.50-445

August 31, 1984
84056.031

Mr. J. B. George
Project General Manager
Texas Utilities Generating Company
Comanche Peak Steam Electric Station
Highway FM 201
Glen Rose, Texas 76043

Subject: Cable Tray Support Review Questions
          Comanche Peak Steam Electric Station
          Independent Assessment Program - Phase 4
          Job No. 84056

Dear Mr. George:

Attachment A contains additional cable tray support review questions. If there
are any questions while preparing responses, please call.

Very truly yours,

N. H. Williams
Project Manager

NHW:jm

cc: Mr. S. Burwell (USNRC)
     Mr. S. Treby (USNRC)
     Mr. D. Wade (TUGCO)
     Ms. J. Van Amerongen (EBASCO/TUGCO)
     Mrs. J. Ellis (CASE)
     Mr. R. Ballard (G&H)

ZZZZ
,/,

USE ATTACHED DIST. LIST

ZZZZ - USE FOR CYGNA LTRS. # 84042.029
                              # 84056.030
                            (# 84056.031)

	LTR	ENCL.
LB #1: DL - S.B. BURWELL	3	3
MEB : DE - D. TERAU	1	1
SGEB : DE - F. RINALDI	1	1
QUAB : I+E - J. SPRAUL	1	1
EGCB : I+E - J. FAIR	1	1
REGION IV - D. HUNNICATT	1	1
REG FILE	1	1
PDR	1	1
LPDR	1	1
NTIS	1	1
BSIC	1	1
REGION IV FILE	1	1
	14	14

DIST: PER S.B. BURWELL

ATTACHMENT A

CABLE TRAY SUPPORT REVIEW QUESTIONS

1. Support Number 202, Type A_4

   References: 1. Gibbs & Hill, Inc. Drawing 2323-E1-0700-01-S
              2. Brown & Root, Inc. Drawing FSE-00174

   The referenced support is the only support located on a straight segment
   of cable tray. The support does not provide longitudinal restraint.

   Please provide Cygna with justification and documentation to show that:

   • The affected cable tray segments are adequately supported to prevent
     overstressing of the trays, and,

   • Support 202 is capable of resisting all applied forces.

2. Eccentric Loads and Connections

   2.1 Cable trays are attached to supports by friction type or heavy-duty
       tray clamps. The former type resists transverse and vertical loads
       while the later resists transverse, vertical and longitudinal
       loads. The connection details for these clamps require that they be
       bolted or welded to the top of the cable tray support beam. A
       typical connection is shown in Figure 2A. Such connections provide
       a load transfer which is eccentric to the major axis and to the
       shear center of the channel sections typically used in the cable
       tray support designs. As a result, several effects are not
       considered in the design of the supports.

       2.1.1 Major and Minor Axes Flexure

             As noted in Figure 2B, the location of the transverse load,
             P_h, is eccentric to the major axis by a distance d/2, where d
             is the channel depth. The effect of this eccentricity is an
             increase in major axis bending. Minor axis bending will
             occur because P_h is eccentric to the minor axis by a distance
             of (g-x) where g is the gage distance and x is the location
             of the neutral axis relative to the back of the channel web.

       2.1.2 Torsion due to Vertical Loads

             As shown in Figure 2C, vertical cable tray loads are applied
             eccentrically to the shear center of the channel section
             which induces torsional moments into the beam. Cygna has

ATTACHMENT A

CABLE TRAY SUPPORT REVIEW QUESTIONS

noted that only beam members for Regular Case cable tray
supports Details A_i, B_i and C_i and Detail SP-7 with brace
have been analyzed for the effects of eccentrically applied
vertical loads. Cygna is currently reviewing these
calculations. No other cable tray supports have been
analyzed for the effects of torsion due to vertical loads.

2.1.3 Torsion Due to Longitudinal Loads

As shown in Figure 2C, longitudinal cable tray loads are
applied eccentrically to the major axis (X-X) of the channel
section which induces torsional moments into the beam
member. Cygna has noted that only Detail SP-7 with brace has
been analyzed for the effects of eccentrically applied loads.

2.2 Eccentric Connections

The cable tray supports are primarily constructed of channel
sections for the hanger and beam members and angles for bracing
members. (For Cygna's concerns regarding angles, reference Cygna's
letter 84056.027, question 2.) Figure 2D shows the eccentricity
between the neutral axis of a typical beam and hanger connection.
Cygna has noted that the effect of this joint eccentricity has not
been considered in the design calculations.

Please provide Cygna with documentation showing the cable tray
supports are capable of resisting the applied loads when the effects
of the eccentricities described above are considered.

3. Load Combinations

Reference: 1. Cygna Technical File 83090.11.2.1.50.

Gibbs & Hill performs the load combination for support member forces by
combining the dead load component with the vertical seismic component
before the seismic components are combined by the square root of the sum
of the squares (SRSS) method. This is Gibbs & Hill's simplified
method. Cygna had previously noted that the above method was incorrect
because the dead load component was to be added to the SRSS of the
vertical and horizontal seismic components. Gibbs & Hill terms this
combination the exact method.

To satisfy Cygna's concerns, Gibbs & Hill performed an evaluation to
compare the results of the exact combination to the simplified

ATTACHMENT A

CABLE TRAY SUPPORT REVIEW QUESTIONS

combination (Reference 1). This evaluation showed that the simplified method underestimated the resultant member stresses and anchor bolt loads by no more than 5% when compared with results from the exact method.

In general, the combinations used by Gibbs & Hill to qualify the acceptability of their simplified method is incorrect because it combines the seismic and dead load accelerations without considering the individual component's effect on the forces in the support members. The configuration of the support was not considered in the qualification calculations. Cygna performed an evaluation of the frames shown in Figures 3A, 3B and 3C for various aspect ratios (H/L for two-way frames H/L and H/d for three-way frames and L/B for cantilevers). The results are shown in Tables 1 through 3 for the Auxiliary, Safeguards, Electrical and Fuel Buildings.

The tables show that when the generic accelerations are used in the support design the simplified combination method is acceptable for all elevations of the four buildings except elevation 899'-6" in the auxilary building, which is acceptable since supports on this elevation were designed specifically for higher accelerations. When the elevation-specific accelerations are employed, the simplified combination method results in reactions which are 4 to 16 percent smaller than the exact combination.

Cygna is not requesting a response to this discussion. However, Cygna believes this information should be considered in the preparation of future responses to Cygna's questions where the cumulative effect of design discrepancies is evaluated.

Project		Prepared By		Date
TEXAS UTILITIES - CPSES PHASE 4		J.P.P.		29 AUG. 84
Subject		Checked By		Date
ECCENTRIC LOADING OF CHANNELS				
System		Job No.	File No	
REVIEW QUESTION 2		84056		
Analysis No.	Rev. No.	Sheet No.		
	0			

CABLE TRAY

TRAY CLAMP

BOLT FOR
TRANSFER OF
LONGITUDINAL
LOAD (SEE
NOTE 1)

CHANNEL

FIGURE 2A - TYPICAL TRAY CLAMP

(NOT TO SCALE)

NOTES: 1. TRAY CLAMP IS AN ANGLE SECTION
WHEN LONGITUDINAL LOADS ARE TO
BE RESISTED. INDICATED BOLT IS
FOR ILLUSTRATION OF LONGITUDINAL
SUPPORT.

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Project	TEXAS UTILITIES - CPSES IAP	Prepared By J.P.R.	Date 29 AUG 84
Subject	ECCENTRIC LOADING OF CHANNELS	Checked By	Date
System	REVIEW QUESTION 2	Job No 84056	File No
Analysis No	Rev. No	Sheet No	

XX - MAJOR AXIS

YY - MINOR OR WEAK AXIS
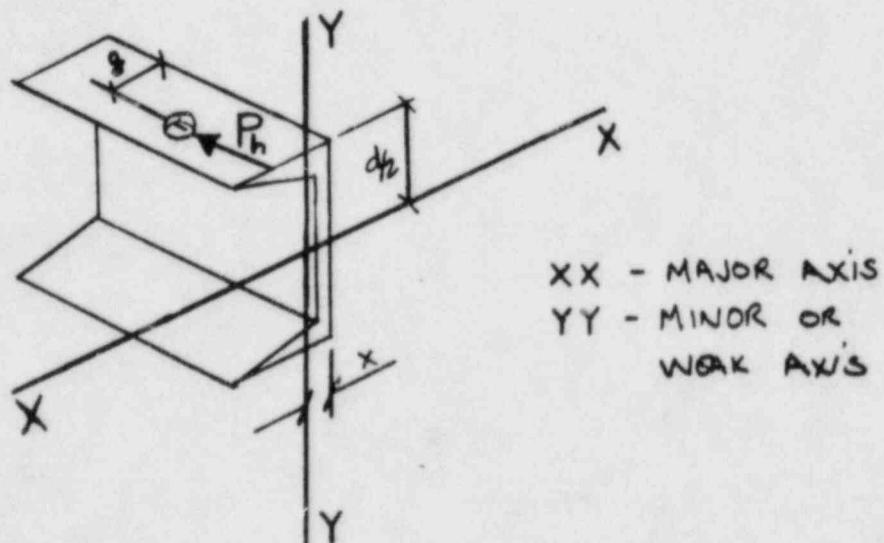
FIGURE 2B - ECCENTRICITY OF TRANSVERSE LOAD P_h FROM MAJOR AND MINOR AXIS OF A CHANNEL

(NOT TO SCALE)

Calculation Sheet

Project			
TEXAS UTILITIES - CASES IAP	Prepared By Q.P.R.		Date 29 AUG '84
Subject	Checked By		Date
ECCENTRIC LOADING OF CHANNEL			
System	Job No		File No
REVIEW QUESTION 2	84056		
Analysis No	Rev No 0	Sheet No	

FIGURE 2C - ECCENTRICITIES OF VERTICAL
AND LONGITUDINAL LOADS
(NOT TO SCALE)
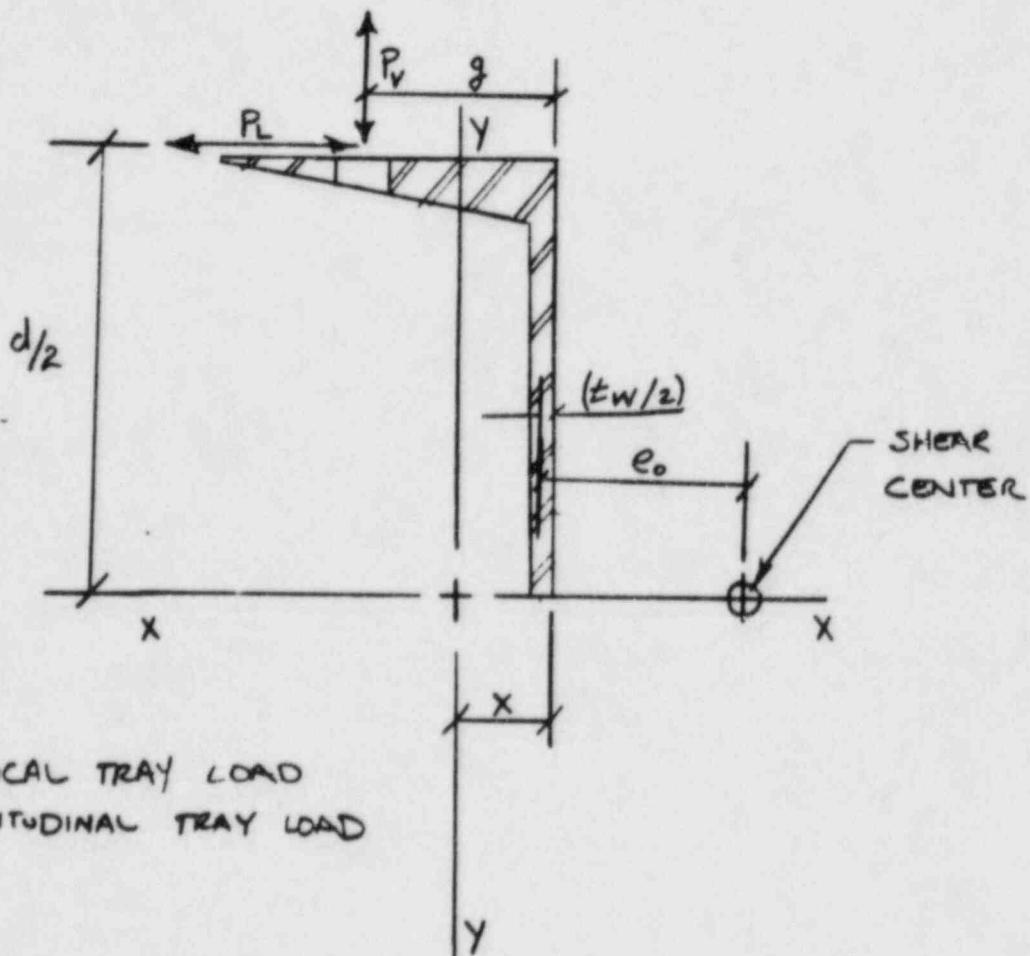
P_V = VERTICAL TRAY LOAD
P_L = LONGITUDINAL TRAY LOAD

NOTES: 1. DISTANCES SHOWN GIVEN IN NOMENCLATURE
OF THE AISC MANUAL OF STEEL CONSTRUCTION,
7TH EDITION.

Calculation Sheet

Project TEXAS UTILITIES - CPSES IAP PHASE 4	Prepared By J.P.R.	Date 29 AUG '84
Subject ECCENTRIC MEMBER CONNECTIONS	Checked By	Date
System REVIEW QUESTION 2	Job No 84056	File No
Analysis No	Rev No 0	Sheet No

P_V

P_N

P_L

BEAM
CHANNEL

HANGER
CHANNEL

c

$$c = \bar{x}_{BEAM} + \bar{x}_{HANGER}$$
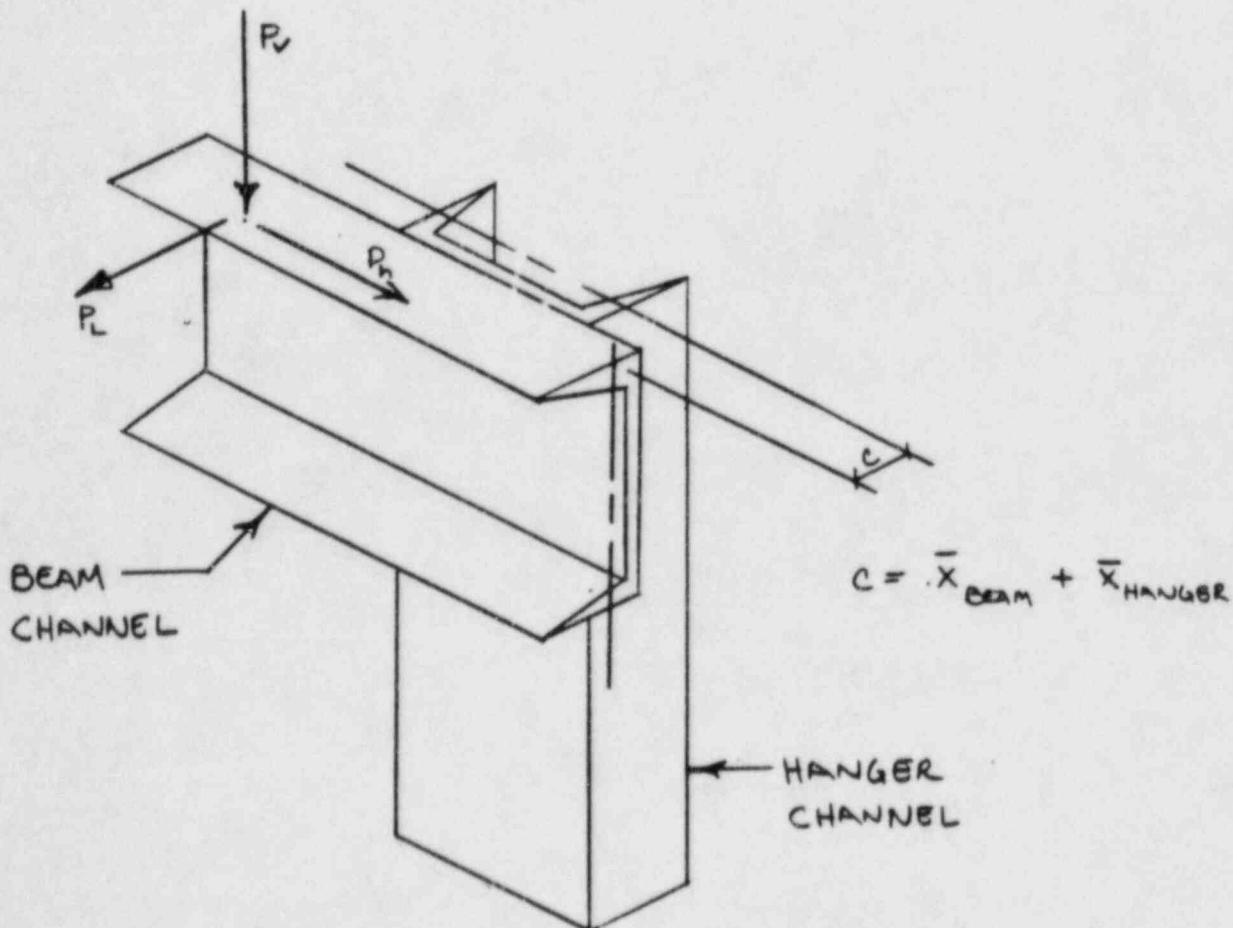
FIGURE 2D - ECCENTRIC MEMBER
CONNECTION

(NOT TO SCALE)

NOTES: 1. DISTANCES $\bar{x}$ PER NOMENCLATURE OF
AISC MANUAL OF STEEL CONSTRUCTION,
7$^{\text{TH}}$ EDITION

FIGURE 3A   TWO-WAY FRAME

SUPPORT CASES $A_1 - A_4$
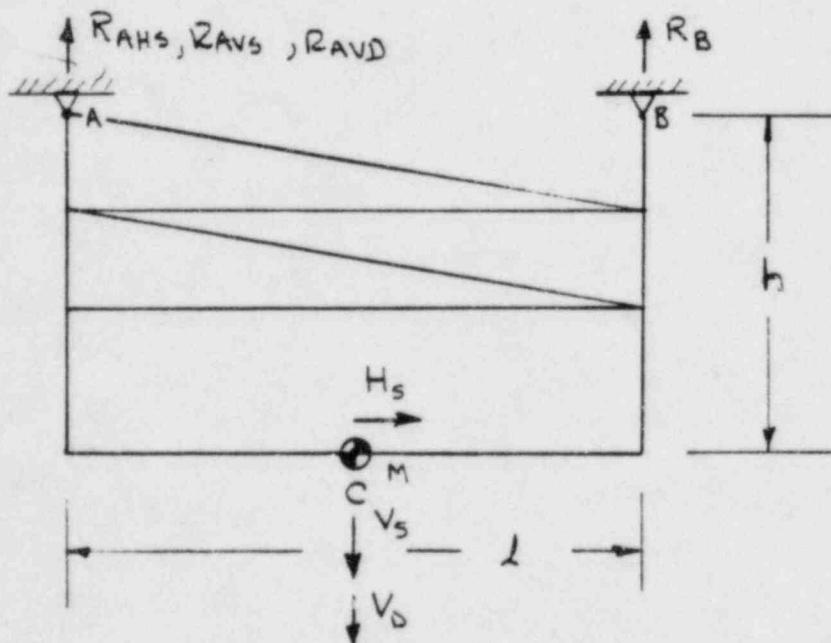
PRESENCE OF BRACES
DEPEND ON SPECIFIC
CASE, BUT ARE NOT
RELEVANT IN THIS
STUDY

DEFN: M = MASS of tray width = W, span = S, $\bar{m} = W$...
        let $M = 1.0$ for transverse LOADING

G_H = PEAK HORIZONTAL SPECTRAL ACCEL.
G_V = PEAK VERTICAL SPECTRAL ACCEL.

H_S = HORIZ. SEISMIC LOAD = $M \times G_H = G_H$
V_S = VERT. SEISMIC LOAD = $M \times G_V = G_V$
V_D = VERTICAL DEAD LOAD = $M \times g = 1$

R_{AHS} = TENSILE REACTION AT A due to $H_S = H_S \times h/\ell$
R_{AVS} = TENSILE REACTION AT A due to $V_S = V_S/2$
R_{AVD} = TENSILE REACTION AT A due to $V_D = V_D/2$

FIGURE 3B   THREE-WAY FRAME
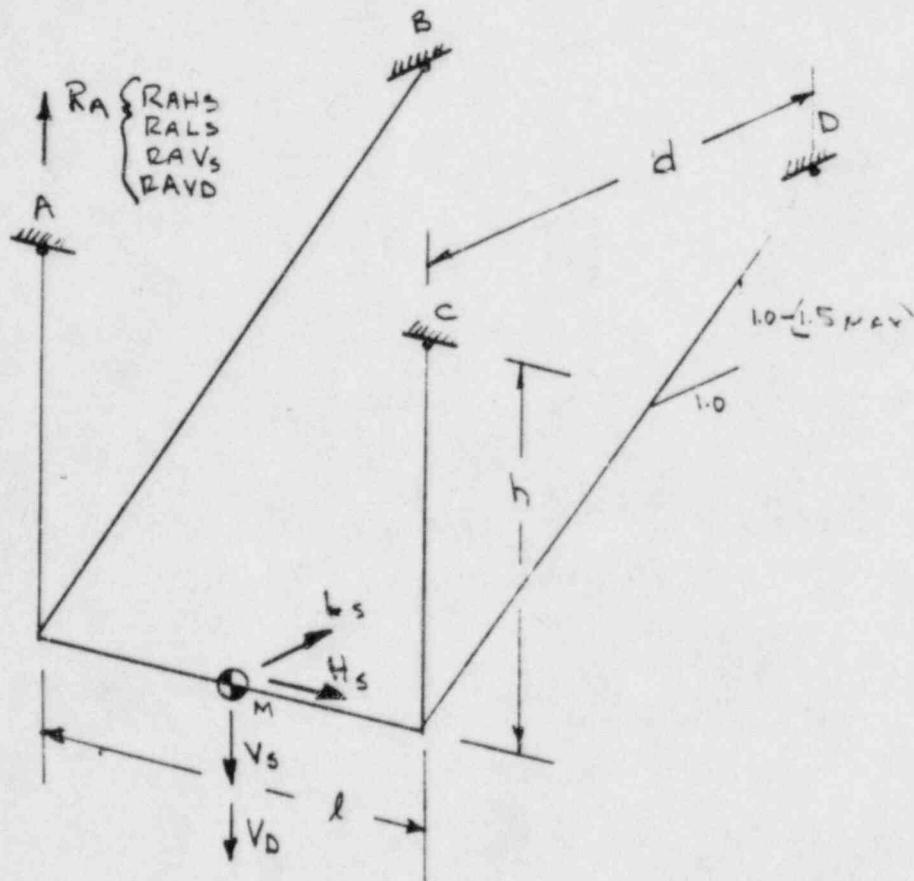
DEFN: M = MASS OF TRAY per span (between vertical supports)
assumed 8'-0" O.C. , assume M = 1.0

$$H_S = \text{HORIZ. SEISMIC LOAD} = M \times G_H = G_H$$

$$V_S = \text{VERT. SEISMIC LOAD} = M \times G_V = G_V$$

$$L_S = \text{LONGIT. SEISMIC LOAD} = 5 \times M \times G_H = 5 G_H$$

$$\text{(SINCE LONGIT. SPAN = 40' = 5 \times VERT. SPAN)}$$

$$V_D = \text{VERT. DEAD LOAD} = M \times g = 1.0$$

CYGNA
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Project TEXAS UTILITIES - CPSES - IAP	Prepared By B. HORSTMAN	Date 9/23/85
Subject SEISMIC LOAD COMBINATIONS	Checked By	Date
System REVIEW QUESTION No. 3	Job No. 84056	File No.
Analysis No.	Rev. No.	Sheet No.

FIGURE 3C   CANTILEVERED RESTRAINT

$16 \leq B \leq 30$

$12 \leq L \leq 34$
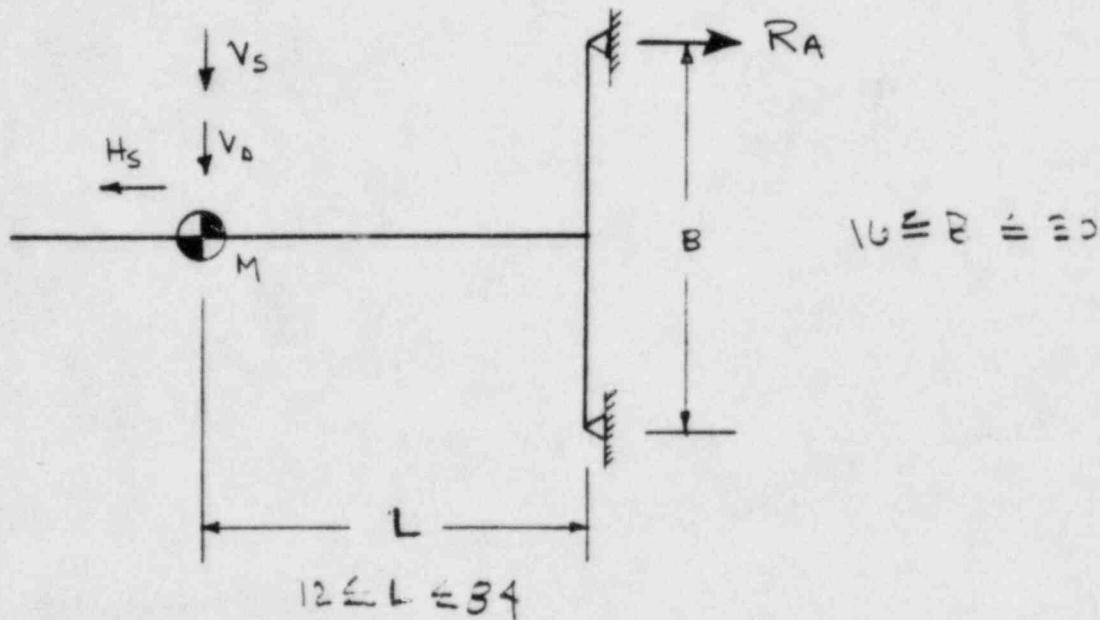
<u>DEFINITIONS</u>

L = distance from wall to tray center of gravity

B = SPACING OF ANCHOR BOLTS

H_S = HORIZ. SEISMIC LOAD $= M \times G_H = G_H$

V_S = VERTICAL SEISMIC LOAD $= M \times G_V = G_V$

V_D = VERTICAL DEAD LOAD $= 1_c \times M = 1.0$

R_{AHS} = REACTION AT A due to H_S = $H_S/2$ = ...

R_{AVS} = REACTION AT A due to V_S = $V_S \left(\frac{L}{B}\right)$ = ...

R_{AVD} = REACTION AT A due to V_D = $V_D \left(\frac{L}{B}\right)$ = ...

TABLE 1
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES Ai
SAFEGUARDS BUILDING ACCELERATIONS

| ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
896.50	2.2830	1.5000	0.2000	1.3781	1.3308	1.0355	0.9584
			0.5000	1.8658	1.6928	1.1022	0.9883
			1.0000	2.9030	2.6028	1.1153	0.9725
			2.0000	5.1272	4.7340	1.0831	0.9315
			4.0000	9.6627	9.2172	1.0483	0.8978
873.50	2.0790	1.6370	0.2000	1.4181	1.3825	1.0257	0.9862
			0.5000	1.8231	1.6790	1.0858	0.9656
			1.0000	2.7343	2.4618	1.1107	0.9160
			2.0000	4.7378	4.3620	1.0861	0.8607
			4.0000	8.8562	8.4199	1.0518	0.8228
852.50	1.6050	1.4580	0.2000	1.2965	1.2702	1.0207	0.9017
			0.5000	1.5842	1.4678	1.0793	0.8391
			1.0000	2.2628	2.0215	1.1194	0.7580
			2.0000	3.7917	3.4372	1.1031	0.6889
			4.0000	6.9613	6.5366	1.0650	0.6468
831.50	1.1410	1.3000	0.2000	1.1889	1.1724	1.0140	0.8269
			0.5000	1.3649	1.2837	1.0632	0.7229
			1.0000	1.8132	1.6200	1.1192	0.6074
			2.0000	2.8728	2.5554	1.1242	0.5219
			4.0000	5.1101	4.7067	1.0857	0.4748
810.50	0.7010	1.2600	0.2000	1.1454	1.1387	1.0059	0.7966
			0.5000	1.2209	1.1831	1.0320	0.6467
			1.0000	1.4425	1.3298	1.0848	0.4832
			2.0000	2.0370	1.8007	1.1313	0.3701
			4.0000	3.3739	3.0231	1.1160	0.3135
790.50	0.4290	1.0490	0.2000	1.0315	1.0281	1.0033	0.7174
			0.5000	1.0667	1.0467	1.0191	0.5650
			1.0000	1.1776	1.1107	1.0602	0.3945
			2.0000	1.5056	1.3363	1.1267	0.2735
			4.0000	2.2944	1.9986	1.1480	0.2132
785.50	0.3920	1.0170	0.2000	1.0145	1.0115	1.0029	0.7056
			0.5000	1.0450	1.0274	1.0171	0.5535
			1.0000	1.1421	1.0820	1.0555	0.3826
			2.0000	1.4345	1.2774	1.1230	0.2606
			4.0000	2.1484	1.8643	1.1524	0.1996
773.50	0.3270	0.9490	0.2000	0.9790	0.9767	1.0023	0.6809
			0.5000	1.0019	0.9881	1.0139	0.5307
			1.0000	1.0763	1.0279	1.0470	0.3605
			2.0000	1.3080	1.1736	1.1145	0.2376
			4.0000	1.8914	1.6311	1.1596	0.1757

TABLE 1
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES A1
ELECTRICAL BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
873.33	1.7900	1.3200	0.2000	1.2508	1.2140	1.0304	0.8699
			0.5000	1.6120	1.4651	1.1003	0.8538
			1.0000	2.4078	2.1330	1.1288	0.8066
			2.0000	4.1403	3.7632	1.1002	0.7522
			4.0000	7.6904	7.2534	1.0602	0.7145
854.33	1.5700	1.3100	0.2000	1.2264	1.1969	1.0246	0.8529
			0.5000	1.5224	1.3965	1.0901	0.0064
			1.0000	2.2012	1.9491	1.1293	0.7374
			2.0000	3.7076	3.3457	1.1082	0.6736
			4.0000	6.8141	6.3853	1.0671	0.6331
830.00	1.1100	1.2200	0.2000	1.1491	1.1320	1.0152	0.7992
			0.5000	1.3247	1.2410	1.0674	0.7016
			1.0000	1.7666	1. 98	1.1254	0.5918
			2.0000	2.8023	2. 20	1.1290	0.5091
			4.0000	4.9817	4.5766	1.0885	0.4628
807.00	0.7200	1.2600	0.2000	1.1462	1.1391	1.0062	0.7972
			0.5000	1.2256	1.1860	1.0334	0.6492
			1.0000	1.4567	1.3399	1.0872	0.4880
			2.0000	2.0718	1.8304	1.1319	0.3764
			4.0000	3.4481	3.0938	1.1145	0.3204
778.00	0.5100	1.2600	0.2000	1.1382	1.1346	1.0032	0.7916
			0.5000	1.1797	1.1584	1.0183	0.6248
			1.0000	1.3106	1.2398	1.0571	0.4390
			2.0000	1.6989	1.5223	1.1160	0.3086
			4.0000	2.6351	2.3321	1.1299	0.2448

TABLE 1
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES Ai
AUXILARY BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
899.50	2.6600	1.7100	0.2000	1.5070	1.4557	1.0352	1.0481
			0.5000	2.0811	1.8987	1.0961	1.1023
			1.0000	3.2940	2.9852	1.1034	1.1035
			2.0000	5.8883	5.4898	1.0726	1.0697
			4.0000	11.1743	10.7259	1.0418	1.0382
886.50	2.3200	1.6300	0.2000	1.4378	1.3945	1.0311	1.0000
			0.5000	1.9177	1.7535	1.0936	1.0157
			1.0000	2.9590	2.6668	1.1096	0.9912
			2.0000	5.2110	4.8227	1.0805	0.9467
			4.0000	9.8157	9.3727	1.0473	0.9120
873.50	1.9800	1.6600	0.2000	1.4196	1.3877	1.0230	0.9873
			0.5000	1.7919	1.6580	1.0808	0.9491
			1.0000	2.6469	2.3852	1.1097	0.8867
			2.0000	4.5460	4.1774	1.0883	0.8259
			4.0000	8.4634	8.0309	1.0539	0.7863
852.50	1.6600	1.6400	0.2000	1.3847	1.3611	1.0173	0.9630
			0.5000	1.6667	1.5593	1.0689	0.8828
			1.0000	2.3515	2.1208	1.1087	0.7877
			2.0000	3.9198	3.5728	1.0971	0.7121
			4.0000	7.1904	6.7699	1.0621	0.6681
831.50	1.2200	1.5800	0.2000	1.3268	1.3129	1.0106	0.9228
			0.5000	1.4981	1.4270	1.0499	0.7935
			1.0000	1.9534	1.7755	1.1002	0.6544
			2.0000	3.0647	2.7600	1.1104	0.5568
			4.0000	5.4435	5.0476	1.0784	0.5058
810.50	0.7100	1.4800	0.2000	1.2535	1.2481	1.0043	0.8718
			0.5000	1.3207	1.2898	1.0240	0.6996
			1.0000	1.5255	1.4289	1.0676	0.5110
			2.0000	2.1012	1.8852	1.1146	0.3817
			4.0000	3.4348	3.0989	1.1061	0.3191
790.50	0.5300	1.3400	0.2000	1.1783	1.1748	1.0030	0.8195
			0.5000	1.2205	1.1996	1.0174	0.6465
			1.0000	1.3543	1.2844	1.0544	0.4537
			2.0000	1.7540	1.5788	1.1110	0.3187
			4.0000	2.7234	2.4214	1.1247	0.2530

TABLE 1
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES Ai
FUEL BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
918.00	2.3000	0.9800	0.2000	1.1721	1.0917	1.0737	0.8152
			0.5000	1.7500	1.5174	1.1533	0.9269
			1.0000	2.8516	2.5040	1.1388	0.9553
			2.0000	5.1260	4.7053	1.0894	0.9313
			4.0000	9.7130	9.2531	1.0497	0.9024
899.50	2.0200	1.0200	0.2000	1.1506	1.0878	1.0578	0.8002
			0.5000	1.6315	1.4284	1.1422	0.8641
			1.0000	2.5834	2.2584	1.1439	0.8654
			2.0000	4.5721	4.1643	1.0979	0.8306
			4.0000	8.5961	8.1429	1.0557	0.7987
860.00	1.1400	0.9400	0.2000	1.0224	0.9964	1.0260	0.7111
			0.5000	1.2388	1.1251	1.1011	0.6561
			1.0000	1.7331	1.4968	1.1578	0.5806
			2.0000	2.8279	2.4778	1.1413	0.5138
			4.0000	5.0842	4.6620	1.0905	0.4724
841.00	0.9700	0.8800	0.2000	0.9809	0.9598	1.0219	0.6822
			0.5000	1.1548	1.0577	1.0918	0.6117
			1.0000	1.5651	1.3507	1.1587	0.5243
			2.0000	2.4893	2.1557	1.1547	0.4522
			4.0000	4.4049	3.9922	1.1034	0.4093
825.00	0.8400	0.8400	0.2000	0.9524	0.9352	1.0183	0.6624
			0.5000	1.0940	1.0113	1.0817	0.5794
			1.0000	1.4391	1.2458	1.1552	0.4821
			2.0000	2.2317	1.9154	1.1651	0.4054
			4.0000	3.8861	3.4837	1.1155	0.3611
810.50	0.7200	0.7600	0.2000	0.9064	0.8917	1.0164	0.6304
			0.5000	1.0234	0.9508	1.0764	0.5421
			1.0000	1.3141	1.1370	1.1558	0.4402
			2.0000	1.9893	1.6876	1.1788	0.3614
			4.0000	3.4050	3.0114	1.1307	0.3164

TABLE 1
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES Ai

NOTES:

1. ACCEL(HOR.):   Peak horizontal spectral acceleration

2. ACCEL(VER.):   Peak vertical spectral acceleration

3. ASPECT(H/L):   Ratio of frame height to width

4. RAE(EXACT):   Reaction for a unit load using the 'EXACT' Method of Seismic Load Combination

5. RAS(SIMP.):   Reaction for a unit load using the 'SIMPLIFIED' Method of Seismic Load Combination

6. RATIO(RAE/RAS):   Ratio of reactions from 'EXACT' and 'SIMPLIFIED' Methods

7. RAD: Reaction for a unit load using the 'SIMPLIFIED' Method with the design acceleration values of 2.67g horizontal and 1.67g vertical

8. RATIO(RAE/RAD):   Ratio of reaction of 'EXACT' Method to the deisgn reactions

TABLE 2
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-Ai
SAFEGUARDS BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	ASPECT (H/D)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
896.50	2.2830	1.5000	0.212	1.0000	11.9499	11.4934	1.0397	0.8899
				1.2500	14.7966	14.3316	1.0325	0.8834
				1.5000	17.6458	17.1749	1.0274	0.8789
			0.500	1.0000	11.9964	11.5398	1.0396	0.8898
				1.2500	14.8340	14.3688	1.0324	0.8833
				1.5000	17.6769	17.2060	1.0274	0.8788
			1.000	1.0000	12.1652	11.7080	1.0391	0.8893
				1.2500	14.9697	14.5042	1.0321	0.8830
				1.5000	17.7903	17.3192	1.0272	0.8787
			1.500	1.0000	12.4412	11.9830	1.0382	0.8886
				1.2500	15.1931	14.7271	1.0316	0.8826
				1.5000	17.9777	17.5063	1.0269	0.8785
			2.389	1.0000	13.1733	12.7127	1.0362	0.8867
				1.2500	15.7940	15.3267	1.0305	0.8816
				1.5000	18.4858	18.0136	1.0262	0.8778
873.50	2.0790	1.6370	0.212	1.0000	10.9365	10.4876	1.0428	0.8144
				1.2500	13.5270	13.0679	1.0351	0.8076
				1.5000	16.1202	15.6544	1.0298	0.8029
			0.500	1.0000	10.9789	10.5297	1.0427	0.8143
				1.2500	13.5609	13.1018	1.0350	0.8075
				1.5000	16.1485	15.6826	1.0297	0.8029
			1.000	1.0000	11.1324	10.6825	1.0421	0.8138
				1.2500	13.6844	13.2249	1.0347	0.8072
				1.5000	16.2518	15.7856	1.0295	0.8027
			1.500	1.0000	11.3835	10.9325	1.0413	0.8130
				1.2500	13.8878	13.4276	1.0343	0.8068
				1.5000	16.4223	15.9559	1.0292	0.8025
			2.389	1.0000	12.0496	11.5958	1.0391	0.8111
				1.2500	14.4347	13.9730	1.0330	0.8057
				1.5000	16.8849	16.4175	1.0285	0.8018
852.50	1.6050	1.4580	0.212	1.0000	8.5652	8.1257	1.0541	0.6378
				1.2500	10.5635	10.1120	1.0446	0.6306
				1.5000	12.5644	12.1049	1.0380	0.6258
			0.500	1.0000	8.5979	8.1581	1.0539	0.6377
				1.2500	10.5897	10.1381	1.0445	0.6306
				1.5000	12.5862	12.1267	1.0379	0.6258
			1.000	1.0000	8.7163	8.2757	1.0532	0.6372
				1.2500	10.6850	10.2329	1.0442	0.6303
				1.5000	12.6659	12.2061	1.0377	0.6256
			1.500	1.0000	8.9100	8.4680	1.0522	0.6364
				1.2500	10.8418	10.3891	1.0436	0.6299
				1.5000	12.7975	12.3373	1.0373	0.6253
			2.389	1.0000	9.4238	8.9785	1.0496	0.6344
				1.2500	11.2638	10.8092	1.0421	0.6287
				1.5000	13.1544	12.6931	1.0363	0.6247

TABLE 2
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-Ai
SAFEGUARDS BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	ASPECT (H/D)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
831.50	1.1410	1.3000	0.212	1.0000	6.2470	5.8248	1.0725	0.4652
				1.2500	7.6649	7.2274	1.0605	0.4576
				1.5000	9.0856	8.6378	1.0518	0.4525
			0.500	1.0000	6.2702	5.8476	1.0723	0.4650
				1.2500	7.6835	7.2459	1.0604	0.4575
				1.5000	9.1011	8.6533	1.0518	0.4525
			1.000	1.0000	6.3542	5.9305	1.0714	0.4645
				1.2500	7.7511	7.3129	1.0599	0.4572
				1.5000	9.1577	8.7095	1.0515	0.4523
			1.500	1.0000	6.4916	6.0662	1.0701	0.4636
				1.2500	7.8625	7.4234	1.0592	0.4568
				1.5000	9.2511	8.8024	1.0510	0.4520
			2.389	1.0000	6.8561	6.4265	1.0668	0.4615
				1.2500	8.1621	7.7206	1.0572	0.4556
				1.5000	9.5046	9.0545	1.0497	0.4513
810.50	0.7010	1.2600	0.212	1.0000	4.0643	3.6857	1.1027	0.3027
				1.2500	4.9288	4.5271	1.0897	0.2943
				1.5000	5.7972	5.3796	1.0776	0.2887
			0.500	1.0000	4.0784	3.6993	1.1025	0.3025
				1.2500	4.9402	4.5382	1.0886	0.2942
				1.5000	5.8067	5.3890	1.0775	0.2887
			1.000	1.0000	4.1295	3.7488	1.1016	0.3019
				1.2500	4.9815	4.5786	1.0880	0.2939
				1.5000	5.8413	5.4231	1.0771	0.2885
			1.500	1.0000	4.2132	3.8298	1.1001	0.3009
				1.2500	5.0495	4.6452	1.0870	0.2933
				1.5000	5.8985	5.4794	1.0765	0.2882
			2.389	1.0000	4.4353	4.0456	1.0963	0.2986
				1.2500	5.2325	4.8246	1.0846	0.2921
				1.5000	6.0536	5.6323	1.0748	0.2875
790.50	0.4290	1.0490	0.212	1.0000	2.7101	2.3788	1.1392	0.2018
				1.2500	3.2336	2.8718	1.1260	0.1930
				1.5000	3.7612	3.3779	1.1135	0.1873
			0.500	1.0000	2.7186	2.3868	1.1390	0.2016
				1.2500	3.2405	2.8783	1.1258	0.1930
				1.5000	3.7670	3.3835	1.1134	0.1873
			1.000	1.0000	2.7495	2.4155	1.1383	0.2010
				1.2500	3.2655	2.9022	1.1252	0.1926
				1.5000	3.7881	3.4038	1.1129	0.1871
			1.500	1.0000	2.8000	2.4627	1.1370	0.2000
				1.2500	3.3068	2.9416	1.1242	0.1921
				1.5000	3.8229	3.4374	1.1121	0.1868
			2.389	1.0000	2.9344	2.5886	1.1336	0.1975
				1.2500	3.4180	3.0478	1.1215	0.1908
				1.5000	3.9173	3.5288	1.1101	0.1860

TABLE 2
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-Ai
SAFEGUARDS BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	ASPECT (H/D)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
785.50	0.3920	1.0170	0.212	1.0000	2.5266	2.2058	1.1454	0.1882
				1.2500	3.0036	2.6508	1.1331	0.1793
				1.5000	3.4848	3.1093	1.1208	0.1736
			0.500	1.0000	2.5344	2.2129	1.1452	0.1880
				1.2500	3.0099	2.6567	1.1329	0.1792
				1.5000	3.4901	3.1143	1.1207	0.1735
			1.000	1.0000	2.5625	2.2388	1.1446	0.1873
				1.2500	3.0327	2.6783	1.1323	0.1789
				1.5000	3.5093	3.1328	1.1202	0.1733
			1.500	1.0000	2.6085	2.2813	1.1434	0.1863
				1.2500	3.0704	2.7139	1.1313	0.1784
				1.5000	3.5410	3.1633	1.1194	0.1730
			2.389	1.0000	2.7310	2.3949	1.1403	0.1838
				1.2500	3.1717	2.8101	1.1287	0.1770
				1.5000	3.6272	3.2462	1.1174	0.1722
773.50	0.3270	0.9490	0.212	1.0000	2.2039	1.9046	1.1571	0.1641
				1.2500	2.5993	2.2653	1.1474	0.1552
				1.5000	2.9989	2.6399	1.1360	0.1494
			0.500	1.0000	2.2103	1.9104	1.1570	0.1639
				1.2500	2.6045	2.2701	1.1473	0.1551
				1.5000	3.0033	2.6441	1.1359	0.1493
			1.000	1.0000	2.2336	1.9313	1.1565	0.1633
				1.2500	2.6234	2.2877	1.1468	0.1548
				1.5000	3.0193	2.6592	1.1354	0.1491
			1.500	1.0000	2.2717	1.9656	1.1558	0.1622
				1.2500	2.6547	2.3167	1.1459	0.1542
				1.5000	3.0457	2.6842	1.1347	0.1488
			2.389	1.0000	2.3731	2.0575	1.1534	0.1597
				1.2500	2.7388	2.3952	1.1435	0.1529
				1.5000	3.1173	2.7522	1.1326	0.1480

TABLE 2
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-Ai
SAFEGUARDS BUILDING ACCELERATIONS

TABLE 2

COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-A1
ELECTRICAL BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	ASPECT (H/D)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
873.33	1.7900	1.3200	0.212	1.0000	9.4823	9.0328	1.0498	0.7061
				1.2500	11.7134	11.2539	1.0408	0.6993
				1.5000	13.9466	13.4804	1.0346	0.6946
			0.500	1.0000	9.5188	9.0691	1.0496	0.7060
				1.2500	11.7426	11.2830	1.0407	0.6992
				1.5000	13.9710	13.5047	1.0345	0.6946
			1.000	1.0000	9.6511	9.2007	1.0490	0.7055
				1.2500	11.8490	11.3890	1.0404	0.6990
				1.5000	14.0599	13.5934	1.0343	0.6944
			1.500	1.0000	9.8674	9.4158	1.0480	0.7047
				1.25C0	12.0241	11.5635	1.0398	0.6985
				1.5000	14.2068	13.7399	1.0340	0.6942
			2.389	1.0000	10.4411	9.9867	1.0455	0.7028
				1.2500	12.4951	12.0330	1.0384	0.6975
				1.5000	14.6051	14.1373	1.0331	0.6935
854.33	1.5700	1.3100	0.212	1.0000	8.3843	7.9415	1.0558	0.6244
				1.2500	10.3400	9.8859	1.0459	0.6173
				1.5000	12.2979	11.8362	1.0390	0.6125
			0.500	1.00C0	8.4163	7.9733	1.0556	0.6242
				1.2500	10.3656	9.9114	1.0458	0.6172
				1.5000	12.3193	11.8575	1.0389	0.6125
			1.000	1.0000	8.5322	8.0884	1.0549	0.6237
				1.2500	10.4589	10.0042	1.0454	0.6170
				1.5000	12.3972	11.9352	1.0387	0.6123
			1.500	1.0000	8.7218	8.2766	1.0538	0.6229
				1.2500	10.6124	10.1570	1.0448	0.6165
				1.5000	12.5260	12.0636	1.0383	0.6121
			2.389	1.0000	9.2246	8.7764	1.0511	0.6210
				1.2500	11.0253	10.5682	1.0433	0.6154
				1.5000	12.8753	12.4118	1.0373	0.6114
830.00	1.1100	1.2200	0.212	1.0000	6.0884	5.6648	1.0748	0.4534
				1.2500	7.4682	7.0297	1.0624	0.4459
				1.5000	8.8506	8.4020	1.0534	0.4408
			0.500	1.0000	6.1109	5.6871	1.0745	0.4532
				1.2500	7.4863	7.0476	1.0623	0.4458
				1.5000	8.8657	8.4170	1.0533	0.4408
			1.000	1.0000	6.1927	5.7677	1.0737	0.4527
				1.2500	7.5522	7.1129	1.0618	0.4455
				1.5000	8.9208	8.4717	1.0530	0.4406
			1.500	1.0000	6.3264	5.8997	1.0723	0.4518
				1.2500	7.6605	7.2203	1.0610	0.4450
				1.5000	9.0118	8.5621	1.0525	0.4403
			2.389	1.0000	6.6811	6.2503	1.0689	0.4497
				1.2500	7.9520	7.5095	1.0589	0.4439
				1.5000	9.2584	8.8074	1.0512	0.4396

TABLE 2
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-A₁
ELECTRICAL BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	ASPECT (H/D)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
807.00	0.7200	1.2600	0.212	1.0000	4.1579	3.7763	1.1011	0.3096
				1.2500	5.0465	4.6422	1.0871	0.3013
				1.5000	5.9388	5.5191	1.0760	0.2958
			0.500	1.0000	4.1724	3.7903	1.1008	0.3095
				1.2500	5.0581	4.6537	1.0869	0.3012
				1.5000	5.9485	5.5287	1.0759	0.2957
			1.000	1.0000	4.2250	3.8413	1.0999	0.3088
				1.2500	5.1006	4.6952	1.0863	0.3009
				1.5000	5.9841	5.5637	1.0756	0.2956
			1.500	1.0000	4.3109	3.9247	1.0984	0.3079
				1.2500	5.1705	4.7637	1.0854	0.3004
				1.5000	6.0429	5.6217	1.0749	0.2953
			2.389	1.0000	4.5393	4.1468	1.0947	0.3056
				1.2500	5.3586	4.9483	1.0829	0.2991
				1.5000	6.2022	5.7789	1.0733	0.2945
778.00	0.5100	1.2600	0.212	1.0000	3.1289	2.7913	1.1210	0.2330
				1.2500	3.7510	3.3836	1.1086	0.2239
				1.5000	4.3780	3.9895	1.0973	0.2181
			0.500	1.0000	3.1390	2.8009	1.1208	0.2328
				1.2500	3.7592	3.3915	1.1084	0.2238
				1.5000	4.3849	3.9966	1.0972	0.2180
			1.000	1.0000	3.1757	2.8354	1.1200	0.2321
				1.2500	3.7889	3.4201	1.1078	0.2235
				1.5000	4.4099	4.0209	1.0968	0.2178
			1.500	1.0000	3.2358	2.8922	1.1188	0.2311
				1.2500	3.8380	3.4673	1.1069	0.2230
				1.5000	4.4513	4.0611	1.0961	0.2175
			2.389	1.0000	3.3955	3.0437	1.1156	0.2286
				1.2500	3.9701	3.5947	1.1044	0.2216
				1.5000	4.5635	4.1704	1.0943	0.2167

TABLE 2
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-A1
AUXILARY BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	ASPECT (H/D)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
899.50	2.6600	1.7100	0.212	1.0000	13.8394	13.3807	1.0343	1.0306
				1.2500	17.1565	16.6897	1.0280	1.0242
				1.5000	20.4763	20.0039	1.0236	1.0199
			0.500	1.0000	13.8937	13.4348	1.0342	1.0305
				1.2500	17.2000	16.7331	1.0279	1.0242
				1.5000	20.5126	20.0401	1.0236	1.0198
			1.000	1.0000	14.0903	13.6309	1.0337	1.0300
				1.2500	17.3582	16.8909	1.0277	1.0239
				1.5000	20.644	20.1721	1.0234	1.0197
			1.500	1.0000	14.4119	13.9516	1.0330	1.0293
				1.2500	17.6185	17.1507	1.0273	1.0235
				1.5000	20.8630	20.3902	1.0232	1.0194
			2.389	1.0000	15.2649	14.8023	1.0313	1.0275
				1.2500	18.3186	17.8496	1.0263	1.0225
				1.5000	21.4551	20.9814	1.0226	1.0188
886.50	2.3200	1.6300	0.212	1.0000	12.1390	11.6847	1.0389	0.9040
				1.2500	15.0312	14.5678	1.0318	0.8974
				1.5000	17.9260	17.4566	1.0269	0.8928
			0.500	1.0000	12.1863	11.7318	1.0387	0.9038
				1.2500	15.0691	14.6056	1.0317	0.8973
				1.5000	17.9577	17.4881	1.0268	0.8928
			1.000	1.0000	12.3578	11.9026	1.0382	0.9034
				1.2500	15.2070	14.7432	1.0315	0.8970
				1.5000	18.0729	17.6032	1.0267	0.8927
			1.500	1.0000	12.6381	12.1819	1.0374	0.9026
				1.2500	15.4340	14.9696	1.0310	0.8966
				1.5000	18.2633	17.7932	1.0264	0.8924
			2.389	1.0000	13.3819	12.9232	1.0355	0.9008
				1.2500	16.0446	15.5788	1.0299	0.8956
				1.5000	18.7796	18.3087	1.0257	0.8918
873.50	1.9800	1.6600	0.212	1.0000	10.4436	9.9978	1.0446	0.7777
				1.2500	12.9099	12.4533	1.0367	0.7707
				1.5000	15.3791	14.9154	1.0311	0.7660
			0.500	1.0000	10.4839	10.0379	1.0444	0.7776
				1.2500	12.9423	12.4856	1.0366	0.7706
				1.5000	15.4061	14.9423	1.0310	0.7659
			1.000	1.0000	10.6301	10.1833	1.0439	0.7771
				1.2500	13.0599	12.6028	1.0363	0.7704
				1.5000	15.5044	15.0403	1.0309	0.7658
			1.500	1.0000	10.8692	10.4211	1.0430	0.7763
				1.2500	13.2534	12.7957	1.0358	0.7700
				1.5000	15.6668	15.2024	1.0306	0.7655
			2.389	1.0000	11.5034	11.0523	1.0408	0.7743
				1.2500	13.7742	13.3148	1.0345	0.7689
				1.5000	16.1073	15.6418	1.0298	0.7649

TABLE 2
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-Ai
AUXILARY BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	ASPECT (H/D)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
852. 50	1. 6600	1. 6400	0. 212	1. 0000	8. 8478	8. 4117	1. 0519	0. 6589
				1. 2500	10. 9133	10. 4646	1. 0429	0. 6515
				1. 5000	12. 9819	12. 5247	1. 0365	0. 6466
			0. 500	1. 0000	8. 8816	8. 4452	1. 0517	0. 6587
				1. 2500	10. 9404	10. 4915	1. 0428	0. 6514
				1. 5000	13. 0046	12. 5473	1. 0364	0. 6465
			1. 000	1. 0000	9. 0040	8. 5667	1. 0510	0. 6582
				1. 2500	11. 0389	10. 5896	1. 0424	0. 6512
				1. 5000	13. 0869	12. 6293	1. 0362	0. 6464
			1. 500	1. 0000	9. 2042	8. 7654	1. 0501	0. 6574
				1. 2500	11. 2011	10. 7510	1. 0419	0. 6507
				1. 5000	13. 2230	12. 7650	1. 0359	0. 6461
			2. 389	1. 0000	9. 7352	9. 2930	1. 0476	0. 6553
				1. 2500	11. 6373	11. 1853	1. 0404	0. 6496
				1. 5000	13. 5921	13. 1329	1. 0350	0. 6454
831. 50	1. 2200	1. 5800	0. 212	1. 0000	6. 6564	6. 2403	1. 0667	0. 4957
				1. 2500	8. 1702	7. 7377	1. 0559	0. 4878
				1. 5000	9. 6877	9. 2441	1. 0480	0. 4825
			0. 500	1. 0000	6. 6811	6. 2647	1. 0665	0. 4955
				1. 2500	8. 1900	7. 7574	1. 0558	0. 4877
				1. 5000	9. 7043	9. 2606	1. 0479	0. 4825
			1. 000	1. 0000	6. 7708	6. 3531	1. 0657	0. 4950
				1. 2500	8. 2623	7. 8290	1. 0553	0. 4874
				1. 5000	9. 7647	9. 3207	1. 0476	0. 4823
			1. 500	1. 0000	6. 9174	6. 4979	1. 0646	0. 4940
				1. 2500	8. 3812	7. 9469	1. 0546	0. 4869
				1. 5000	9. 8646	9. 4200	1. 0472	0. 4820
			2. 389	1. 0000	7. 3065	6. 8825	1. 0616	0. 4918
				1. 2500	8. 7012	8. 2644	1. 0529	0. 4857
				1. 5000	10. 1354	9. 6892	1. 0460	0. 4813
810. 50	0. 7100	1. 4800	0. 212	1. 0000	4. 1294	3. 7633	1. 0973	0. 3075
				1. 2500	5. 0013	4. 6100	1. 0849	0. 2986
				1. 5000	5. 8783	5. 4695	1. 0747	0. 2928
			0. 500	1. 0000	4. 1436	3. 7771	1. 0971	0. 3073
				1. 2500	5. 0128	4. 6212	1. 0847	0. 2985
				1. 5000	5. 8879	5. 4790	1. 0746	0. 2927
			1. 000	1. 0000	4. 1952	3. 8268	1. 0963	0. 3067
				1. 2500	5. 0545	4. 6619	1. 0842	0. 2982
				1. 5000	5. 9229	5. 5134	1. 0743	0. 2925
			1. 500	1. 0000	4. 2795	3. 9082	1. 0950	0. 3056
				1. 2500	5. 1231	4. 7290	1. 0833	0. 2976
				1. 5000	5. 9006	5. 5702	1. 0737	0. 2922
			2. 389	1. 0000	4. 5034	4. 1252	1. 0917	0. 3031
				1. 2500	5. 3079	4. 9098	1. 0811	0. 2963
				1. 5000	6. 1374	5. 7245	1. 0721	0. 2914

TABLE 2
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-Ai
AUXILARY BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	ASPECT (H/D)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
790.50	0.5300	1.3400	0.212	1.0000	3.2357	2.8990	1.1162	0.2410
				1.2500	3.8814	3.5149	1.1043	0.2317
				1.5000	4.5326	4.1451	1.0935	0.2258
			0.500	1.0000	3.2462	2.9089	1.1160	0.2408
				1.2500	3.8900	3.5230	1.1041	0.2316
				1.5000	4.5398	4.1521	1.0934	0.2257
			1.000	1.0000	3.2843	2.9449	1.1153	0.2401
				1.2500	3.9209	3.5528	1.1036	0.2313
				1.5000	4.5658	4.1774	1.0930	0.2255
			1.500	1.0000	3.3467	3.0039	1.1141	0.2390
				1.2500	3.9718	3.6019	1.1027	0.2307
				1.5000	4.6087	4.2192	1.0923	0.2252
			2.389	1.0000	3.5124	3.1614	1.1110	0.2364
				1.2500	4.1090	3.7343	1.1003	0.2294
				1.5000	4.7252	4.3327	1.0906	0.2244

TABLE 2
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-Ai
FUEL BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	ASPECT (H/D)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
918.00	2.3000	0.9800	0.212	1.0000	12.0208	11.5528	1.0405	0.8952
				1.2500	14.8916	14.4173	1.0329	0.8890
				1.5000	17.7639	17.2853	1.0277	0.8848
			0.500	1.0000	12.0677	11.5997	1.0404	0.8950
				1.2500	14.9292	14.4549	1.0328	0.8890
				1.5000	17.7952	17.3166	1.0276	0.8847
			1.000	1.0000	12.2380	11.7695	1.0398	0.8946
				1.2500	15.0661	14.5915	1.0325	0.8887
				1.5000	17.9096	17.4308	1.0275	0.8846
			1.500	1.0000	12.5163	12.0471	1.0390	0.8939
				1.2500	15.2913	14.8163	1.0321	0.8883
				1.5000	18.0984	17.6195	1.0272	0.8844
			2.389	1.0000	13.2547	12.7837	1.0368	0.8922
				1.2500	15.8972	15.4212	1.0309	0.8874
				1.5000	18.6106	18.1310	1.0265	0.8837
899.50	2.0200	1.0200	0.212	1.0000	10.6219	10.1594	1.0455	0.7910
				1.2500	13.1426	12.6726	1.0371	0.7846
				1.5000	15.6646	15.1897	1.0313	0.7802
			0.500	1.0000	10.6632	10.2005	1.0454	0.7909
				1.2500	13.1756	12.7055	1.0370	0.7845
				1.5000	15.6922	15.2172	1.0312	0.7802
			1.000	1.0000	10.8126	10.3494	1.0448	0.7904
				1.2500	13.2957	12.8254	1.0367	0.7843
				1.5000	15.7926	15.3174	1.0310	0.7800
			1.500	1.0000	11.0570	10.5930	1.0438	0.7897
				1.2500	13.4935	13.0227	1.0362	0.7839
				1.5000	15.9584	15.4830	1.0307	0.7798
			2.389	1.0000	11.7053	11.2391	1.0415	0.7879
				1.2500	14.0255	13.5536	1.0348	0.7829
				1.5000	16.4082	15.9321	1.0299	0.7792
860.00	1.1400	0.9400	0.212	1.0000	6.2245	5.7870	1.0756	0.4635
				1.2500	7.6446	7.1948	1.0625	0.4564
				1.5000	9.0663	8.6082	1.0532	0.4516
			0.500	1.0000	6.2477	5.8100	1.0753	0.4634
				1.2500	7.6632	7.2133	1.0624	0.4563
				1.5000	9.0819	8.6237	1.0531	0.4515
			1.000	1.0000	6.3319	5.8933	1.0744	0.4629
				1.2500	7.7309	7.2805	1.0619	0.4560
				1.5000	9.1385	8.6800	1.0528	0.4514
			1.500	1.0000	6.4695	6.0295	1.0730	0.4621
				1.2500	7.8424	7.3913	1.0610	0.4556
				1.5000	9.2320	8.7731	1.0523	0.4511
			2.389	1.0000	6.8347	6.3913	1.0694	0.4601
				1.2500	8.1422	7.6892	1.0589	0.4545
				1.5000	9.4856	9.0256	1.0510	0.4504

TABLE 2
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-Ai
FUEL BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (H/L)	ASPECT (H/D)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
841.00	0.9700	0.9800	0.212	1.0000	5.3743	4.9445	1.0869	0.4002
				1.2500	6.5819	6.1384	1.0723	0.3929
				1.5000	7.7912	7.3384	1.0617	0.3881
			0.500	1.0000	5.3940	4.9640	1.0866	0.4001
				1.2500	6.5978	6.1541	1.0721	0.3929
				1.5000	7.8044	7.3515	1.0616	0.3880
			1.000	1.0000	5.4656	5.0346	1.0856	0.3995
				1.2500	6.6554	6.2112	1.0715	0.3926
				1.5000	7.8526	7.3993	1.0613	0.3879
			1.500	1.0000	5.5826	5.1501	1.0840	0.3987
				1.2500	6.7502	6.3051	1.0706	0.3921
				1.5000	7.9321	7.4784	1.0607	0.3876
			2.389	1.0000	5.8932	5.4567	1.0800	0.3967
				1.2500	7.0052	6.5580	1.0682	0.3910
				1.5000	8.1478	7.6928	1.0591	0.3869
825.00	0.8400	0.8400	0.212	1.0000	4.7247	4.3033	1.0979	0.3518
				1.2500	5.7698	5.3330	1.0819	0.3445
				1.5000	6.8165	6.3693	1.0702	0.3395
			0.500	1.0000	4.7418	4.3200	1.0976	0.3517
				1.2500	5.7835	5.3465	1.0817	0.3444
				1.5000	6.8279	6.3807	1.0701	0.3395
			1.000	1.0000	4.8037	4.3809	1.0965	0.3512
				1.2500	5.8333	5.3958	1.0811	0.3441
				1.5000	6.8696	6.4220	1.0697	0.3393
			1.500	1.0000	4.9050	4.4804	1.0948	0.3503
				1.2500	5.9154	5.4769	1.0801	0.3437
				1.5000	6.9385	6.4903	1.0691	0.3390
			2.389	1.0000	5.1737	4.7448	1.0904	0.3483
				1.2500	6.1361	5.6953	1.0774	0.3425
				1.5000	7.1252	6.6756	1.0674	0.3383
810.50	0.7200	0.7600	0.212	1.0000	4.1232	3.7091	1.1116	0.3070
				1.2500	5.0186	4.5878	1.0939	0.2996
				1.5000	5.9155	5.4734	1.0808	0.2946
			0.500	1.0000	4.1379	3.7234	1.1113	0.3069
				1.2500	5.0303	4.5993	1.0937	0.2995
				1.5000	5.9253	5.4831	1.0807	0.2946
			1.000	1.0000	4.1909	3.7753	1.1101	0.3064
				1.2500	5.0731	4.6414	1.0930	0.2993
				1.5000	5.9610	5.5184	1.0802	0.2944
			1.500	1.0000	4.2777	3.8602	1.1082	0.3055
				1.2500	5.1434	4.7107	1.0918	0.2988
				1.5000	6.0200	5.5768	1.0795	0.2942
			2.389	1.0000	4.5079	4.0857	1.1033	0.3034
				1.2500	5.3325	4.8973	1.0889	0.2977
				1.5000	6.1801	5.7352	1.0776	0.2935

TABLE 2

**COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASES L-Ai**

NOTES:

1. ACCEL(HOR.):   Peak horizontal spectral acceleration

2. ACCEL(VER.):   Peak vertical spectral acceleration

3. ASPECT(H/L):   Ratio of frame height to width

4. ASPECT(H/D):   Slope of longitudinal brace

5. RAE(EXACT):   Reaction for a unit load using the 'EXACT'
                       Method of Seismic Load Combination

6. RAS(SIMP.):   Reaction for a unit load using the 'SIMPLIFIED'
                       Method of Seismic Load Combination

7. RATIO(RAE/RAS):   Ratio of reactions from 'EXACT' and 'SIMPLIFIED'
                       Methods

8. RAD: Reaction for a unit load using the 'SIMPLIFIED'
                       Method with the design acceleration values of
                       2.67g horizontal and 1.67g vertical

9. RATIO(RAE/RAD):   Ratio of reaction of 'EXACT' Method to the deisgn
                       reactions

TABLE 3
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASE SP-7
SAFEGUARDS BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (L/B)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
896.50	2.2830	1.5000	0.4000	1.6896	1.5176	1.1133	0.9883
			0.8000	2.4562	2.3028	1.0666	0.9751
			1.0000	2.8849	2.7483	1.0497	0.9664
			2.0000	5.2098	5.1286	1.0158	0.9465
			3.0000	7.6425	7.5864	1.0074	0.9411
			4.0000	10.1076	10.0649	1.0042	0.9391
			5.2500	13.2073	13.1745	1.0025	0.9380
873.50	2.0790	1.6370	0.4000	1.6285	1.4809	1.0997	0.9526
			0.8000	2.4720	2.3518	1.0511	0.9814
			1.0000	2.9392	2.8345	1.0369	0.9846
			2.0000	5.4351	5.3755	1.0111	0.9874
			3.0000	8.0198	7.9790	1.0051	0.9876
			4.0000	10.6300	10.5991	1.0029	0.9876
			5.2500	13.9069	13.8832	1.0017	0.9876
852.50	1.6050	1.4580	0.4000	1.3920	1.2691	1.0968	0.8142
			0.8000	2.2158	2.1238	1.0433	0.8797
			1.0000	2.6643	2.5857	1.0304	0.8925
			2.0000	5.0244	4.9811	1.0087	0.9128
			3.0000	7.4470	7.4175	1.0040	0.9171
			4.0000	9.8870	9.8647	1.0023	0.9186
			5.2500	12.9465	12.9294	1.0013	0.9194
831.50	1.1410	1.3000	0.4000	1.1719	1.0825	1.0826	0.6855
			0.8000	1.9862	1.9264	1.0310	0.7885
			1.0000	2.4197	2.3697	1.0211	0.8106
			2.0000	4.6619	4.6352	1.0057	0.8469
			3.0000	6.9415	6.9235	1.0026	0.8548
			4.0000	9.2312	9.2177	1.0015	0.8577
			5.2500	12.0988	12.0885	1.0009	0.8592
810.50	0.7010	1.2600	0.4000	1.0139	0.9696	1.0457	0.5930
			0.8000	1.8672	1.8417	1.0139	0.7413
			1.0000	2.3078	2.2870	1.0091	0.7731
			2.0000	4.5443	4.5336	1.0024	0.8256
			3.0000	6.7962	6.7891	1.0011	0.8369
			4.0000	9.0522	9.0468	1.0006	0.8410
			5.2500	11.8743	11.8702	1.0003	0.8433
790.50	0.4290	1.0490	0.4000	0.8712	0.8472	1.0284	0.5096
			0.8000	1.6662	1.6532	1.0079	0.6615
			1.0000	2.0707	2.0602	1.0051	0.6937
			2.0000	4.1089	4.1036	1.0013	0.7465
			3.0000	6.1543	6.1507	1.0006	0.7579
			4.0000	8.2015	8.1988	1.0003	0.7620
			5.2500	10.7614	10.7594	1.0002	0.7643

TABLE 3
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASE SP-7
SAFEGUARDS BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (L/B)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
785.50	0.3920	1.0170	0.4000	0.8516	0.8303	1.0256	0.4981
			0.8000	1.6369	1.6255	1.0070	0.6498
			1.0000	2.0357	2.0265	1.0045	0.6819
			2.0000	4.0434	4.0388	1.0012	0.7346
			3.0000	6.0573	6.0542	1.0005	0.7459
			4.0000	8.0727	8.0704	1.0003	0.7500
			5.2500	10.5928	10.5911	1.0002	0.7523
773.50	0.3270	0.9490	0.4000	0.8133	0.7966	1.0210	0.4757
			0.8000	1.5766	1.5677	1.0056	0.6259
			1.0000	1.9630	1.9558	1.0036	0.6576
			2.0000	3.9050	3.9014	1.0009	0.7094
			3.0000	5.8517	5.8493	1.0004	0.7206
			4.0000	7.7995	7.7977	1.0002	0.7247
			5.2500	10.2349	10.2336	1.0001	0.7269

TABLE 3
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASE SP-7
ELECTRICAL BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (L/B)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
873.33	1.7900	1.3200	0.4000	1.4391	1.2893	1.1162	0.8418
			0.8000	2.1843	2.0605	1.0600	0.8672
			1.0000	2.5948	2.4866	1.0435	0.8692
			2.0000	4.7876	4.7255	1.0131	0.8698
			3.0000	7.0599	7.0173	1.0061	0.8694
			4.0000	9.3553	9.3231	1.0035	0.8692
			5.2500	12.2376	12.2128	1.0020	0.8691
854.33	1.5700	1.3100	0.4000	1.3438	1.2124	1.1084	0.7860
			0.8000	2.1094	2.0078	1.0506	0.8374
			1.0000	2.5272	2.4397	1.0358	0.8466
			2.0000	4.7351	4.6862	1.0104	0.8602
			3.0000	7.0076	6.9743	1.0048	0.8630
			4.0000	9.2985	9.2733	1.0027	0.8639
			5.2500	12.1722	12.1529	1.0016	0.8644
830.00	1.1100	1.2200	0.4000	1.1390	1.0472	1.0877	0.6662
			0.8000	1.9228	1.8607	1.0334	0.7633
			1.0000	2.3403	2.2883	1.0227	0.7840
			2.0000	4.5023	4.4746	1.0062	0.8180
			3.0000	6.7018	6.6831	1.0028	0.8253
			4.0000	8.9115	8.8973	1.0016	0.8280
			5.2500	11.6790	11.6682	1.0009	0.8294
807.00	0.7200	1.2600	0.4000	1.0194	0.9730	1.0476	0.5962
			0.8000	1.8704	1.8435	1.0146	0.7425
			1.0000	2.3104	2.2885	1.0096	0.7740
			2.0000	4.5456	4.5343	1.0025	0.8258
			3.0000	6.7971	6.7895	1.0011	0.8370
			4.0000	9.0528	9.0472	1.0006	0.8411
			5.2500	11.8748	11.8705	1.0004	0.8433
778.00	0.5100	1.2600	0.4000	0.9648	0.9393	1.0272	0.5644
			0.8000	1.8398	1.8259	1.0076	0.7304
			1.0000	2.2855	2.2743	1.0049	0.7656
			2.0000	4.5329	4.5272	1.0013	0.8235
			3.0000	6.7886	6.7848	1.0006	0.8360
			4.0000	9.0464	9.0436	1.0003	0.8405
			5.2500	11.8699	11.8677	1.0002	0.8430

TABLE 3
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASE SP-7
AUXILARY BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (L/B)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
899.50	2.6600	1.7100	0.4000	1.8956	1.7158	1.1048	1.1088
			0.8000	2.7080	2.5434	1.0647	1.0751
			1.0000	3.1663	3.0188	1.0489	1.0607
			2.0000	5.6695	5.5808	1.0159	1.0300
			3.0000	8.2996	8.2381	1.0075	1.0221
			4.0000	10.9681	10.9213	1.0043	1.0190
			5.2500	14.3255	14.2895	1.0025	1.0174
886.50	2.3200	1.6300	0.4000	1.7307	1.5660	1.1052	1.0123
			0.8000	2.5453	2.4026	1.0594	1.0105
			1.0000	3.0006	2.8745	1.0439	1.0052
			2.0000	5.4602	5.3864	1.0137	0.9920
			3.0000	8.0257	7.9748	1.0064	0.9883
			4.0000	10.6224	10.5838	1.0036	0.9869
			5.2500	13.8858	13.8561	1.0021	0.9861
873.50	1.9800	1.6600	0.4000	1.5921	1.4533	1.0954	0.9312
			0.8000	2.4564	2.3470	1.0466	0.9752
			1.0000	2.9328	2.8383	1.0333	0.9825
			2.0000	5.4645	5.4113	1.0098	0.9928
			3.0000	8.0774	8.0412	1.0045	0.9947
			4.0000	10.7134	10.6860	1.0026	0.9954
			5.2500	14.0210	14.0000	1.0015	0.9957
852.50	1.6600	1.6400	0.4000	1.4579	1.3431	1.0855	0.8528
			0.8000	2.3525	2.2692	1.0367	0.9339
			1.0000	2.8381	2.7674	1.0255	0.9507
			2.0000	5.3834	5.3448	1.0072	0.9780
			3.0000	7.9895	7.9634	1.0033	0.9839
			4.0000	10.6123	10.5926	1.0019	0.9860
			5.2500	13.8999	13.8848	1.0011	0.9871
831.50	1.2200	1.5800	0.4000	1.2784	1.1988	1.0664	0.7477
			0.8000	2.2035	2.1523	1.0238	0.8748
			1.0000	2.6937	2.6511	1.0160	0.9024
			2.0000	5.2183	5.1959	1.0043	0.9480
			3.0000	7.7791	7.7640	1.0019	0.9580
			4.0000	10.3494	10.3380	1.0011	0.9616
			5.2500	13.5674	13.5587	1.0006	0.9635
810.50	0.7100	1.4800	0.4000	1.0903	1.0536	1.0348	0.6377
			0.8000	2.0361	2.0155	1.0102	0.8083
			1.0000	2.5220	2.5053	1.0067	0.8448
			2.0000	4.9812	4.9727	1.0017	0.9050
			3.0000	7.4542	7.4485	1.0008	0.9179
			4.0000	9.9306	9.9263	1.0004	0.9227
			5.2500	13.0281	13.0248	1.0003	0.9252

TABLE 3
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASE SP-7
AUXILARY BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (L/B)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
790.50	0.5300	1.3400	0.4000	0.9979	0.9728	1.0258	0.5837
			0.8000	1.9043	1.8907	1.0072	0.7560
			1.0000	2.3660	2.3550	1.0047	0.7926
			2.0000	4.6931	4.6875	1.0012	0.8526
			3.0000	7.0287	7.0250	1.0005	0.8656
			4.0000	9.3665	9.3638	1.0003	0.8702
			5.2500	12.2900	12.2879	1.0002	0.8728

TABLE 3
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASE SP-7
AUXILARY BUILDING ACCELERATIONS

TABLE 3

COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASE SP-7
FUEL BUILDING ACCELERATIONS

ELEV. (FT.)	ACCEL. (HOR.)	ACCEL. (VER.)	ASPECT (L/B)	RAE (EXACT)	RAS (SIMP.)	RATIO (RAE/RAS)	RATIO (RAE/RAD)
918.00	2.3000	0.9800	0.4000	1.6150	1.3963	1.1566	0.9446
			0.8000	2.1918	1.9574	1.1197	0.8702
			1.0000	2.5109	2.2897	1.0966	0.8411
			2.0000	4.2725	4.1236	1.0361	0.7762
			3.0000	6.1569	6.0503	1.0176	0.7582
			4.0000	8.0852	8.0031	1.0103	0.7512
			5.2500	10.5220	10.4584	1.0061	0.7472
899.50	2.0200	1.0200	0.4000	1.4893	1.2934	1.1514	0.8711
			0.8000	2.0984	1.9057	1.1012	0.8331
			1.0000	2.4354	2.2584	1.0784	0.8157
			2.0000	4.2763	4.1643	1.0269	0.7769
			3.0000	6.2224	6.1436	1.0128	0.7663
			4.0000	8.2032	8.1429	1.0074	0.7622
			5.2500	10.6994	10.6530	1.0044	0.7599
860.00	1.1400	0.9400	0.4000	1.0828	0.9628	1.1246	0.6334
			0.8000	1.7436	1.6534	1.0546	0.6922
			1.0000	2.0993	2.0220	1.0382	0.7033
			2.0000	3.9645	3.9216	1.0109	0.7203
			3.0000	5.8770	5.8478	1.0050	0.7237
			4.0000	7.8030	7.7809	1.0028	0.7250
			5.2500	10.2178	10.2009	1.0017	0.7256
841.00	0.9700	0.8800	0.4000	0.9993	0.8948	1.1167	0.5845
			0.8000	1.6549	1.5803	1.0472	0.6570
			1.0000	2.0048	1.9416	1.0326	0.6716
			2.0000	3.8256	3.7912	1.0091	0.6950
			3.0000	5.6842	5.6608	1.0041	0.7000
			4.0000	7.5533	7.5356	1.0023	0.7018
			5.2500	9.8954	9.8819	1.0014	0.7028
825.00	0.8400	0.8400	0.4000	0.9379	0.8474	1.1067	0.5486
			0.8000	1.5925	1.5307	1.0403	0.6322
			1.0000	1.9391	1.8873	1.0275	0.6496
			2.0000	3.7317	3.7039	1.0075	0.6780
			3.0000	5.5548	5.5360	1.0034	0.6840
			4.0000	7.3861	7.3720	1.0019	0.6862
			5.2500	9.6800	9.6691	1.0011	0.6875
810.50	0.7200	0.7600	0.4000	0.8712	0.7907	1.1018	0.5096
			0.8000	1.5066	1.4533	1.0367	0.5981
			1.0000	1.8410	1.7964	1.0248	0.6167
			2.0000	3.5620	3.5384	1.0067	0.6471
			3.0000	5.3082	5.2923	1.0030	0.6537
			4.0000	7.0612	7.0492	1.0017	0.6561
			5.2500	9.2562	9.2470	1.0010	0.6574

TABLE 3
COMPARISON OF SIMPLIFIED AND EXACT METHODS OF SEISMIC LOAD COMBINATION
FOR HANGER CASE SP-7

NOTES:

1. ACCEL(HOR.):   Peak horizontal spectral acceleration

2. ACCEL(VER.):   Peak vertical spectral acceleration

3. ASPECT(H/L):   Ratio of frame height to width

4. RAE(EXACT):   Reaction for a unit load using the 'EXACT' Method of Seismic Load Combination

5. RAS(SIMP.):   Reaction for a unit load using the 'SIMPLIFIED' Method of Seismic Load Combination

6. RATIO(RAE/RAS): Ratio of reactions from 'EXACT' and 'SIMPLIFIED' Methods

7. RAD: Reaction for a unit load using the 'SIMPLIFIED' Method with the design acceleration values of 2.67g horizontal and 1.67g vertical

8. RATIO(RAE/RAD): Ratio of reaction of 'EXACT' Method to the deisgn reactions