SEISMIC QUALIFICATION

OF THE

REACTOR CORE COOLING BENCH BOARD

EQUIPMENT NO.1H13-P601

PREPARED BY SARGENT & LUNDY

8304210421 830415
PDR ADOCK 05000358
A PDR

SARGENT & LUNDY ENGINEERS CHICAGO

Calcs. For SEISMIC ANALYSIS OF MAIN CONTROL BOARDS FOR ZIMMER NUCLEAR PLANT

CALC. NO: CQD-002323
REV: 00 DATE: 06/03/82
PROJECT NUMBER: 4130-15

X	Safety-Related		Non-Safety-Related

Client	CG&E Co.	Prepared by [signature]	Date 06-03-82
Project	ZIMMER-1	Reviewed by Talat Kisma[n]	Date 06-04-82
Proj. No. 4130-15	Equip. No. 1H13-P601	Approved by Y. A. Patel	Date 06/04/82

Purpose

To requalify panel 1H13-P601 per the latest instrument list.

Data and Assumptions

Structural details were obtained from drawing Nos. E2406 & E2407. The finite element model as well as member structural properties were based on the original qualification report; EMD File No. 021333

Form GQ 3.08.1 Rev. 2

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Project		Reviewed by	Date
Proj. No.	Equip. No.	Approved by	Date

References

1. Sargent & Lundy drawing Nos. E2406, sheet 1 Rev. F, E2406 Sheet 3, Rev F, E2407, Sheet 2, Rev. 5
2. Seismic Qualification Report for Panel 1H13-P601 EMD File No. 021333, Rev. 00 Feb. 8, 1980
3. Response Spectra For Zimmer Elevation 546'-0" SDD-EMD-30 Rev. 1 8-16-76 pp. 26 thru 29, 31, 32.

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Conclusion

A dynamic finite element analysis was performed to requalify panel 1H13-P601. Results of this analysis indicate that panel 1H13-P601 is seismically qualified. Pertinent details of the evaluation are summarized below.

Panel 1H13-P601 was qualified earlier (EMD File No. 021333). The requalification was required due to changes in both the location and weight of the instruments.

A finite element model of the panel was constructed based on the original qualification report. The model constructed has 121 nodes, 90 plate elements and 152 beam elements. The static analysis based on the revised loads yielded negligibly small element stresses as well as small nodal displacements. The dynamic analysis consisted of (i) an eigenfrequency analysis and (ii) a response spectra analysis.

In the eigen-frequency analysis a total of 16 modes were determined. The fundamental frequency is 5.57 Hz., the predominant vibratory response for the first 3 modes is along the shorter horizontal axis of the panel. The factored global matricies as well as modal participation factors have been saved on permanent file for later use.

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Calcs. For

CALC. NO: CQD-002323
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A response spectra analysis based on the factored global matricies saved on permanent file during the eigen-frequency analysis was performed. The response spectra used are the Required Response Spectra for Zimmer, Auxiliary Building Elevation 546'-0. Damping ratios of 1% for OBE and 2% for SSE were used in the response spectra analysis. The maximum plate stress is 3940psi. The beam stresses are low and well within allowable value of 18ksi. The maximum acceleration is 2.2g along the vertical axis occuring at a top panel location.

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Analysis

A three dimensional finite element model was used in the analysis. The model consisted of 121 nodes, 90 plate elements and 152 beam elements. The input to the response spectra analysis consist of acceleration-spectra - "Envelope of Soil-Structure Interaction Response Spectra for Aux. Bldg. Elev. 546-0" (ERS)

An eigen-frequency analysis was performed and a response spectra analysis based on the eigen analysis was performed.

Bounding stresses for both plate and beam elements were computed. The stresses were very small. The Maximum acceleration value of 2.2g in the vertical direction.

The finite element model and nodal co-ordinates as well as all information required to generate the model are described.

Appendix A contains all the input data - nodal coordinates, beam and plate data.

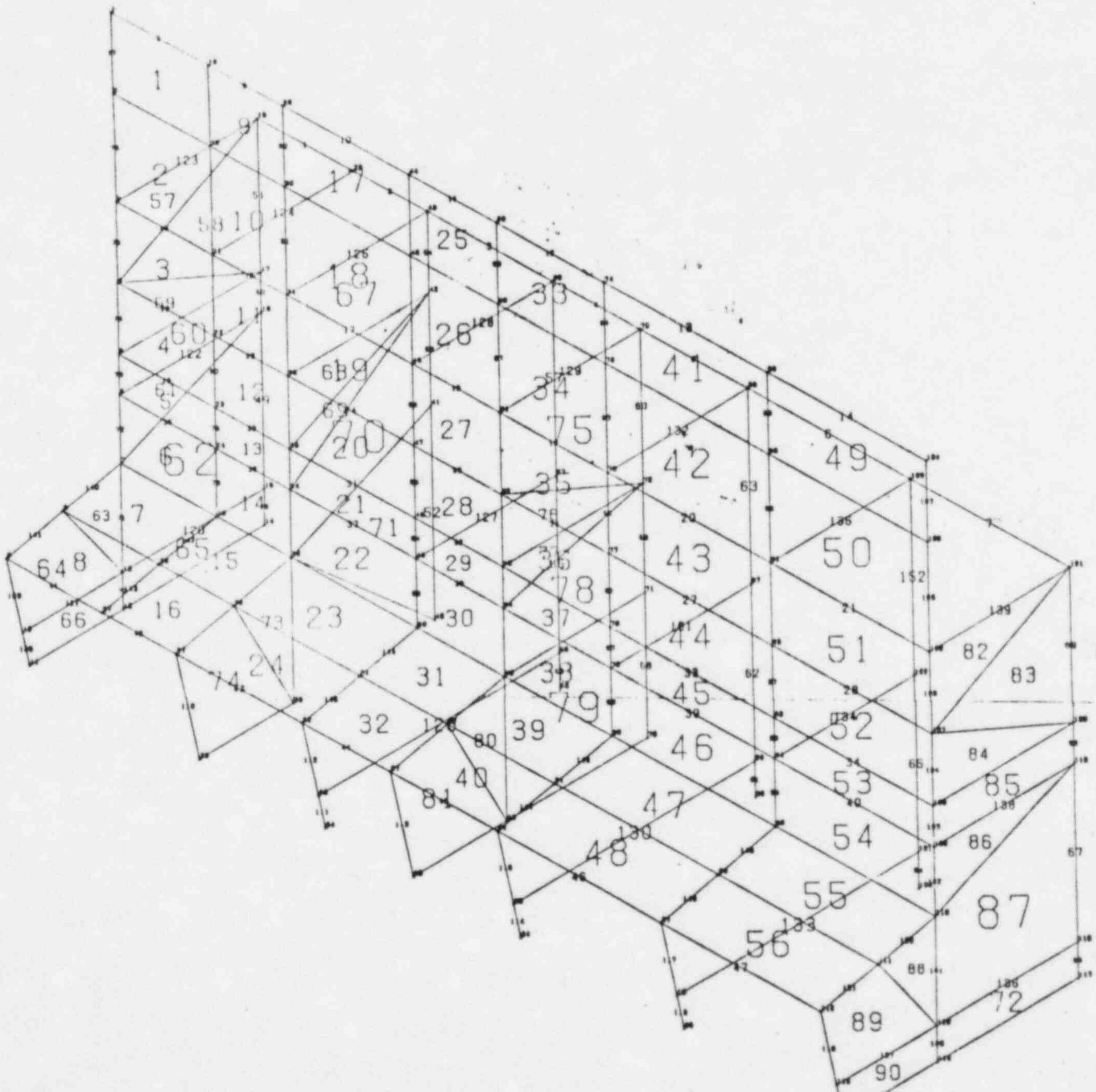
Appendix B contains beam property data

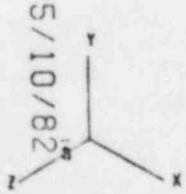
Appendix C contains stress calculation. This appendix verifies that the structural integrity of the panel.

Appendix D contains the Required response spectra

Appendix E Instrument Weights/Masses

SNM 05/10/82





DYNAMIC ANALYSIS OF MAIN CONTROL BOARDS FOR ZIMMER.

SCALE: 1./9.840

FINITE ELEMENT MODEL GE PANEL 1H13-P601

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Nodal Masses & Moments of Inertia

Revised nodal masses and moments of Inertia corresponding to the new instrument location as well as new instruments are incorporated in the model. A list of instruments including weight and size are stated in Appendix E. The changed nodal masses as well as mass-locations necessitated this requalification

Eigen-frequency Analysis

A total of 16 frequencies were determined ranging from 5.75 Hz to 35.04 Hz.

Mode Number	Frequency (Hz.)
1	5.57
2	7.27
3	9.86
4	13.25
5	16.55
6	18.20
7	19.56
8	19.68
9	25.75
10	26.76
11	26.92
12	28.73
13	29.20
14	30.22
15	31.3
16	35.04

SARGENT & LUNDY ENGINEERS CHICAGO	Calcs. For	CALC. NO: CQD-002323 REV: 00 DATE: 06/03/82 PROJECT NUMBER: 4130-15
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Modal Participation Factors are:

MODAL PARTICIPATION FACTORS SAVED ON UNIT 32

MODE	X-DIRECTION	Y-DIRECTION	Z-DIRECTION
1	-.94823-04	-.90543-03	.74022+00
2	.31725-03	-.50837-03	.29363+00
3	-.98245-03	-.29933-03	.22507+00
4	.15963-02	-.22376-03	-.12644-01
5	-.34777-02	-.53128-03	.75019-01
6	.81082-03	-.46108-03	.14566-01
7	-.31188-03	-.15199-03	.10819-02
8	.31566-02	-.16561-02	.14429+00
9	-.43097-02	.18019-03	-.25041-02
10	.14840-04	-.54360-03	.64574-01
11	.10866-01	.12614-01	-.11036+01
12	-.12516-02	-.77451-04	.11284-02
13	.32869-01	.12339-02	-.15923+00
14	.24077-02	-.19632-03	.57147-02
15	.46922-02	.48123-03	-.19578-02
16	.14726+00	-.32935-02	.30068-01

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The maximum acceleration occurs at node 4; 2.2g in the vertical direction.

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Response Spectra Analysis

Applicable Response Spectra are shown in Appendix B. Appendix C contains the stress calculations.

2% SSE Response Spectra curves

& 1% OBE Response Spectra curves

at elevation 546'-0" are used.

Upper bound plate stress is 3940 psi
Beam stresses are all well below the 18,000 psi allowable value.

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CHICAGO

Calcs. For	
Safety–Related	Non–Safety–Related

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APPENDIX -A-

INPUT DATA

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DYNAMIC ANALYSIS OF MAIN CONTROL BOARDS FOR ZIMMER.

C O N T R O L   I N F O R M A T I O N

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NUMBER OF NODAL POINTS     =  121
NUMBER OF ELEMENT TYPES    =    2
NUMBER OF LOAD CASES       =    0
NUMBER OF FREQUENCIES      =   36
ANALYSIS CODE (NDYN)       =    1
  EQ.0,  STATIC
  EQ.1,  MODAL EXTRACTION
  EQ.2,  FORCED RESPONSE
  EQ.3,  RESPONSE SPECTRUM
  EQ.4,  DIRECT INTEGRATION
SOLUTION MODE (MODEX)      =    0
  EQ.0,  EXECUTION
  EQ.1,  DATA CHECK
NUMBER OF SUBSPACE
ITERATION VECTORS (NAD)    =    0
EQUATIONS PER BLOCK        =    0
SAVE FLAG (NDYN.EQ.4)
  (NSVD,NSVV,NSVA,NSVS)    =    0

RESOLUTION MODE            =    0
  EQ.0,  NO SAVING
  EQ.1,  SAVING
  EQ.2,  USING INFO. SAVED

ALLOWABLE CORE STORAGE = 65000

OPTION FOR RETAINING GEOMETRIC DATA,(0=NO, 1=YES)=             1
OPTION TO SAVE FILE-32 OF MODE SHAPE + FREQ(0=NO,1=YES) =      1
SAVING FILE-14 FOR STATIC OR RESP SPEC(0=NO,1=YES)=            0
OPTION FOR PERFORMING EQUILIBRIUM CHECK,(0=YES, 1=NO)=         0
OPTION FOR PRINTING OUT FINAL LOAD VECTOR,(0=NO,1=YES)=        0
PRINTING OUT RESIDUAL FORCE AT EACH NODE, (0=NO,1=YES)=        0
TOLERANCE OF RESIDUAL FORCE/MAX. NODAL FORCE OR MOMENT=   .00000
NUMBER OF ITERATIONS FOR NON-LINEAR BOUNDARY ELEMENT  =   100
TOLERANCE FOR NON-LINEAR BOUNDARY ELEMENTS CONVERGENCY=   .00100
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NODAL POINT INPUT DATA

NODE	BOUNDARY CONDITION CODES						NODAL POINT COORDINATES				
NUMBER	X	Y	Z	XX	YY	ZZ	X	Y	Z		T
1	0	0	0	0	0	0	.000	132.000	36.000	0	.000
2	0	0	0	0	0	0	.000	114.000	36.000	0	.000
3	0	0	0	0	0	0	.000	90.000	36.000	0	.000
4	0	0	0	0	0	0	.000	72.000	36.000	0	.000
5	0	0	0	0	0	0	.000	56.000	36.000	0	.000
6	0	0	0	0	0	0	.000	47.000	36.000	0	.000
7	0	0	0	0	0	0	.000	32.000	36.000	0	.000
8	0	0	0	0	0	0	.000	29.000	50.700	0	.000
9	0	0	0	0	0	0	.000	26.000	65.400	0	.000
10	0	0	0	0	0	0	.000	8.000	61.660	0	.000
11	1	1	1	1	1	1	.000	.000	60.000	0	.000

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12	1	1	1	1	1	1	.000	.000	36.000	0	.000
13	0	0	0	0	0	0	.000	8.000	36.000	0	.000
14	1	1	1	1	1	1	.000	.000	.000	0	.000
15	0	0	0	0	0	0	.000	8.000	.000	0	.000
16	0	0	0	0	0	0	.000	47.000	.000	0	.000
17	0	0	0	0	0	0	.000	56.000	.000	0	.000
18	0	0	0	0	0	0	.000	90.000	.000	0	.000
19	0	0	0	0	0	0	24.000	132.000	36.000	0	.000
20	0	0	0	0	0	1	24.000	114.000	36.000	0	.000
21	0	0	0	0	0	0	24.000	90.000	36.000	0	.000
22	0	0	0	0	0	0	24.000	72.000	36.000	0	.000
23	0	0	0	0	0	0	24.000	56.000	36.000	0	.000
24	0	0	0	0	0	0	24.000	47.000	36.000	0	.000
25	0	0	0	0	0	0	24.000	32.000	36.000	0	.000
26	0	0	0	0	0	0	24.000	29.000	50.700	0	.000
27	0	0	0	0	0	0	24.000	26.000	65.400	0	.000
28	0	0	0	0	0	0	24.000	90.000	.000	0	.000
29	0	0	0	0	0	0	42.500	132.000	36.000	0	.000
30	0	0	0	0	0	0	42.500	114.000	36.000	0	.000
31	0	0	0	0	0	0	42.500	90.000	36.000	0	.000
32	0	0	0	0	0	0	42.500	72.000	36.000	0	.000
33	0	0	0	0	0	0	42.500	56.000	36.000	0	.000
34	0	0	0	0	0	0	42.500	47.000	36.000	0	.000
35	0	0	0	0	0	0	42.500	32.000	36.000	0	.000
36	0	0	0	0	0	0	42.500	29.000	50.700	0	.000
37	0	0	0	0	0	0	42.500	26.000	65.400	0	.000
38	1	1	1	1	1	1	42.500	.000	60.000	0	.000
39	1	1	1	1	1	1	42.500	.000	36.000	0	.000
40	1	1	1	1	1	1	42.500	.000	.000	0	.000
41	0	0	0	0	0	0	42.500	47.000	.000	0	.000
42	0	0	0	0	0	0	42.500	72.000	.000	0	.000
43	0	0	0	0	0	0	42.500	90.000	.000	0	.000
44	0	0	0	0	0	0	74.000	132.000	36.000	0	.000
45	0	0	0	0	0	1	74.000	114.000	36.000	0	.000
46	0	0	0	0	0	0	74.000	90.000	36.000	0	.000
47	0	0	0	0	0	0	74.000	72.000	36.000	0	.000
48	0	0	0	0	0	0	74.000	56.000	36.000	0	.000
49	0	0	0	0	0	0	74.000	47.000	36.000	0	.000
50	0	0	0	0	0	0	74.000	32.000	36.000	0	.000
51	0	0	0	0	0	0	74.000	29.000	50.700	0	.000
52	0	0	0	0	0	0	74.000	26.000	65.400	0	.000
53	0	0	0	0	0	0	74.000	8.000	61.660	0	.000
54	1	1	1	1	1	1	74.000	.000	60.000	0	.000
55	1	1	1	1	1	1	74.000	.000	.000	0	.000
56	0	0	0	0	0	0	74.000	8.000	.000	0	.000
57	0	0	0	0	0	0	74.000	47.000	.000	0	.000
58	0	0	0	0	0	0	74.000	90.000	.000	0	.000
59	0	0	0	0	0	0	96.000	132.000	36.000	0	.000
60	0	0	0	0	0	0	96.000	114.000	36.000	0	.000
61	0	0	0	0	0	0	96.000	90.000	36.000	0	.000
62	0	0	0	0	0	0	96.000	72.000	36.000	0	.000
63	0	0	0	0	0	0	96.000	56.000	36.000	0	.000
64	0	0	0	0	0	0	96.000	47.000	36.000	0	.000
65	0	0	0	0	0	0	96.000	32.000	36.000	0	.000
66	0	0	0	0	0	0	96.000	29.000	50.700	0	.000
67	0	0	0	0	0	0	96.000	26.000	65.400	0	.000
68	1	1	1	1	1	1	96.000	.000	60.000	0	.000
69	1	1	1	1	1	1	96.000	.000	36.000	0	.000

GENERATED NODAL DATA

NODE NUMBER	BOUNDARY CONDITION CODES X	Y	Z	XX	YY	ZZ	NODAL POINT COORDINATES X	Y	Z	T
70	1	1	1	1	1	1	96.000	.000	.000	0	.000
71	0	0	0	0	0	0	96.000	32.000	.000	0	.000
72	0	0	0	0	0	0	96.000	56.000	.000	0	.000
73	0	0	0	0	0	0	96.000	90.000	.000	0	.000
74	0	0	0	0	0	0	123.000	132.000	36.000	0	.000
75	0	0	0	0	0	0	123.000	114.000	36.000	0	.000
76	0	0	0	0	0	0	123.000	90.000	36.000	0	.000
77	0	0	0	0	0	0	123.000	72.000	36.000	0	.000
78	0	0	0	0	0	0	123.000	56.000	36.000	0	.000
79	0	0	0	0	0	0	123.000	47.000	36.000	0	.000
80	0	0	0	0	0	0	123.000	32.000	36.000	0	.000
81	0	0	0	0	0	0	123.000	29.000	50.700	0	.000
82	0	0	0	0	0	0	123.000	26.000	65.400	0	.000
83	0	0	0	0	0	0	123.000	8.000	61.660	0	.000
84	1	1	1	1	1	1	123.000	.000	60.000	0	.000
85	1	1	1	1	1	1	123.000	.000	.000	0	.000
86	0	0	0	0	0	0	123.000	8.000	.000	0	.000
87	0	0	0	0	0	0	123.000	47.000	.000	0	.000
88	0	0	0	0	0	0	123.000	90.000	.000	0	.000
89	0	0	0	0	0	0	164.000	132.000	36.000	0	.000
90	0	0	0	0	0	0	164.000	114.000	36.000	0	.000
91	0	0	0	0	0	0	164.000	90.000	36.000	0	.000
92	0	0	0	0	0	0	164.000	72.000	36.000	0	.000
93	0	0	0	0	0	0	164.000	56.000	36.000	0	.000
94	0	0	0	0	0	0	164.000	47.000	36.000	0	.000
95	0	0	0	0	0	0	164.000	32.000	36.000	0	.000
96	0	0	0	0	0	0	164.000	29.000	50.700	0	.000
97	0	0	0	0	0	0	164.000	26.000	65.400	0	.000
98	0	0	0	0	0	0	164.000	8.000	61.660	0	.000
99	1	1	1	1	1	1	164.000	.000	60.000	0	.000
100	1	1	1	1	1	1	164.000	.000	.000	0	.000
101	0	0	0	0	0	0	164.000	8.000	.000	0	.000
102	0	0	0	0	0	0	164.000	47.000	.000	0	.000
103	0	0	0	0	0	0	164.000	90.000	.000	0	.000
104	0	0	0	0	0	0	204.000	132.000	36.000	0	.000
105	0	0	0	0	0	0	204.000	114.000	36.000	0	.000
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108	0	0	0	0	0	0	204.000	56.000	36.000	0	.000
109	0	0	0	0	0	0	204.000	47.000	36.000	0	.000
110	0	0	0	0	0	0	204.000	32.000	36.000	0	.000
111	0	0	0	0	0	0	204.000	29.000	50.700	0	.000
112	0	0	0	0	0	0	204.000	26.000	65.400	0	.000
113	0	0	0	0	0	0	204.000	8.000	61.660	0	.000
114	1	1	1	1	1	1	204.000	.000	60.000	0	.000
115	1	1	1	1	1	1	204.000	.000	36.000	0	.000
116	0	0	0	0	0	0	204.000	8.000	36.000	0	.000
117	1	1	1	1	1	1	204.000	.000	.000	0	.000
118	0	0	0	0	0	0	204.000	8.000	.000	0	.000
119	0	0	0	0	0	0	204.000	47.000	.000	0	.000
120	0	0	0	0	0	0	204.000	56.000	.000	0	.000
121	0	0	0	0	0	0	204.000	90.000	.000	0	.000

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1	0	0	0	0	0	0	.000	132.000	36.000	.000
2	0	0	0	0	0	0	.000	114.000	36.000	.000
3	0	0	0	0	0	0	.000	90.000	36.000	.000
4	0	0	0	0	0	0	.000	72.000	36.000	.000
5	0	0	0	0	0	0	.000	56.000	36.000	.000
6	0	0	0	0	0	0	.000	47.000	36.000	.000
7	0	0	0	0	0	0	.000	32.000	36.000	.000
8	0	0	0	0	0	0	.000	29.000	50.700	.000
9	0	0	0	0	0	0	.000	26.000	65.400	.000
10	0	0	0	0	0	0	.000	8.000	61.660	.000
11	1	1	1	1	1	1	.000	.000	60.000	.000
12	1	1	1	1	1	1	.000	.000	36.000	.000
13	0	0	0	0	0	0	.000	8.000	36.000	.000
14	1	1	1	1	1	1	.000	.000	.000	.000
15	0	0	0	0	0	0	.000	8.000	.000	.000
16	0	0	0	0	0	0	.000	47.000	.000	.000
17	0	0	0	0	0	0	.000	56.000	.000	.000
18	0	0	0	0	0	0	.000	90.000	.000	.000
19	0	0	0	0	0	0	24.000	132.000	36.000	.000
20	0	0	0	0	0	1	24.000	114.000	36.000	.000
21	0	0	0	0	0	0	24.000	90.000	36.000	.000
22	0	0	0	0	0	0	24.000	72.000	36.000	.000
23	0	0	0	0	0	0	24.000	56.000	36.000	.000
24	0	0	0	0	0	0	24.000	47.000	36.000	.000
25	0	0	0	0	0	0	24.000	32.000	36.000	.000
26	0	0	0	0	0	0	24.000	29.000	50.700	.000
27	0	0	0	0	0	0	24.000	26.000	65.400	.000
28	0	0	0	0	0	0	24.000	90.000	.000	.000
29	0	0	0	0	0	0	42.500	132.000	36.000	.000
30	0	0	0	0	0	0	42.500	114.000	36.000	.000
31	0	0	0	0	0	0	42.500	90.000	36.000	.000
32	0	0	0	0	0	0	42.500	72.000	36.000	.000
33	0	0	0	0	0	0	42.500	56.000	36.000	.000
34	0	0	0	0	0	0	42.500	47.000	36.000	.000
35	0	0	0	0	0	0	42.500	32.000	36.000	.000
36	0	0	0	0	0	0	42.500	29.000	50.700	.000
37	0	0	0	0	0	0	42.500	26.000	65.400	.000
38	1	1	1	1	1	1	42.500	.000	60.000	.000
39	1	1	1	1	1	1	42.500	.000	36.000	.000
40	1	1	1	1	1	1	42.500	.000	.000	.000
41	0	0	0	0	0	0	42.500	47.000	.000	.000
	0	0	0	0	0	0	42.500	72.000	.000	.000
43	0	0	0	0	0	0	42.500	90.000	.000	.000
44	0	0	0	0	0	0	74.000	132.000	36.000	.000
45	0	0	0	0	0	1	74.000	114.000	36.000	.000
46	0	0	0	0	0	0	74.000	90.000	36.000	.000
47	0	0	0	0	0	0	74.000	72.000	3[illegible].000	.000
48	0	0	0	0	0	0	74.000	56.000	36.000	.000
49	0	0	0	0	0	0	74.000	47.000	36.000	.000
50	0	0	0	0	0	0	74.000	32.000	36.000	.000
51	0	0	0	0	0	0	74.000	29.000	50.700	.000
52	0	0	0	0	0	0	74.000	26.000	65.400	.000
53	0	0	0	0	0	0	74.000	8.000	61.660	.000
54	1	1	1	1	1	1	74.000	.000	60.000	.000
55	1	1	1	1	1	1	74.000	.000	.000	.000
56	0	0	0	0	0	0	74.000	8.000	.000	.000
57	0	0	0	0	0	0	74.000	47.000	.000	.000
58	0	0	0	0	0	0	74.000	90.000	.000	.000

59	0	0	0	0	0	0	96.000	132.000	36.000	.000
60	0	0	0	0	0	0	96.000	114.000	36.000	.000
61	0	0	0	0	0	0	96.000	90.000	36.000	.000
62	0	0	0	0	0	0	96.000	72.000	36.000	.000
63	0	0	0	0	0	0	96.000	56.000	36.000	.000
64	0	0	0	0	0	0	96.000	47.000	36.000	.000
65	0	0	0	0	0	0	96.000	32.000	36.000	.000
66	0	0	0	0	0	0	96.000	29.000	50.700	.000
67	0	0	0	0	0	0	96.000	26.000	65.400	.000
68	1	1	1	1	1	1	96.000	.000	60.000	.000
69	1	1	1	1	1	1	96.000	.000	36.000	.000
70	1	1	1	1	1	1	96.000	.000	.000	.000
71	0	0	0	0	0	0	96.000	32.000	.000	.000
72	0	0	0	0	0	0	96.000	56.000	.000	.000
73	0	0	0	0	0	0	96.000	90.000	.000	.000
74	0	0	0	0	0	0	123.000	132.000	36.000	.000
75	0	0	0	0	0	0	123.000	114.000	36.000	.000
76	0	0	0	0	0	0	123.000	90.000	36.000	.000
77	0	0	0	0	0	0	123.000	72.000	36.000	.000
78	0	0	0	0	0	0	123.000	56.000	36.000	.000
79	0	0	0	0	0	0	123.000	47.000	36.000	.000
80	0	0	0	0	0	0	123.000	32.000	36.000	.000
81	0	0	0	0	0	0	123.000	29.000	50.700	.000
82	0	0	0	0	0	0	123.000	26.000	55.400	.000
83	0	0	0	0	0	0	123.000	8.000	61.660	.000
84	1	1	1	1	1	1	123.000	.000	60.000	.000
85	1	1	1	1	1	1	123.000	.000	.000	.000
86	0	0	0	0	0	0	123.000	8.000	.000	.000
87	0	0	0	0	0	0	123.000	47.000	.000	.000
88	0	0	0	0	0	0	123.000	90.000	.000	.000
89	0	0	0	0	0	0	164.000	132.000	36.000	.000
90	0	0	0	0	0	0	164.000	114.000	36.000	.000
91	0	0	0	0	0	0	164.000	90.000	36.000	.000
92	0	0	0	0	0	0	164.000	72.000	36.000	.000
93	0	0	0	0	0	0	164.000	56.000	36.000	.000
94	0	0	0	0	0	0	164.000	47.000	36.000	.000
95	0	0	0	0	0	0	164.000	32.000	36.000	.000
96	0	0	0	0	0	0	164.000	29.000	50.700	.000
97	0	0	0	0	0	0	164.000	26.000	65.400	.000
98	0	0	0	0	0	0	164.000	8.000	61.660	.000
99	1	1	1	1	1	1	164.000	.000	60.000	.000
100	1	1	1	1	1	1	164.000	.000	.000	.000
101	0	0	0	0	0	0	164.000	8.000	.000	.000
102	0	0	0	0	0	0	164.000	47.000	.000	.000
103	0	0	0	0	0	0	164.000	90.000	.000	.000
104	0	0	0	0	0	0	204.000	132.000	36.000	.000
105	0	0	0	0	0	0	204.000	114.000	36.000	.000
106	0	0	0	0	0	0	204.000	90.000	36.000	.000
107	0	0	0	0	0	0	204.000	72.000	36.000	.000
108	0	0	0	0	0	0	204.000	56.000	36.000	.000
109	0	0	0	0	0	0	204.000	47.000	36.000	.000
110	0	0	0	0	0	0	204.000	32.000	36.000	.000
111	0	0	0	0	0	0	204.000	29.000	50.700	.000
112	0	0	0	0	0	0	204.000	26.000	65.400	.000
113	0	0	0	0	0	0	204.000	8.000	61.660	.000
114	1	1	1	1	1	1	204.000	.000	60.000	.000
115	1	1	1	1	1	1	204.000	.000	36.000	.000
116	0	0	0	0	0	0	204.000	8.000	36.000	.000

SARGENT & LUNDY ENGINEERS

117	1	1	1	1	1	1	204.000	.000	.000	.000
118	0	0	0	0	0	0	204.000	8.000	.000	.000
119	0	0	0	0	0	0	204.000	47.000	.000	.000
120	0	0	0	0	0	0	204.000	56.000	.000	.000
121	0	0	0	0	0	0	204.000	90.000	.000	.000

* INDICATES SPECIAL BOUND. COND.,READ NODAL INPUT DATA FOR MORE INFORMATIONS.

EQUATION NUMBERS

N	X	Y	Z	XX	YY	ZZ
1	1	2	3	4	5	6
2	7	8	9	10	11	12
3	13	14	15	16	17	18
4	19	20	21	22	23	24
5	25	26	27	28	29	30
6	31	32	33	34	35	36
7	37	38	39	40	41	42
8	43	44	45	46	47	48
9	49	50	51	52	53	54
10	55	56	57	58	59	60
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	61	62	63	64	65	66
14	0	0	0	0	0	0
15	67	68	69	70	71	72
16	73	74	75	76	77	78
17	79	80	81	82	83	84
18	85	86	87	88	89	90
19	91	92	93	94	95	96
20	97	98	99	100	101	0
21	102	103	104	105	106	107
22	108	109	110	111	112	113
23	114	115	116	117	118	119
24	120	121	122	123	124	125
25	126	127	128	129	130	131
26	132	133	134	135	136	137
27	138	139	140	141	142	143
28	144	145	146	147	148	149
29	150	151	152	153	154	155
30	156	157	158	159	160	161
31	162	163	164	165	166	167
32	168	169	170	171	172	173
33	174	175	176	177	178	179
34	180	181	182	183	184	185
35	186	187	188	189	190	191
36	192	193	194	195	196	197
37	198	199	200	201	202	203
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	0
41	204	205	206	207	208	209
42	210	211	212	213	214	215
43	216	217	218	219	220	221
44	222	223	224	225	226	227
45	228	229	230	231	232	0
46	233	234	235	236	237	238
47	239	240	241	242	243	244
48	245	246	247	248	249	250

SARGENT & LUNDY ENGINEERS

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49	251	252	253	254	255	256
50	257	258	259	260	261	262
51	263	264	265	266	267	268
52	269	270	271	272	273	274
53	275	276	277	278	279	280
54	0	0	0	0	0	0
55	0	0	0	0	0	0
56	281	282	283	284	285	286
57	287	288	289	290	291	292
58	293	294	295	296	297	298
59	299	300	301	302	303	304
60	305	306	307	308	309	310
61	311	312	313	314	315	316
62	317	318	319	320	321	322
63	323	324	325	326	327	328
64	329	330	331	332	333	334
65	335	336	337	338	339	340
66	341	342	343	344	345	346
67	347	348	349	350	351	352
68	0	0	0	0	0	0
69	0	0	0	0	0	0
70	0	0	0	0	0	0
71	353	354	355	356	357	358
72	359	360	361	362	363	364
73	365	366	367	368	369	370
74	371	372	373	374	375	376
75	377	378	379	380	381	382
76	383	384	385	386	387	388
77	389	390	391	392	393	394
78	395	396	397	398	399	400
79	401	402	403	404	405	406
80	407	408	409	410	411	412
81	413	414	415	416	417	418
82	419	420	421	422	423	424
83	425	426	427	428	429	430
84	0	0	0	0	0	0
85	0	0	0	0	0	0
86	431	432	433	434	435	436
87	437	438	439	440	441	442
88	443	444	445	446	447	448
89	449	450	451	452	453	454
90	455	456	457	458	459	460
91	461	462	463	464	465	466
92	467	468	469	470	471	472
93	473	474	475	476	477	478
94	479	480	481	482	483	484
95	485	486	487	488	489	490
96	491	492	493	494	495	496
97	497	498	499	500	501	502
98	503	504	505	506	507	508
99	0	0	0	0	0	0
100	0	0	0	0	0	0
101	509	510	511	512	513	514
102	515	516	517	518	519	520
103	521	522	523	524	525	526
104	527	528	529	530	531	532
105	533	534	535	536	537	538
106	539	540	541	542	543	544

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107	545	546	547	548	549	550
108	551	552	553	554	555	556
109	557	558	559	560	561	562
110	563	564	565	566	567	568
111	569	570	571	572	573	574
112	575	576	577	578	579	580
113	581	582	583	584	585	586
114	0	0	0	0	0	0
115	0	0	0	0	0	0
116	587	588	589	590	591	592
117	0	0	0	0	0	0
118	593	594	595	596	597	598
119	599	600	601	602	603	604
120	605	606	607	608	609	610
121	611	612	613	614	615	616

3 / D   B E A M   E L E M E N T S

NUMBER OF BEAMS	=	152
NUMBER OF GEOMETRIC PROPERTY SETS	=	26
NUMBER OF FIXED END FORCE SETS	=	0
NUMBER OF MATERIALS	=	1
NUMBER OF UNIFORM LOADS	=	0
NUMBER OF DAMPING PROPERTY SETS	=	0

MATERIAL	YOUNG S MODULUS	POISSON S RATIO	WEIGHT DENSITY	MASS DENSITY	THERMAL COEFFICIENT
1	29000000.	.30000	.28300	.00073	.000000000

BEAM GEOMETRIC PROPERTIES

SECTION NUMBER	AXIAL AREA A(1)	SHEAR AREA A(2)	SHEAR AREA A(3)	TORSION J(1)	INERTIA I(2)	INERTIA I(3)	ECCENTRICITY	LENGTH FACTOR
1	.1000+01	.0000	.0000	.2000-01	.1333+01	.5200-02	.0000	.0000
2	.1500+01	.0000	.0000	.3125-01	.4500+01	.7800-02	.0000	.0000
3	.2250+01	.0000	.0000	.2637-01	.2700+02	.6590-02	.0000	.0000
4	.2300+00	.0000	.0000	.2320-03	.2200-01	.8500-01	.0000	.0000
5	.1080+01	.0000	.0000	.1336-01	.1830+00	.3140+00	.0000	.0000
6	.6200+00	.0000	.0000	.1290-01	.1300-01	.2700+00	.0000	.0000
7	.1190+01	.0000	.0000	.2480-01	.1090+01	.3920+00	.0000	.0000
8	.6880+00	.0000	.0000	.1433-01	.1390+00	.1390+00	.0000	.0000
9	.1360+01	.0000	.0000	.1450-01	.5809+01	.7700-01	.0000	.0000
10	.6840+00	.0000	.0000	.7300-02	.4320-01	.6146+00	.0000	.0000
11	.2300+01	.0000	.0000	.2230-01	.2872+02	.1200+00	.0000	.0000
12	.1576+01	.0000	.0000	.1460-01	.7159+01	.1130+00	.0000	.0000
13	.4600+00	.0000	.0000	.4640-03	.4400-01	.1700+00	.0000	.0000
14	.9200+00	.0000	.0000	.9280-03	.8800-01	.3400+00	.0000	.0000
15	.2138+01	.0000	.0000	.4100-01	.1239+01	.1511+01	.0000	.0000
16	.1000+01	.0000	.0000	.2000-01	.5200-02	.1333+01	.0000	.0000
17	.7500+00	.0000	.0000	.1563-01	.5625+00	.3900-02	.0000	.0000
18	.3250+01	.0000	.0000	.4637-01	.2833+02	.1179-01	.0000	.0000
19	.2720+01	.0000	.0000	.2900-01	.1162+02	.1540+00	.0000	.0000
20	.1368+01	.0000	.0000	.1460-01	.8640-01	.1229+01	.0000	.0000
21	.2500+01	.0000	.0000	.5125-01	.5833+01	.1300-01	.0000	.0000
22	.9380+00	.0000	.0000	.1954-01	.3480+00	.3480+00	.0000	.0000
23	.1240+01	.0000	.0000	.2580-01	.2600-01	.5400+00	.0000	.0000
24	.1700+01	.0000	.0000	.1465+00	.1960+00	.5840+00	.0000	.0000
25	.4600+00	.0000	.0000	.4640-03	.1080+00	.1700+00	.0000	.0000
26	.1876+01	.0000	.0000	.3908-01	.6960+00	.6960+00	.0000	.0000

ELEMENT LOAD MULTIPLIERS

	A	B	C	D
X-DIR	.000000	.000000	.000000	.000000
Y-DIR	.000000	.000000	.000000	.000000
Z-DIR	.000000	.000000	.000000	.000000
TEMP	.000000	.000000	.000000	.000000

SARGENT & LUNDY ENGINEERS

3306

53	41	42	38	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
54	42	43	38	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
55	55	56	54	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
56	56	57	54	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
57	57	58	54	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
58	70	71	68	1	12	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
59	71	72	68	1	12	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
60	72	73	68	1	12	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
61	85	86	84	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
62	86	87	84	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
63	87	88	84	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
64	100	101	99	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
65	101	102	99	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
66	117	118	114	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
67	118	119	114	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
68	119	120	114	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
69	120	121	114	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
70	12	13	115	1	9	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
71	13	7	115	1	9	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
72	7	6	14	1	10	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
73	6	5	14	1	10	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
74	5	4	14	1	10	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
75	4	3	14	1	10	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
76	3	2	14	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
77	2	1	14	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
78	25	24	12	1	1	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
79	24	23	12	1	1	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
80	23	22	12	1	1	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
81	31	30	12	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
82	30	29	12	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
83	50	49	12	1	3	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
84	49	48	12	1	3	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
85	48	47	12	1	3	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
86	47	46	12	1	3	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
87	61	60	12	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
88	60	59	12	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
89	80	79	12	1	18	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
90	79	78	12	1	18	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
91	78	77	12	1	18	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
92	77	76	12	1	18	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
93	76	75	12	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
94	75	74	12	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
95	95	94	12	1	1	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
96	94	93	12	1	1	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
97	93	92	12	1	1	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
98	91	90	12	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
99	90	89	12	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
100	115	116	12	1	19	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
101	116	110	12	1	19	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
102	110	109	117	1	20	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
103	109	108	117	1	20	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
104	108	107	117	1	20	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
105	107	106	117	1	20	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
106	106	105	117	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
107	105	104	117	1	8	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
108	11	10	7	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
109	10	9	7	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
110	38	37	35	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0

111	54	53	50	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
112	53	52	50	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
113	68	67	65	1	12	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
114	84	83	80	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
115	83	82	80	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
116	99	98	95	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
117	98	97	95	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
118	114	113	110	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
119	113	112	110	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
120	15	13	14	1	4	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
121	13	10	14	1	4	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
122	16	6	14	1	4	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
123	18	3	14	1	22	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
124	28	21	18	1	6	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
125	43	31	18	1	6	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
126	56	53	55	1	13	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
127	57	49	55	1	13	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
128	58	46	18	1	23	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
129	73	61	18	1	6	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
130	86	83	85	1	13	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
131	87	79	85	1	14	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
132	88	76	18	1	24	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
133	101	98	100	1	13	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
134	102	94	100	1	13	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
135	103	91	18	1	6	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
136	118	116	117	1	4	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
137	116	113	117	1	4	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
138	119	109	117	1	25	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
139	121	106	117	1	26	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
140	7	8	11	1	10	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
141	8	9	11	1	10	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
142	25	26	7	1	1	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
143	26	27	7	1	1	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
144	50	51	7	1	18	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
145	51	52	7	1	18	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
146	80	81	7	1	3	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
147	81	82	7	1	3	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
148	95	96	7	1	1	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
149	96	97	7	1	1	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
150	110	111	117	1	20	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
151	111	112	117	1	20	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0
152	102	103	99	1	11	0	0	0	0	0	0	0	0	0	0	.00	.00	.00	0

3306

T H I N   P L A T E / S H E L L   E L E M E N T S

ELEMENT TYPE = 6
NUMBER OF ELEMENTS = 90
NUMBER OF MATERIALS = 1
NUMBER OF DAMPINGS = 0

MATERIAL PROPERTY TABLE

MATL. NO.	MASS DENSITY	THERMAL EXP. COEFF. X	Y	Z	ELASTIC CONSTANTS C(XX)	C(XY)	C(XS)	C(YY)	C(YS)	G(XY)	E	POISSON RATIO
1	.001	.00	.00	.0	31868131.25	9560439.37	.00	31868131.25	.00	11153846.12	29000000.00	.300

ELEMENT LOAD CASE MULTIPLIERS

ELEMENT LOAD CASE NUMBER	PRESSURE	THERMAL EFFECTS	X-ACCELERATION	Y-ACCELERATION	Z-ACCELERATION
1	.000	.000	.000	.000	.000
2	.000	.000	.000	.000	.000
3	.000	.000	.000	.000	.000
4	.000	.000	.000	.000	.000

THIN PLATE/SHELL ELEMENT DATA

ELEMENT NUMBER	NODE-I	NODE-J	NODE-K	NODE-L	NODE-O	MATERIAL NUMBER	AVERAGE THICKNESS	NORMAL PRESSURE	TEMPERATURE DIFFERENCE	THERMAL GRADIENT	DAMPING	BAND
1	1	2	20	19	0	1	.1250	.0	.00	.000	0	101
2	2	3	21	20	0	1	.1250	.0	.00	.000	0	101
3	3	4	22	21	0	1	.1790	.0	.00	.000	0	101
4	4	5	23	22	0	1	.1790	.0	.00	.000	0	101
5	5	6	24	23	0	1	.1790	.0	.00	.000	0	101
6	6	7	25	24	0	1	.1790	.0	.00	.000	0	101
7	7	8	26	25	0	1	.1790	.0	.00	.000	0	101
8	8	9	27	26	0	1	.1790	.0	.00	.000	0	101
9	19	20	30	29	0	1	.1250	.0	.00	.000	0	71
10	20	21	31	30	0	1	.1250	.0	.00	.000	0	71
11	21	22	32	31	0	1	.1790	.0	.00	.000	0	72
12	22	23	33	32	0	1	.1790	.0	.00	.000	0	72
13	23	24	34	33	0	1	.1790	.0	.00	.000	0	72
14	24	25	35	34	0	1	.1790	.0	.00	.000	0	72
15	25	26	36	35	0	1	.1790	.0	.00	.000	0	72
16	26	27	37	36	0	1	.1790	.0	.00	.000	0	72
17	29	30	45	44	0	1	.1250	.0	.00	.000	0	83
18	30	31	46	45	0	1	.1250	.0	.00	.000	0	83
19	31	32	47	46	0	1	.1790	.0	.00	.000	0	83
20	32	33	48	47	0	1	.1790	.0	.00	.000	0	83
21	33	34	49	48	0	1	.1790	.0	.00	.000	0	83
22	34	35	50	49	0	1	.1790	.0	.00	.000	0	83
23	35	36	51	50	0	1	.1790	.0	.00	.000	0	83
24	36	37	52	51	0	1	.1790	.0	.00	.000	0	83
25	44	45	60	59	0	1	.1250	.0	.00	.000	0	89
26	45	46	61	60	0	1	.1250	.0	.00	.000	0	89
27	46	47	62	61	0	1	.1790	.0	.00	.000	0	90
28	47	48	63	62	0	1	.1790	.0	.00	.000	0	90
29	48	49	64	63	0	1	.1790	.0	.00	.000	0	90
30	49	50	65	64	0	1	.1790	.0	.00	.000	0	90
31	50	51	66	65	0	1	.1790	.0	.00	.000	0	90
32	51	52	67	66	0	1	.1790	.0	.00	.000	0	90
33	59	60	75	74	0	1	.1250	.0	.00	.000	0	84
34	60	61	76	75	0	1	.1250	.0	.00	.000	0	84
35	61	62	77	76	0	1	.1790	.0	.00	.000	0	84
36	62	63	78	77	0	1	.1790	.0	.00	.000	0	84
37	63	64	79	78	0	1	.1790	.0	.00	.000	0	84
38	64	65	80	79	0	1	.1790	.0	.00	.000	0	84
39	65	66	81	80	0	1	.1790	.0	.00	.000	0	84
40	66	67	82	81	0	1	.1790	.0	.00	.000	0	84
41	74	75	90	89	0	1	.1250	.0	.00	.000	0	90
42	75	76	91	90	0	1	.1250	.0	.00	.000	0	90
43	76	77	92	91	0	1	.1790	.0	.00	.000	0	90
44	77	78	93	92	0	1	.1790	.0	.00	.000	0	90
45	78	79	94	93	0	1	.1790	.0	.00	.000	0	90
46	79	80	95	94	0	1	.1790	.0	.00	.000	0	90
47	80	81	96	95	0	1	.1790	.0	.00	.000	0	90
48	81	82	97	96	0	1	.1790	.0	.00	.000	0	90
49	89	90	105	104	0	1	.1250	.0	.00	.000	0	90
50	90	91	106	105	0	1	.1250	.0	.00	.000	0	90
51	91	92	107	106	0	1	.1790	.0	.00	.000	0	90
52	92	93	108	107	0	1	.1790	.0	.00	.000	0	90
53	93	94	109	108	0	1	.1790	.0	.00	.000	0	90

SARGENT & LUNDY

54	94	95	110	109	0	1	.1790	.0	.00	.000	0	90
55	95	96	111	110	0	1	.1790	.0	.00	.000	0	90
56	96	97	112	111	0	1	.1790	.0	.00	.000	0	90
57	18	4	3	0	0	1	.1790	.0	.00	.000	0	78
58	18	17	4	0	0	1	.1790	.0	.00	.000	0	72
59	17	5	4	0	0	1	.1790	.0	.00	.000	0	66
60	17	16	6	5	0	1	.1790	.0	.00	.000	0	60
61	16	7	6	0	0	1	.1790	.0	.00	.000	0	48
62	16	15	13	7	0	1	.1790	.0	.00	.000	0	42
63	7	13	8	0	0	1	.1790	.0	.00	.000	0	30
64	13	10	9	8	0	1	.1790	.0	.00	.000	0	24
65	15	14	12	13	0	1	.1790	.0	.00	.000	0	12
66	13	12	11	10	0	1	.1790	.0	.00	.000	0	12
67	43	42	32	31	0	1	.1790	.0	.00	.000	0	60
68	42	33	32	0	0	1	.1790	.0	.00	.000	0	48
69	42	34	33	0	0	1	.1790	.0	.00	.000	0	42
70	42	41	35	34	0	1	.1790	.0	.00	.000	0	36
71	41	40	35	0	0	1	.1790	.0	.00	.000	0	24
72	118	117	115	116	0	1	.2500	.0	.00	.000	0	12
73	35	39	36	0	0	1	.1790	.0	.00	.000	0	12
74	36	39	38	37	0	1	.1790	.0	.00	.000	0	12
75	73	72	62	61	0	1	.1790	.0	.00	.000	0	60
76	72	63	62	0	0	1	.1790	.0	.00	.000	0	48
77	72	64	63	0	0	1	.1790	.0	.00	.000	0	42
78	72	71	65	64	0	1	.1790	.0	.00	.000	0	36
79	71	70	69	65	0	1	.1790	.0	.00	.000	0	24
80	65	69	66	0	0	1	.1790	.0	.00	.000	0	12
81	66	69	68	67	0	1	.1790	.0	.00	.000	0	12
82	121	107	106	0	0	1	.2500	.0	.00	.000	0	78
83	121	120	107	0	0	1	.2500	.0	.00	.000	0	72
84	120	108	107	0	0	1	.2500	.0	.00	.000	0	66
85	120	119	109	108	0	1	.2500	.0	.00	.000	0	60
86	119	110	109	0	0	1	.2500	.0	.00	.000	0	48
87	119	118	116	110	0	1	.2500	.0	.00	.000	0	42
88	110	116	111	0	0	1	.2500	.0	.00	.000	0	30
89	116	113	112	111	0	1	.2500	.0	.00	.000	0	24
90	116	115	114	113	0	1	.2500	.0	.00	.000	0	12

APPENDIX - B

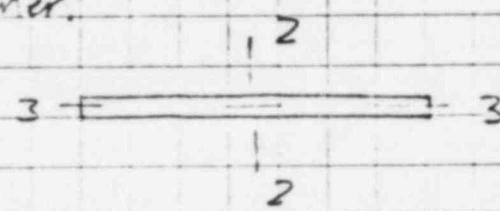
BEAM PROPERTIES

(G)

Client	Prepared by	Date
Project	Reviewed by	Date
Proj. No. Equip. No.	Approved by	Date

Beam Type 1

1/4" × 4" Flat stiffener.



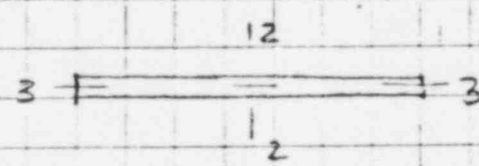
$A = 1.04\ in^2$

$J_1 = 0.02\ in^4$

$I_2 = 1.33\ in^4$

$I_3 = 0.0052\ in^4$

Beam Type 2



$A = 1.5\ in^2$

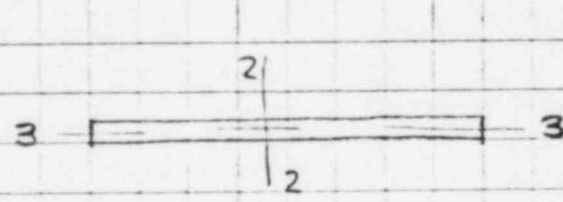
$J_1 = 0.03125\ in^4$

$I_2 = 4.5\ in^4$

$I_3 = 0.0078\ in^4$

1/4" × 6" Stiffener

Beam Type 3



$A = 2.25\ in^2$

$J_1 = 0.02637\ in^4$

$I_2 = 27\ in^4$

$I_3 = 0.00659\ in^4$

Client		Prepared by	Date
Project		Reviewed by	Date
Proj. No.	Equip. No.	Approved by	Date

Beam Type (4)

P - 4000 Channel - Unistrut (.81" x 1.62")

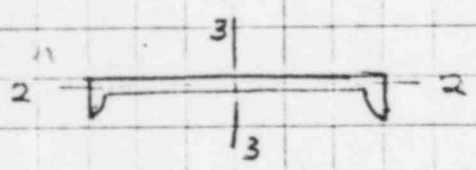
$A = .23 \text{ in}^2$
$J = 0.000232 \text{ in}^4$
$I_2 = 0.022 \text{ in}^4$
$I_3 = 0.085 \text{ in}^4$

Beam Type (5)

Linear Combination of two type (4) & one type (6) Bms.

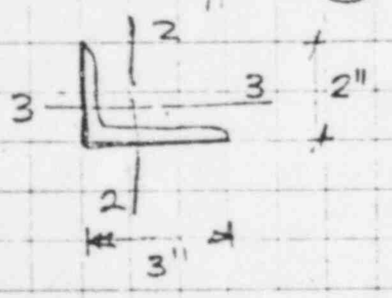
$A = (2.(0.23) + .62) = 1.08 \text{ in}^2$
$I_2 = 2I_{3)\,TYP.4} + I_{2\,TYP.6} = [0.013 + 2(0.085)] = 0.183 \text{ in}^4$
$I_3 = I_{3)\,TYP.6} + 2I_{2\,TYP.4} = [0.27 + 2(0.022)] = 0.314 \text{ in}^4$
$J_1 = J_{1\,TYP.6} + 2J_{1\,TYP.4} = [0.0129 + 2(0.000232)] = 0.013364 \text{ in}^4$

Beam Type (6) AISI M1020 Channel 2" x .62" x .25"



$A = 0.62 \text{ in}^2$
$I_2 = 0.031 \text{ in}^4$
$I_3 = 0.27 \text{ in}^4$
$J_1 = 0.0129 \text{ in}^4$

Beam Type (7) 1/4" x 2" x 3"



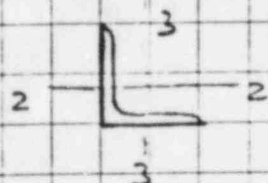
$A = 1.19 \text{ in}^2$
$I_2 = 1.09 \text{ in}^4$
$I_3 = 0.392 \text{ in}^4$
$J_1 = 0.0248 \text{ in}^4$

Form GQ-3.08.1 Rev. 2

Client	Prepared by / Date
Project	Reviewed by / Date
Proj. No. / Equip. No.	Approved by / Date

Beam Type (8)

1/4" x 2" x 2"



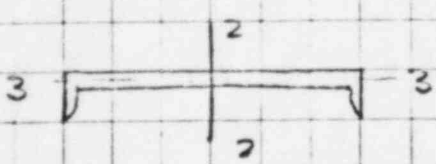
A = .938 in²

$J_1 = 0.0195$ in⁴

$I_3 = I_2 = 0.348$ in⁴

Beam Type (9)

Channel 6" x 1" x .179"



A = 1.36 in²

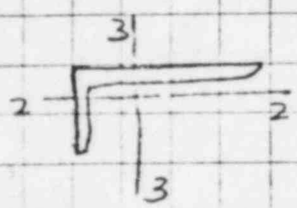
$I_2 = 5.809$ in⁴

$I_3 = 0.077$ in⁴

$J_1 = 0.0145$ in⁴

Beam Type (10)

3" x 1" x .179' ∠



A = .684 in²

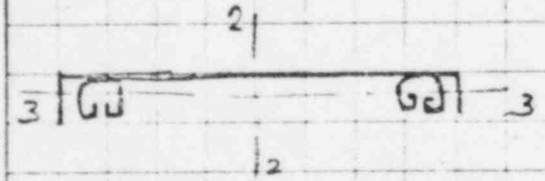
$I_2 = 0.432$ in⁴

$I_3 = 0.6146$ in⁴

$J_1 = 0.0073$ in⁴

Beam Type (12)

Two P-6000 Unistruts attached to a 6"x1"x.179" channel.



A = 1.576 in²

$I_2 = 7.159$ in⁴

$I_3 = 0.113$ in⁴

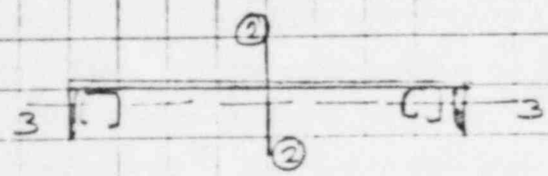
$J_1 = 0.0146$ in⁴

SARGENT LUNDY ENGINEERS CHICAGO	Calcs. For	
	Safety-Related	Non-Safety-Related

Client		Prepared by	Date
Project		Reviewed by	Date
Proj. No.	Equip. No.	Approved by	Date

Beam Type (11)

2 P-6000 unistruts attached to a 10.5' x 1" x 0.179" channel



$A = 2.31 \text{ in}^2$
$J_1 = 0.0223 \text{ in}^4$
$I_2 = 28.724 \text{ in}^4$
$I_3 = 0.12 \text{ in}^4$

Beam Type (13) 2 P-4000 channel unistruts.

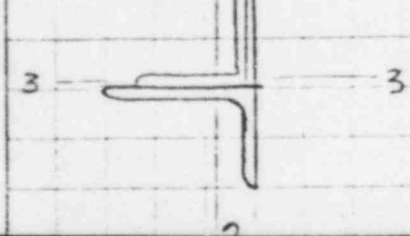
$A = 0.46 \text{ in}^2$
$J_1 = 0.000464 \text{ in}^4$
$I_2 = 0.044 \text{ in}^4$
$I_3 = 0.17 \text{ in}^4$

Beam Type (14)

4 P-4000 channel unistruts

$A = 0.92 \text{ in}^2$
$J_1 = 0.000928 \text{ in}^4$
$I_2 = 0.088 \text{ in}^4$
$I_3 = 0.34 \text{ in}^4$

Beam Type (15) Combination of one 2" x 2" x 1/4" & one 3" x 2" x 1/4" ∠les with a 2", .179" thick cover plate



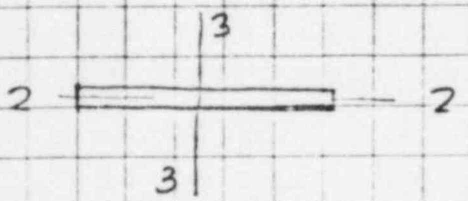
$A = 2.488 \text{ in}^2$
$I_2 = 1.539 \text{ in}^4$
$I_3 = 1.811 \text{ in}^4$
$J_1 = 0.04818 \text{ in}^4$

Form GO-3.08.1 Rev. 2

Client		Prepared by	Date
Project		Reviewed by	Date
Proj. No.	Equip. No.	Approved by	Date

Beam Type (16)

$1/4'' \times 4''$ Flat stiffener



$A = 1.0 \text{ in}^2$

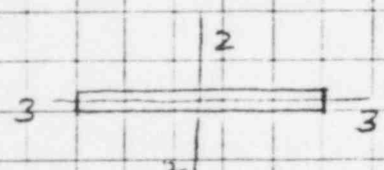
$J_1 = 0.02 \text{ in}^4$

$I_2 = 0.0052 \text{ in}^4$

$I_3 = 1.333 \text{ in}^4$

Beam Type (17)

$1/4'' \times 3''$ Flat stiffener



$A = 0.75 \text{ in}^2$

$J_1 = 0.015625 \text{ in}^4$

$I_2 = 0.5625 \text{ in}^4$

$I_3 = 0.0039 \text{ in}^4$

Beam Type (18)

Linear combination of (1) beam type
& (3) beam type

$A = 3.25 \text{ in}^2$

$J_1 = 0.04637 \text{ in}^4$

$I_2 = 28.33 \text{ in}^4$

$I_3 = 0.01179 \text{ in}^4$

Form GQ-3.08.1 Rev. 2

Client	Prepared by	Date
Project	Reviewed by	Date
Proj. No. Equip. No.	Approved by	Date

Beam Type (19)

Linear combination of 2 type 9 beams

$A = 2.72 \text{ in}^2$
$J_1 = 0.029 \text{ in}^4$
$I_2 = 11.62 \text{ in}^4$
$I_3 = 0.154 \text{ in}^4$

Beam Type (20)

Linear Combination of 2 type 11 beams

$A = 1.386 \text{ in}^2$
$J_1 = 0.0176 \text{ in}^4$
$I_2 = 0.0864 \text{ in}^4$
$I_3 = 1.229 \text{ in}^4$

Beam Type (21)

Linear combination of 1- type (1)
& 2 -type (2) beams

$A = 2.5 \text{ in}^2$
$J_1 = 0.05125 \text{ in}^4$
$I_2 = 5.833 \text{ in}^4$
$I_3 = 0.013 \text{ in}^4$

Beam Type (22)

2" x 2" x 1/4" ∠

$A = .938 \text{ in}^2$
$J_1 = 0.01954 \text{ in}^4$
$I_2 = I_3 = 0.348 \text{ in}^4$

Form GQ-3.08.1 Rev. 2

APPENDIX - C

(12)

Stress Computation:

Beams

Bounding force values are written below for each beam No. Since the force resultants are small, an allowable safe value of 18ksi is assumed and based on this value and the beam section modulus permissable values of allowable moments are computed. These values are compared with the actual values obtained from the response spectra. For beams with larger section properties or carrying less load than lighter beams seperate calculations have not been performed.

The results from this analysis indicates that the beams are lightly stressed for both OBE & SSE cases. Stresses due to static load are negligibly small

Plates

Bounding value of the membrane stress and bending moment are used to verify that the plates are lightly stressed. A max. boundary stress of 3490 psi was computed.

(I)

Beam Elements: Groups

Group #1 (Max values)

Units:
P1 - lbs
V2 - lbs
V3 - lbs
M2 - in lb
M3 - in lb
T1 - in lb

Beam

P1 ≤ ~~25~~ 30

V2 ≤ 10

V3 ≤ 35

M2 ≤ 540

M3 ≤ 10

T1 ≤ 20

Group #2

M2 ≤ 110

Group #3.

M2 = 2040

Group #4

M2 ≤ 10

SARGENT & LUNDY ENGINEERS CHICAGO

Calcs. For

Safety-Related | Non-Safety-Related

Client		Prepared by	Date
Project		Reviewed by	Date
Proj. No.	Equip. No.	Approved by	Date

Group # 5 –

Group # 6

M2 ≤ ~~150~~ 320
M3 ≤ 160

Group # 7

M2 ≤ ~~130~~ 2205
M3 ≤ 25

Group # 8

M2 ≤ ~~450~~ 1069
TL ≤ 40.

Group # 9

M2 ≤ 25

Group # 10

M3 ≤ 300

Group # 11

M2 ≤ 40
Pl ≤ 60

SARGENT & LUNDY
ENGINEERS
CHICAGO

Calcs. For		
	Safety–Related	Non–Safety–Related

Client		Prepared by	Date
Project		Reviewed by	Date
Proj. No.	Equip. No.	Approved by	Date

Group # 12

P1 ≤ 120

M2 ≤ 20

M3 ≤ 40

Group # 13

M3 ≤ 50
M2 ≤ 50

Group # 14

M3 = [illegible]75
M2 = 13

Group # 15

T1 ≤ 40
M3 ≤ 10
M2 ≤ 500

Group 18

M2 = 2500

Group 19

M2 = 65
M3 ≤ 10

Group #20

M2 ≤ 10
M3 ≤ 500

Group # 22

M2 = 26
M3 = ~~61~~ 282

Group 23

M2 < 30
M3 ≤ 30

Group 24

M2 = ~~52~~ 102.6
M3 = 380

Group 25

M2 ≤ 25
M3 ≤ 25

Group 26

M2 = ~~364~~ 380
M3 = 10

SARGENT LUNDY ENGINEERS CHICAGO

Calcs. For

Safety-Related | Non-Safety-Related

Client
Project
Proj. No. Equip. No.
Prepared by Date
Reviewed by Date
Approved by Date

Z VALUES FOR BEAMS.

	(3)	(2)	
1	~~10.667~~ 0.042	~~0.0052~~ 10.67	
2	0.062	36	
3	0.0071	216	
4	0.105 ~~[illegible]~~	0.05	
5	This Beam consists of 2 type 4 & 1¼"×2"×3"×¼"		
6	.27/(1)	0.013/.12	
7	.392/	1.09/	2×3×1/4
8	.348/	.3-8/	∠ 2×2×1/4
9	0.077/.09	5.809/3	
10	.432/1.5	.0432/.09	
11	2 unistruts & 10.5"×1"×.179" channel. (4)		
12	Default (4)		
13	Default (4)		
14	Default (4)		
15	Default (7) Combination of ∠ 2×2×1/4 & 2×3×1/4"		
16	}		
17	}		
18	Default (1)		
19	Default (9)		
20	Default (11)/(4)		
21	} ~~end~~		
22	~~Def~~ ≡ 8		
23	Default (6)		
24	Default (6)		
25	P4001 Unistrut Channel.		
26	Default (8)		

SARGENT & LUNDY ENGINEERS CHICAGO

Calcs. For

Safety-Related | Non-Safety-Related

Client		Prepared by	Date
Project		Reviewed by	Date
Proj. No.	Equip. No.	Approved by	Date

Beam Group # 6

P1 ≤ 50
V2 ≤ 1
V3 ≤ 20
M2 ≤ 420
M3 ≤ 173

Beam Group # 7

P1 ≤ 20
V2 ≤ 10
V3 ≤ 40
M2 ≤ 2930
M3 ≤ 371
T1 ≤ 26

Beam Group # 8

P1 ≤ 10
V2 ≤ 15
V3 ≤ 15
T1 ≤ 40
M2 ≤ 989/1069
M3 ≤ 1741

Beam Group # 9

P1 ≤ 36
V2 < 1
V3 ≤ 5
M2 ≤ 36
M3 ≤ 10
T1 ≤ .01

Beam Group # 10

P1 ≤ 20
V2 ≤ 102
V3 ≤ 10
M2 ≤ 10
M3 ≤ 407

Beam Group # 11

P1 ≤ 80
V2 ≤ 20
V3 ≤ 5
M2 ≤ 60
M3 ≤ 203
T1 ≤ 10

Form GQ-3.08.1 Rev. 2

SARGENT & LUNDY
ENGINEERS
CHICAGO

Calcs For

Safety-Related | Non-Safety-Rela

Client		Prepared by	Date
Project		Reviewed by	Date
Proj. No.	Equip. No.	Approved by	Date

(II)

Beam Group # 12

P1 ≤ 147
V2 ≤ 10
V3 ≤ 10
M2 ≤ 20
M3 ≤ 163
T1 ≤ 1

Beam Group # 13

P1 ≤ 10
V2 ≤ 10
V3 ≤ 10
M2 ≤ 1/55
M3 ≤ 55
T1 ≤ 1

Beam Group # 14

P1 ≤ 10
V2 ≤ 10
V3 ≤ 1
M2 ≤ 9/13
M3 ≤ 78
T1 ≤ 1

Beam Group # 15

P1 ≤ 10
V2 ≤ 1
V3 ≤ 45
T1 ≤ ~~183.7~~ 191.1
M2 ≤ 142.3/500
M3 ≤ 30

Beam Group 18

P1 ≤ 25
V2 ≤ 5
V3 ≤ 60
T1 ≤ 10
M2 ≤ 3090
M3 ≤ 10

Beam Group # 19

P1 ≤ 45
V2 ≤ 1
V3 ≤ 10
M2 ≤ 60
M3 ≤ 2.2
T1 ≤ 1

Form GQ-3.08.1 Rev. 2

SARGENT & LUNDY ENGINEERS CHICAGO

Calcs. For

Safety-Related | Non-Safety-Related

Client
Project
Proj. No. Equip. No.
Prepared by Date
Reviewed by Date
Approved by Date

Beam Group # 20

P1 ≤ 20
V2 ≤ 50
V3 ≤ 1
M2 ≤ 30
M3 ≤ 800
T1 ≤ 20

Beam Group 22

P1 ≤ 20
V2 ≤ 20
T1 ≤ 1
M2 ≤ 44
M3 ≤ 54/120
V2 ≤ 12
V3 ≤ 2

Beam Group # 23

P1 ≤ 20
V2 ≤ 5
V3 ≤ 1
T1 ≤ 1
M3 ≤ 22/30
M2 ≤ 5/30

Beam Group # 24

P1 ≤ 36
V2 ≤ 24
V3 ≤ 5.3
T1 ≤ 0.1
M2 ≤ 130
M3 ≤ 430

Beam Group # 25

P1 ≤ 5
V2 ≤ 1
V3 ≤ 0.23
M2 ≤ 11/25
M3 ≤ 1/25
T1 ≤ 1

Beam Group # 26

P1 ≤ 12
V2 ≤ 5.3
V3 ≤ 24
T1 ≤ 1
M2 ≤ 421
M3 ≤ 174

Form GQ-3.08.1 Rev. 2

Client	Prepared by	Date
Project	Reviewed by	Date
Proj. No. Equip. No.	Approved by	Date

Z VALUES FOR BEAMS

	(3)	(2)	M3*	M2*
1	0.042	10.67	756	
2	0.062	36.	1116	
3	0.0071	216.	128	
4	0.105	0.05		900
5	The Beam consists of 2 type 4 & 4 1/4" x 2" x 3"			
6	0.27/1	0.013/.12		1950
7	0.392/2	1.09/1.5	3528	
8	0.348/1.4	0.348/1.4	4474	
9	0.077/.09	5.809/3	15400	
10	0.432/1.5	0.0432/0.09		8640
11	2 unistruts & 10.5" x 1" x .179" channel ④			
12	Default ④			
13	Default ④			
14	Default ④			
15	Default ⑦ Combination of 4k 2"x2"x 1/4 & 2"x3"x 1/4			
16 }				
17 }				
18	Default ①			
19	Default ⑨			
20	Default ⑪/④			
21 }				
22	→ 8			
23	Default ⑥			
24	Default ⑥			
25	P 4001 Unistrut Channel/ Default ④			
26	Default ⑧			

* Allowable moments based on a stress of 18000 psi.
Default indicates the beam in question is at least as stiff as the default value indicates.

Plates

Plate stresses are small ; bounding values are:

$M = 10 \text{ in lb}$

$N = 100 \text{ psi}$

$$\sigma = \left\{ \frac{10(6)}{(.125)^2} + 100 \right\} \text{psi}$$

$$= 3940 \text{ psi}$$

Plate and Beam stresses due to static load are negligibly small and are therefore not considered.

SARGENT & LUNDY ENGINEERS CHICAGO	Calcs. For	Calc. No. 00?323
	Safety-Related / Non-Safety-Related	Rev. 00 Date 06 ... Page 48.1 of 67

Client	Prepared by	Date
Project	Reviewed by	Date
Proj. No. 4130-15 Equip. No.	Approved by	Date

WELD STRESSES

plate element 17, maximum stresses in the top filler plates which are welded are as follows

	Mxx	Myy	Mxy
OBE	0.69	0.94	0.225
SSE	0.52	0.71	.154

Welds are 1" long 1/8" wide @ 12"

$$Z_x = \frac{[0.707(0.125)]^3(1)}{12 \quad \frac{0.707(.125)}{2}} = 0.0013012$$

$$Z_y = \frac{(.707)(.125)1^3}{12 \quad (.5)} = 0.01473$$

$$\sigma_b = \frac{0.69(12)}{0.0013} + \frac{0.71(12)}{0.01473}$$

$$= 6947.5 \text{ psi}$$

This stress is well below the allowable value of 18ksi. Thus the adequacy of the welds is assured.

Form GQ 3.08.1 Rev. 2

SARGENT & LUNDY ENGINEERS CHICAGO

Calcs. For

Safety-Related | Non-Safety-Related

Client	Prepared by	Date
Project	Reviewed by	Date
Proj. No. Equip. No.	Approved by	Date

APPENDIX D

Form GO-3.08.1 Rev. 2

RESPONSE SPECTRA CURVES FOR OBE & SSE

CURVES USED

OBE 1%

SSE 2%

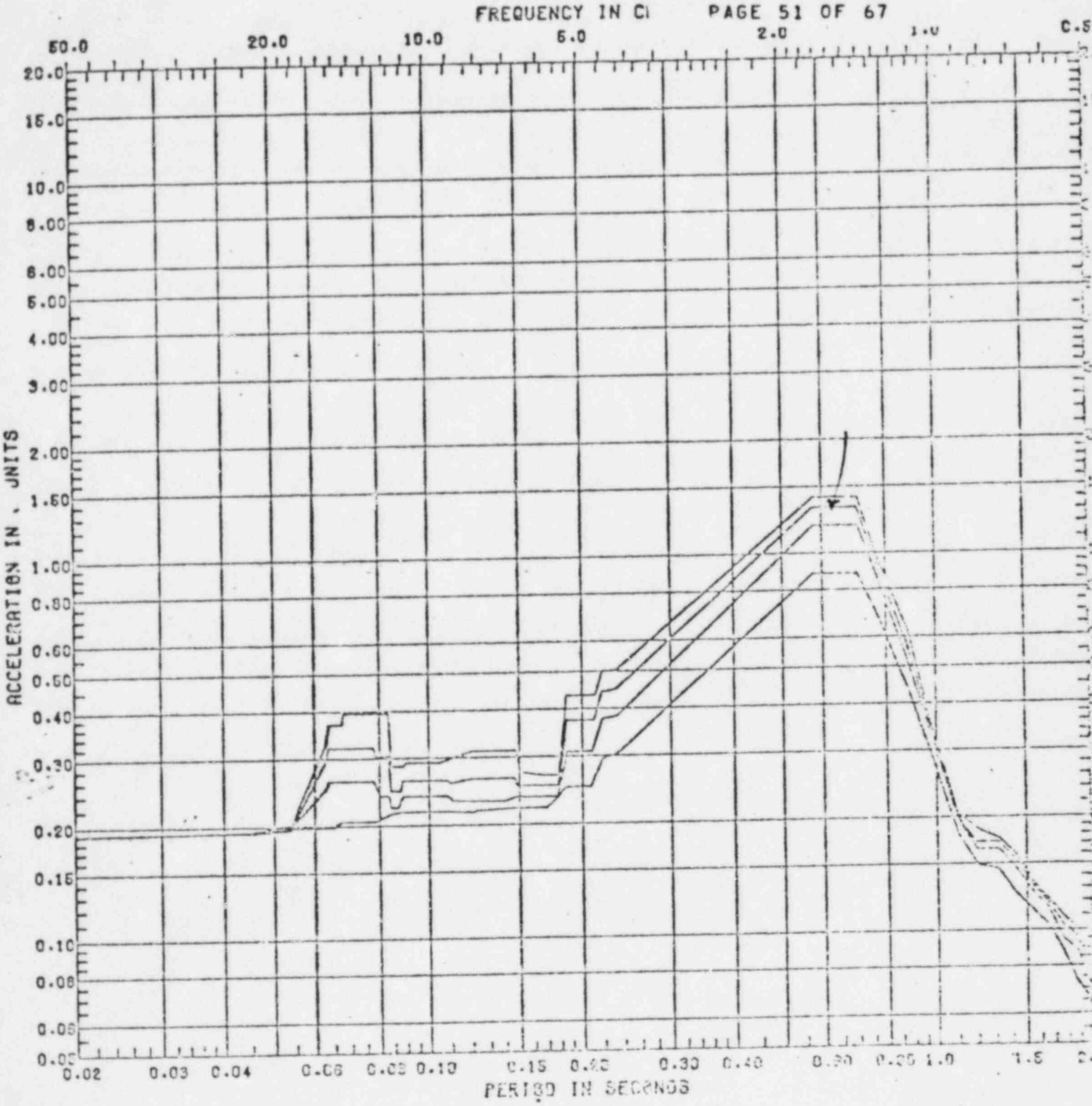
HORIZONTAL CURVES ARE ENVELOPED FOR N-S & E-W DIRECTIONS IN THE ANALYSIS.

SARGENT & LUNDY
ENGINEERS

14 JUL 76
SL180

2%

ZIMMER1 SOIL-STRUCT.N?R,OBE,SLAB 3 X
DESIGNER O.E. Lev CHECKER R. P. Jain
DESIGN SPECTRA AT JOINT/SLAB
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.005 0.010 0.020 0.050
PAGE
CALC. NO: CQD-002323
REV: 00 DATE: 06/03/82
PROJECT NUMBER:4130-15



O.B.E. Horiz. Response Spectra N-S Component SPECTRA NO. 3-A

ELEVATION 546'-0"

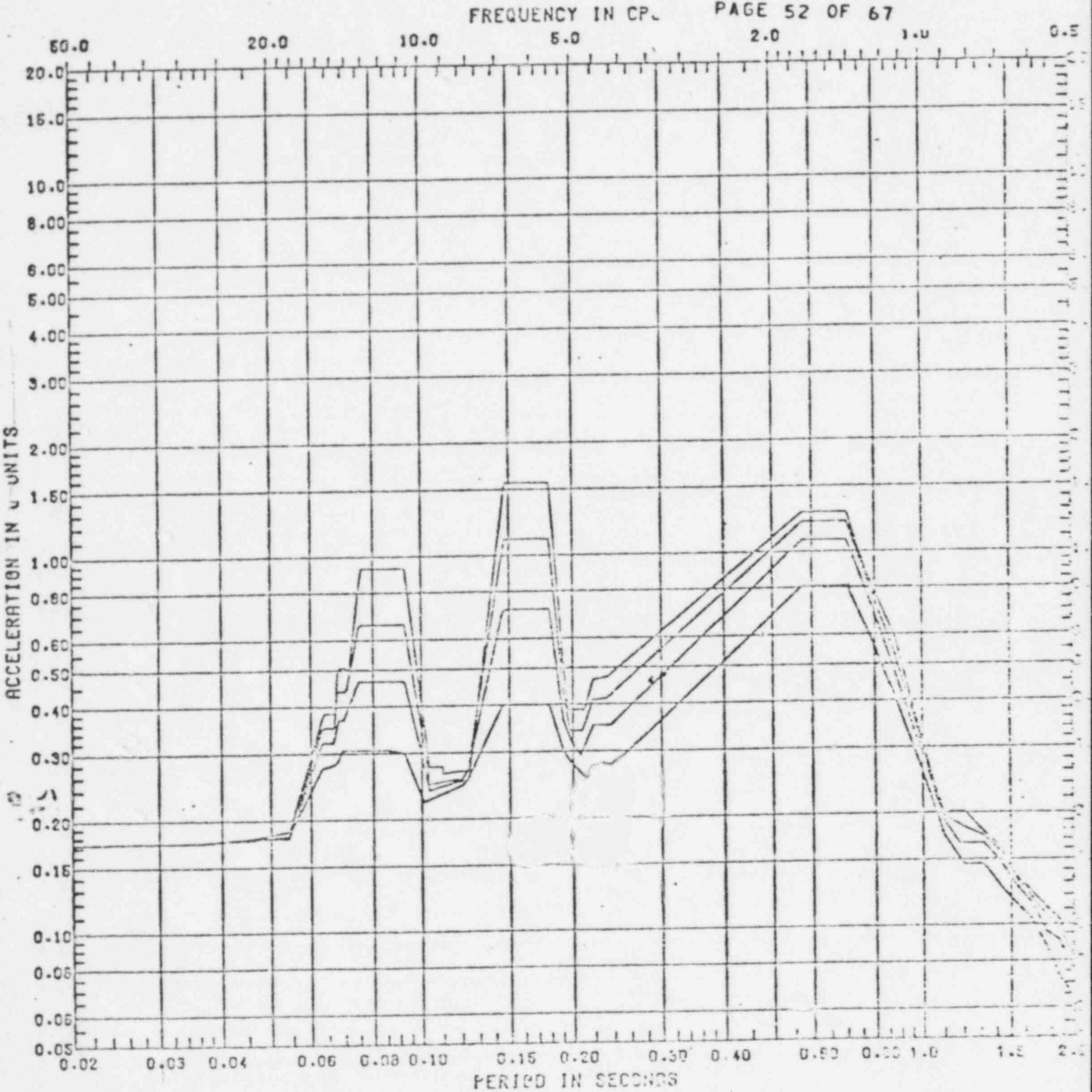
LOCATION Reactor, Auxiliary, Turbine REVISION No. 0

SARGENT & LUNDY
ENGINEERS

14 JUL 76
SL180

2%

ZIMMER1 SOIL-STRUCT.HOR.OBE.SLAB 3
DESIGNER O.E. Lev CHECKER B. P. Jain
DESIGN SPECTRA AT JOINT/SLAB
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.005 0.010 0.020 0.050
PAGE CALC. NO: CQD-002323
REV: 00 DATE: 06/03/82
PROJECT NUMBER:4130-15



O.B.E. Horiz. Response Spectra E-W Component SPECTRA NO. 3-B

ELEVATION 546'-0"

LOCATION Reactor, Auxiliary, Turbine Buildings Slab

REVISION NO. 0

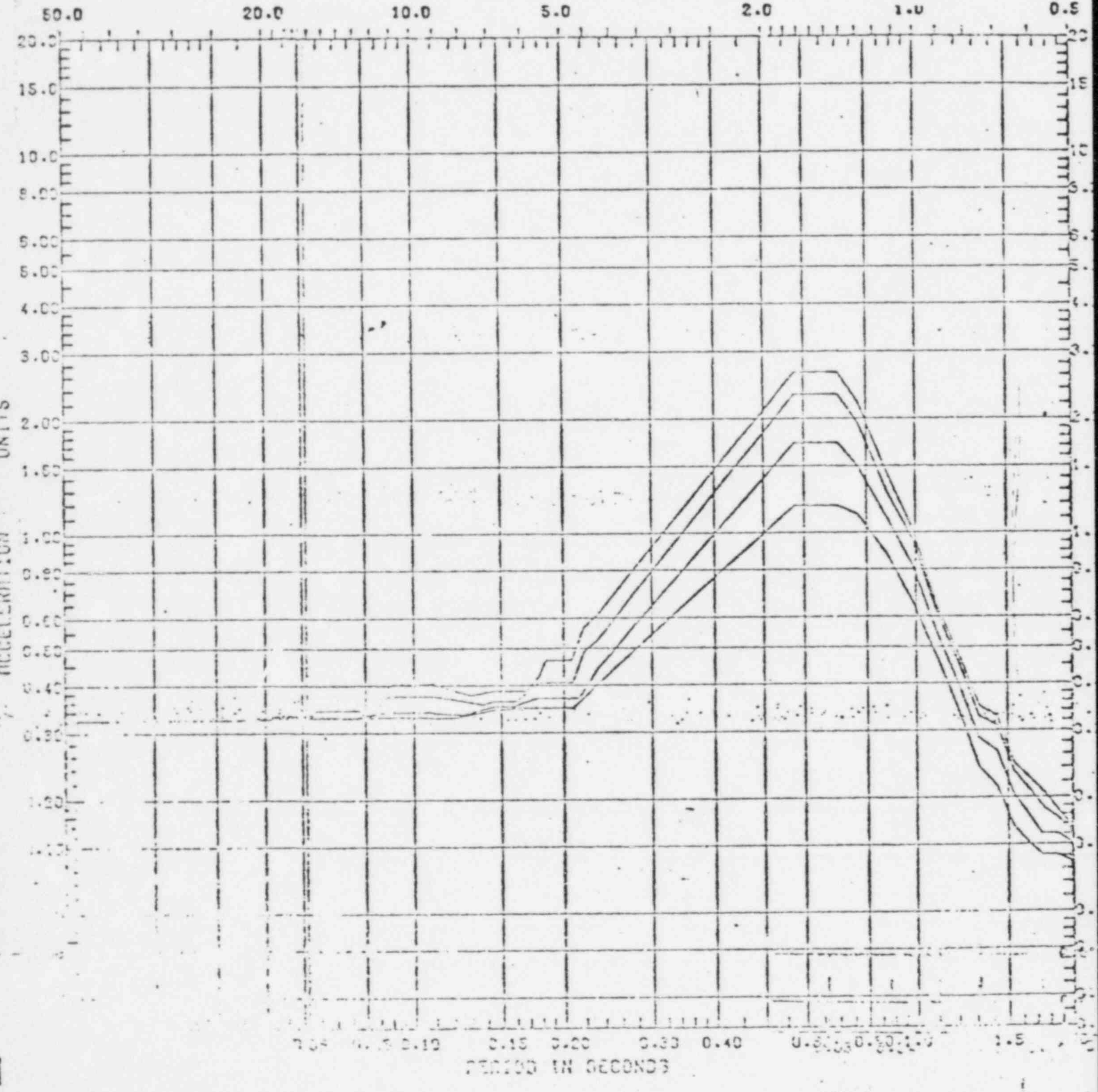
SARGENT & LUNDY ENGINEERS

28 JUL 76

8290EL

ZIMMER.413015.SOIL-STRUCT.HORIZ.DBE
DESIGNER O.E. Lev CHECKER B.P. Jain
DESIGN SPECTRA AT JOINT/SLAB 3 X-COMP
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.010 0.020 0.050 0.100
PAGE

CALC. NO: COD-002323
REV: 00 DATE: 06/03/82
PROJECT NUMBER:4130-15



D.B.E. N-S Component SPECTRA Response Spectra

546 -0"

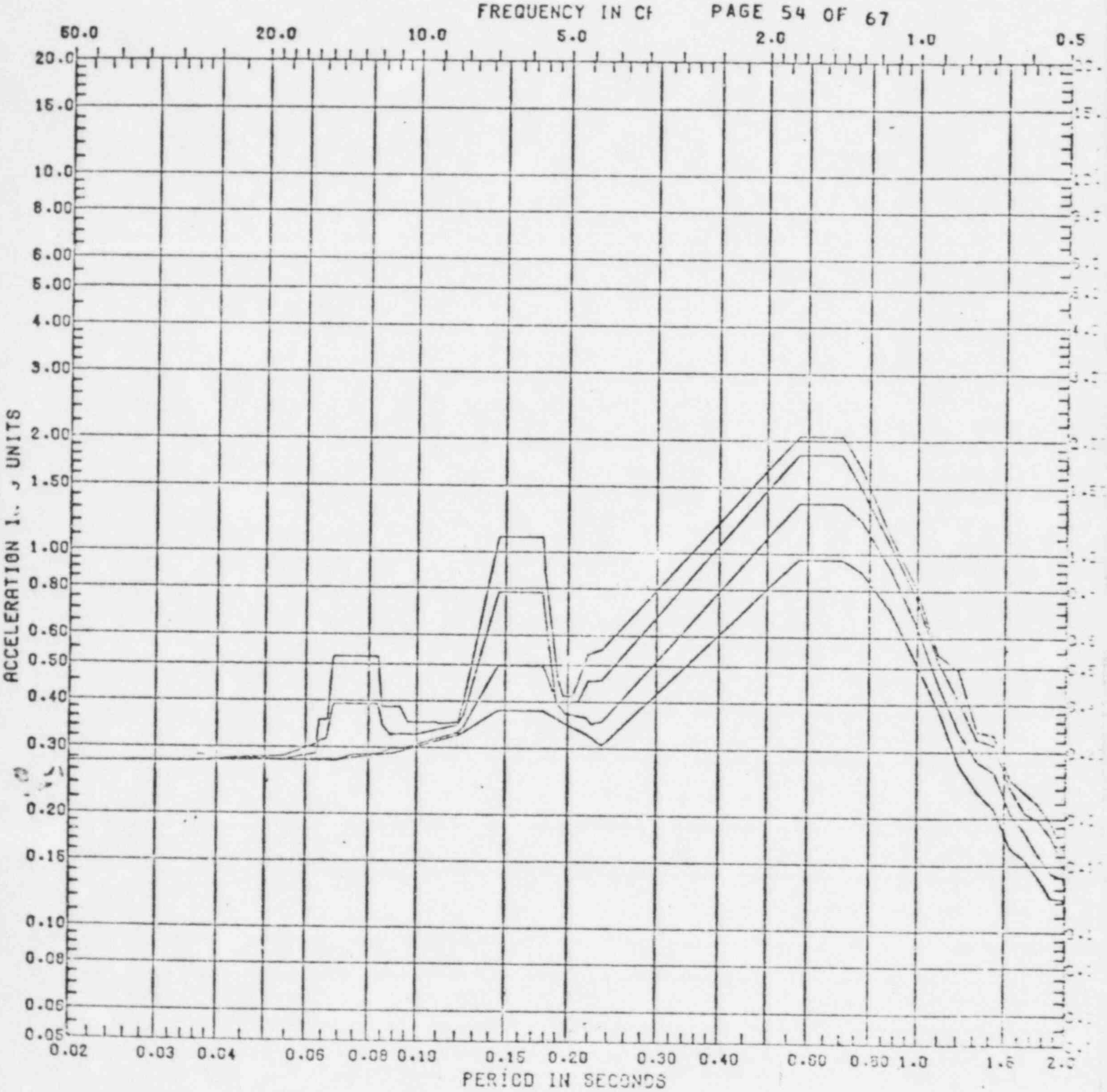
ELEVATION

Reactor, Auxiliary, Turbine Buildings Slab REVISION NO. 0

SARGENT & LUNDY
ENGINEERS

28 JUL 76
8290EL

ZIMMER.4130:S.SOIL-STRUCT.HORIZ.DSE
DESIGNER D.E. Lev CHECKER B.P. Cain
DESIGN SPECTRA AT JOINT/SLAB 3 Y-COMP
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.010 0.020 0.050 0.100
PAGE CALC. NO: CQD-002323
REV: 00 DATE: 06/03/82
PROJECT NUMBER: 4130-15



O.B.E. Horiz. Response Spectra E-W Component SPECTRA NO. 3-D

ELEVATION 546'-0"

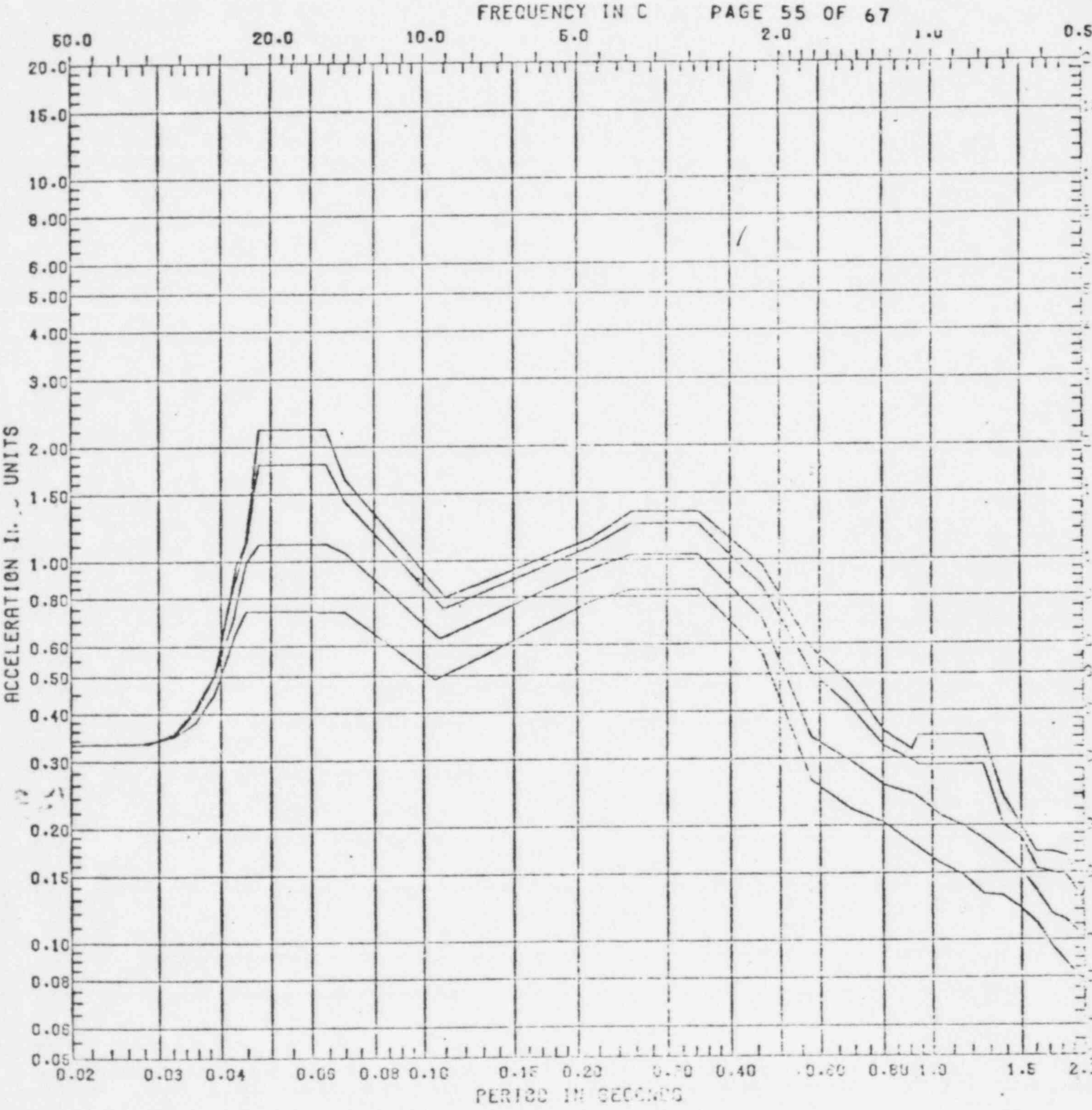
LOCATION Reactor, Auxiliary, Turbine Buildings Slab REVISION NO. 0

SARGENT & LUNDY
ENGINEERS

01 AUG 76
6730EL

ZIMMER1,413015,SOIL-STRUCT.V.S 3.DBE
DESIGNER D.E. Lev CHECKER D.P. Jain
DESIGN SPECTRA AT JOINT/SLAB 22 X-COMP
PEAKS WIDENED BY 15% ON EACH SIDE
DAMPING 0.010 0.020 0.050 0.100
PAGE

CALC. NO: CQD-002323
REV: 00 DATE: 06/03/82
PROJECT NUMBER: 4130-15



D.B.E. VERT RESPONSE SPECTRA

ELEVATION 546'-0", 525'-7", 503'-6"

LOCATION Reactor Bldg. Slab

SPECTRA NO. 1F, 2-F, 3-F

REVISION NO. 0

SARGENT & LUNDY ENGINEERS

16 JUL 76

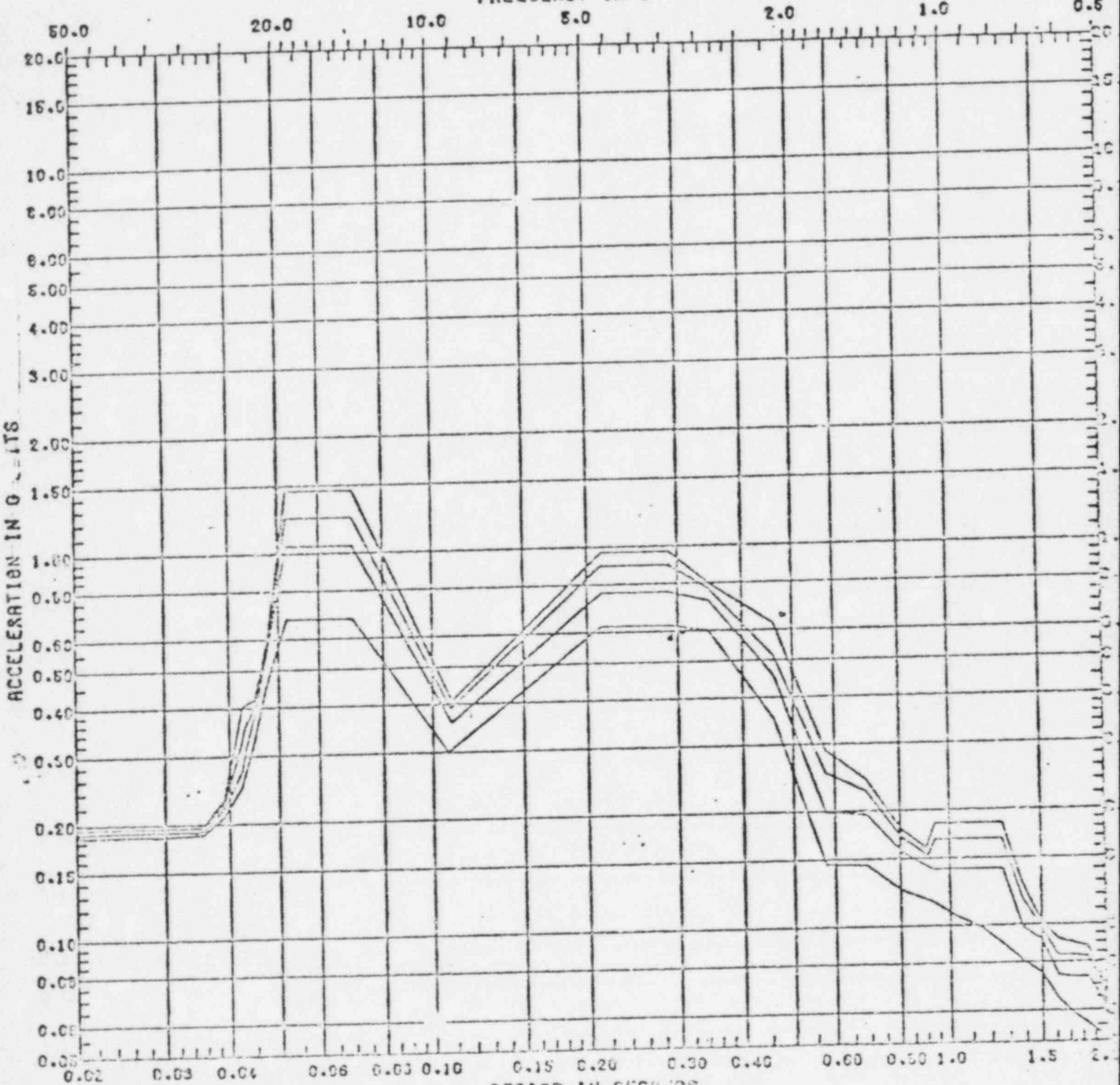
2170EL

ZIMMER1.413015.SOIL-STRUCT.V.S 3.88E
DESIGNER O.E. Lev CHECKER B.P. Jain
DESIGN SPECTRA AT JOINT/SLAB 31 X-COMP
PEAKS WIDENED BY 15% ON EACH SIDE
DAMPING 0.005 0.010 0.020 0.050
PAGE CALC. NO: CQD-002323
REV: 00 DATE: 06/03/82
PROJECT NUMBER:4130-15

15

55?

1%



O.B.E. Vert. Response Spectra

SPECTRA NO. 2-E, 3-E

ELEVATION 546'-0", 525'-7"

LOCATION Auxiliary Bldg. Slab

REVISION NO. 0

SARGENT & LUNDY
ENGINEERS
CHICAGO

Calcs. For

Safety-Related | Non-Safety-Related

Client		Prepared by	Date
Project		Reviewed by	Date
Proj. No.	Equip. No.	Approved by	Date

APPENDIX - E

INSTRUMENT WEIGHTS/MASSES

Inst. #	Description
1E22-R601 (N)	GE Pump Suction pressure indicator 180 vertical edgewise 2.3X6X7 1.2 pounds
1E22-R604	GE Cond. Test line valve indicator 180 vertical edgewise 2.3X6X7 1.2 pounds
1E22-R606	GE Electrical indicator 180 vertical edgewise 2.3XGX7 1.2 Pounds
1II-RH501	GE Electrical indicator 180 vertical edgewise 2.3XGX7 1.2 pounds

1II-RH502	GE Electrical indicator 180 vertical edgewise 2.3 X 6 X 7 1.2 pounds
1II-HP500	GE Electrical indicator 180 vertical edgewise 2.3 X 6 X 7 1.2 pounds
1E51-C002	GE Electrical indicator 180 vertical edgewise 2.3 X 6 X 7 1.2 pounds
1E51-R601	GE Tb STm exhaust pressure indicator 180 vertical edgewise 2.3 X 6 X 7 1.2 pounds
1E51-R602	GE Tb STm inlet pressure indicator 180 vertical edgewise 2.3 X 6 X 7 1.2 pounds

1E51-R603	GE Tb Stm. exhaust 180 vertical edgewise 2.3x6x7 1.2 pounds
1E51-R604	GE pump suction indicator 180 vertical edgewise 2.3x6x7 1.2 pounds
1PI-CM081A	GE Electrical indicator 180 vertical edgewise 2.3x6x7 1.2 pounds
TI-CM024	GE Supp. chamber air Temp. indicator 180 vertical edgewise 2.3x6x7 1.2 pounds
LI-CM009	GE Supp. chamber WTR indicator 180 vertical edgewise 2.3x6x7 1.2 pounds

1E51-K601	Bailey Square Root Converter 750020 AAAA 1 1.25 X 7 X 1 1 pound
1E51-R600	Bailey Meter pump discharge Controller 701003 AAE 1 2.75 X 7.25 X 17.75 5 pounds
1B21-R623 A, B	Bailey Reactor level & reactor pressure recorder 732232 BB AA 1WAB 6 X 6 X 15 20 pounds
1B21-R615	Bailey Meter RCIC flow Controller 731112 AZ AA1 6 X 6 X 15 20 pounds
B21-R610	G E vessel water level fuel zone level indicator 2 x 6 X 5 19 pounds

1E12 - R603	GE RHR flow indicator 180 vertical edge wise 2.3x 6 x7 1.2 pounds
1FIR - LD099	westronics Drywell floor drain sump level D4E 6x6x5 18 pounds
1FIR - LD100	westronics Drywell equipment drain sump. level D4E 6x6x5 18 pounds
1UR - CM113	westronics Drywell pressure wide range and Temperature D4E 6x6x15 18 pounds
1UR - CM090	westronics Supp. pool water level wide range D4E 6x6x15 18 pounds

IRR - CM114	westronics Drywell radiation level D4E 6X6 X 15 18 pounds
IAIR - CM115	westronics Drywell Concentration D 4E 6X6X 15 18 pounds
IPI - CM02 B	GE Electrical indicator 180 vertical edge wise 2.3 X 6 X 7 1.2 pounds
IPI - CM088A	GE Electrical indicator 180 vertical edgewise 2.3 X 6 X 7 1.2 pounds
IPI - FW139	GE electrical indicator 180 vertical edgewise 2.3X 6X7 1.2 pounds

1UAI - AN601AA	Electro device Annunciator window box 4 X 4 X 125 15 pounds
1UAI - AN601AB	Electro device Annunciator window box 4 X 4 X 125 15 Pounds
1UAI - AN601AC	Electro device Annunciator window box 8 X 4 X 13.0 30 pounds
1UAI - AN601AD	Electro device Annunciator window box 8 X 4 X 135 30
1UAI - AN601AW	Electro device Annunciator window box 4 X 4 X 125 15 Pounds
1L I - AN601Y	Electro-device Annunciator window box 7 X 4 X 9.0 26.25

1UAI - AN601Z	Electro device Annunciator window box 8 X 4 X 120 30 pounds

N O D A L   L O A D S   (~~S T A T I C~~)   ~~OR~~   M A S S E S   (D Y N A M I C)

MASS MOMENT OF INERTIA

NUMBER OF INPUT LOADING CARDS--   22

NODE NUMBER	LOAD CASE	X-AXIS FORCE	Y-AXIS FORCE	Z-AXIS FORCE	X-AXIS ~~MOMENT~~	Y-AXIS ~~MOMENT~~	Z-AXIS ~~MOMENT~~
22	0	.62000-01	.62000-01	.62000-01	.34700+01	.34700+01	:34700+01
26	0	.12900-01	.12900-01	.12900-01	.00000	.00000	.00000
32	0	.36000-01	.36000-01	.36000-01	.20300+01	.20300+01	.20300+01
33	0	.52000-01	.52000-01	.52000-01	.83000+00	.83000+00	.83000+00
34	0	.20000-01	.20000-01	.20000-01	.31200+00	.31200+00	.31200+00
36	0	.26000-01	.26000-01	.26000-01	.00000	.00000	.00000
47	0	.36000-01	.36000-01	.36000-01	.20300+01	.20300+01	.20300+01
48	0	.86000-01	.86000-01	.86000-01	.48400+01	.48400+01	.48400+01
49	0	.72000-01	.72000-01	.72000-01	.40500+01	.40500+01	.40500+01
51	0	.26000-01	.26000-01	.26000-01	.00000	.00000	.00000
62	0	.54000-01	.54000-01	.54000-01	.30400+01	.30400+01	.30400+01
63	0	.76000-01	.76000-01	.76000-01	.42800+01	.42800+01	.42800+01
64	0	.68000-01	.68000-01	.68000-01	.38300+01	.38300+01	.38300+01
66	0	.26000-01	.26000-01	.26000-01	.00000	.00000	.00000
77	0	.41000-01	.41000-01	.41000-01	.23100+01	.23100+01	.23100+01
78	0	.10500+00	.10500+00	.10500+00	.58900+01	.58900+01	.58900+01
79	0	.64000-01	.64000-01	.64000-01	.36000+01	.36000+01	.36000+01
81	0	.26000-01	.26000-01	.26000-01	.00000	.00000	.00000
92	0	.75000-01	.75000-01	.75000-01	.42200+01	.42200+01	.42200+01
93	0	.73000-01	.73000-01	.73000-01	.11600+01	.11600+01	.11600+01
94	0	.28000-01	.28000-01	.28000-01	.45000+00	.45000+00	.45000+00
96	0	.26000-01	.26000-01	.26000-01	.00000	.00000	.00000

* AFTER NODAL POINT INDICATES OUTPUT IN SPECIAL COORDINATES, READ NODAL INPUT DATA FOR MORE INFORMATIONS.

STRUCTURE LOAD CASE	ELEMENT LOAD MULTIPLIERS A	B	C	D
1	.000	.000	.000	.000