2\left[(17\times10)+(17\times24)+(10\times24)\right] = 43.5^{\#}$

There are total of 5 components (meters) mounted inside the box. wt. of each component is estimated to be less than 10 #.

Total wt. of the box = $43.5 + 5(10^{\#}) = 93.5^{\#}$

wt. of the support panel = $\frac{490}{12^3} \times \frac{5}{32} \times \left[(24\times6)+2(6\times24)+(24\times24)\right]$

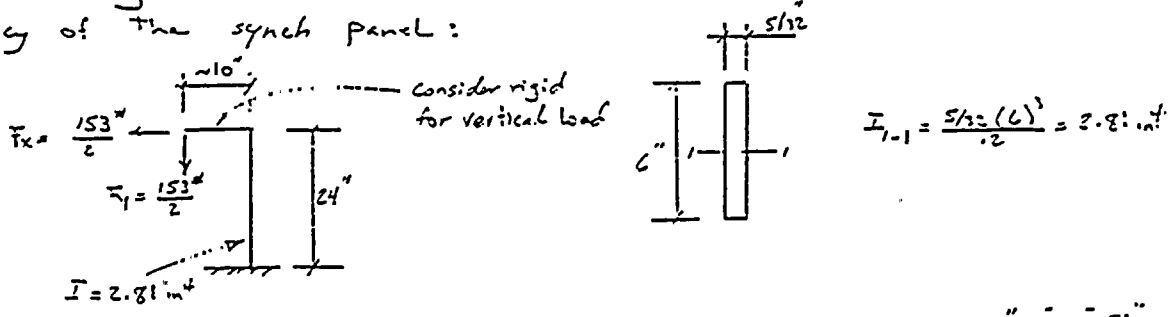
$= 45^{\#}$

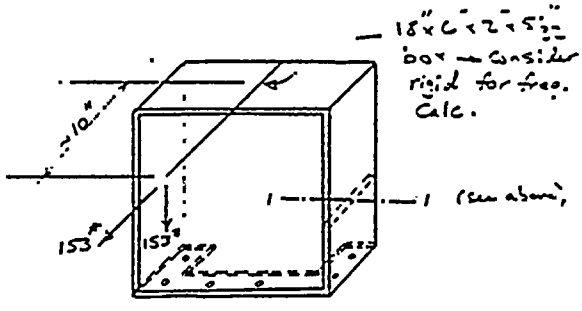
wt. of connecting arms (~18" x 6" x 2") ≈ $\frac{490}{12^3} \times \frac{5}{32} \times 2\left[(18\times2)+(18\times6)+(6\times2)\right] = 14^{\#}$

Total wt. of synchronizing panel = $93.5 + 45 + 14 = 153.^{\#}$
(This wt. could be ignored in anchorage calc. since it is very small as compared to the overall S.G. wt. ($153/60000 = 0.3\%$).)

Note 14 (Cont'd)

Consider the following model and Calculate The frequency of the synch panel:





$$\delta_{x_1} \text{ (due to } F_x) = \frac{(153\#/2)(24)^3}{3 \times 29E6 \times 2.81} = 0.0043"$$

$$\delta_{x_2} \text{ (due to } F_y) = \frac{(153/2 \times 10")(24)^2}{2 \times 29E6 \times 2.81} = 0.0027"$$

$$\delta_x = \delta_{x_1} + \delta_{x_2} = 0.0043 + 0.0027 = 0.007"$$

$$f = \frac{1}{2\pi}\sqrt{\frac{g}{\delta_x}}$$

$$= \frac{1}{2\pi}\sqrt{\frac{386.4}{.007}} = 37.4 \text{ HZ} \quad (\therefore \text{Rigid})$$

Note: F_x and F_y above are conservative since the restraint provided by the lower member connecting the box to the supporting panel. is ignored in the frequency calculation.

15) The long heavy loaded panel doors are consistently reinforced with stiffenening angles. A similar panel door for low voltage switchgear with no reinforcement was shown to have an estimated fundamental frequency of 9.5 HZ (see SEWS for SSEL No 9018). By comparison, the fundamental frequency of the panel doors on this equipment where relays are attached to is greater than 9.5 HZ (due to additional stiffeners). A conservative amplification factor of 7.0 is assigned to this switchgear, consistent with that suggested in EPRI Report

SEL Line No. 9012 Status Y (N) U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 0-BDAA-211-0000A Equip. Class 03 - Medium Voltage Switchgear

Equipment Description 4KV SHDN BD A

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 (1)

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) Racking Wrench is loosely attached to bay No. 2 and it would impact the front of this bay of switchgear in a seismic event. IF it is determined that there are essential relays in this bay, the impact could potentially chatter the relays. outlier OSVS-9012.

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ___ NO ✓ (1)

Evaluated by: J Bea Date: 9-12-95

Evaluated by: John A. Dizon Date: 9/18/95

SSEL Line No. 9012 (OSVS-9012)

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 0-BDAA-211-0000A Equipment Class 03- MVSG

Equipment Location: Bldg. RB, 111 Floor Elevation 621'-3"

Room or Row/Column R-R2 Base Elevation 621'-3"

Equipment Description 4KV SHDN BD A

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	___
		Cable and Conduit Raceways	
Essential Relays		Inclusion Rules	___
Capacity vs. Demand	___	Other Seismic Performance Concerns	___
Mounting, Type, Location	___	Limited Analytical Review	___
Other	✓	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):

A breaker racking wrench is loosely attached to bay No. 2 of this switchgear. In a Seismic event this wrench will interact with the panel it is attached to (it will "bang" into it). This impact by the wrench could chatter relays in this bay.

SSEL Line No. 9012 (OSVS-9012)

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 0-BDAA-211-0000A

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

i) IF the relay review identifies this bay to include essential relays then the wrench needs to be removed from the bay or positively attached to it such that any interaction would be precluded.

↳ Issue Work Request

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 BEIGI	Farzin Beigi	9-12-95
JOHN O. DIZON, P.E.	John O. Dizon	9/18/95

(UNIT-UNIT)

SSEL Line No. 9006 Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of ~~35~~

Equip. ID No. 2-XFA-253-0002A1 Equip. Class 04 - Transformers

Equipment Description 480V-120/208V XFMR FOR I&C BUS 2A

Location: Bldg. RB Floor El. 621'-3" Room, Row/Col P-R13

Manufacturer, Model, Etc. (optional but recommended) SQUARE D, 75 KVA, 3 phase

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	(1)
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A	(2)
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	BS	
	1.5 x Bounding Spectrum	ABS	
	GERS	(GERS)	
5.	Demand based on: Ground Response Spectrum	GRS	
	1.5 x Ground Response Spectrum	AGS	
	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 (3,10)

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.	4.16 KV rating or less	(Y) N U N/A
3.	For floor-mounted dry- and oil-type unit, transformer coils are positively restrained within cabinet	(Y) N U N/A
4.	For 750 kVA or larger units, coils are top braced or adequacy shown by evaluation	Y N U (N/A)
5.	For 750 kVA or larger units, 2-inch clearance is provided between energized component and cabinet	Y N U (N/A)
6.	For 750 kVA or larger units, the slack in the connection between the high-voltage leads and the first anchor accomodates 3-inch relative displacement	Y N U (N/A)
7.	For wall-mounted units, transformer coils anchored to enclosure near enclosure support surface	Y N U (N/A)
8.	For floor-mounted units, anchorage does not rely on weak-way bending of cabinet structures under lateral forces	(Y) N U N/A (9)
9.	Adjacent cabinets which are close enough to impact are bolted together if they contain essential relays	Y N U (N/A)
10.	All doors secured by latch or fastener	(Y) N U N/A
11.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (8)
12.	Relays mounted on equipment evaluated only for relays (non-essential)	Y N U (N/A)
13.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

SSEL Line No. 9006

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of ~~35~~

Equip. ID No. 2-XFA-253-0002A1 Equip. Class 04 - Transformers

Equipment Description 480V-120/208V XFMR FOR I&C BUS 2A

CAVEATS - GERS

1.	Equipment is included in generic seismic testing equipment class	(Y) N U N/A
2.	Meets all Bounding Spectrum caveats	(Y) N U N/A
3.	Dry-type unit (not oil-filled)	(Y) N U N/A
4.	Wall or floor-mounted NEMA-type enclosure	(Y) N U N/A
5.	120 to 480 VAC rating	(Y) N U N/A
6.	7.5 to 225 KVA rating	(Y) N U N/A
7.	180 to 2000 pound weight	(Y) N U N/A
8.	Internal supports provide positive attachment of transformer components	(Y) N U N/A
9.	There is a minimum clearance of 3/8 inches between bare conductors and enclosure	(Y) N U N/A
10.	All adjacent cabinets or sections of multi-bay assemblies bolted together	Y N U (N/A)

Is the intent of all the caveats met for GERS? (Y) N U N/A

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A (4,5)
2.	Type of anchorage covered by GIP (Exp. Anch.)	(Y) N U N/A (4,5)
3.	Sizes and locations of anchors determined	(Y) N U N/A
4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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)
9.	Strength of equipment base and load path to CG adequate	(Y) N U N/A (9)
10.	Embedded steel, grout pad or large concrete pad adequacy evaluated	Y N U (N/A)

Are anchorage requirements met? (Y) N U (8)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A (6)
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
4.	Overhead equipment or distribution systems are not likely to collapse	(Y) N U N/A (7)

SSEL Line No. 9006

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 3 of ~~35~~

Equip. ID No. 2-XFA-253-0002A1 Equip. Class 04 - Transformers

Equipment Description 480V-120/208V XFMR FOR I&C BUS 2A

INTERACTION EFFECTS (Cont'd)

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

COMMENTS

1) Effective grade for RB 2 is @ EL. 550' (Ref. Calc. CD-Q0000-940339)

2) The fundamental frequency of this transformer is judged to be greater than 8 HZ due to rigid mounting configuration of its coil, small mass and reinforced base channel. Additionally, per EPRI Report TR-102180 the fundamental frequency of Transformers <750 KVA is greater than 8HZ (see also Note 10)

3) Per Calc. CD-Q0000-940339, Rev. 0, Figure 8.3A, the 1.5 x Instructure SSE Response Spectra (i.e., Realistic Median Centered Instructure Response spectrum) @ RBEL 621' exceeds the GERS for Transformers in the frequency range of about 5.5 HZ to 6.2 HZ. Since the lowest frequency of this transformer is estimated to be greater than 8 HZ (see Note 2) the intent of the capacity vs. Demand criteria is met. OK

– Notes 4 thru 9 continued on sheets 4 & 5.

10) Furthermore, the above transformer (75 KVA) is also seismically qualified [*] by comparison to similar transformer (45 KVA) that was tested per IEEE 344-75 requirements. The 75KVA transformer base mounting bracket and base mounting dimension were increased to lower the resulting stresses and increase the natural frequency, (78HZ) based on comparable test results from the 45 kva transformer. (Wyle Test Report # 44509-1, 5/14/80) JDD 9/21 FB 9/21

Evaluated by: Fozzi Beiji Date: 7-21-95

John O. Dizon 7/25/95

[*] Seismic qualification documented in a letter from B.R. Rich (Square D Co.) to Anita Helton (TVA) dated 1/21/81.

EQE INTERNATIONAL

SHEET NO. 4 of 5

JOB NO. 50147.05 JOB TVA/BFN A-46/IPEEE BY 78ej DATE 7-21-

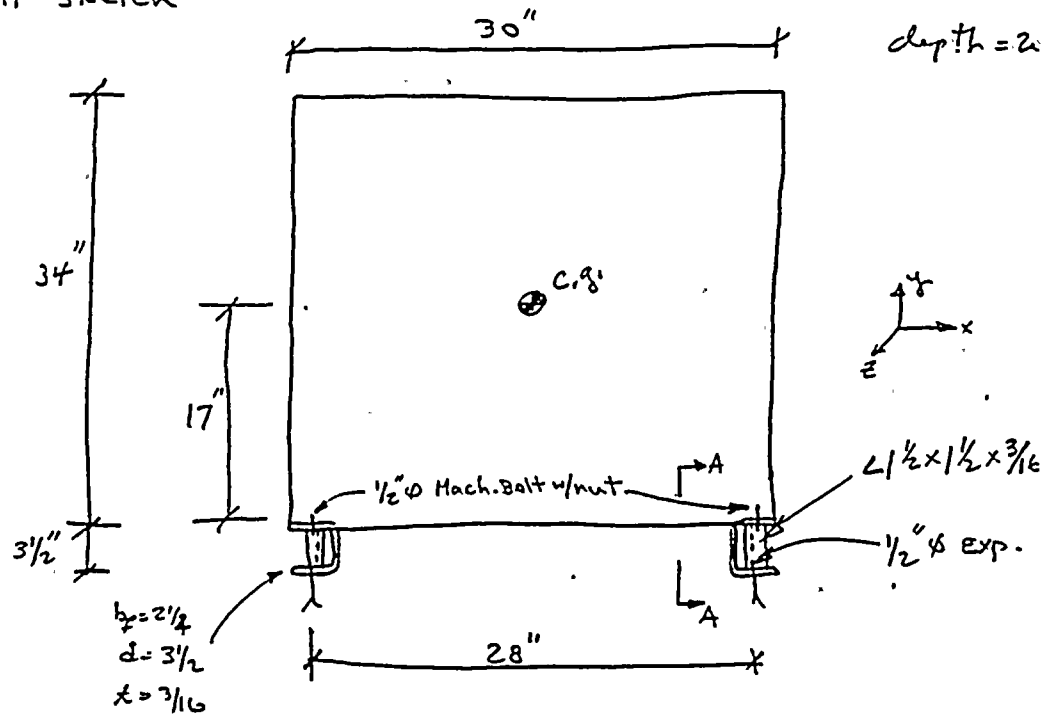
CALC. NO. N/A SUBJECT 2-XFA-253-0002A1 (SSEL #9006) CHK'D JDizon DATE 7/25/9

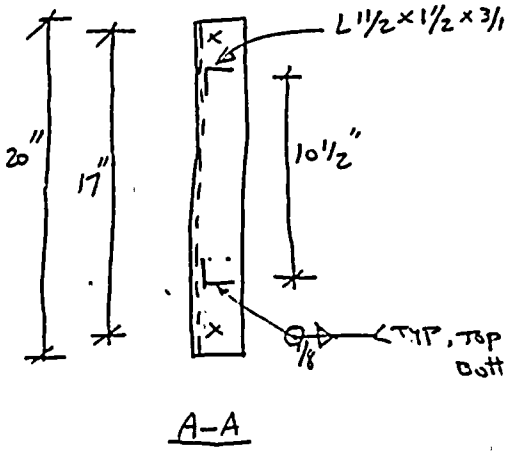
SSEL No. 9006, 9008 (photos; R1, F 9 & 10)

Comp-ID: 2-XFA-253-0002A1, 2B1

Manufacturer: SQUARE D company
75 KVA, 3 phase

Note 4) - as-built sketch





A-A

5) - C.G. @ center of the Transformer (Conservative)

6) - Fire Extinguisher near by not supported positively may fall & impact the Transformer. Judged ok since Transf. is enclosed by 3/32" thick steel & does not have any soft targets or relays.

7) - Fluorescent lights above this comp. are potential interaction hazard. but it is insignificant (See above note)

SSEL No. 9006

Equip. ID. 2-XFA-253-0002A1

8) Anchorage Evaluation :

WT ≃ 385 # (similar to the transformer analyzed in Calc. CD-Q3043-93048 Rev.

conservatively use peak accelerations @ RB, EL 621'-3", 5% Damping, SS

$a_h^{Peak} = 2.15\ g$

$a_V^{Peak} = 0.66\ g$ (Ref: CEB-88-05-C, Rev.1)

T = Resultant pull out load per 1/2" ϕ Exp. Anchor (for median-centers spectra)

$$= \left[\left(\frac{385^{\#} \times 2.15g \times 20.5"}{28" \times 2}\right)^2 + \left(\frac{385^{\#} \times 2.15g \times 20.5"}{17" \times 2}\right)^2 + \left(\frac{385^{\#} \times 0.66g}{4}\right)^2\right]^{1/2} \times 1.25$$

$$- \frac{385^{\#}}{4} = 638^{\#} \quad < T_{all} = 2.29^{K} \times \frac{3600}{4000} = 2.06^{K}$$ (Ref. GIP, App. C)

f'_c Red. Factor

V = Resultant shear load per 1/2" ϕ Anchor

$$= \sqrt{2}\ (385^{\#} \times 2.15g \times 1.25)/4 = 366^{\#} \quad < V_{all} = 2.38^{K};\ \frac{V}{V_{all}} < 0.3$$

$$IR = \frac{638}{2060} = \underline{0.31} < 1.0 \quad \text{ok}$$

9) - Base channel

The stress in the base channel is very small by inspection and due to the fact that the channel flanges are reinforced @ the anchor points by L 1 1/2 x 1 1/2 x 3/16 members.

SSEL Line No. 9006 Status Y N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-XFA-253-0002A1 Equip. Class 04 - Transformers

Equipment Description 480V-120/208V XFMR FOR I&C BUS 2A

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: Fanzi Bei Date: 7-21-95

Evaluated by: John O. Dizon Date: 7/25/95

SQUARE D COMPANY
ELECTRICAL EQUIPMENT

SORGEL TRANSFORMERS

(414) 384-8100 838 WEST NATIONAL AVE. MILWAUKEE, WIS. 53204
P.O. BOX 04548

CERTIFICATION

The transformers described in the following documentation are nuclear qualified based on previous test data from similar equipment. This similar equipment operated properly before, during and after the Qualification Test Program performed at the Wyle Laboratories and as recorded in Wyle Test Report No. 44509-1. (One copy included for documentation).

State of Wisconsin)
County of Milwaukee) ss

Wisconsin Professional Engineer
License No. E 10174

Marvin O. Kanter, being duly sworn, desposes and says: The information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Marvin O. Kanter

SUBSCRIBED and sworn to before me this 26TH day of FEBRUARY, 19 81.

Dan Van Vleet

Notary Public for the County of Milwaukee, State of Wisconsin.

My Commission expires 29TH OCTOBER, 19 84.

RECEIVING REPORT

SQUARE "D" COMPANY	Vendor: SAME	Number: 8601-01436
Shipping Point: ATLANTA, GA.	Receiving Point: BROWNS FERRY NUCLEAR PLANT POWER STOREROOM MODIFICATIONS	Contract No: 81P6-828602
Delivering Carrier: GHNY EXPRESS	Cases and Marks:	Gross Weight: 4380 LB
3-353883 7	Shipment: ☐ COMPLETE ☐ PARTIAL ☐ FINAL	707633-31159-02344

CONT. ITEM NO.	ARTICLES OR SERVICES	CLASS, BIN OR STOCK NO.	QUAN RECD.	UNIT	UNIT PRICE	AMOUNT
	ECN-P0399					
1	TRANSFORMER, DRY TYPE, 75 KVA, 3 PHASE, 480V	0810-8	6	EA		
	DELTA PRIMARY, SECONDARY 208Y/120V, 60 HERTZ					
	FLOOR MOUNTED, 220 DEG INSULATION SYS, INS CL					
	H, MAX TEMP RISE 80 DEG, IMPEDANCE 4.0, ALUM					
	WINDINGS, CLASS 1E, STANDARD INDOOR ENCLOSURE					
	SERIAL NO. : 156541-1 156541-4 156541-2 156541-5 156541-3 156541-6					
	MFG. BY SQUARE "D" CO.					
	TVA QC CHECKLIST AND SHIPPING RELEASE FURNISHED.					
2	QUALIFICATION TEST PER BULLETIN HEQ-80 TO		LUMP SUM			
	DEMONSTRATE COMPLIANCE OF ITEM 1 WITH IEC 323-1974 AND 344-1975					
	CC: JERRY DEMENT, OUTAGE SECTION, BFNP RON BORUM, EXPEDITOR, 350 CUBE-C					

DIRECT CHARGE

COMPLETE

00002 0017 5

Carrier's Charges: Collect $ ____ Paid $ 178.71 XXX

XXX

Date Material Was Received 8 APRIL 19 81

I certify that the articles or services listed above have been received except as noted:

Approved as Reported Above:

Signed: BUDDIE J. [illegible]

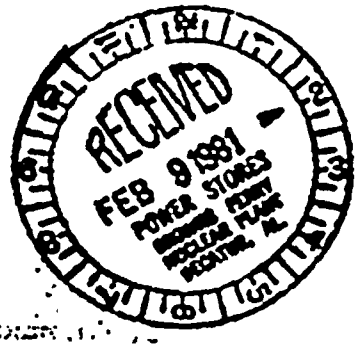
4 - Stock clerk ... For nonstock items, retained by ...
5 Retained by ...
6 Extra.

SQUARE D COMPANY
ELECTRICAL EQUIPMENT

(615) 877-1381 4220 DAYTON BOULEVARD POST OFFICE 18820 CHATTANOOGA, TENNESSEE 37415

U 0 0 0 0 2 0 1 7 4

January 21, 1981



Ms. Anita Helton
Tennessee Valley Authority
Division of Purchasing
400 Commerce Union Bank Bldg.
633 Chestnut St.
Chattanooga, TN 37401

Subject: TVA Ref. #6-828602

Dear Ms. Helton:

This letter is to confirm our phone conversation wherein I advised you that we would supply additional material in the form of a documentation of test results on the 45KVA transformer and the calculations necessary to show how these test results can be applied to the 75KVA transformer to show that it does meet your seismic requirements.

Shipment can be made in order for material to arrive at the job site by April 1, if the order is received by January 23, with the following requirements:

1. Approval drawings are waived by TVA. Drawings will be for record.
2. TVA will accept previous qualification data. No additional testing required.

If you have any questions concerning the documentation of test results and their application to the 75KVA transformer, you may contact Ron Franzen at (414) 384-8100.

Very truly yours,

SQUARE D COMPANY

B. R. Rich
Senior Field Representative

BR/mc

JAN 22 1981

SQUARE D COMPANY
ELECTRICAL EQUIPMENT

SORGEL TRANSFORMERS

(414) 384-8100 838 WEST NATIONAL AVE. MILWAUKEE, WIS. 53204
P.O. BOX 04549

Nuclear Environmental Qualification of Class 1E Transformers

Tennessee Valley Authority
1010 Georgia Ave.
Chattanooga, Tennessee

Tennessee Valley Authority
Brown's Ferry Nuclear Plant
Near Athens, Alabama

Project Identification
Contract No. 81P6-828602
Specification No. 6-828602

SQUARE D COMPANY
ELECTRICAL EQUIPMENT

SORGEL TRANSFORMERS

(414) 384-8100 838 WEST NATIONAL AVE. MILWAUKEE, WIS. 53204
P.O. BOX 04549

U0U062 0184

DOCUMENTATION

Method of Qualification:

The equipment required for this contract specification is seismically qualified in accordance with IEEE 344-1975 and meets all environmental requirements of IEEE 323-1974 as described in Test Report No. 44509-1.

I. Description of both equipment

A. Tested equipment is rated 45 KVA, three phase, 60 Hertz, 480 volt delta primary to 208Y/120 volt secondary, 115°C rise transformer. Dimensions and physical description as shown on comparison analysis sheet B-111118 with modification per drawing A-103247.

B. Equipment to be supplied on this contract is rated 75 KVA, three phase, 60 Hertz, 480 volt delta primary to 208Y/120 volt secondary, 80°C rise transformer. Dimensions and physical description as shown on comparison analysis sheet B-111118 and drawing A-111117 with modification per drawing A-103247. Electrical connections and wiring details as per drawing A-109886.

II. Test data on original equipment

A. Wyle Laboratories nuclear environmental qualification test report No. 44509-1 provides complete test data on the original equipment.

B. The environmental limits for temperature, pressure, humidity and radiation are defined in the qualification plan Section II, page 12.

C. The age-sensitive materials involved are listed on Page 34, Figure 1 of the qualification plan. The qualified life for 80°C rise transformers is 59 years at 100% load. Qualified life at other conditions are listed in Table III, Page 30 of the qualification plan.

D. Documentation Figure No. 1 is a comparative plot of the horizontal TRS at 3% damping using composite response spectra taken from test report No. 44509-1 Pages IX-56 and IX-66 showing a ZPA of 3.2 g compared with the response acceleration spectra in Appendix A of Spec. 6-828602. The data on this floor spectra was doubled for an equivalent horizontal SSE and shown as the RRS with a ZPA of 0.5 g.

E. Documentation Figure No. 2 is a comparative plot of the vertical TRS at 3% damping using composite response spectra taken from test report No. 44509-1 Pages IX-57 and IX-67 showing a ZPA of 3.8 g compared with the response acceleration spectra in Appendix A of Spec. 6-828602. The data on this floor spectra was doubled for an equivalent horizontal SSE and then reduced to 2/3 horizontal response for an equivalent vertical SSE and shown as the RRS with a ZPA of 0.33 g.

III. Detailed description of difference between the two equipments.

A. The enclosure housing on both designs is the same part 43005-033-50.

B. The same mounting bolts and ESNA type elastic stop nuts are used to fasten the base mounting brackets to the enclosure base.

C. The base mounting brackets of the test unit were made from 1/2" x 1-1/2" iron bar. The base mounting brackets of the transformer to be supplied will have base mounting brackets of 1/2" x 2" iron bar.

D. The transformer to be supplied will be very similar in electrical design and overall weight to the tested transformer, however, the center of gravity will be one inch higher.

IV. Justification of Data.

A. The nuclear environmental qualification test plan No. 44509-1 is a generic program to qualify a line of transformers. The qualification will satisfy any specification whose environmental conditions fall within the worst-case environments defined in Paragraph 1.0, Section II of the plan. Since the transformer to be furnished incorporates the same age-sensitive materials as the tested transformer, the documentation satisfies the qualification of this unit.

B. The seismic acceptability of the transformer to be furnished is covered by comparison analysis with the tested transformer per paragraph 3.1.1, Section I of the plan. The data necessary to make both the static and dynamic comparison of the two transformers is given on drawing B-111118. Since the furnished transformer's center of gravity was found to be higher, the stresses and fundamental frequency were adjusted by increasing the size of the base mounting brackets and by increasing the base mounting dimension (d) by 2 inches. These modifications had the effect of lowering the normalized stresses and increasing the fundamental frequency and thus satisfying the qualification of this unit.

C. With reference to the Documentation Curves Figures 1 and 2, taking into account that the TRS is plotted at 3% damping and that at 2% damping it would have an even higher g peak level in the flexible frequency range of 1 to 20 Hz and thus envelope the RRS with an even greater margin, this variation in damping can be ignored since the important consideration is the comparison of the Zero Period Acceleration (ZPA) between the two curves.

D. Comparison of the ZPA levels indicates that the tested transformer passed tests at levels six times greater in the horizontal and eleven times greater in the vertical than those required in Appendix A of Spec. 6-828602. This wide margin or factor of safety in seismic activity should be ample to justify the qualification of the transformers to be supplied on this contract.

SORGEL TRANSFORMERS

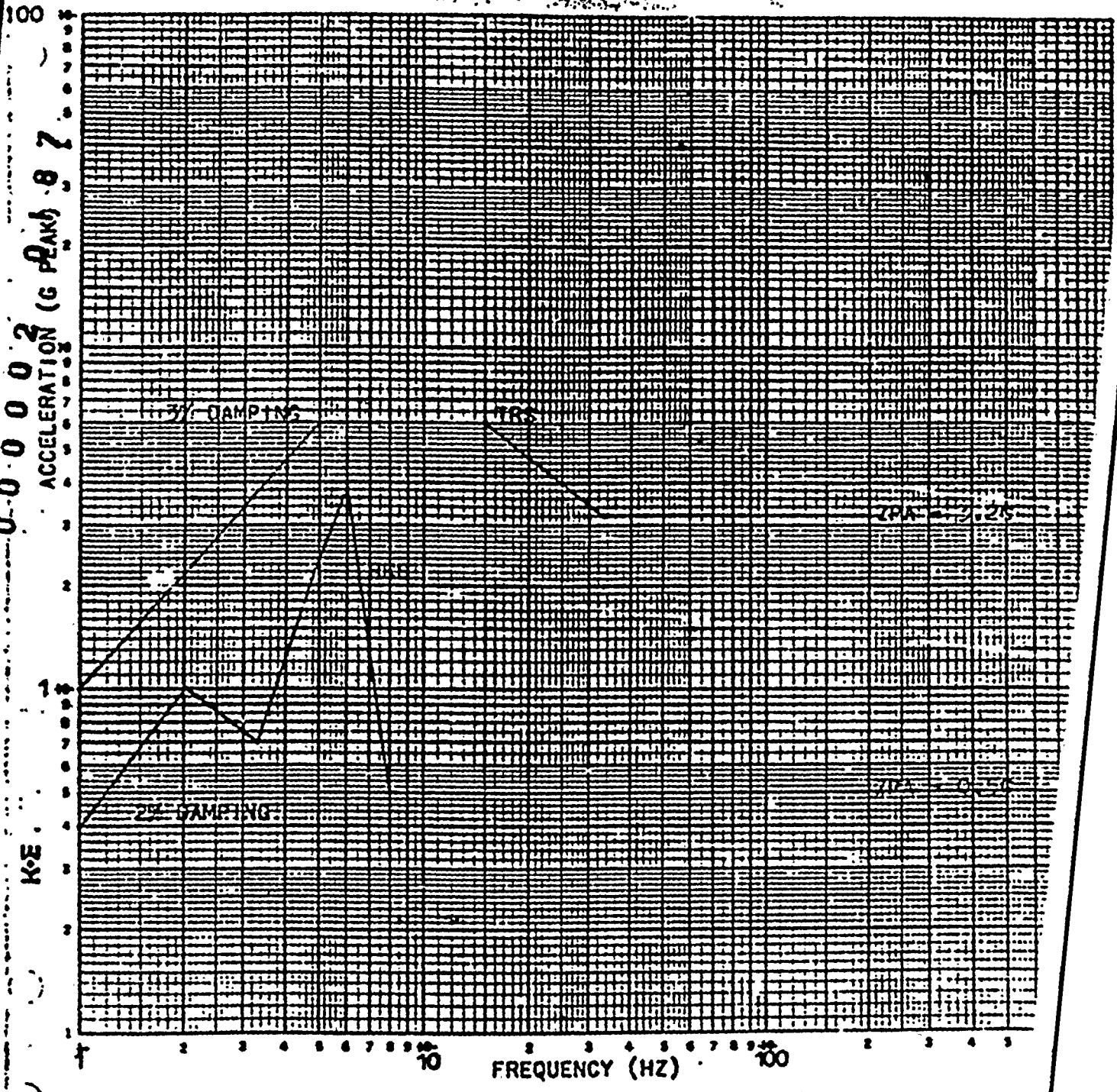
SQUARE D COMPANY

MILWAUKEE WISCONSIN

DOCUMENTATION

FIG. NO. 1

FULL SCALE SHOCK SPECTRUM (G PEAK)



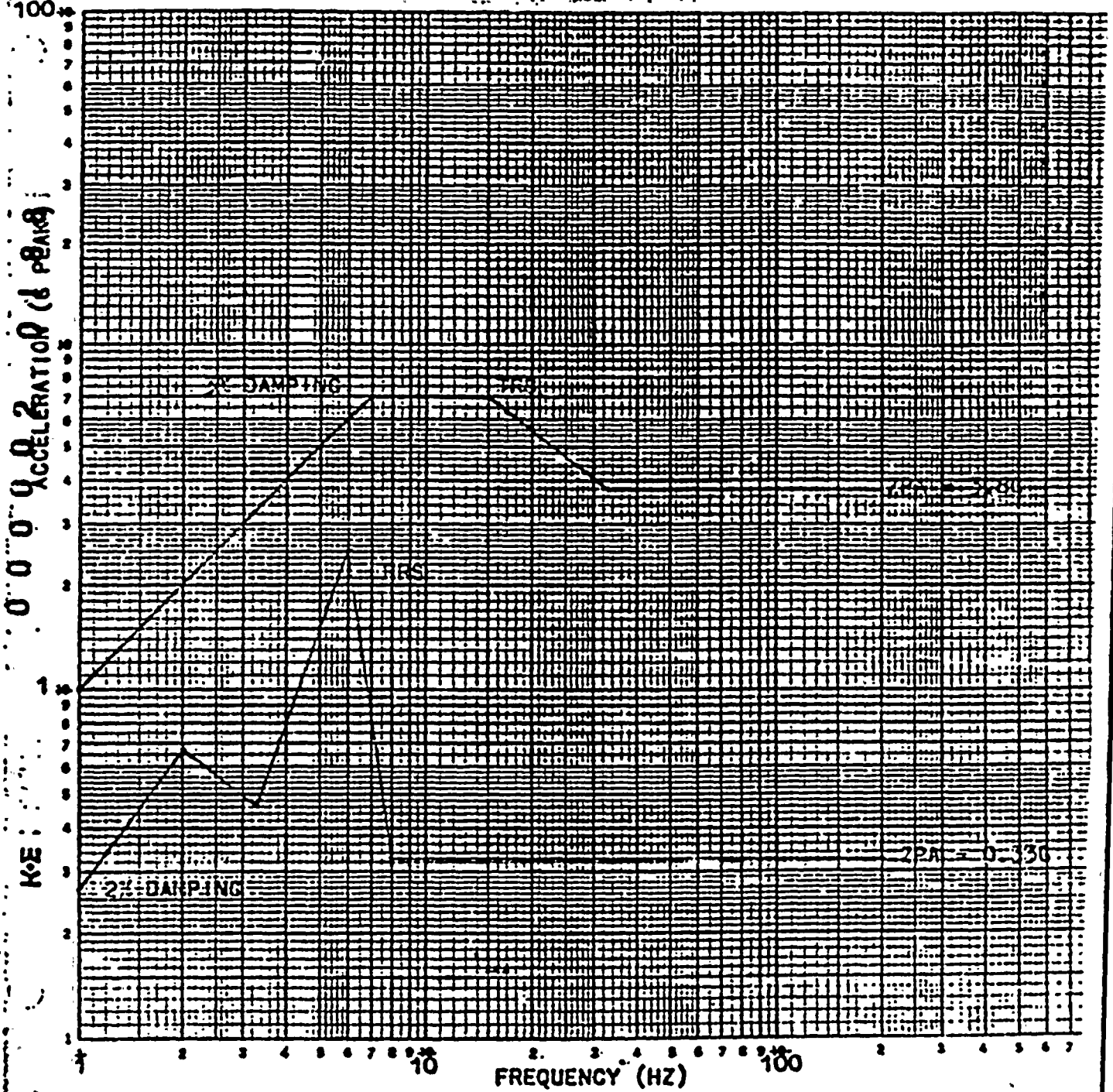
SSE HORIZONTAL RESPONSE SPECTRUM

SQUARE D COMPANY

DOCUMENTATION

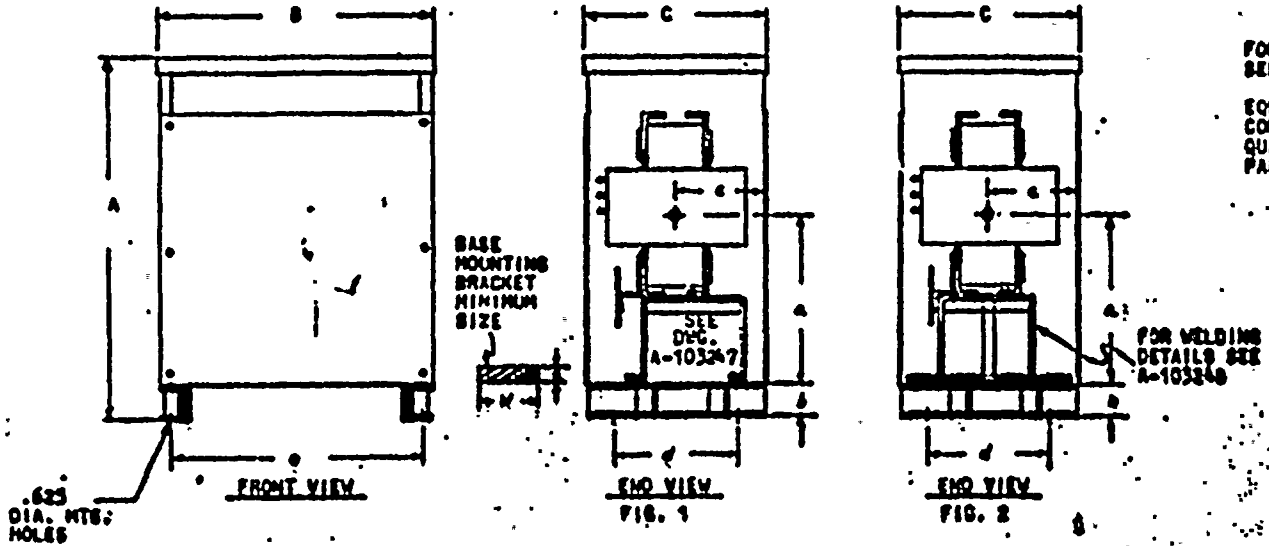
FIG. NO. 2

FULL SCALE SHOCK SPECTRUM (G PEAK)



SSE VERTICAL RESPONSE SPECTRUM

A - 79144



FOR TRANSFORMER SPECIFICATIONS: SEE DIMENSION PRINTS.

EQUATIONS FOR STATIC AND DYNAMIC COMPARISONS ARE IN SECTION XII OF QUALIFICATION PLAN 44509-1 ON PAGES 8 AND 10, EQUATION 5,6,7 AND 8.

*TEST SPECIMEN

KVA	DIMENSION IN INCHES													END VIEW FIGURE	WT. IN LBS.	STATIC COMPARISON OF TRANSFORMERS — NORMALIZED TO TEST SPECIMEN LEVELS: NORMALIZED STRESS (EQ 5)		NORMALIZED BASE FORCE (EQ 6)		DYNAMIC COMPARISON OF TRANSFORMERS: NORMALIZED FUNDAMENTAL FREQUENCY	
	A	B	C				a	b	c	d	e	t	w			N_o	N_r	F_o	K_r	f_n	f_r
*45	37.0	30.0	20.0				16.8125	3.8125	9.25	15.0	28.0	.50	1.5	1	700	1.00	1.00	1.00	1.00	1.00	1.00
75	37.0	30.0	20.0				17.8125	3.812:	8.6875	17.0	28.0	.50	2.0	1	690	.73	.74	.95	.82	1.07	1.42

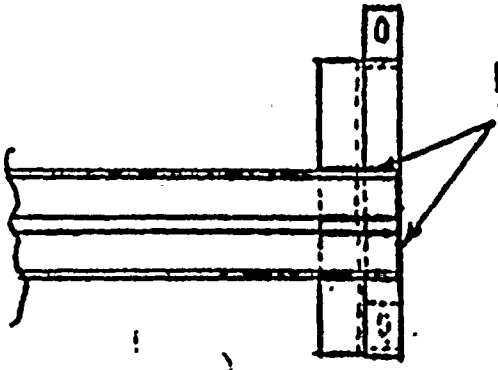
SORGEL TRANSFORMERS
SQUARE D COMPANY

COMPARISON ANALYSIS OF 45 KVA TRANSFORMER TO OTHER TRANSFORMERS PER QUALIFICATION PLAN 44509-1.

DRAWN BY: B.U.

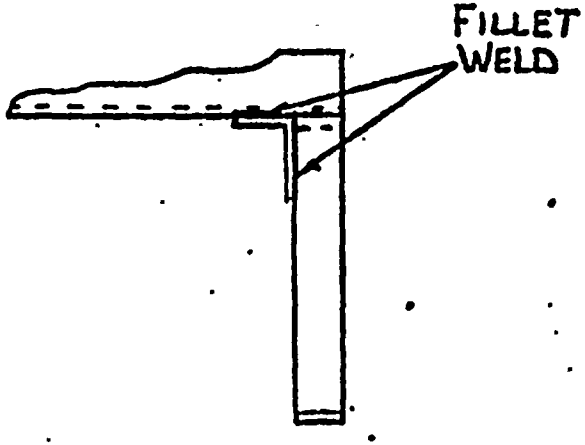
B-111118

0 0 0 0 0 2 0 1 9 0 DWG. NO. A-103247

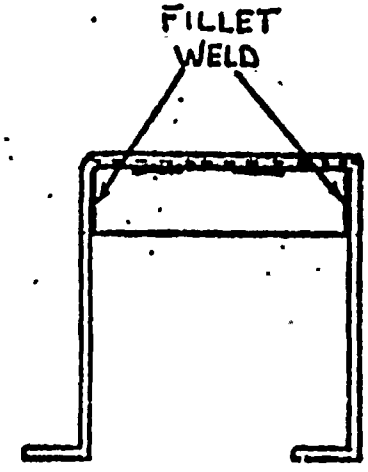


TOP VIEW

1/4" x 3.0 x 4.0 ANGLE



FRONT & REAR VIEWS



END VIEW

DWG. NO. A-103247

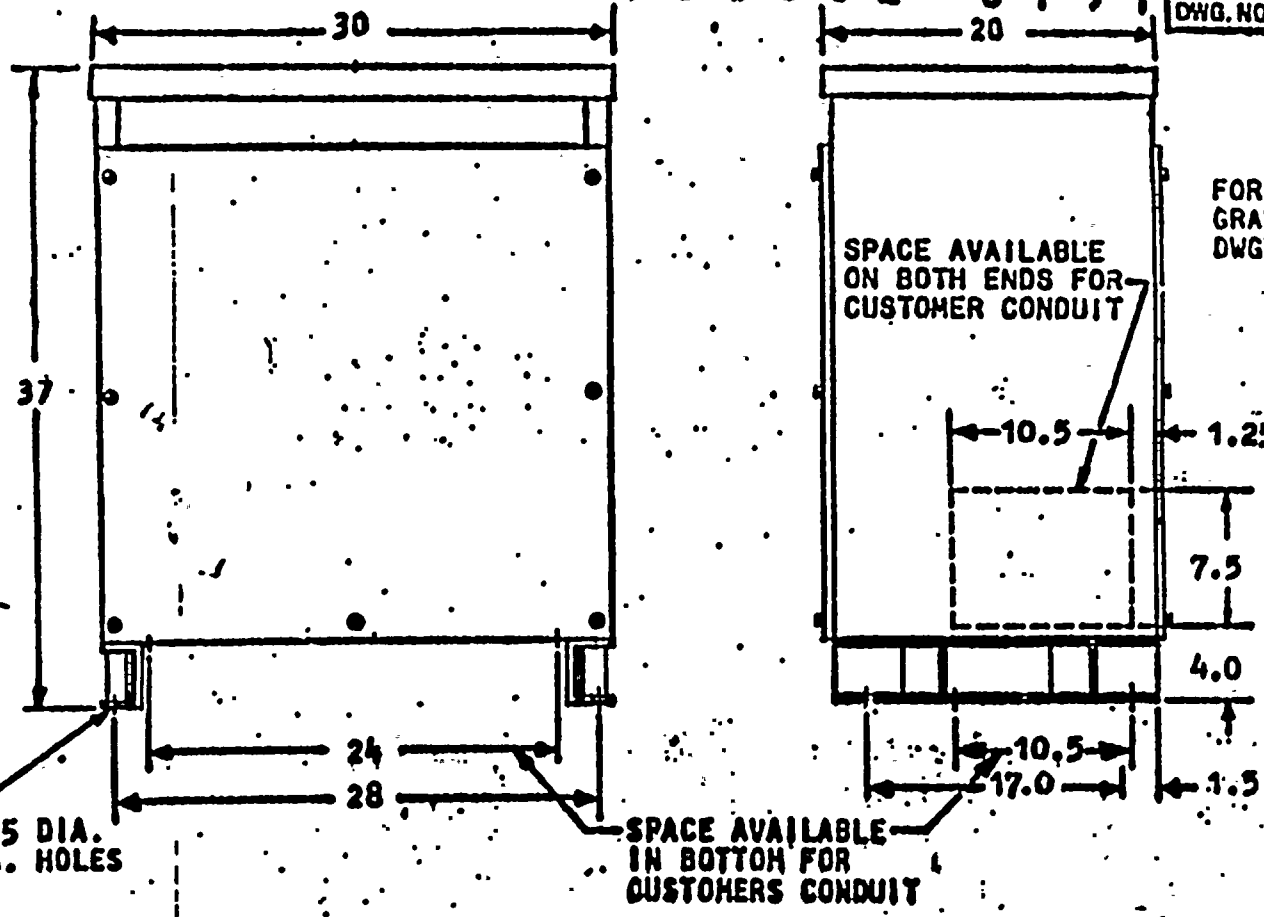
NO.	REVISION	DATE

DETAILS OF WELDING 3.0x4.0 ANGLE TO BASE MOUNTING BRACKET & CORE CLAMPING ANGLES.

SORGEL TRANSFORMERS
SQUARE D COMPANY
MILWAUKEE WISCONSIN

DRAWN BY
DATE
JOB NO.

DWG. NO. A-111117



ALUMINUM WOUND
PAINT - ANSI 61 LIGHT GRAY
TVA CONTRACT NO. 81P6-828602

KVA 75 PHASE 3 HERTZ 60
HIGH VOLTAGE 480 DELTA
HIGH VOLT. TAPS (6)2.5%, 2+ & 4-
LOW VOLTAGE 208Y/120
TYPE SO NET WEIGHT 690 LBS.
220°C INS. SYSTEM FOR 80 °C. RISE
IMPEDANCE APPROX. 4.3%

DWG. NO. A-111117

CHECKED BY: KFL 2-16-81

NO.	REVISION	DATE

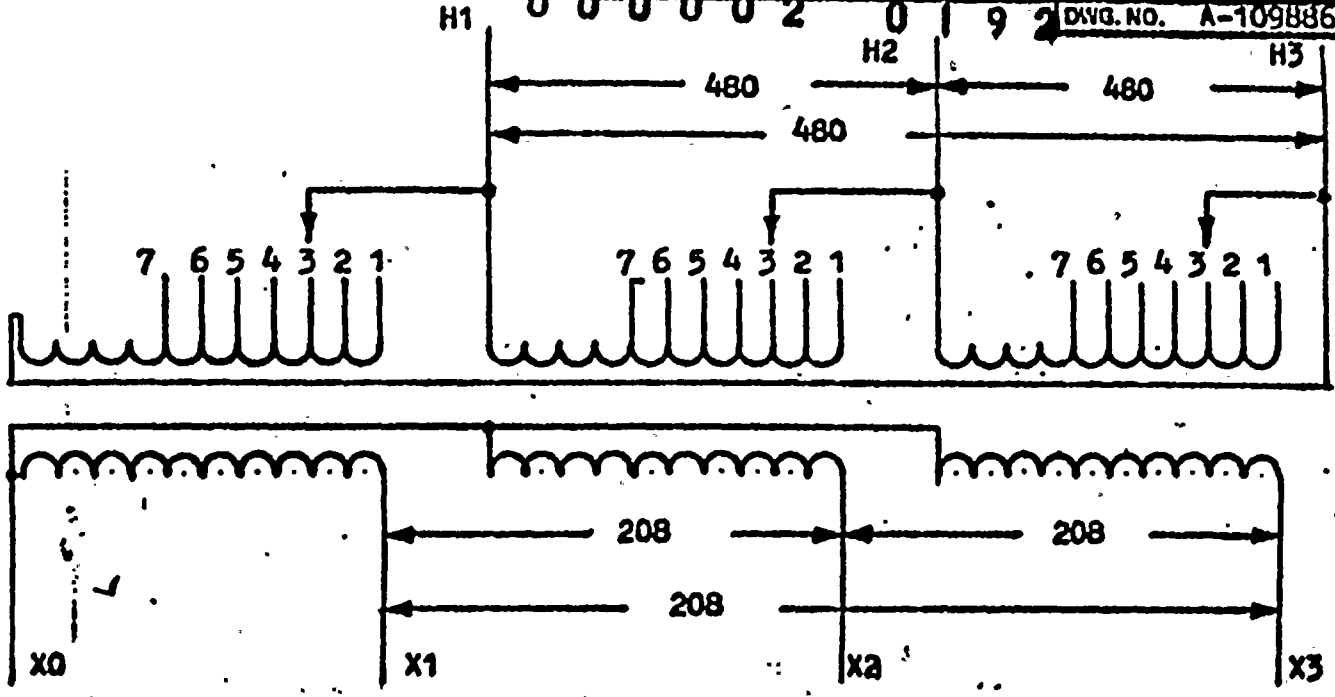
DIMENSION PRINT FOR THREE PHASE INSULATED TRANSFORMER

SEISMIC CLASS IE

SORGEL TRANSFORMERS
SQUARE D COMPANY
MILWAUKEE WISCONSIN

DRAWN BY B.U.
DATE 2-13-81
JOB NO.

DWG. NO. A-109886



CONNECTIONS			
WINDING	VOLTAGE	AMPERES	CONNECT TO TAP
	504	86	1
	492	88	2
	480	90	3
	468	93	4
	456	95	5
	444	98	6
	432	100	7
LOW VOLTAGE	208Y/120	208	

75 KVA 3 PHASE 60 HZ
HIGH VOLTAGE 480
LOW VOLTAGE 208Y/120
TYPE 80

DWG. NO. A-109886

CHECKED BY: KFL 2-16-81

TVA CONTRACT NO. 81P6-828602

NO.	REVISION	DATE

WIRING DIAGRAM FOR THREE PHASE INSULATED TRANSFORMER.

SORGEL TRANSFORMERS
SQUARE D COMPANY
MILWAUKEE . WISCONSIN

DRAWN BY B.U.
DATE 2-13-81
JOB NO.

/INTENT/

SSEL Line no. 9285
AI

Revision 2A
Status (Y) N U

SCREENING EVALUATION WORK-SHEET (SEWS) Sheet 1 of 3

Equip. ID No. 2-JBOX-268-5991 Equip. Class 14 - Distribution Panels

Equipment Description M-G Set 2DA Control Station (2-HS-268-0002DA)

Location: Bldg. U2-RB Floor El. 639' Room, Row/Col U/R14

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input	~644' (Eff Grade @ El. 550')	
2.	Elevation of seismic input below about 40' from grade	Y (N) U N/A	
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A	(1)
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	BS	
	1.5 x Bounding Spectrum	(ABS)	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	GRS	
	1.5 x Ground Response Spectrum	AGS	
	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.	Contains only circuit breakers and switches	(Y) N U N/A
3.	All latches and fasteners in door secured	(Y) N U N/A
4.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	Y N U (N/A)
5.	Wall- or floor-mounted NEMA-type enclosure	(Y) N U N/A
6.	Anchorage adequate (See checklist below for details)	(Y) N U N/A
7.	Relays mounted on equipment evaluated	Y N U (N/A)
8.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

CAVEATS - GERS (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 the generic seismic testing equipment class	Y N U (N/A)
2.	Meets all Bounding Spectrum caveats	Y N U (N/A)
3.	Use panelboard GERS unless unit is free-standing and designated as a switchboard by manufacturer	Y N U (N/A)
4.	W "Quicklag" Type E circuit breakers are not in distribution panel	Y N U (N/A)
5.	All adjacent cabinets or sections of multi-bay assemblies bolted together	Y N U (N/A)

Is the intent of all the caveats met for GERS? Y N U (N/A)

SSEL Line no. 9285
AI

Revision 2A
Sheet 2 of 3

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-JBOX-268-5991 Equip. Class 14 - Distribution Panels

Equipment Description M-G Set 2DA Control Station (2-HS-268-0002DA)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A
2.	Type of anchorage covered by GIP	(Y) N U N/A
3.	Sizes and locations of anchors determined	(Y) N U N/A
4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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) (Y) N U (3)

Are anchorage requirements met?

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
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
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

(1) Component is rigidly mounted to the wall close to the floor elevation; $f > 8$ hz. by judgment.

(2) Per calc. CD-Q0000-940339, in-structure spectra @ RB El. 639' (seismic demand) exceeds the capacity (1.5 x Bounding spectrum) at and beyond the component's lowest bound fundamental frequency (> 8 hz). The intent of the GIP is met.

SSEL Line no. 9285
AI

Revision 2A
Sheet 3 of 3

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-JBox-268-5991 Equip. Class 14 - Distribution Panels

Equipment Description MG Set 2DA Control Station (2-HS-268-0002DA)

COMMENTS

(3) Component is small + light weight. Tug test demonstrates adequate anchorage.

Evaluated by: John O. Dizon Date: 1/12/96

J.R. Bissor 1/12/96

SSEL Line No. 9285
AI

Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-JBox-268-5991 Equip. Class 14- Dist. Panels

Equipment Description M-G Set 2DA Control Station (2-HS-268-5002DA)

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: John O. Dizon Date: 1/12/96

Evaluated by: J. R. Dissere Date: 1/12/96

/ INTENT /

SSEL No. 9406

Revision 2A
Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 84

Equip. ID No. 2-CHGD-283-A1-2 Equip. Class 16 - Battery Chargers & Inverters

Equipment Description ±24V NEUTRON MONITOR BATTERY CHARGERS A1-2

Location: Bldg. CB Floor El. 593 Room, Row/Col BATTERY BOARD - ROOM 2

Manufacturer, Model, Etc. (optional but recommended) GENERAL ELECTRIC ±24V

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input	598'	
2.	Elevation of seismic input below about 40' from grade	Y (N) U N/A	
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A	NOTE 1
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	BS	
	1.5 x Bounding Spectrum	(ABS)	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	GRS	
	1.5 x Ground Response Spectrum	AGS	
	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 * NOTE (1)

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.	Solid state type	(Y) N U N/A	
3.	For floor-mounted, transformer positively anchored and mounted near base, or load path is evaluated	Y N U (N/A)	NOTE (2)
4.	Base assembly of floor-mounted unit properly braced or stiffened for lateral forces	Y N U (N/A)	NOTE (2)
5.	For wall-mounted units, transformer supports and bracing provide adequate load path to the rear cabinet wall XMFR secured w/ 4-1/4"ϕ bolts to internal frame	(Y) N U N/A	NOTE (2)
6.	All latches and fasteners in doors secured	Y N U (N/A)	
7.	Anchorage adequate (See checklist below for details)	Y (N) U N/A	NOTE (2)
8.	Relays mounted on equipment evaluated AF = 3.0	(Y) N U N/A	NOTE (3)
9.	Have you looked for and found no other adverse concerns?	(Y) N U N/A	

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

CAVEATS - GERS (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 generic seismic testing equipment class	Y N U (N/A)	
2.	Meets all Bounding Spectrum caveats	Y N U (N/A)	

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-CHGR-283-A1-2 Equip. Class 16 - Battery Chargers & Inverters

Equipment Description ±24 V NEUTRON MONITOR BATTERY CHARGERS A1-2

CAVEATS - GERS (Cont'd)

3.	Silicon-Controlled Rectifier (SCR) power controls; wall- or floor-mounted NEMA-type enclosure	Y	N	U	N/A
4.	Within range of battery charger ratings:				
	24-250 VDC	Y	N	U	N/A
	120-480 VAC	Y	N	U	N/A
	25-600 amps	Y	N	U	N/A
	150-2850 pounds (floor-mounted)	Y	N	U	N/A
	150-600 pounds (wall-mounted)	Y	N	U	N/A
5.	Within range of inverter ratings:				
	120 VDC only	Y	N	U	N/A
	120-480 VAC	Y	N	U	N/A
	0.5-15 KVA	Y	N	U	N/A
	300-2000 pounds	Y	N	U	N/A
6.	Heavy components are located in lower half of cabinet and are supported from base or rear panel with no panel cutouts adjacent to attachment	Y	N	U	N/A

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y)	N	U	N/A
2.	Type of anchorage covered by GIP	Y	N	(U)	N/A
3.	Sizes and locations of anchors determined	Y	N	(U)	N/A
4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	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

Are anchorage requirements met? Y (N) U

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y)	N	U	N/A
2.	If equipment contains sensitive relays, equipment free from all impact by nearby equipment or structures	(Y)	N	U	N/A

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-CHGR-283-A1-2 Equip. Class 16 - Battery Chargers & Inverters

Equipment Description ±24V NEUTRON MONITOR BATTERY CHARGERS A1-2

INTERACTION EFFECTS (Cont'd)

3. Attached lines have adequate flexibility	(Y) N U N/A	NOTE 4
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	

COMMENTS

1. THE BATTERY CHARGER IS RIGIDLY MOUNTED TO THE WALL WITH 4 - 3/8" ϕ DIAMETER ANCHORS USING WASHERS AS SPACERS TO PROVIDE ABOUT 1/2" CLEARANCE FROM THE WALL. TEST RESULTS INDICATE THE NATURAL FREQUENCY OF TYPICAL WALL MOUNTED BATTERY CHARGERS TO BE GREATER THAN 8 HZ (REFER TO EPRI TR-102180). THE 593' REACTOR BUILDING ELEVATION RRS EXCEEDS THE ABS IN THE FREQUENCY RANGE OF 5.5-6.2 HZ. BECAUSE THE NATURAL FREQUENCY OF THE BATTERY CHARGER IS GREATER THAN 8 HZ, THE CAPACITY SPECTRUM ENVELOPES THE DEMAND SPECTRA AND THE INTENT OF THE CAVEAT IS MET.
2. THE BATTERY CHARGER IS WALL MOUNTED USING 4-3/8" ϕ ANCHORS. HOWEVER, THE ANCHORS ARE MOUNTED IN A SEISMIC BLOCK WALL AND DETAILS OF THE ANCHORAGE USED ARE UNAVAILABLE, OUTLIER. SEE OSVS - 9406. SEE THE ATTACHED SKETCH OF THE BATTERY CHARGER AND VISIBLE ANCHORAGE DETAILS.
3. RELAYS ARE EVALUATED IN A SEPARATE PROGRAM. IT IS NOT KNOWN IF RELAYS ARE LOCATED IN THE CHARGERS.
4. CONDUIT EXITING/ENTERING THE TOP OF THE CHARGER ARE RIGID. CONDUIT EXITING/ENTERING THE BOTTOM OF THE CHARGER ARE FLEX CONDUITS. THE ATTACHED CONDUIT IS ACCEPTABLE AS THEY ARE ATTACHED TO THE SAME BLOCK WALL THE CHARGER IS MOUNTED ON.

Evaluated by: J.R. Disser Date: 4/19/96

John O. Dizon 4/19/96

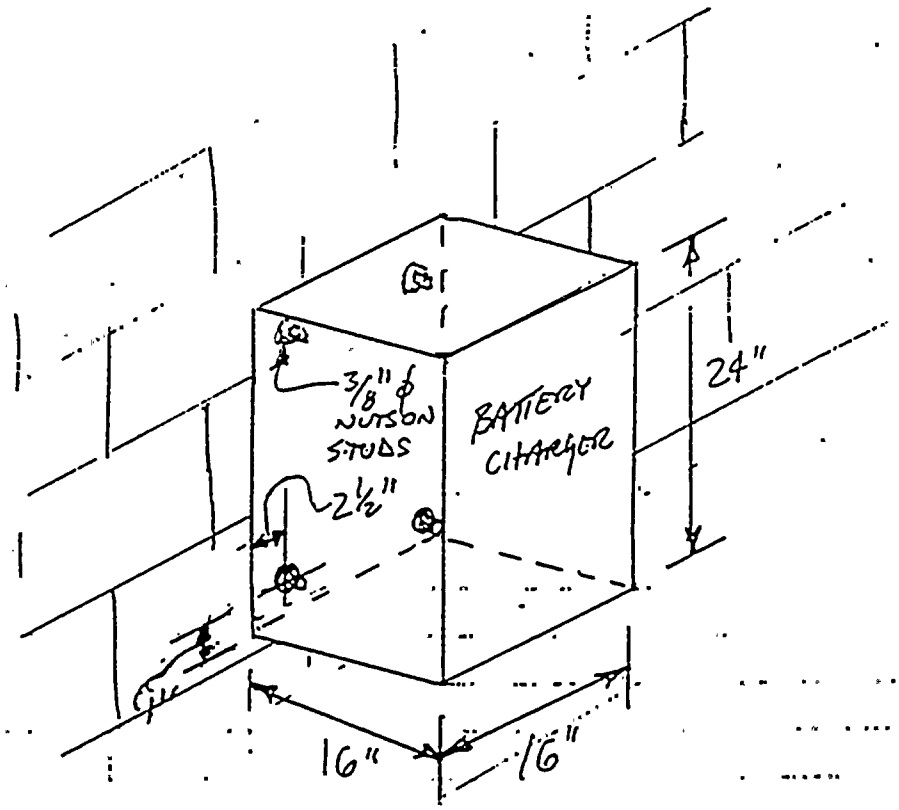
PHOTOS: 4/18/96 ROLL 8; 13 & 14

EQE INTERNATIONAL

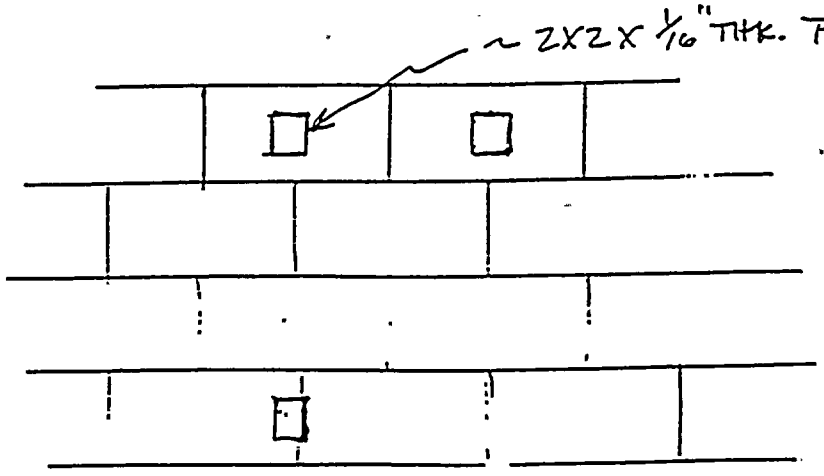
JOB NO. 50147 JOB 2-CHGA-283-A1-2 SHEET NO. 4/4

CALC. NO. N/A SUBJECT SSEL # 9406 BY [signature] DATE 4/19/96

CHK'D [signature] DATE 4/19/96



FRONT OF WALL



BACK OF WALL

SSEL Line No. 9406 Status Y (N) U
AI

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. Z-CHGD-283-A1-2 Equip. Class 16-BATTERY CHARGERS

Equipment Description ±24V NEUTRON MONITOR BATTERY CHARGERS A1-2

RELAY WALKDOWN

1. Does spot check of essential relays indicate relays present and properly mounted? Y N U (N/A) COULD NOT ACCESS INSIDE OF CHARGERS

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

   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

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)

ADEQUACY OF ANCHORAGE IS INDETERMINATE.
SEE OSVS-9406

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES___ NO ✓

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

Evaluated by: J.R. Disser Date: 4/19/96

Evaluated by: J.O. Dixon Date: 4/19/96

SSEL Line No. 9406 OSVS-9406

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number Z-CHGD-283-A1-2 Equipment Class ~~18~~ 16

Equipment Location: Bldg. CB Floor Elevation 593

Room or Row/Column BATTERY BOARD RM 2 Base Elevation ~598'

Equipment Description ±24V NEUTRON MONITOR BATTERY CHARGERS A1-2

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	X	Anchorage Connections	___
Seismic Interaction	___	Flexibility of Attached Piping*	___
Other	___	Other	___
		Cable and Conduit Raceways	
Essential Relays		Inclusion Rules	
Capacity vs. Demand	___	Other Seismic Performance Concerns	___
Mounting, Type, Location	___	Limited Analytical Review	___
Other	___	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):

CHARGERS ARE MOUNTED ON A SEISMIC MASONARY BLOCK WALL USING 3/8" ANCHORS (NUTS ON STUDS VISIBLE; 3-1/16" PLATES ON BACK OF WALL VISIBLE). NO DETAILS ARE AVAILABLE TO DETERMINE THE SEISMIC ADEQUACY OF THE ANCHORAGE.

SSEL Line No. 9406

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 2-CHGD-283-A1-2

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

LOCATE ANCHORAGE DETAILS AND EVALUATE OR INSTALL THROUGH BOLTS IN BLOCK WALL

SEE ATTACHED SHEETS JE 9/23/96

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

SEE SKETCH IN THE SEWS FOR THIS EQUIPMENT.

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
JAMES R. DISSOR		4/19/96
JOHN DIZON, PE		4/19/96

24V Neutron Monitoring Battery Chargers
A1-2, A2-2, B1-2, & B2-2
SSEL # 9406, 9407, 9408, 9409

The 24V Neutron Monitoring Battery Chargers A1-2, A2-2, B1-2, & B2-2 are located in the Battery Board Room, Unit 2, floor elevation 593. They are mounted on the existing block wall adjacent to the MG-Motor Set room. There is no drawing available which shows the existing anchorage and mounting details to these chargers. It is clear, however, that each of these battery chargers are securely fastened to the block wall via 4 anchor bolts. (appear to be 1/2 inch or greater in diameter). If any plates were used as they were in Unit 3, they were inaccessible at the time of inspection. As was previously calculated for Unit 3, an analytical approach was used to determine an effective load on each of the anchors. That effective load was determined to be 47.6 lbs. To get this load it was assumed the chargers weighed (conservatively), 150 lbs. For the purpose of determining the anchorage inherent strength and ability to withstand seismic forces, a vertical live load (200 lbs +, full weight applied by R. T. Deal), was applied to the chargers. The result was no slip or damage to the chargers or existing anchors. Additionally, an approximate horizontal force of 100 lbs. was placed on the boxes. This also produced no damage, slip, or failures. These applied loads were applied and witnessed by R. T. Deal and J. W. Beason (9.10.96). Both agreed on results, i.e. the charger's anchorage inherent strength would prevent the chargers from falling during or after an SSE. (this of course is contingent upon the masonry block performing its function and remaining in place..

Currently, the EMS shows these chargers as quality-related. Therefore, being in the Reactor Building, they must maintain Class II/I criteria, i.e. not to fall in an SSE.

Based upon the anchorage geometry, rigidity of the chargers, inherent strength, and the added live load with no changes to support/anchorage integrity, it is concluded by engineering judgement that the chargers would remain on the block wall during and after an SSE.

Prepared: _____ *Date:* 9.11.96

Checked: _____ *Date:* 9-12-96

SHEET _____ OF _____

24 V NEUTRON MONITORING BATTERY CHARGERS
A1-3, A2-3, B1-3 & B2-3
(SSEL # 39307, 39308, 39309 & 39310

COMPUTED SSH DATE 8-6-96
CHECKED RTO DATE 9-10-96

24V. NEUTRON MONITORING BATTERY CHARGERS A1-3, A2-3, B1-3 & B2-3 ARE LOCATED IN BATTERY BOARD ROOM UNIT-3. THEY ARE MOUNTED ON BLOCK WALL NEXT TO THE STAIRWELL. THERE IS NO DRAWING AVAILABLE TO DEPICT THE DETAIL OF THE ATTACHMENT TO THE BLOCK WALL. WHAT IS CLEARLY VISIBLE, IS THAT THERE ARE FOUR BOLTS ATTACHING EACH OF THE BATTERY CHARGERS TO THE BLOCK WALL. ON THE OTHER SIDE OF THE BLOCK WALL, THERE IS A PLATE 1/16" x 2" x 2" AT THE LOCATION OF EACH ANCHOR.

IN THE ABSENCE OF INFORMATION AVAILABLE ON THESE BATTERY CHARGERS AND THEIR SUPPORTS, S. S. HAIDER AND C. N. SIMMS, VISUALLY INSPECTED AND CONSERVATIVELY ESTIMATED WEIGHTS OF EACH CHARGERS AS 150 LBS.

FOLLOWING CALCULATION WILL DEMONSTRATE THAT 47.6 LBS. OF WEIGHT NEEDS TO BE HUNG FROM THE FRONTS OF THE CHARGERS, TO SIMULATE THE EFFECT OF SSE ON ANCHORS.

IN REALITY A PERSON WEIGHING 125 LBS. * HUNG HIMSELF FROM EACH OF THE 4 BATTERY CHARGERS, WITHOUT ANY DETRIMENTAL EFFECT ON THE CHARGERS OR ITS SUPPORTS. THIS DEMONSTRATION WAS WITNESSED BY SEVERAL INDIVIDUALS, INCLUDING S. S. HAIDER, JOHNY DUKE (SRO) AND DAVE WHITEHEAD (MOD).

HENCE, IT IS CONCLUDED THAT THE SUPPORTS FOR THE BATTERY CHARGERS ARE ACCEPTABLE AS IS.

* IN 9.10.96 R.T.O'CAL ACCOMPANIED BY J. W. BERSON INSPECTED CHARGERS. R.T.O. APPLIED LOAD TO EACH CHARGER > 50 LBS. OK

SHEET _____ OF _____

COMPUTED SSH DATE 8/6/96

CHECKED RTJ DATE 9.10.96

BASED ON THE SIZE AND SHAPE OF THE CHARGERS, AND THE FACT THAT IT IS MOUNTED DIRECTLY ON THE WALL WITH 4 ANCHORS, IT IS JUDGED TO BE RIGID, AND ZPA IS USED TO CALCULATE SSE REACTION AT EACH ANCHOR.

PER CER REPORT 88-05-C, EL. 621'-3":

$g_H = 2 \times 0.19 = 0.38\,g$

$g_V = 2 \times 0.08 = 0.16\,g$

$H = 150 \times 0.38 = 57$ LBS.

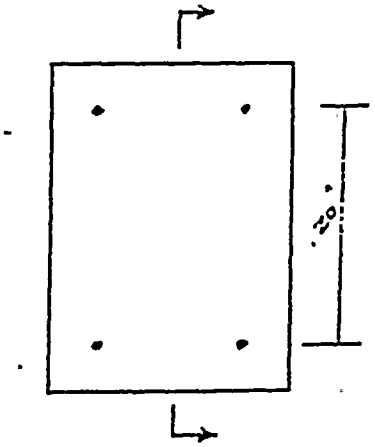
$V = 150 \times 1.16 = 174$ LBS.

$\text{TENSION/ANCHOR} = \frac{57}{4} + \frac{174 \times 8}{20 \times 2} = 49.05$ LBS.

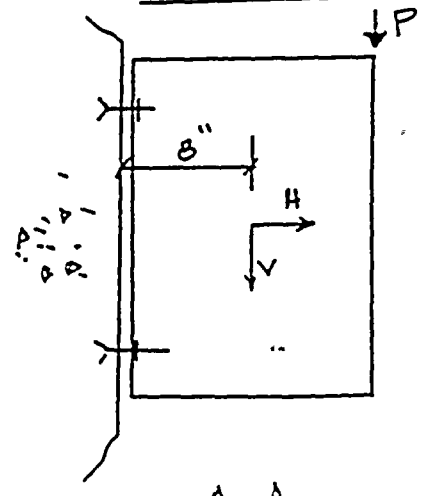
TO SIMULATE THE ABOVE EFFECT, CALCULATE THE MAGNITUDE OF P:

$\frac{P(16)}{20 \times 2} + \frac{150 \times 8}{20 \times 2} = 49.05$ LBS.

$\therefore P = 47.6$ LBS.



ELEV. LOOKING AT WALL



A-A

INTENT

SSEL Line No. 9305

Revision 2, Corrected, 6/28/91
Status (Y) N U

SCREENING-EVALUATION WORK SHEET (SEWS) Sheet 1 of 3

Equip. ID No. 2-LPNL-925-247A Equip. Class 18 - Instruments on Racks

Equipment Description Local Panel 2-25-247A (CAD Drywell & Supres Chm V)

Location: Bldg. RR2 Floor El. 621-7" Room, Row/Col Q, R11

Manufacturer, Model, Etc. (optional) —

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input	626'
2.	Elevation of seismic input below about 40' from grade	Y (N) U (grade @ 550')
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A (1)
4.	Capacity based on: Existing Documentation	DOC
	1.5 x Bounding Spectrum > Bounding Spectrum	BS (ABS)
	GERS	GERS
5.	Demand based on: Ground Response Spectrum	GRS
	Ground — 1.5 x Bounding Spectrum	~~ABS~~ AGS
	Conserv. Des. In-Str. Resp. Spec.	CRS
	Realistic M-Ctr. In-Str. Resp. Spec.	(RRS)

Does capacity exceed demand? (Y) N U (3)*

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.	Steel frame and sheet metal structurally adequate	(Y) N U N/A
4.	Adjacent racks which are close enough to impact or sections of multi-bay racks are bolted together if they contain essential relays	Y N U (N/A)
5.	Natural frequency relative to 8 Hz limit considered	(Y) N U N/A
6.	Attached lines have adequate flexibility	(Y) N U N/A (2)
7.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (4)
8.	Relays mounted on equipment evaluated	Y N U (N/A)
9.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

CAVEATS - GERS (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 the generic seismic testing equipment class	Y N U (N/A)
2.	Meets all Bounding Spectrum caveats	Y N U (N/A)
3.	Component is a pressure, temperature, level or flow transmitter	Y N U (N/A)

SSEL Line No. 9305

Revision 2, Corrected, 6/28/91

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-LPNL-925-0247A Equip. Class 18 - Instruments on Racks

Equipment Description Panel 2-25-247A

CAVEATS - GERS (Cont'd)

4.	Component is one of the specific makes and models tested, as listed in Appendix B	Y N U (N/A)
5.	Necessary function of component not sensitive to seismically induced system perturbations (e.g., sloshing)	Y N U (N/A)
6.	No vacuum tubes	Y N U (N/A)
7.	All external mounting bolts in place	Y N U (N/A)
8.	Demand based on amplified portion of 3% damped floor response spectrum if estimated natural frequency of rack less than 33 Hz	Y N U (N/A)
9.	Rack capable of structurally transferring GERS level seismic loads to anchorage	Y N U (N/A)

Is the intent of all the caveats met for GERS? Y N U (N/A)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A (1)
2.	Type of anchorage covered by GIP	(Y) N U N/A
3.	Sizes and locations of anchors determined	(Y) N U N/A
4.	Adequacy of anchorage installation evaluated (weld quality and length, nuts and washers, expansion anchor tightness, etc.)	(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)

Are anchorage requirements met? (Y) N U (4)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
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 (2)

SSEL Line no. 9305

SCREENING EVALUATION WORK SHEET (SEWS)

Equip. ID No. 2-LPNL-925-0247A Equip. Class 18 - Instruments on Racks

Equipment Description Panel 2-25-247A

INTERACTION EFFECTS (Cont'd)

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

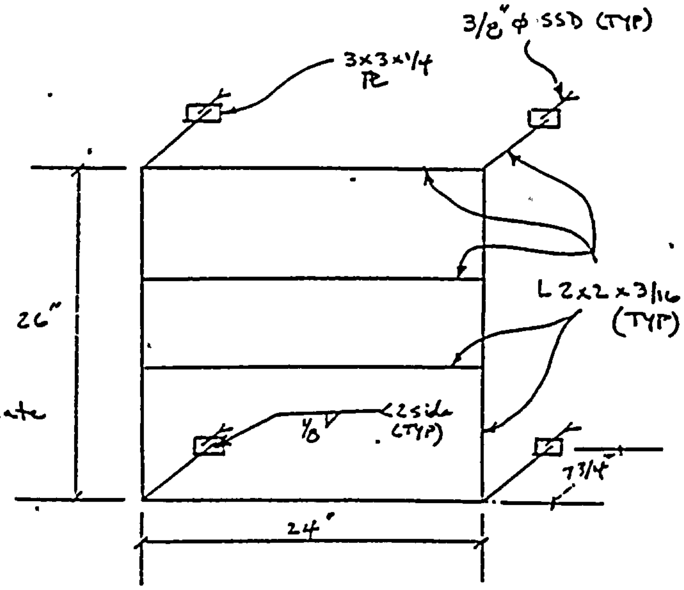
Is equipment free of interaction effects? — (Y) N U

IS EQUIPMENT SEISMICALLY ADEQUATE? — (Y) N U

COMMENTS

1) Rack (local panel) configuration is shown below. The rack is of all welded construction. Components mounted on this rack are light weight and are rigidly attached. Fundamental frequency of this rack is greater than 8 HZ, by judgment.

2) Attached lines (conduit & Tubing) are rigidly supported from the same wall and are rigidly attached to the components on the rack. → line flexibility ok



Wall-mounted panel

3) Per Calc. CD-Q0000-940339, The 1.5x B.S. is exceeded by the In-structure spectra @ EL. 621' of RB, in the 5.0 to 7.0 HZ frequency range. Since the lowest natural frequency of this rack is > 8 HZ (See note 1), the intent of the GIP seismic capacity vs. Demand criteria is met.

4) The anchorage of this rack to the wall is judged adequate due to rack rigidity (low spectral acceleration) and that Dead wt. on this rack is very small

Evaluated by: [signature] Date: 3-1-96

[signature] 3-4-96

SSEL Line No. 9305 Status (Y) N U
AI

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-LPNL-925-0247A Equip. Class 18 - Instruments on Racks

Equipment Description Local Panel 2-25-247A

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: Farzi Baj Date: 3-1-96

Evaluated by: [signature] Date: 3-4-96

/INTENT/

SSEL Line No. 9040 Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 24

Equip. ID No. 2-PNLA-009-0003A Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-3A

Location: Bldg. CB Floor El. 617 Room, Row/Col U2 MCR

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		617
2.	Elevation of seismic input below about 40' from grade		Y (N) U (Grade @ 550')
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (1)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	BS
		1.5 x Bounding Spectrum	(ABS)
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	GRS
		1.5 x Ground Response Spectrum	AGS
		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 (8)
3.	No strip chart recorders	(Y) N U N/A (8)
4.	Steel frame and sheet metal structurally adequate	(Y) N U N/A (3)
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 (8)
7.	All doors secured by latch or fastener	(Y) N U N/A (5)
8.	Attached lines have adequate flexibility	(Y) N U N/A
9.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (1)
10.	Relays mounted on equipment evaluated AF=4.5	(Y) N U N/A (9)
11.	Have you looked for and found no other adverse concerns?	Y (N) U N/A (4)

Is the intent of all the caveats met for Bounding Spectrum? Y (N) U N/A (4)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A (1)
2.	Type of anchorage covered by GIP	(Y) N U N/A
3.	Sizes and locations of anchors determined	(Y) N U N/A

SSEL Line No. 9040

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 24

Equip. ID No. 2-PNLA-009-0003A Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-3A

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate; e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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

Are anchorage requirements met? (Y) N U (1)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A (6)
2.	If equipment contains sensitive relays, equipment free from all impact by nearby equipment or structures	Y (N) U N/A (7)
3.	Attached lines have adequate flexibility	(Y) N U N/A
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 (7)

IS EQUIPMENT SEISMICALLY ADEQUATE? Y (N) U (4), (7)

COMMENTS

For notes see pages 3 and 4 of this SEWS.

Evaluated by: Fayez Beg Date: 11-27-95

John O. Dizon 11/28/95

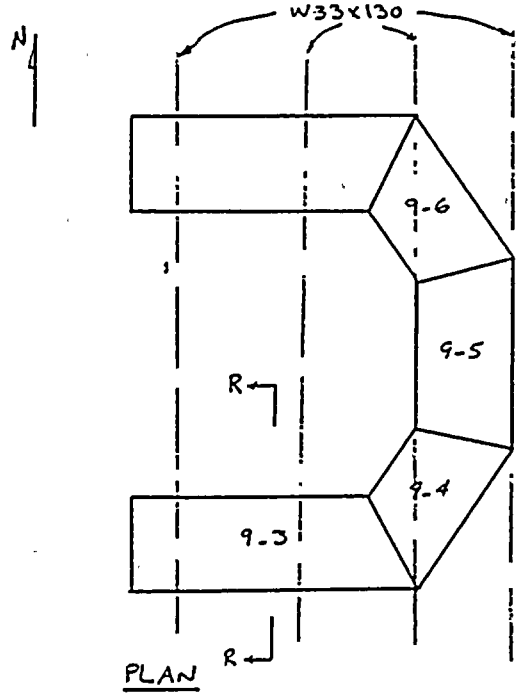
EQE INTERNATIONAL

SHEET NO. 3 of 4

JOB NO. 50147 JOB TVA / BTNP A-46 / IPEEE BY JBen DATE 11-27-95

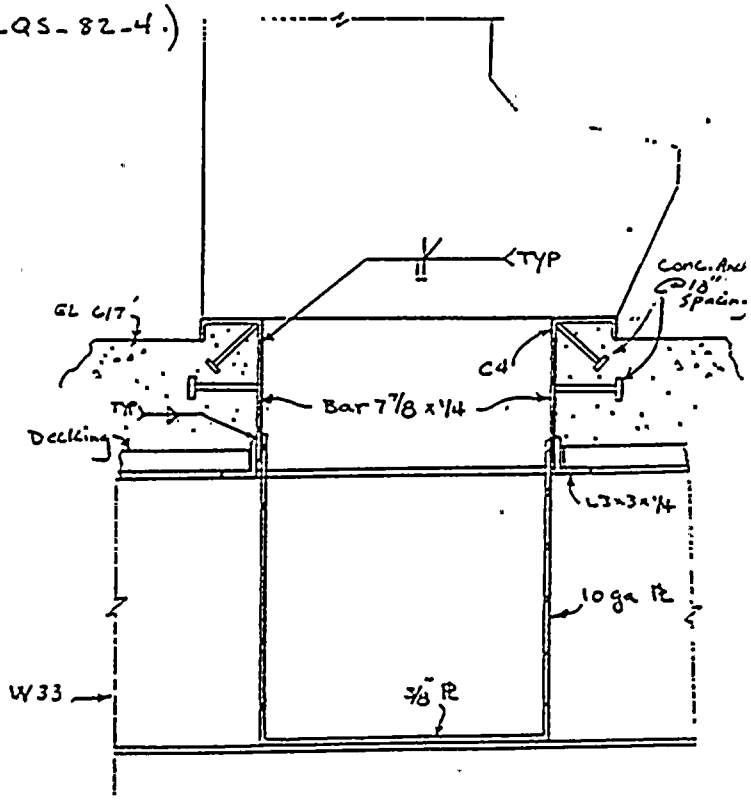
CALC. NO. N/A SUBJECT Attach. to SENS for 2-PNLA-009-0003A (SSEL9040) CHK'D J.D. Stevenson DATE 11/28/95

1) Benchboards 2-9-3A, 3B, 4-8, 3-9-3, 4-8 and 1-9-3 & 8 are all of the same construction type. This includes panel thickness of 5/32" and reinforced panel faces (with 1/4"x3" welded plate bars) where the components are mounted. There are also angle irons reinforcing the panel perimeters. These benchboards are heavily welded to their sill channel by closely spaced (front & back of the panels) welded bars (~14" to 22" max. c.c. spacing). This anchorage configuration is conservatively qualified in calculation CD-Q0009-871685, Rev. 6. DWG. 48N933 and 0-48N934 shows the embedment details (shown below). This type of benchboards have exhibited natural frequency of 11 to 13 HZ when shake table tested (see GE Report NEDO-10678, "Seismic Qualification of Electrical Equipment," CEB-CQS-82-4.)



PLAN

(Benchboard Panel lineup)



R-R

(Ref. DWG. 0-48N934)

2) Per Calculation CD-Q0000-940339, the in-structure response spectra @ EL. 621' of RB (Seismic Demand) exceeds the 1.5xB.S. (Seismic Capacity) in the frequency range of 5 to 7 HZ. Since the lowest natural frequency of these panels is greater than 7 HZ the intent of the GIP seismic capacity vs. Demand Criteria is met.

3) Face of the benchboards are stiffened with welded 1/4" x 3" plate bars.

4) Cables running horizontally right under the face of the benchboard 9-3A (bay 2) are sagging. It appears that plastic strap ties holding these cables to their supporting Unistrut member are missing. In a seismic event these cables may potentially pull out at their terminal connection points. outlier OSVS-9040-1

5) All doors rattle in closed position. due to small gap between door + cab. framing. Since relays in these panels are too far from the doors it is judged that this condition (door rattling) is ok-as-is, as it will not cause any relay chatter in a seismic event, except for isolated cases as noted on the respective SEWS.

6) Fluorescent lights in the panel are all caged in with a wire mesh housing - ok

7) Miscellaneous items, such as; Vacuum on wheels, breathing apparatus boxes and typer covers are located very near the back .. side of this panel (2-9-3A). These items are unanchored and may slide and impact this panel in a seismic event. outlier OSVS-9040-2

8) Programable controller in bay 3 has its own rigid independent support and the panel face at this controller is heavily reinforced. strip charts and flow control devices on slides are positively restrained.

9) A typical in-cabinet amplification factor of 4.5 is reasonable and conservative for benchboard type panels consistent with the recommendations provided in EPRI Reports NP-7146-SL and NP-7148-SL

10) All adjacent benchboard panels (shown in the figure on the previous page)

SSEL Line No. 9040 Status Y (N) U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 2-PNLA-009-0003A Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description PANEL 9-3A

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) See note 7 on SEWS for this equipment. → outlier OSVS-9040-2
(unanchored equipment/objects near this panel)

2) See note 4 on SEWS for this equipment. → outlier OSVS-9040-1
(sagging cables/unrestrained cables inside this panel)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES___ NO ✓ (See note 2 above)

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES___ NO ✓ (See note 1 above)

Evaluated by: Farzi Beig Date: 11-27-95

Evaluated by: John O. Bizon Date: 1/28/95

SSEL Line No. 9040

OSVS-9040-1

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 2-PNLA-009-003A Equipment Class 20-Instr. & Control Panels

Equipment Location: Bldg. CB Floor Elevation 617'

Room or Row/Column MCR U2 Base Elevation 617'

Equipment Description PANEL 2-9-3A

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):

Cables running horizontally inside the benchboard panel 9-3A (bay 2) are sagging. It appears that plastic strap ties holding these cables to their supporting Unistrut member are missing. In a seismic event these cables may potentially pull out at their terminal connection points.

SSEL Line No. 9040

OSVS-9040-1

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 2-PNLA-009-0003A

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

Provide positive restraint for the sagging cables. (This could be accomplished by plastic strap ties that wrap around the cables, as a bundle, and the unistrut member supporting the plastic tray containing these cables)

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

N/A

WORK REQUEST (WR) C165336 IS INITIATED TO RESOLVE OUTLIER 9040-1 — [illegible] 9-18-96

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	11-27-95
JOHN O. DIZON, P.E.	John O. Dizon	11/28/95

SSEL Line No. 9040 OSVS-9040-2

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 2-PNLA-009-0003A Equipment Class 20- Instr & Control Panels

Equipment Location: Bldg. CB Floor Elevation 617'

Room or Row/Column MCR U2 Base Elevation 617'

Equipment Description PANEL 2-9-3A

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	
		Cable and Conduit Raceways	
Essential Relays		Inclusion Rules	
Capacity vs. Demand		Other Seismic Performance Concerns	
Mounting, Type, Location		Limited Analytical Review	
Other	✓	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):

Miscellaneous items, such as; Vacume on wheels, breathing apparatus boxes and typer cover for electrical cabinets, are near the back side of This panel. These items are unanchored and may slide / tipover and impact this panel in a seismic event causing potential relay chatter.

SSEL Line No. 9040

OSVS-9040-2

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 2-PNLA-009-0003A

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

1) provide positive restraint for these items;

OR 2) relocate these items

; OR if it is shown that these panels (2-9-3A & 3B & 4) do not contain essential relays this outlier can be resolved AS-IS.

There are no essential relays in panels 2-9-3A, 3B, and -4, See attached inform of memo. KVG 9-16-96

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	Farzi R. Beigi	11-27-95
JOHN O. DIZON, P.E.	John O. Dizon	11/28/95

INFORMAL

September 16, 1996

REVIEW FOR ESSENTIAL RELAYS IN PANELS 2-PNLA-009-0003A, 2-PNLA-009-0003B, 2-PNLA-009-0004, 2-PNLA-009-0009, 2-PNLA-009-0020, AND 2-PNLA-009-0021.

Modifications to panels 2-PNLA-009-0003A (SSEL No. 9040), 2-PNLA-009-0003B (SSEL No. 9041), 2-PNLA-009-0004 (SSEL No. 9042), 2-PNLA-009-0009 (SSEL No. 9045), 2-PNLA-009-0020, and 2-PNLA-009-0021 (SSEL No. 9050) were determined to possibly be required under the USI A-46 program, resulting from outliers OSVS-9040-2, OSVS-9045, and OSVS-9050, if these panels contain essential relays. A review of the Browns Ferry Nuclear Plant USI A-46 Seismic Evaluation Report, May 1996, Revision 0, Appendix A determined that there are no essential relays installed in these panels. This review resolves outliers OSVS-9040-2, OSVS-9045, and OSVS-9050. Note that modifications may be required resulting from other outliers on these panels.

Review performed by _____ K. H. Gromek 9-16-96 date

Verified by _____ B. M. Pedroso 9-16-96 date

/INTENT/

SSEL Line No. 39117 Status Y (N) U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 2

Equip. ID No. 3-PNLA-009-0005 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description REACTOR CONTROL PNL

Location: Bldg. CB Floor El. 621 Room, Row/Col U3 MCR

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

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input		617'
2.	Elevation of seismic input below about 40' from grade		Y (N) U (grade @ 562')
3.	Equipment has fundamental frequency above about 8 Hz		(Y) N U N/A (1)
4.	Capacity based on:	Existing Documentation	DOC
		Bounding Spectrum	BS
		1.5 x Bounding Spectrum	(ABS)
		GERS	GERS
5.	Demand based on:	Ground Response Spectrum	GRS
		1.5 x Ground Response Spectrum	AGS
		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 (8)
3.	No strip chart recorders	(Y) N U N/A (8)
4.	Steel frame and sheet metal structurally adequate	(Y) N U N/A (3)
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 (8)
7.	All doors secured by latch or fastener	Y (N) U N/A (5)
8.	Attached lines have adequate flexibility	(Y) N U N/A
9.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (1)
10.	Relays mounted on equipment evaluated AF-4.5	(Y) N U N/A (9)
11.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

Is the intent of all the caveats met for Bounding Spectrum? Y (N) U N/A (5)

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A (1)
2.	Type of anchorage covered by GIP	(Y) N U N/A ↓
3.	Sizes and locations of anchors determined	(Y) N U N/A ↓

SEL Line No. 39117

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 2

Equip. ID No. 3-PNLA-009-0005 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description REACTOR CONTROL PNL

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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

re anchorage requirements met? (Y) N U(1)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A (6)
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
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 (5)

COMMENTS

For notes 1-3, 6, 8-10 see the corresponding notes on SEWS for 2-PNLA-009-0003A (SSEL 9040)

note 5) The door latch to bay no. 2 of this panel is broken. Outlier OSVS-39117

Notes 4 & 7 not used.

Evaluated by: Fangi Beij Date: 11-27-95

John O. Dizon 11/28/95

SSEL Line No. 39117 Status Y (N) U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 3-PNLA-009-0005 Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description REACTOR CONTROL PNL

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) Door latch is broken on bay no. 2. outlier OSVS-39117

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ___ NO ✓ (see note 1) above

Evaluated by: Fanqi Bai Date: 11-27-95

Evaluated by: John O. Dizon Date: 11/28/95

SSEL Line No. 39117

OSVS-39117

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

Equipment ID Number 3-PNLA-009-0005 Equipment Class 20 - Instr. & Control Panels

Equipment Location: Bldg. CB Floor Elevation 617'

Room or Row/Column MCR U3 Base Elevation 617'

Equipment Description Reactor 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	___
		Cable and Conduit Raceways	
Essential Relays		Inclusion Rules	___
Capacity vs. Demand	___	Other Seismic Performance Concerns	___
Mounting, Type, Location	___	Limited Analytical Review	___
Other	___	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 door latch to bay no 2 of this panel is broken. The door could impact to the panel frame in a seismic event and cause potential relay chatter.

SSEL Line No. 39117

OSVS-39117

OUTLIER SEISMIC VERIFICATION SHEET (OSVS)

Equipment ID Number 3-PNLA-009-0005

3. PROPOSED METHOD OF OUTLIER RESOLUTION (OPTIONAL)

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

Replace the broken Latch.

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

N/A

REVIEW OF ESSENTIAL RELAY LIST INDICATED NO ESSENTIAL RELAYS ARE PRESENT IN PANEL 3-PNLA-009-0005; THEREFORE, OSVS. 39117 IS RESOLVED.

2.23.97

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	11-27-95
JOHN O. DIZON, PE.	John O. Dizon	11/27/95

SSEL Line no. 39216
AI

[INTACT]

Revision 2A
Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 2

Equip. ID No. 3-LPNL-925-65SA Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description DIV. I Load Shed Logic Panel

Location: Bldg. 43-RB Floor El. 621'-3" Room, Row/Col 480V SD Bd Rm. 3A

Manufacturer, Model, Etc. (optional but recommended) Spectrum Technologies

SEISMIC CAPACITY VS DEMAND

1. Elevation where equipment receives seismic input — ~626' (Eff. Grade @ El. 563')
2. Elevation of seismic input below about 40' from grade — Y (N) U N/A
3. Equipment has fundamental frequency above about 8 Hz — (Y) N U N/A (8)
4. Capacity based on:
   - Existing Documentation — DOC
   - Bounding Spectrum — BS
   - 1.5 x Bounding Spectrum — (ABS)
   - GERS — GERS
5. Demand based on:
   - Ground Response Spectrum — GRS
   - 1.5 x Ground Response Spectrum — AGS
   - 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 (7)*

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. Steel frame and sheet metal structurally adequate — (Y) N U N/A (1) (5)
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)
6. Drawers and equipment on slides restrained from falling out — Y N U (N/A)
7. All doors secured by latch or fastener — (Y) N U N/A
8. Attached lines have adequate flexibility — (Y) N U N/A (4)
9. Anchorage adequate (See checklist below for details) — (Y) N U N/A (7)
10. Relays mounted on equipment evaluated AF = 4.5 — (Y) N U N/A (5)
11. Have you looked for and found no other adverse concerns? — (Y) N U N/A

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

ANCHORAGE

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

SSEL Line no. 39216
AI

SCREENING EVALUATION WORK SHEET (SEWS) Revision 2A Sheet 2 of 2

Equip. ID No. 3-LPNL-925-655A Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description DIV. I Load Shed Logic Panel

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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)
Are anchorage requirements met?		(Y) N U (7)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
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 (4)
4.	Overhead equipment or distribution systems are not likely to collapse	(Y) N U N/A (6)
5.	Have you looked for and found no other adverse concerns?	(Y) N U N/A (2)
Is equipment free of interaction effects?		(Y) N U

IS EQUIPMENT SEISMICALLY ADEQUATE? (Y) N U

COMMENTS

See notes on SEWS package for 3-LPNL-925-654A (SSEL #39105) since both equipment are similar. (panel and anchorage configurations).

Evaluated by: John O. Dizon Date: 1/12/96

J.R. ISSER 1/12/96

SSEL Line No. 39216 Status (Y) N U
AI

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 3-LPNL-925-655A Equip. Class 20 - I&C Panels & Cabinets

Equipment Description Div. I Load Shed Logic Panel

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER?
YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: John O. Dizon Date: 1/12/96

Evaluated by: J.R. Disser Date: 1/12/96

IN CENT

SSEL Line No. 39105 Status (Y) N U

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 1 of 23

Equip. ID No. 3-LPNL-925-654A Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description DIV I LOAD SHED LOGIC PANEL - DCN W21284

Location: Bldg. RB Floor El. 621'-3" Room, Row/Col SD BD RM E

Manufacturer, Model, Etc. (optional but recommended) Spectrum Technologies

SEISMIC CAPACITY VS DEMAND

1.	Elevation where equipment receives seismic input	~620' Eff.	
2.	Elevation of seismic input below about 40' from grade	Y (N) U (Bldg. @ 563')	
3.	Equipment has fundamental frequency above about 8 Hz	(Y) N U N/A (8)	
4.	Capacity based on: Existing Documentation	DOC	
	Bounding Spectrum	BS	
	1.5 x Bounding Spectrum	(ABS)	
	GERS	GERS	
5.	Demand based on: Ground Response Spectrum	GRS	
	1.5 x Ground Response Spectrum	AGS	
	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 (9)*

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.	Steel frame and sheet metal structurally adequate	(Y) N U N/A (1, 5)
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)
6.	Drawers and equipment on slides restrained from falling out	Y N U (N/A)
7.	All doors secured by latch or fastener	(Y) N U N/A
8.	Attached lines have adequate flexibility	(Y) N U N/A (4)
9.	Anchorage adequate (See checklist below for details)	(Y) N U N/A (7)
10.	Relays mounted on equipment evaluated AF=4.5	(Y) N U N/A (5)
11.	Have you looked for and found no other adverse concerns?	(Y) N U N/A

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

ANCHORAGE

1.	Appropriate equipment characteristics determined (mass, CG, natural freq., damping, center of rotation)	(Y) N U N/A
2.	Type of anchorage covered by GIP	(Y) N U N/A
3.	Sizes and locations of anchors determined	(Y) N U N/A

SSEL Line No. 39105

SCREENING EVALUATION WORK SHEET (SEWS) Sheet 2 of 2 3

Equip. ID No. 3-LPNL-925-654A Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description DIV I LOAD SHED LOGIC PANEL - DCN W21284

ANCHORAGE (Cont'd)

4.	Anchorage installation adequate, e.g., weld quality and length, nuts and washers, expansion anchor tightness	(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)

Are anchorage requirements met? (Y) N U (7)

INTERACTION EFFECTS

1.	Soft targets free from impact by nearby equipment or structures	(Y) N U N/A
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 (4)
4.	Overhead equipment or distribution systems are not likely to collapse	(Y) N U N/A (6)
5.	Have you looked for and found no other adverse concerns?	(Y) N U N/A (2)

Is equipment free of interaction effects? (Y) N U

IS EQUIPMENT SEISMICALLY ADEQUATE? (Y) N U

COMMENTS

- see next sheet for notes.

Evaluated by: Fanzi Bazi Date: 9-19-95

John O. Dizon 9/21/95

EQE INTERNATIONAL

SHEET NO. 3 of 3

JOB NO. 50147 JOB TVA/BFNP A-46/IPEEE BY FBeji DATE 9-19-95

CALC. NO. N/A SUBJECT Attach. to SEWS for 3-LPNL-925-C54A (SSEL 39105) CHK'D J.D. Stevenson DATE 9/21/95

SSEL: 39105

I.D. 3-LPNL-925-C54A (Division I Load Shed Logic panel)

Spectrum Technologies

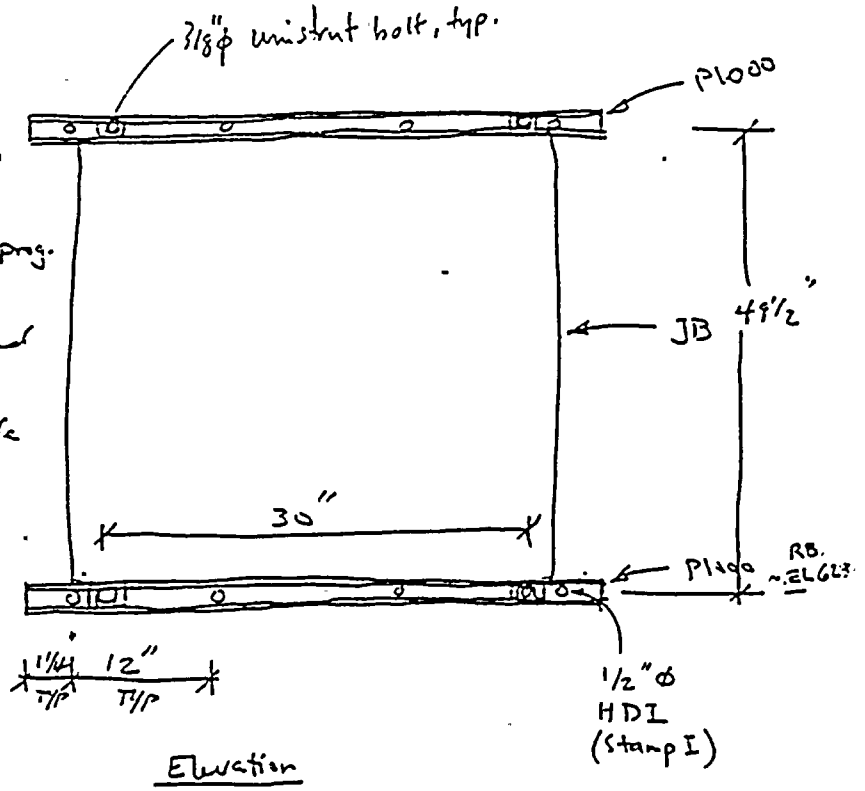
1) Size: 36x48x16" (gage 14) Typ. Hoffman single door enclosure, NEMA type 12

2) - Block wall on panel's south side qualified per IEB 80-11 prog. (Ref. DWG. 41N1203-1)

3) - panel is very lightly loaded

4) - Flex & rigid conduit w/ adequate flexibility

5) - Relays and other components (mostly fuses) are mounted on a 1/8" thick Mounting plate. The mounting plate is attached to the back of the panel by 8-3/8" ϕ welded studs.



Elevation (Looking west)

Front Door & back of panel have stiffeners (Ref. Hoffman Catalog) → AF = 4.5

6) - Fluorescent light tubes overhead have compression fittings, ok no falling hazard

7) Anchorage is conservatively qualified in Calc. CD-Q3361-930572, Rev.1. (Also see bounding Calc. in SEWS for 3-JBOX-253-7162, SSEL No. 39051)

8) See note 1 on SEWS for 2-JBOX-253-7193 (SSEL 9010). → f > 8 HZ.

9) Per Figure B.1 of Calc. CD-Q0000-940339, The 1.5 x BS exceeds the In-structure spectrum @ EL 639' of RB in the frequency range of ~ 4.8 HZ to 7.3 HZ Since the lowest natural frequency of this panel is greater than 7.3 HZ the intent of seismic capacity VS Demand criteria of

SSEL Line No. 39105 Status (Y) N U

Sheet 1 of 1

IPEEE SUPPLEMENTAL SCREENING EVALUATION WORKSHEET

Equip. ID No. 3-LPNL-925-654A Equip. Class 20 - Instr. & Control Panels & Cabinets

Equipment Description DIV I LOAD SHED LOGIC PANEL - DCN W21284

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

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)

IS EQUIPMENT FREE OF NEED FOR FURTHER INVESTIGATION, EXCLUDING RELAY CHATTER? YES ✓ NO ___

IS EQUIPMENT FREE OF NEED FOR FURTHER RELAY CHATTER INVESTIGATION? YES ✓ NO ___

Evaluated by: Fouzi Beji Date: 9-19-95

Evaluated by: John O. Dixon Date: 9/21/95

ATTACHMENT 8-4