Conceptual Design Report

NUCLEAR MATERIALS STORAGE FACILITY RENOVATION

Part V - Structural / Seismic Investigation
**Section B Renovation Calculations/
Supporting Data**

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JULY 14, 1995

CONCEPTUAL DESIGN REPORT

LA-UR96-1

FOR

LINE ITEM PROJECT

NUCLEAR MATERIALS STORAGE FACILITY RENOVATION

AT THE

LOS ALAMOS NATIONAL LABORATORY

Project Identification Number 11818

Technical Area 55

Building PF-41

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DESIGN/BUILD ACQUISITION STRATEGY

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C.	ESCALATION ANALYSIS	C
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I. DETAILED CONSTRUCTION ANALYSIS

I

SUPPORTING INFORMATION

**ICF KAISER
ENGINEERS**

**STRUCTURAL EVALUATION OF NMSF FACILITY AT LANL
JOB 41552**

No. of
Sheets
1 of 473

DESIGN CALCULATION INDEX/COVER SHEET

CALC. NO.
S-0002

TITLE: **STRUCTURAL EVALUATION OF NMSF FACILITY
RENOVATION OPTION (1) & OPTION (2)**

CALCULATION DESCRIPTION:

TASK/WORK PACKAGE:

REVISION RECORD

△			ORIGINATOR	<u>B. Mesalada</u>	<u>1/3/7/95</u>
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STATUS: <u>Preliminary*</u>		Final	Void*		Superseded*
*BASIS:					
△			ORIGINATOR		
			CHECKER		
			APPROVER		
STATUS: Preliminary*		Final	Void*		Superseded*
*BASIS:					
△			ORIGINATOR		
			CHECKER		
			APPROVER		
STATUS: Preliminary*		Final	Void*		Superseded*
*BASIS:					

RELATED DCNs

DCN	DATE	DCN	DATE	DCN	DATE

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LANL

EVALUATION OF NMSF FACILITY AT LANL

Modification Option (1).

DESIGNED BY B.M.

DATE 3/10/95

CHECKED BY JC

DATE 3/10/95

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NOTES :

SEE COMPUTER OUTPUT BINDERS "C", "D", and "E"
ASSOCIATED WITH THIS CALCULATION.

EVALUATION OF NMSF FACILITY AT LANL

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1.0 INTRODUCTION

1.0 INTRODUCTION

The NMSF building consists of a two story storage area and a single story section including mechanical and administration area. The 1st floor of the storage area continues on grade to form the administration building, See figure 1. The basement of the storage building is buried in the soil. The 1st floor walls of the storage area is also completely embedded on east side, north side and south side of the building.

This calculation documents the details of the analysis procedure and structural evaluation of the renovated (With modification Option 1) NMSF building in accordance with the LANL, DOE and associated industry standard design codes (1,2,3,4). For a complete presentation of the evaluation criteria and presentation of the summary of evaluation results refer to the report titled:

"Structural Evaluation of the NMSF Building at LANL , Volume I - Report"

1.1 DESCRIPTION OF STRUCTURAL MODIFICATIONS

The proposed modifications to the As-Built structure of the NMSF Facility Includes but is not limited to the following major items:

- 1) The 1st floor slab between lines 1 and 3 is removed.
- 2) A New deck, 30 inches thick charge deck is added at about 3 feet below the existing 1st floor level between lines 1 and 2.
- 3) North/South wall on line 1.5 in the basement is removed.
- 4) The existing Mezzanine slab between lines A and B is removed.
- 5) A new Mezzanine level at 10 feet above the basement slab is added between lines 2 and 3.
- 6) New 1.5 feet thick concrete Shielding walls are added below charge deck at lines 1 and 2. These walls are added to existing 1.5 feet thick and 1 foot thick walls at these locations, respectively.

EVALUATION OF NMSF FACILITY AT LANL

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- 7) Two additional 1.5' thick walls are proposed to be added in north-south direction between the basement floor and the charge deck. These walls (15) were not included in the 3-d SAP90 (10) model to save time. The impact of these additional walls is increase in rigidity and strength of the lateral load resisting system of the NMSF building in north/south direction. Omission of these walls from analytical models is conservative.

The impact of these loads are however accounted for in thermal analysis presented in section 6.0 of this calculation.

EVALUATION OF NMSF FACILITY AT LANL

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CHECKED BY SV DATE 3/10/95**2.0 LIST OF REFERENCES**

- (1) Los Alamos Facilities Engineering Standard- Structural
- (2) "Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities", DOE Standard DOE-STD-1020-94, April 1994.
- (3) "Minimum Design Loads for Buildings and Other Structures", ASCE Standard ASCE-7.
- (4) Uniform Building Code (UBC), 1991 edition.
- (5) Dames & Moor Geotechnical report , 1972
- (6) EPRI Report NP-6041-SL Rev 1.
- (7) Soil Dynamics, By Shamsheer Parkash
- (8) "Seismic Analysis of Safety-Related Nuclear Structures and Commentary on Standard for Seismic Analysis of Safety Related Nuclear Structures", ASCE Standard ASCE-4-86, September 1986.
- (9) Nuclear Regulatory Guide NUREG-098
- (10) "A Series of Computer Programs for Static and Dynamic Finite Element Analysis of Structures", SAP90 User's Manual, Computers and Structures, Inc., Berkeley , California.
- (11) Soil-Structure-Interaction in Time Domain, by Wolf.
- (12) Burns and Roe Drawings

DOE DRG. NO.: LA-ZJ-B.A.1 Through LA-ZJ-B.A.25
and
DOE DRG NO.: LA-ZJ-B.S.1 Through LA-ZJ-B.S.11
- (13) ICF KAISER Preliminary (0%) Architectural drawings of NMSF Facility, Sheets A1 to A5, Received by Oakland/KAISER Office on Jan 13, 1995.
- (14) "Advanced Value Engineering Study for NMSF at LANL", Volume II (PART G): Supporting Data," Prepared by ICF Kaiser Engineering and University of California Los Alamos National Laboratory, October 6, 1994.

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- (15) Marked up Preliminary (0%) ICF Kaiser Architectural drawing Sheet A2. Transmitted to Oakland Office of ICF Kaiser on Feb. 12, 1995.
- (16) Notes from Thad Knight of LANL to Pepe Vellenas of ICF Kaiser, Dated
- (17) "Condition Survey of Nuclear Materials Storage Facility, Los Alamos Laboratory, Los Alamos, New Mexico", By Construction Technology Laboratory, Inc, January 1995.
- (18) "Seismic Evaluation of NMSF Facility, Volume I - Report, DRAFT", Draft Report Prepared by ICF Kaiser Engineering Inc., March 1995.
- (19) "Seismic Evaluation of NMSF Facility at LANL- As Built Condition", ICF Engineering Calculation no. S-001, Project No. 41552, March 1995.

THE REFERENCES PROVIDED HERE
ARE FOR INFORMATION ONLY.

A COMPLETE LIST CAN
BE FOUND IN PART V, SECTION
A, PRELIMINARY REPORT, WHICH
CONTAINS MORE COMPLETE
CITATIONS.

EVALUATION OF NMSF FACILITY AT LANL

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3.0 SCOPE OF EVALUATION

A preliminary evaluation of the exterior walls are first performed using a simple two-dimensional analysis of typical sections of the perimeter walls, subjected to lateral soil pressures due to earthquakes. In this evaluation the out-of-plane bending and shear demand on the walls are estimated and compared with corresponding capacities. The results from this evaluation is presented in section 4.0 of this calculation.

A three dimensional dynamic analysis of the Modified structure of the NMSF building is performed using Computer program SAP90 (10). The finite element model used in evaluation of as-built NMSF building was modified to incorporate the proposed structural changes described in section 1.1 of this calculation. The detail of model modifications and associated calculations are presented in section 5.1 of this calculations.

The finite element model includes the soil-structure-interaction effects using a lumped mass approach per guidelines of ASCE 4-86(8). The static and dynamic lateral soil pressure on the embedded perimeter walls are included as equivalent static loads in the 3-dimensional model. The accidental torsional effects are accounted for by imposing a deliberate additional 5% eccentricity of floor masses. A frequency analysis of the model was performed to compute natural frequency and mode shapes of the modified NMSF Building. The results of frequency analysis is presented in section 5.2.

Response spectrum analysis is performed using 5% damped NUREG-98 (9) acceleration response spectrum applied in three orthogonal directions simultaneously. The magnitude of the vertical components of the earthquake is assumed to be 2/3 of the horizontal component. The peak ground acceleration of 0.3g is used in these analysis. The structural modal damping used in response spectrum analysis is assumed to be equal to 7% of the critical damping. In addition to dynamic loads the NMSF building is also evaluated for UBC code specified static load combinations including dead, live and soil pressure loads. The In-Plane shears and out-of-plane moments for the critical wall segments are summarized and compared to their capacities to obtain Demand/Capacity (D/C) ratios in sections 7.0 of this calculations.

Thermal stress analysis of the concrete walls surrounding the proposed nuclear material storage area in the basement of NMSF facility was also performed as part of the current evaluation. In this evaluation thermal gradients of 20 and 40 degrees of are assumed for the west and east walls and the charge deck per recommendations from LANL Staff (16). A future heat transfer analysis is needed to determine a more accurate estimate of the thermal gradient through the concrete walls during operation and accidental failure of the proposed passive cooling system of the storage area. The results from this analysis is presented in section 6.0 of this calculation.

EVALUATION OF NMSF FACILITY AT LANL

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The Capacity of the structural components of the NMSF Structure is calculated based on ultimate capacity of reinforced concrete structures using provisions of Chapter 26 of UBC (4).

The Engineering drawings of the NMSF building used in this evaluation were those generated by Burns and Roe (12), and ICF Kaiser drawings (13,15).

A structural evaluation of the existing precast roof of the administrative area of NMSF facility is performed for loads due to proposed additional thickness to 8". The Calculations for this task is presented in section 8.2.

A Structural evaluation of the proposed Penthouse for HVAC equipment is also performed and presented in section 8.2 of this calculation.

A structural evaluation of the interaction between the buried access tunnel and the NMSF structure is performed for earthquake loads. The calculations for this study is presented in section 8.3.

EVALUATION OF NMSF FACILITY AT LANL

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Modification Option (1).

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4.0 2-DIMENSIONAL ANALYSIS OF EXTERIOR WALLS

The purpose of this analysis was to perform a preliminary evaluation of the exterior walls of the NMSF building that are buried in the ground and/or are backfilled with soil on for sides of the western portion of the building.

In this analysis a 1 foot slice of the typical walls are modeled using beam elements of Computer program SAP90. The loadings consist of static and dynamic soil pressures. The dynamic soil pressure is estimated using Mononobe-Okabe Formulas from reference provided by reference (6,7,8) using a PGA of equal to 0.3g.

A summary of computed demands and capacities of different walls are tabulated on next page. The results indicate that the all exterior walls have adequate strength to withstand the lateral soil pressure caused by the postulated DBE earthquake except the wall at the west side of the building which shows significant overstress between the charge deck and roof elevations.

The 2-dimensional analysis is conservative because it ignores the 3-dimensional response of the wall to lateral loads and also can not account for the support of newly added buttress along the height of the west wall. A more realistic D/C ratios results from three dimensional analysis of the NMSF building, described next.

Evaluation of NMSP @ LANC
OPTION (1) Mod.

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DATE 3/10/95

CHECKED BY JV

DATE 3/10/95

EVALUATION OF MODIFICATION OPTION 1

REF :

EVALUATION OF NMSF CAPACITY @ LAUL DESIGNED BY: B. Mousaddad
 Mod = option (1) CHECKED BY: TC

DATE: 3-6-95
DATE: 3/10/95

SUMMARY OF DEMAND/CAPACITY RATIO CALCULATIONS (*) (OPTION 1)

WALL SECTION	UNITS (KIPS,IN)	LC1	LC2	LC3	LC4	(&) CAPACITY	MAX D/C
=====						=====	=====
WEST WALL							
Basement	MOM(+)	727	775	538	587	1395	0.56
	MOM(-)	146	89	207	149	1395	0.15
	SHEAR	15.4	14.6	13.7	12.9	21.3	0.72
1st Floor	MOM(+)	727	775	538	587	781	0.99
	MOM(-)	530	629	315	414	317	1.98
	SHEAR	18.5	19.7	13.4	14.6	18.7	1.05
EAST WALL							
1st Floor	MOM(+)	271	264	239	232	687	0.39
	MOM(-)	149	153	116	121	687	0.22
	SHEAR	6.7	6.1	6.9	6.3	21.3	0.32
SOUTH WALL							
Basement	MOM(+)	727	775	538	587	2347	0.33
	MOM(-)	146	89	207	149	2779	0.07
	SHEAR	15.4	14.6	13.7	12.9	21.3	0.72
1st Floor	MOM(+)	727	775	538	587	1012	0.77
	MOM(-)	530	629	315	414	530	1.19
	SHEAR	18.5	19.7	13.4	14.6	21.3	0.92
=====							
LC1 =	S1 + D1 + I + Q			S1: Trapezoidal Static Soil Pressure			
LC2 =	S1 + D2 + I + Q			S2: Triangular Static Soil Pressure			
LC3 =	S2 + D1 + I + Q			D1: Uniform Dynamic soil Pressure			
LC4 =	S2 + D2 + I + Q			D2: Inv. Triangular Dynamic soil Pressure			

(*) - Reference SAP90 Runs: WEST4, EAST2

(&) – As Built Wall Capacities

D-C11.WK3

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ENGINEERS

(Calc 3-0002, Rev. 0)

JOB NO.

41552-056-03

SHEET 12 OF

DESIGNED BY: B. Mosaddeq

DATE: 3-6-95

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DATE: 3/10/95

OPTION (4) Mod.

SUMMARY OF WALL CAPACITY CALCULATIONS

(OPTION 1)

WALL SECTION		UNITS: (KIPS,IN)				(*)
		Rebar	As	d	a	CAPACITY
=====						
WEST WALL						
Basement	Mu(+)	#10@9	1.693	33	2.49	2904
	Mu(-)	#10@9	1.693	33	2.49	2904
	Vc			33		42.6
1st Floor	Mu(+)	#8@9	1.053	15	1.55	809
	Mu(-)	#5@9	0.413	15	0.61	328
	Vc			15		19.4
EAST WALL						
1st Floor	Mu(+)	#7@9	0.8	33	1.18	1400
	Mu(-)	#7@9	0.8	33	1.18	1400
	Vc			33		42.6
SOUTH WALL						
Basement	Mu(+)	#10@5	3.048	15	4.48	2100
	Mu(-)	#11@5	3.744	15	5.51	2476
	Vc			15		19.4
1st Floor	Mu(+)	#9@10	1.2	15	1.76	915
	Mu(-)	#5@10	0.612	15	0.90	481
	Vc			15		19.4
f'c=		4 ksi		fy=		60 ksi
=====						
Mu = 0.95 * As * fs * (d - a/2) , a=As * fs / (.85*f'c*b)						
Vc = 0.85 * 2 * Sqrt(f'c) * bw * d						

(*) - As Built Wall Capacities

EVAL. of NMSE @ LANL

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DATE 3/15/95

Mod OPTION (1)

LOAD CASES

1) EAST WALL:

$$S1: \quad S1 = 25 H = 25 \times 40.04 = 1001 \text{ lb/ft} = 83 \text{ lb/in}$$

$$S2: \quad S2 = K_a \gamma H$$

$$K_a = 0.3 \quad \text{Corresponds To } \phi = 33^\circ \text{ (Cons.)}$$

$$S2 = 0.3 \times 110 \times 40.04 = 1321 \text{ lb/ft} = 110 \text{ lb/in}$$

$$D1: \quad P_d = 19,840 \text{ lb}$$

$$D1 = 19,840 / 40.04 / 12 = 41.3 \text{ lb/in}$$

$$D2: \quad D2 = 2 \times D1 = 82.6 \text{ lb/in}$$

$$I: \quad \begin{array}{ll} I = 5.6 \text{ lb/in} & \text{basement} \\ I = 5 \text{ lb/in} & \text{1st Floor} \end{array}$$

2) West Wall:

$$S1: \quad S1 = 25 \times 16.58 = 415 \text{ lb/ft} = 35 \text{ lb/in}$$

$$S2: \quad S2 = 0.3 \times 110 \times 16.58 = 547 \text{ lb/ft} = 46 \text{ lb/in}$$

$$D1: \quad P_d = 3402 \text{ lb}$$

$$D1 = 3402 / 16.58 / 12 = 17.1 \text{ lb/in}$$

$$D2: \quad D2 = 2 \times D1 = 34.2 \text{ lb/in}$$

$$I: \quad \text{Same}$$

$$Q: \quad \text{Same}$$

East
Mononobe Okabe Analysis of Typical West Wall Section (Line 3 between B and G) – OPTION 1

Parameter	(units):		(1)	(2)	(3)
Slope of Back of Wall to Vertical (rad):		Beta=	0	0	
Slope of Ground Behind Wall (rad):		i=	0	0	
Angle of Friction – Soil to Wall (rad):		Delta=	0	0	
Internal Angle of Friction – Soil (deg):		Phi=	40	40	
	(rad):	Phi=	0.698	0.698	
Unit Weight of Soil (pcf):		Gamma	110	110	110
Wall Height (ft):		H=	16.58	16.58	16.58
Horizontal Ground Acceleration (g):		Kh=	0.3	0.3	0.3
Vertical Ground Acceleration (g):		Kv=	0.2	-0.2	
chi = atan (Kh/(1-Kv)) (rad):		chi=	0.359	0.245	
Total Soil Pressure (psf):		pae=	677	794	
Static Soil Pressure (psf):		pa=	397	397	
Dynamic Soil Pressure Increment (psf):		pd=	281	397	410
Static Soil Pressure (psf):		ps=	414.5	414.5	414.5
Total Dynamic Force (lb/ft):		Pd=	2328	3295	3402
Total Static Force (lb/ft):		Ps=	5498	5498	5498

- (1) – Mononobe Okabe as represented in ASCE 4-86
 (2) – Mononobe Okabe as represented in "Soil Dynamics, By Prakash", 1981.
 (3) – Dynamic Soil Pressure Increment Given by EPRI Report NP-6041-SL, Rev. 1, App. C

1.01. 5-0002, Rev. 0. 10618-552

5/11/03

West
Mononobe Okabe Analysis of Typical ~~East~~ Wall Section (Line 1 between B and G) – OPTION 1

Parameter	(units):		(1)	(2)	(3)
Slope of Back of Wall to Vertical (rad):	Beta=		0	0	
Slope of Ground Behind Wall (rad):	i=		0	0	
Angle of Friction – Soil to Wall (rad):	Delta=		0	0	
Internal Angle of Friction – Soil (deg):	Phi=		40	40	
	(rad):	Phi=	0.698	0.698	
Unit Weight of Soil (pcf):	Gamma		110	110	110
Wall Height (ft):	H=		40.04	40.04	40.04
Horizontal Ground Acceleration (g):	Kh=		0.3	0.3	0.3
Vertical Ground Acceleration (g):	Kv=		0.2	-0.2	
chi = atan (Kh/(1 - Kv)) (rad):	chi=		0.359	0.245	
Total Soil Pressure (psf):	pae=		1636	1918	
Static Soil Pressure (psf):	pa=		958	958	
Dynamic Soil Pressure Increment (psf):	pd=		678	960	991
Static Soil Pressure (psf):	ps=		1001	1001	1001
Total Dynamic Force (lb/ft):	Pd=		13576	19216	19840
Total Static Force (lb/ft):	Ps=		32064	32064	32064

- (1) – Mononobe Okabe as represented in ASCE 4-86
 (2) – Mononobe Okabe as represented in "Soil Dynamics, By Prakash", 1981.
 (3) – Dynamic Soil Pressure Increment Given by EPRI Report NP-6041-SL, Rev. 1, App. C

Calc. S-0002, Rev. 10, Job # 41553

11/15/86

ANALYSIS OF WEST WALL SECTION - MONONOBE OKABE DYNAMIC SOIL PRESSURE
(WEST41)

REV.	DATE	FILE	DESCRIPTION
C	12- 7-94	B.MOSADDAD	WEST1 ORIGINAL
C	12-09-94	BM	WEST2 ADD TRIANGULAR DYN. PRESSURE
C	12-12-94	BM	WEST3 ADD TRIANGULAR STATIC PRES
C	12-14-94	BM	WEST31 ADD SURCHARGE LOAD (L=6)
C	12-14-94	BM	WEST4 OPTION 1
C	3- 6-95	BM	WEST41 LOWER ROOF TO ORIGINAL LEV

C
SYSTEM
L=6

JOINTS
1 X=0 Y=0 S=12
3 X=0 Y=16.58
5 X=0 Y=35.88
50 X=1 Y=0

RESTRAINTS
1 5 2 R=0,0,1,1,1,0
1 R=1,1,1,1,1,1
3 R=1,0,1,1,1,0
5 R=1,0,1,1,1,0
50 R=1,1,1,1,1,1

FRAME

NM=2 NL=10 NSEC=8
1 SH=R T=18,12 E=3600.
2 SH=R T=16,12 E=3600.
C ----- 0.2*40.04/16.58=0.48 , (.8*40.04-16.58)/23.46=0.66
1 TRAP=0,0,0,-.48,0.083,0,-1.,0.083,0 :STATIC-TRAP BSMNT,S1
2 TRAP=0,0,0.083,0,-.66,0.083,0,-1.,0,0 :STATIC-TARP 1ST FLR,S1
3 WL=0,0,0.0413,0 :DYN. SOIL PRESSURE, UNIFORM, D1
4 WL=0,0,0.0056,0 :INERTIA- BASEMENT, I
5 WL=0,0,0.0050,0 :INERTIA- 1ST FLR, I
C ----- 0.034=0.0826*16.58/40.04
6 TRAP=0,0,0,-1,0.034,0 :DYN SOIL PRESSURE TRIANGULAR BSMNT, D2
7 TRAP=0,0,0.034,0,-1,0.0826,0 :DYN SOIL PRESSURE TRIANGULAR 1ST FLR, D2
C ----- 0.064=0.110*23.43/40.04
8 TRAP=0,0,0.11,0,-1,0.064,0 :STATIC- TRIANGULAR BSMNT
9 TRAP=0,0,0.064,0,-1.,0,0 :STATIC- TRIANGULAR 1ST FLR
C ----- q=250 PSF SURCHARGE, w=ka x q=0.3*0.250/12=0.0063 K/IN
10 WL=0,0,0.0063,0
1 1 3 M=1,1 LP=0,50 NSL=1,3,4,6,8,10
2 3 5 M=2,2 LP=0,50 NSL=2,3,5,7,9,10

COMBO

1 C=1,0,0,0,0,0 :STATIC-TRAP
2 C=0,1,0,0,0,0 :DYNAMIC, UNIF
3 C=0,0,1,0,0,0 :INERTIAL
4 C=0,0,0,1,0,0 :DYNAMIC, TRIANGULAR
5 C=0,0,0,0,1,0 :STATIC-TRIANGULAR
6 C=1,1,1,0,0,1 :LC1 S1 +D1 +I +Q
7 C=1,0,1,1,0,1 :LC2 S1 +D2 +I +Q
8 C=0,1,1,0,1,1 :LC3 S2+ D1 +I +Q
9 C=0,0,1,1,1,1 :LC4 S2+ D2 +I +Q

CSI / SAP90 - - FINITE ELEMENT ANALYSIS OF STRUCTURES PAGE 1
PROGRAM:SAP90/FILE:WEST41.F3F

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE	AXIAL
		SHEAR	MOMENT		SHEAR	TORQ
1						
1	0.000			0.000		
	0.000	-3.326	112.205			
	28.423	-2.975	20.991			
	56.846	-1.922	-50.267			
	85.269	-0.167	-81.613			
	113.691	2.147	-53.963			
	142.114	4.506	40.585			
	170.537	6.865	202.185			
	198.960	9.224	430.837			
	198.960			0.000		
2	0.000			0.000		
	0.000	-3.392	89.307			
	28.423	-2.218	9.587			
	56.846	-1.044	-36.768			
	85.269	0.130	-49.759			
	113.691	1.304	-29.385			
	142.114	2.478	24.353			
	170.537	3.651	111.456			
	198.960	4.825	231.923			
	198.960			0.000		
3	0.000			0.000		
	0.000	-0.480	13.456			
	28.423	-0.321	2.062			
	56.846	-0.162	-4.808			
	85.269	-0.003	-7.154			
	113.691	0.156	-4.976			
	142.114	0.315	1.725			
	170.537	0.475	12.951			
	198.960	0.634	28.701			
	198.960			0.000		
4	0.000			0.000		
	0.000	0.582	-59.583			
	28.423	0.651	-42.386			
	56.846	0.858	-21.266			
	85.269	1.203	7.702			
	113.691	1.686	48.441			
	142.114	2.308	104.876			
	170.537	3.067	180.931			
	198.960	3.964	280.529			
	198.960			0.000		
5	0.000			0.000		
	0.000	-9.793	316.639			
	28.423	-6.760	81.841			
	56.846	-3.914	-69.401			
	85.269	-1.254	-142.395			

CSI / SAP90 - - FINITE ELEMENT ANALYSIS OF STRUCTURES PAGE 2
PROGRAM:SAP90/FILE:WEST41.F3F

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
	113.691	1.219	-142.452				
	142.114	3.505	-74.879				
	170.537	5.604	55.014				
	198.960	7.517	241.919				
	198.960			0.000			
6	0.000			0.000			
	0.000	-7.716	228.591				
	28.423	-5.853	34.102				
	56.846	-3.287	-97.452				
	85.269	-0.020	-146.117				
	113.691	3.806	-92.807				
	142.114	7.677	70.378				
	170.537	11.548	343.593				
	198.960	15.419	726.839				
	198.960			0.000			
7	0.000			0.000			
	0.000	-3.742	79.702				
	28.423	-2.984	-17.871				
	56.846	-1.385	-81.950				
	85.269	1.053	-88.656				
	113.691	4.188	-14.980				
	142.114	7.507	150.901				
	170.537	10.964	413.068				
	198.960	14.558	775.444				
	198.960			0.000			
8	0.000			0.000			
	0.000	-14.183	433.025				
	28.423	-9.637	94.953				
	56.846	-5.279	-116.586				
	85.269	-1.107	-206.899				
	113.691	2.878	-181.297				
	142.114	6.676	-45.086				
	170.537	10.287	196.422				
	198.960	13.712	537.921				
	198.960			0.000			
9	0.000			0.000			
	0.000	-10.209	284.136				
	28.423	-6.768	42.979				
	56.846	-3.377	-101.084				
	85.269	-0.034	-149.438				
	113.691	3.260	-103.470				
	142.114	6.506	35.437				
	170.537	9.703	265.897				
	198.960	12.851	586.526				
	198.960			0.000			

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PROGRAM: SAP90/FILE: WEST41.F3F

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
2							
1	0.000			0.000			
	0.000	-11.101	430.837				
	33.086	-8.355	108.971				
	66.171	-5.609	-122.038				
	99.257	-2.863	-262.190				
	132.343	-0.117	-311.484				
	165.429	2.546	-270.271				
	198.514	4.277	-154.223				
	231.600	4.854	0.000				
	231.600			0.000			
2	0.000			0.000			
	0.000	-5.784	231.923				
	33.086	-4.417	63.162				
	66.171	-3.051	-60.389				
	99.257	-1.685	-138.730				
	132.343	-0.318	-171.862				
	165.429	1.048	-159.784				
	198.514	2.415	-102.497				
	231.600	3.781	0.000				
	231.600			0.000			
3	0.000			0.000			
	0.000	-0.703	28.701				
	33.086	-0.537	8.181				
	66.171	-0.372	-6.866				
	99.257	-0.207	-16.439				
	132.343	-0.041	-20.540				
	165.429	0.124	-19.166				
	198.514	0.290	-12.320				
	231.600	0.455	0.000				
	231.600			0.000			
4	0.000			0.000			
	0.000	-7.024	280.529				
	33.086	-5.785	67.997				
	66.171	-4.315	-99.717				
	99.257	-2.616	-215.011				
	132.343	-0.687	-270.287				
	165.429	1.472	-257.944				
	198.514	3.860	-170.382				
	231.600	6.478	0.000				
	231.600			0.000			
5	0.000			0.000			
	0.000	-5.985	241.919				
	33.086	-4.019	77.250				
	66.171	-2.355	-27.368				
	99.257	-0.994	-81.945				

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FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	132.343	0.065	-96.488				
	165.429	0.821	-81.006				
	198.514	1.275	-45.507				
	231.600	1.426	0.000				
	231.600			0.000			
6	0.000			0.000			
	0.000	-18.470	726.839				
	33.086	-13.984	189.949				
	66.171	-9.498	-198.505				
	99.257	-5.011	-438.522				
	132.343	-0.525	-530.102				
	165.429	3.878	-473.595				
	198.514	7.349	-284.675				
	231.600	9.667	0.000				
	231.600			0.000			
7	0.000			0.000			
	0.000	-19.711	775.444				
	33.086	-15.351	194.783				
	66.171	-10.762	-237.833				
	99.257	-5.943	-514.803				
	132.343	-0.894	-628.527				
	165.429	4.302	-571.755				
	198.514	8.795	-352.560				
	231.600	12.363	0.000				
	231.600			0.000			
8	0.000			0.000			
	0.000	-13.355	537.921				
	33.086	-9.648	158.228				
	66.171	-6.244	-103.835				
	99.257	-3.142	-258.277				
	132.343	-0.343	-315.106				
	165.429	2.153	-284.331				
	198.514	4.347	-175.959				
	231.600	6.239	0.000				
	231.600			0.000			
9	0.000			0.000			
	0.000	-14.595	586.526				
	33.086	-11.015	163.062				
	66.171	-7.508	-143.163				
	99.257	-4.074	-334.558				
	132.343	-0.712	-413.531				
	165.429	2.576	-382.490				
	198.514	5.792	-243.844				
	231.600	8.936	0.000				
	231.600			0.000			

ANALYSIS OF EAST WALL SECTION - MONONOBE OKABE DYNAMIC SOIL PRESSURE
(EAST21)-OPTION 1

REV.	DATE	FILE	DESCRIPTION
C	12- 7-94	B.MOSADDAD	WEST1 ORIGINAL
C	12-09-94	BM	WEST2 ADD TRIANGULAR DY
C	12-09-94	BM	EAST1 EAST WALL MODEL
C	12-12-94	BM	ADD TRIANGULAR ST
C	12-14-94	BM	EAST11 ADD SURCHARGE (L-
C	12-14-94	BM	EAST2 OPTION 1
C	3 - 6-95	BM	EAST21 LOWER ROOF TO AS-

C
SYSTEM
L=6

JOINTS
1 X=0 Y=0 S=12
3 X=0 Y=16.58
5 X=0 Y=35.88
50 X=1 Y=0

RESTRAINTS
1 5 2 R=0,0,1,1,1,0
1 R=1,1,1,1,1,1
3 R=1,0,1,1,1,0
5 R=1,0,1,1,1,0
50 R=1,1,1,1,1,1

FRAME
NM=2 NL=6 NSEC=8
1 SH=R T=18,12 E=3600.
2 SH=R T=16,12 E=3600.
1 TRAP=0,0,0,-.2,0.035,0,-.8,0.035,0,-1.,0,0 :STATIC-TRAP, S1
2 WL=0,0.0171,0 :DYN. SOIL PRESSURE, UNIFORM, D1
3 WL=0,0.0056,0 :INERTIA- BASEMENT, I
4 TRAP=0,0,0,-1,0.0342,0 :DY. SOIL PRESSURE TRIANGULAR, D2
5 TRAP=0,.046,0,-1.,0,0 :STATIC- TRIANGULAR, S2
C SURCHARGE OF 250 PSF, Q=0.3*0.250/12=0.0063
6 WL=0,0.0063,0
1 1 3 M=1,1 LP=0,50 NSL=1,2,3,4,5,6
2 3 5 M=2,2 LP=0,50

COMBO
1 C=1,0,0,0,0,0 :STATIC-TRAP
2 C=0,1,0,0,0,0 :DYNAMIC, UNIF
3 C=0,0,1,0,0,0 :INERTIAL
4 C=0,0,0,1,0,0 :DYNAMIC, TRIANGULAR
5 C=0,0,0,0,1,0 :STATIC-TRIANGULAR
6 C=1,1,1,0,0,1 :LC1 S1 +D1 +I +Q
7 C=1,0,1,1,0,1 :LC2 S1 +D2 +I +Q
8 C=0,1,1,0,1,1 :LC3 S2+ D1 +I +Q
9 C=0,0,1,1,1,1 :LC4 S2+ D2 +I +Q

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CSI / SAP90 - - FINITE ELEMENT ANALYSIS OF STRUCTURES PAGE 1
 PROGRAM: SAP90/FILE: EAST21.F3F
 ANALYSIS OF EAST WALL SECTION - MONONOBE OKABE DYNAMIC SOIL PRESSURE

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
1							
1	0.000			0.000			
	0.000	-3.335	143.153				
	28.423	-2.980	51.717				
	56.846	-2.042	-20.250				
	85.269	-1.047	-64.157				
	113.691	-0.053	-79.789				
	142.114	0.942	-67.146				
	170.537	1.880	-26.444				
	198.960	2.235	33.728				
	198.960			0.000			
2	0.000			0.000			
	0.000	-1.991	75.367				
	28.423	-1.505	25.694				
	56.846	-1.019	-10.165				
	85.269	-0.533	-32.209				
	113.691	-0.047	-40.439				
	142.114	0.439	-34.855				
	170.537	0.926	-15.456				
	198.960	1.412	17.757				
	198.960			0.000			
3	0.000			0.000			
	0.000	-0.652	24.682				
	28.423	-0.493	8.414				
	56.846	-0.334	-3.329				
	85.269	-0.174	-10.548				
	113.691	-0.015	-13.243				
	142.114	0.144	-11.414				
	170.537	0.303	-5.062				
	198.960	0.462	5.815				
	198.960			0.000			
4	0.000			0.000			
	0.000	-1.370	68.063				
	28.423	-1.300	29.796				
	56.846	-1.092	-4.525				
	85.269	-0.745	-30.952				
	113.691	-0.259	-45.538				
	142.114	0.366	-44.336				
	170.537	1.130	-23.399				
	198.960	2.033	21.220				
	198.960			0.000			
5	0.000			0.000			
	0.000	-3.513	111.194				
	28.423	-2.299	29.042				
	56.846	-1.272	-21.258				
	85.269	-0.431	-45.014				

CSI / SAP90 - - FINITE ELEMENT ANALYSIS OF STRUCTURES PAGE 2

PROGRAM:SAP90/FILE:EAST21.F3F

ANALYSIS OF EAST WALL SECTION - MONONOBE OKABE DYNAMIC SOIL PRESSURE

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	113.691	0.223	-47.535				
	142.114	0.690	-34.129				
	170.537	0.970	-10.106				
	198.960	1.063	19.226				
	198.960			0.000			
6	0.000			0.000			
	0.000	-6.711	270.968				
	28.423	-5.532	95.291				
	56.846	-3.770	-37.489				
	85.269	-1.951	-118.781				
	113.691	-0.132	-148.371				
	142.114	1.688	-126.257				
	170.537	3.450	-52.656				
	198.960	4.629	63.843				
	198.960			0.000			
7	0.000			0.000			
	0.000	-6.090	263.664				
	28.423	-5.327	99.393				
	56.846	-3.843	-31.849				
	85.269	-2.163	-117.524				
	113.691	-0.344	-153.469				
	142.114	1.614	-135.738				
	170.537	3.654	-60.598				
	198.960	5.250	67.306				
	198.960			0.000			
8	0.000			0.000			
	0.000	-6.889	239.009				
	28.423	-4.851	72.616				
	56.846	-2.999	-38.497				
	85.269	-1.334	-99.638				
	113.691	0.144	-116.116				
	142.114	1.435	-93.240				
	170.537	2.539	-36.318				
	198.960	3.457	49.340				
	198.960			0.000			
9	0.000			0.000			
	0.000	-6.268	231.705				
	28.423	-4.646	76.717				
	56.846	-3.072	-32.857				
	85.269	-1.546	-98.381				
	113.691	-0.068	-121.214				
	142.114	1.362	-102.720				
	170.537	2.744	-44.261				
	198.960	4.078	52.803				
	198.960			0.000			

Calc. S-0002, Rev. 0, Job # 41552

SW. 2-8-81

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ANALYSIS OF EAST WALL SECTION - MONONOBE OKABE DYNAMIC SOIL PRESSURE

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
2							
1	0.000			0.000			
	0.000	-0.146	33.728				
	33.086	-0.146	28.910				
	66.171	-0.146	24.092				
	99.257	-0.146	19.273				
	132.343	-0.146	14.455				
	165.429	-0.146	9.637				
	198.514	-0.146	4.818				
	231.600	-0.146	0.000				
	231.600			0.000			
2	0.000			0.000			
	0.000	-0.077	17.757				
	33.086	-0.077	15.220				
	66.171	-0.077	12.684				
	99.257	-0.077	10.147				
	132.343	-0.077	7.610				
	165.429	-0.077	5.073				
	198.514	-0.077	2.537				
	231.600	-0.077	0.000				
	231.600			0.000			
3	0.000			0.000			
	0.000	-0.025	5.815				
	33.086	-0.025	4.984				
	66.171	-0.025	4.154				
	99.257	-0.025	3.323				
	132.343	-0.025	2.492				
	165.429	-0.025	1.661				
	198.514	-0.025	0.831				
	231.600	-0.025	0.000				
	231.600			0.000			
4	0.000			0.000			
	0.000	-0.092	21.220				
	33.086	-0.092	18.189				
	66.171	-0.092	15.157				
	99.257	-0.092	12.126				
	132.343	-0.092	9.094				
	165.429	-0.092	6.063				
	198.514	-0.092	3.031				
	231.600	-0.092	0.000				
	231.600			0.000			
5	0.000			0.000			
	0.000	-0.083	19.226				
	33.086	-0.083	16.479				
	66.171	-0.083	13.733				
	99.257	-0.083	10.986				

Calc. S-0002, Rev. 0, Job # 41552 SWT. 2-22

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PROGRAM: SAP90/FILE: EAST21.F3F
ANALYSIS OF EAST WALL SECTION - MONONOBE OKABE DYNAMIC SOIL PRESSURE

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	132.343	-0.083	8.240				
	165.429	-0.083	5.493				
	198.514	-0.083	2.747				
	231.600	-0.083	0.000				
	231.600			0.000			
6	0.000			0.000			
	0.000	-0.276	63.843				
	33.086	-0.276	54.722				
	66.171	-0.276	45.602				
	99.257	-0.276	36.481				
	132.343	-0.276	27.361				
	165.429	-0.276	18.241				
	198.514	-0.276	9.120				
	231.600	-0.276	0.000				
	231.600			0.000			
7	0.000			0.000			
	0.000	-0.291	67.306				
	33.086	-0.291	57.690				
	66.171	-0.291	48.075				
	99.257	-0.291	38.460				
	132.343	-0.291	28.845				
	165.429	-0.291	19.230				
	198.514	-0.291	9.615				
	231.600	-0.291	0.000				
	231.600			0.000			
8	0.000			0.000			
	0.000	-0.213	49.340				
	33.086	-0.213	42.292				
	66.171	-0.213	35.243				
	99.257	-0.213	28.195				
	132.343	-0.213	21.146				
	165.429	-0.213	14.097				
	198.514	-0.213	7.049				
	231.600	-0.213	0.000				
	231.600			0.000			
9	0.000			0.000			
	0.000	-0.228	52.803				
	33.086	-0.228	45.260				
	66.171	-0.228	37.717				
	99.257	-0.228	30.173				
	132.343	-0.228	22.630				
	165.429	-0.228	15.087				
	198.514	-0.228	7.543				
	231.600	-0.228	0.000				
	231.600			0.000			

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M. DATE 3/10/75

Modification Option (1).

CHECKED BY J✓ DATE 3/12/75

5.0 THREE DIMENSIONAL DYNAMIC ANALYSIS**5.1 3-DIMENSIONAL MODEL DEVELOPMENT**

The 3-D model is constructed using shell element to represent the major exterior and interior walls of the NMSF building. Two different versions of the model was utilized in this evaluation are described below.

NMSF05:

This is the version of the model that was use to carry out the final set of dynamic analyses used in the structural evaluation of the building. This model was used to compute the member stresses due to seismic load combinations:

$$D + L + H_s + H_d + E$$

and $D + L + H_s + H_d - E$

The following features are added to the NMSF41 (Three dimensional Model of As-Built Structure of NMSF building) Model to create NMSF05:

- 1) The floor masses, including the tributary wall masses, are recalculated for each floor and placed at a distance equal to 5% of the building dimensions away from the center of rigidity to account for accidental torsion loads.
- 2) Walls and slabs are removed and added per the list presented in section 1.1 to reflect the proposed major structural changed to the as-built structure.
- 3) No changes are made to the SSI effects. The same soil spring constants used in NMSF41 Model are used.
- 4) Dead weight of the nuclear material to be stored in dry well area are conservatively lumped at the charge deck elevation.

NMSF51:

This model, essentially the same as NMSF51, was used to carry out analysis for the static load case of:

$$1.4D + 1.7L + 1.7H_s$$

EVALUATION OF NMSE FACILITY AT LANL

DESIGNED BY DM

DATE 3/2/65

MODIFICATION OPTION (1)

CHECKED BY JV

DATE 3/10/66

Dead Load / Live load / Mass of 30" Deck

(REF: ICF KAISER
ADVANCED VALUE
ENGINEERING STUDY
OCTOBER 1964)

TOTAL	D.L.	715	PSF
LIVE	LOAD	150	"

Include 25% of LL in Mass.

$$M = (715 + .25 \times 150) / 32.2 = 0.0234 \text{ K} \cdot \text{FT}^3 \cdot \text{S}^2$$

$$W_1 = .715 + .150 = .865 \text{ K/FT}^2 \text{ (DL+LL)}$$

$$W_2 = 1.4 \times .715 + 1.7 \times .15 = 1.256 \text{ K/FT}^2 \text{ (1.4DL+1.7LL)}$$

EVALUATION OF NMSE FACILITY AT LANL
MODIFICATION OPTION (1)

DESIGNED BY LM DATE 2/2/95
CHECKED BY JV DATE 5/12/95

Dead Load / Mass of New 30" Deck.

TOTAL Dead Load	
Including weight of Contents	715 PSF
Live Load	150
	<hr/>
	865 PSF

USE 25% of L.L. for mass calculation:

$$\text{mass per unit area} = \frac{(715 + .25 \times 150)}{32.2 \times 1000} = 0.0234 \text{ K-Ft.}^2$$

Call. 4-0002, Rev. 0

EVALUATION OF NMSE FACULTY AT ZANU

MODIFICATION (1)

DESIGNED BY

ns

SHEET 5 OF 5

15

CHECKED BY

DATE 5/10/5

New Contact Baffle 4' south of line B

EVALUATION OF NMSF FAULTY AT LANL
MODIFICATION OPTION (1)

DESIGNED BY RM DATE 2/2/95

CHECKED BY JL DATE 3/12/95

New Concrete Baffle 5.5' North of Line G.

□ New Beam Elements
Section Prop.

$$A = 1.5 \times 1.5 = 2.25 \text{ ft}^2$$

$$I_x = I_y = \frac{1.5 \times 1.5^3}{12} = 0.42 \text{ ft}^4$$

△ New Shell Elements

○ New Nodes

EVALUATION OF NMSF FACILITY AT LANL
MODIFICATION OPTION (1)

DESIGNED BY B.M. DATE 2/2/95

CHECKED BY JV DATE 3/1/95

NMSF OPTION (1) MODEL

FLOOR MASS DISTRIBUTION:

- use distributed mass for stack
- use lumped mass @ floor C.G.'s for other floors
- lump Mezz mass @ Elev. 18.58', Conservatively

EVALUATION OF NMSE FACILITY AT LANL
MODIFICATION ACTIONS (1)

DESIGNED BY BR1 DATE 2/15/95

CHECKED BY JV DATE 3/2/95

FLOOR MASS CALCULATION SUMMARY

<u>FLOOR</u>	<u>$M_x = M_y = M_z$</u>	<u>M_{xx}</u>	<u>M_{yy}</u>	<u>M_{zz}</u>
Basement	143	305,525	66,165	371,690
30" Deck	256	446,907	119,211	566,117
1st Floor	156	424,312	254,411	678,723
Roof	228	560,438	386,867	947,305

FLOOR C.C. Coordinates

<u>FLOOR</u>	<u>$\bar{X}$</u>	<u>$\bar{Y}$</u>	<u>$\bar{Z}$</u>
Basement	29.33'	80.76'	0
30" Deck	30.02'	77.79'	18.58'
1st Floor	66.87	85.37	21.0
Roof	53.47	81.34	36.5'

ICF KAISER
ENGINEERS

Calc. 5-0002, Rev. 0

SHEET: 35 OF
JOB NO: 4552DESIGNED BY:
SUBJ: ---Basement Floor Mass
OPTION (1)
CHECKED BY:DATE:
DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1	3.00	130.45	9.29	0.0	78.7	0.00466	16.9	0	1333.9	14574.45	69.648	24026	13
2	1.50	13.50	9.29	0.0	6.8	0.00466	0.88	0	5.9174	754.1397	4801.5	13	0
2a	1.50	4.75	9.29	0.0	146.3	0.00466	0.31	0	45.136	265.3455	1326.3	1	0
3	29.60	1.50	9.29	14.8	6.5	0.00466	1.92	28.44764	12.494	405.8055	10599	0	140
4	1.33	13.50	9.29	29.6	6.8	0.00466	0.78	23.00799	5.2468	0.05665	4257.3	12	0
5	2.83	130.45	9.29	29.6	78.7	0.00466	16	473.0683	1258.3	1.164787	65.702	22664	11
4a	1.33	4.75	9.29	29.6	146.3	0.00466	0.27	8.095405	40.02	0.019932	1176	1	0
6	1.00	148.70	9.29	53.5	74.4	0.00466	6.44	344.4026	478.62	3760.665	264.3	11862	1
7	29.60	1.50	9.29	14.8	144.0	0.00466	1.92	28.44764	276.69	405.8055	7675.6	0	140
8	1.00	44.40	9.29	72.5	126.5	0.00466	1.92	139.355	243.15	3582.185	4021.8	316	0
9	72.50	1.38	9.29	36.3	148.7	0.00466	4.33	157.0098	644.06	207.4085	19994	1	1897
10	29.00	1.00	9.29	68.0	104.3	0.00466	1.26	85.37064	130.94	1877.358	695.83	0	88
11	23.90	1.00	9.29	41.6	119.3	0.00466	1.03	42.99031	123.44	154.5039	1537	0	49
12	53.5	1.50	9.29	26.8	0.0	0.00466	3.47	92.93311	0	23.12586	22658	1	829
13	53.5	148.70	1.50	26.8	74.4	0.00616	73.5	1966.349	5465.3	489.3144	3018	135450	17533
14	29.0	44.40	1.50	68.0	126.5	0.00616	11.9	809.0248	1505	17791.01	24894	1955	834
15			1.50			0.00466	0	0	0	0	0	0	0
16			1.50			0.00466	0	0	0	0	0	0	0
17			1.50			0.00466	0	0	0	0	0	0	0
18	29.6	1.50	1.50	14.8	13.5	0.00466	0.31	4.593269	4.1898	65.52296	1403.9	0	23
19			1.50			0.00466	0	0	0	0	0	0	0
20			1.50			0.00466	0	0	0	0	0	0	0
21			1.50			0.00466	0	0	0	0	0	0	0
22			1.50			0.00466	0	0	0	0	0	0	0
23			1.50			0.00466	0	0	0	0	0	0	0
24			1.50			0.00466	0	0	0	0	0	0	0
25			1.50			0.00466	0	0	0	0	0	0	0
25			1.50			0.00466	0	0	0	0	0	0	0
26			1.50			0.00466	0	0	0	0	0	0	0
27			1.50			0.00466	0	0	0	0	0	0	0
28			1.50			0.00466	0	0	0	0	0	0	0
29	15.0	1.50	1.50	-7.5	89.3	0.00466	0.16	-1.17956	14.045	213.3359	11.477	0	3
30			1.50			0.00466	0	0	0	0	0	0	0
31			1.50			0.00466	0	0	0	0	0	0	0
32			1.50			0.00466	0	0	0	0	0	0	0
33	23.9	1.00	1.50	41.6	13.5	0.00466	0.17	6.941385	2.2553	24.94681	755.71	0	8
34			1.50			0.00466	0	0	0	0	0	0	0
35			1.50			0.00466	0	0	0	0	0	0	0
36			1.50			0.00466	0	0	0	0	0	0	0
37			1.50			0.00466	0	0	0	0	0	0	0
38			1.50			0.00466	0	0	0	0	0	0	0
39			1.50			0.00466	0	0	0	0	0	0	0
40			1.50			0.00466	0	0	0	0	0	0	0
41			1.50			0.00466	0	0	0	0	0	0	0
42			1.50			0.00466	0	0	0	0	0	0	0
43			1.50			0.00466	0	0	0	0	0	0	0
44			1.50			0.00466	0	0	0	0	0	0	0
45			1.50			0.00466	0	0	0	0	0	0	0
46			1.50			0.00466	0	0	0	0	0	0	0
47			1.50			0.00466	0	0	0	0	0	0	0
48			1.50			0.00466	0	0	0	0	0	0	0

Total Floor Mass= 143 4208.857 11589 44596.16 109225 196300 21569

C. G. COORDINATES: XCG= 29.33 ft YCG= 80.76 ft Wt.= 4621

MASS MOMENTS OF INERTIA: IXX= 305525 IYY= 66165 IZZ= 371690

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

Calc. S-0002, Rev. 0

SHEET: 26 OF
JOB NO: 41552SUBJ---CHARGE DECK ELEV. ---DESIGNED BY:
---OPTION (1) ---CHECKED BY:DATE:
DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ixo	Iyo
1	3.00	130.45	9.29	0.0	78.7	0.00466	16.9	0	1333.9	15268.31	15.107	24026	13
2	1.50	13.50	9.29	0.0	6.8	0.00466	0.88	0	5.9174	790.0427	4423.6	13	0
2a	1.50	4.75	9.29	0.0	146.3	0.00466	0.31	0	45.136	277.978	1449.2	1	0
3	29.60	1.50	10.50	14.8	6.5	0.00466	2.17	32.15288	14.121	503.26	11040	0	159
4	1.33	13.50	9.29	29.6	6.8	0.00466	0.78	23.00799	5.2468	0.137172	3922.3	12	0
5	2.83	130.45	9.29	29.6	78.7	0.00466	16	473.0683	1258.3	2.820397	14.251	22664	11
4a	1.33	4.75	9.29	29.6	146.3	0.00466	0.27	8.095405	40.02	0.048264	1285	1	0
6	1.00	148.70	9.29	53.5	74.4	0.00466	6.44	344.4026	478.62	3548.997	75.989	11862	1
7	29.60	1.50	10.50	14.8	144.0	0.00466	2.17	32.15288	312.73	503.26	9510.5	0	159
8	1.00	44.40	9.29	72.5	126.5	0.00466	1.92	139.355	243.15	3468.581	4561.4	316	0
9	72.50	1.38	9.29	36.3	148.7	0.00466	4.33	157.0098	644.06	168.1058	21781	1	1897
10	29.00	1.00	9.29	68.0	104.3	0.00466	1.26	85.37064	130.94	1810.955	882.59	0	88
11	23.90	1.00	9.29	41.6	119.3	0.00466	1.03	42.99031	123.44	137.5472	1783.2	0	49
12	53.5	1.50	9.29	26.8	0.0	0.00466	3.47	92.93311	0	37.15055	21021	1	829
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15	23.9	148.70	1.00	65.5	74.4	0.00616	21.9	1432.845	1627.7	27480.82	258.42	40339	1042
16	3.0	130.45	1.21	29.6	78.7	0.00466	2.21	65.31732	173.72	0.389417	1.9468	3129	2
17	1.5	4.75	1.21	29.5	146.3	0.00466	0.04	1.185163	5.8786	0.010867	188.73	0	0
18	29.6	1.50	9.29	14.8	13.5	0.00466	1.92	28.44764	25.949	445.2653	7943.5	0	140
19	2.8	143.95	1.21	0.0	72.0	0.00466	2.3	0	165.33	2070.109	77.558	3967	2
20	1.5	6.50	1.21	29.6	3.3	0.00466	0.05	1.6273	0.1787	0.009702	305.43	0	0
21	1.3	148.70	1.21	53.5	74.4	0.00466	1.05	56.072	77.924	577.8103	12.372	1931	0
22	1.0	15.00	1.21	72.5	111.8	0.00466	0.08	6.131978	9.4559	152.6264	97.855	2	0
23	1.3	4.75	1.21	0.0	146.3	0.00466	0.04	0	5.2124	32.10262	167.34	0	0
24	11.0	1.00	1.21	137.0	128.7	0.00466	0.06	8.49737	7.9826	709.8531	160.78	0	1
25	0.9	128.70	1.21	131.5	64.4	0.00466	0.62	82.06804	40.16	6427.002	112.66	861	0
						0.00000	0	0	0	0	0	0	0
26	1.0	20.00	1.21	142.5	138.7	0.00466	0.11	16.07001	15.641	1426.761	418.45	4	0
27	72.5	1.12	1.21	36.3	148.7	0.00466	0.46	16.59722	68.083	17.77016	2302.5	0	201
28	70.0	1.00	1.21	107.5	148.7	0.00466	0.39	42.43047	58.692	2369.45	1984.9	0	161
29	15.0	1.50	10.50	-7.5	89.3	0.00466	1.1	-8.25694	98.313	1549.835	145.96	0	21
30	78.0	0.84	1.21	92.5	59.3	0.00466	0.37	34.1733	21.908	1442.202	126.25	0	187
31						0.00466	0	0	0	0	0	0	0
32						0.00466	0	0	0	0	0	0	0
33	23.9	1.00	10.50	41.6	13.5	0.00466	1.17	48.58969	15.787	155.4623	4832.8	0	56
34	53.5	1.33	1.21	26.8	0.0	0.00466	0.4	10.73249	0	4.290375	2427.6	0	96
35	78.0	1.00	1.21	92.5	0.0	0.00466	0.44	40.6825	0	1716.907	2661.1	0	223
36	19.0	0.67	1.21	63.0	104.3	0.00466	0.07	4.522101	7.4866	78.07261	50.461	0	2
37						0.00466	0	0	0	0	0	0	0
38						0.00466	0	0	0	0	0	0	0
39						0.00466	0	0	0	0	0	0	0
40						0.00466	0	0	0	0	0	0	0
41						0.00466	0	0	0	0	0	0	0
42						0.00466	0	0	0	0	0	0	0
43						0.00466	0	0	0	0	0	0	0
44						0.00466	0	0	0	0	0	0	0
45	53.5	130.45	1.00	26.8	78.7	0.02340	163	4368.552	12857	1746.354	144.08	231590	38953
46						0.00466	0	0	0	0	0	0	0
47						0.00466	0	0	0	0	0	0	0
48						0.00466	0	0	0	0	0	0	0

Total Floor Mass= 256 7686.824 19918 74920.3 106186 340721 44290

C. G. COORDINATES: XCG= 30.02 ft YCG= 77.79 ft Wt.= 8245

MASS MOMENTS OF INERTIA: IXX= 446907 IYY= 119211 IZZ= 566117

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

Calc. 4-0002, Rev. 0

SHEET: 57 OF
JOB NO: 21552SUBJ: 1ST FLOOR
OPTION (1)DESIGNED BY:
CHECKED BY:DATE:
DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ixo	Iyo
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	8.96	14.8	6.5	0.00466	1.85	27.43713	12.05	5026.611	11532	0	135
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	8.96	14.8	144.0	0.00466	1.85	27.43713	266.86	5026.611	6361.8	0	135
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	8.96	29.6	78.7	0.00466	16.3	483.672	1286.4	22699.2	721.47	23172	12
17	1.5	4.75	8.96	29.5	146.3	0.00466	0.3	8.776085	43.531	415.4869	1105.4	1	0
18							0	0	0	0	0	0	0
19	2.8	143.95	8.96	0.0	72.0	0.00466	17	0	1224.3	76062.88	3051.8	29372	11
20	1.5	6.50	8.96	29.6	3.3	0.00466	0.41	12.05009	1.3231	565.5223	2745.3	1	0
21	1.3	148.70	8.96	53.5	74.4	0.00466	7.76	415.2108	577.03	1387.612	942.45	14301	1
22	1.0	15.00	8.96	72.5	111.8	0.00466	0.63	45.40704	70.021	19.84208	437.51	12	0
23	1.3	4.75	8.96	0.0	146.3	0.00466	0.26	0	38.597	1179.56	980.08	0	0
24	11.0	1.00	7.75	137.0	128.7	0.00466	0.4	54.42531	51.128	1953.758	745.87	0	4
25	0.9	128.70	7.75	131.5	64.4	0.00466	4	525.6424	257.22	16696.07	1766.1	5517	0
			8.96			0.00000	0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00466	0.72	102.9278	100.18	4131.329	2054.3	24	0
27	72.5	1.12	8.96	36.3	148.7	0.00466	3.39	122.9017	504.15	3179.068	13598	0	1485
28	70.0	1.00	7.75	107.5	148.7	0.00466	2.53	271.7654	375.92	4173.011	10139	0	1032
29	15.0	1.50	8.96	-7.5	89.3	0.00466	0.94	-7.04592	83.893	5196.229	14.511	0	18
30	78.0	0.84	7.75	92.5	59.3	0.00466	2.37	218.8786	140.32	1554.217	1608.2	0	1200
31						0.00466	0	0	0	0	0	0	0
32						0.00466	0	0	0	0	0	0	0
33							0	0	0	0	0	0	0
34	53.5	1.33	8.96	26.8	0.0	0.00466	2.97	79.47365	0	4782.46	21652	0	709
35	78.0	1.00	7.75	92.5	0.0	0.00466	2.82	260.5697	0	1850.258	20530	0	1428
36	19.0	0.67	7.75	63.0	104.3	0.00466	0.46	28.96387	47.951	6.890492	164.75	0	14
37						0.00466	0	0	0	0	0	0	0
38	80.0	1.00	7.75	112.5	181.7	0.00466	2.89	325.035	524.97	6015.227	26810	0	1541
39	29.6	148.70	1.00	68.3	74.4	0.00691	30.4	2077.311	2261.3	62.07362	3693.4	56043	2221
40	78.0	104.30	0.50	92.5	52.2	0.00691	28.1	2599.972	1467.2	18461.93	30925	25481	14251
41	19.0	44.40	1.00	63.0	126.5	0.00691	5.83	367.2444	737.4	87.36729	9861.4	958	175
42	59.0	44.40	0.50	102.0	126.5	0.00691	9.05	923.1732	1144.9	11168.76	15311	1487	2625
43	80.0	33.00	0.67	112.5	165.2	0.00691	12.2	1375.021	2019.1	25446.69	77892	1109	6519
44	11.0	20.00	0.50	137.0	138.7	0.00691	0.76	104.1337	105.43	3738.188	2161.8	25	8
45							0	0	0	0	0	0	0
46						0.00466	0	0	0	0	0	0	0
47						0.00466	0	0	0	0	0	0	0
48						0.00466	0	0	0	0	0	0	0
Total Floor Mass=							156	10450.38	13341	220886.8	266806	157506	33525
C. G. COORDINATES:							XCG= 66.87 ft		YCG= 85.37 ft		Wt.= 5032		
MASS MOMENTS OF INERTIA:							IXX= 424312		IYY= 254411		IZZ= 678723		

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

Calc. 5-0002 - Rev. 0

SHEET: 38 OF
JOB NO.: 41552

SUBJ---ROOF

DESIGNED BY:

DATE:

---OPTION (1)

CHECKED BY:

DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	7.75	14.8	6.5	0.00466	1.6	23.73189	10.423	2398.044	8982	0	117
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	7.75	14.8	144.0	0.00466	1.6	23.73189	230.82	2398.044	6285.1	0	117
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	7.75	29.6	78.7	0.00466	14.1	418.3547	1112.7	8054.149	96.878	20043	11
17	1.5	4.75	7.75	29.5	146.3	0.00466	0.26	7.590922	37.652	147.8666	1086.6	0	0
18							0	0	0	0	0	0	0
19	2.8	143.95	7.75	0.0	72.0	0.00466	14.7	0	1058.9	42066.24	1291.2	25406	10
20	1.5	6.50	7.75	29.6	3.3	0.00466	0.35	10.42279	1.1444	200.6591	2147.4	1	0
21	1.3	148.70	7.75	53.5	74.4	0.00466	6.71	359.1388	499.1	0.005376	328.28	12369	1
22	1.0	15.00	7.75	72.5	111.8	0.00466	0.54	39.27506	60.565	196.1457	502.52	10	0
23	1.3	4.75	7.75	0.0	146.3	0.00466	0.23	0	33.385	652.3503	963.42	0	0
24	11.0	1.00	7.75	137.0	128.7	0.00466	0.4	54.42531	51.128	2771.709	890.94	0	4
25	0.9	128.70	7.75	131.5	64.4	0.00466	4	525.6424	257.22	24337.1	1154.3	5517	0
			7.75			0.00000	0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00466	0.72	102.9278	100.18	5724.977	2376.2	24	0
27	72.5	1.12	7.75	36.3	148.7	0.00466	2.93	106.3045	436.07	869.7526	13305	0	1285
28	70.0	1.00	7.75	107.5	148.7	0.00466	2.53	271.7654	375.92	7379.522	11470	0	1032
29	15.0	1.50	7.75	-7.5	89.3	0.00466	0.81	-6.09441	72.564	3020.833	51.447	0	15
30	78.0	0.84	7.75	92.5	59.3	0.00466	2.37	218.8786	140.32	3604.299	1149.8	0	1200
31	53.5	148.70	1.00	26.8	74.4	0.01183	94.1	2517.522	7002	67201.3	4536.9	173416	22448
32	78.0	148.70	0.86	92.5	74.4	0.00578	57.7	5333.025	4289.5	87819.53	2779.3	106236	29231
33							0	0	0	0	0	0	0
34	53.5	1.33	7.75	26.8	0.0	0.00466	2.57	68.74116	0	1834.937	17003	0	613
35	78.0	1.00	7.75	92.5	0.0	0.00466	2.82	260.5697	0	4290.832	18639	0	1428
36	19.0	0.67	7.75	63.0	104.3	0.00466	0.46	28.96387	47.951	41.73946	242.29	0	14
37	80.0	33.00	0.86	112.5	165.0	0.00578	13.1	1476.328	2165.3	45724.69	91840	1191	6999
38	80.0	1.00	7.75	112.5	181.7	0.00466	2.89	325.035	524.97	10066.96	29099	0	1541
39							0	0	0	0	0	0	0
40							0	0	0	0	0	0	0
41							0	0	0	0	0	0	0
42							0	0	0	0	0	0	0
43							0	0	0	0	0	0	0
44							0	0	0	0	0	0	0
45							0	0	0	0	0	0	0
46						0.00466	0	0	0	0	0	0	0
47						0.00466	0	0	0	0	0	0	0
48						0.00466	0	0	0	0	0	0	0

Total Floor Mass= 228 12166.28 18508 320801.7 216220 344217 66065

C. G. COORDINATES: XCG= 53.47 ft YCG= 81.34 ft Wt.= 7326

MASS MOMENTS OF INERTIA: IXX= 560438 IYY= 386867 IZZ= 947305

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

Calc. S-0002, Rev. 0

SHEET: 39 OF
JOB NO: 41552SUBJ: --Basement Floor Mass (DL+LL)
--OPTION (1)DESIGNED BY:
CHECKED BY:DATE:
DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1	3.00	130.45	9.29	0.0	78.7	0.00466	16.9	0	1333.9	15445.4	86.638	24026	13
2	1.50	13.50	9.29	0.0	6.8	0.00466	0.88	0	5.9174	799.206	4831.9	13	0
2a	1.50	4.75	9.29	0.0	146.3	0.00466	0.31	0	45.136	281.2021	1316.8	1	0
3	29.60	1.50	9.29	14.8	6.5	0.00466	1.92	28.44764	12.494	455.4802	10666	0	140
4	1.33	13.50	9.29	29.6	6.8	0.00466	0.78	23.00799	5.2468	0.273962	4284.3	12	0
5	2.83	130.45	9.29	29.6	78.7	0.00466	16	473.0683	1258.3	5.632951	81.728	22664	11
4a	1.33	4.75	9.29	29.6	146.3	0.00466	0.27	8.095405	40.02	0.096394	1167.6	1	0
6	1.00	148.70	9.29	53.5	74.4	0.00466	6.44	344.4026	478.62	3496.713	283.94	11862	1
7	29.60	1.50	9.29	14.8	144.0	0.00466	1.92	28.44764	276.69	455.4802	7619	0	140
8	1.00	44.40	9.29	72.5	126.5	0.00466	1.92	139.355	243.15	3440.29	3980.8	316	0
9	72.50	1.38	9.29	36.3	148.7	0.00466	4.33	157.0098	644.06	158.868	19857	1	1897
10	29.00	1.00	9.29	68.0	104.3	0.00466	1.26	85.37064	130.94	1794.438	682.08	0	88
11	23.90	1.00	9.29	41.6	119.3	0.00466	1.03	42.99031	123.44	133.4366	1518.4	0	49
12	53.5	1.50	9.29	26.8	0.0	0.00466	3.47	92.93311	0	41.19951	22789	1	829
13	53.5	148.70	1.50	26.8	74.4	0.01004	120	3205.527	8909.6	1421.088	5285.5	220809	28583
14	29.0	44.40	1.50	68.0	126.5	0.01004	19.4	1318.866	2453.5	27721.76	40168	3186	1359
15			1.50			0.00466	0	0	0	0	0	0	0
16			1.50			0.00466	0	0	0	0	0	0	0
17			1.50			0.00466	0	0	0	0	0	0	0
18	29.6	1.50	1.50	14.8	13.5	0.00466	0.31	4.593269	4.1898	73.54362	1413.7	0	23
19			1.50			0.00466	0	0	0	0	0	0	0
20			1.50			0.00466	0	0	0	0	0	0	0
21			1.50			0.00466	0	0	0	0	0	0	0
22			1.50			0.00466	0	0	0	0	0	0	0
23			1.50			0.00466	0	0	0	0	0	0	0
24			1.50			0.00466	0	0	0	0	0	0	0
25			1.50			0.00466	0	0	0	0	0	0	0
25			1.50			0.00466	0	0	0	0	0	0	0
26			1.50			0.00466	0	0	0	0	0	0	0
27			1.50			0.00466	0	0	0	0	0	0	0
28			1.50			0.00466	0	0	0	0	0	0	0
29	15.0	1.50	1.50	-7.5	89.3	0.00466	0.16	-1.17956	14.045	223.4584	10.857	0	3
30			1.50			0.00466	0	0	0	0	0	0	0
31			1.50			0.00466	0	0	0	0	0	0	0
32			1.50			0.00466	0	0	0	0	0	0	0
33	23.9	1.00	1.50	41.6	13.5	0.00466	0.17	6.941385	2.2553	21.54519	760.98	0	8
34			1.50			0.00466	0	0	0	0	0	0	0
35			1.50			0.00466	0	0	0	0	0	0	0
36			1.50			0.00466	0	0	0	0	0	0	0
37			1.50			0.00466	0	0	0	0	0	0	0
38			1.50			0.00466	0	0	0	0	0	0	0
39			1.50			0.00466	0	0	0	0	0	0	0
40			1.50			0.00466	0	0	0	0	0	0	0
41			1.50			0.00466	0	0	0	0	0	0	0
42			1.50			0.00466	0	0	0	0	0	0	0
43			1.50			0.00466	0	0	0	0	0	0	0
44			1.50			0.00466	0	0	0	0	0	0	0
45			1.50			0.00466	0	0	0	0	0	0	0
46			1.50			0.00466	0	0	0	0	0	0	0
47			1.50			0.00466	0	0	0	0	0	0	0
48			1.50			0.00466	0	0	0	0	0	0	0

Total Floor Mass= 197 5957.877 15981 55969.11 126804 282891 33144

C. G. COORDINATES: XCG= 30.19 ft YCG= 80.99 ft Wt.= 6354

MASS MOMENTS OF INERTIA: IXX= 409695 IYY= 89113 IZZ= 498807

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

Calc. S-0002, Rev. 0

SHEET: 0 OF 2
JOB NO.: 0552SUBJ: ---Basement Floor Mass (1.4DL + 1.7LL)---
DESIGNED BY:
CHECKED BY:
OPTION (1)DATE:
DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1	3.00	130.45	9.29	0.0	78.7	0.00652	23.7	0	1867.4	20404.23	97.508	33636	18
2	1.50	13.50	9.29	0.0	6.8	0.00652	1.23	0	8.2844	1055.796	6722.1	19	0
2a	1.50	4.75	9.29	0.0	146.3	0.00652	0.43	0	63.19	371.4836	1856.8	1	0
3	29.60	1.50	9.29	14.8	6.5	0.00652	2.69	39.8267	17.491	568.1277	14839	1	196
4	1.33	13.50	9.29	29.6	6.8	0.00652	1.09	32.21119	7.3455	0.07931	5960.3	17	0
5	2.83	130.45	9.29	29.6	78.7	0.00652	22.4	662.2956	1761.6	1.630702	91.982	31730	15
4a	1.33	4.75	9.29	29.6	146.3	0.00652	0.38	11.33357	56.028	0.027905	1646.3	1	0
6	1.00	148.70	9.29	53.5	74.4	0.00652	9.01	482.1636	670.07	5264.931	370.02	16607	1
7	29.60	1.50	9.29	14.8	144.0	0.00652	2.69	39.8267	387.37	568.1277	10746	1	196
8	1.00	44.40	9.29	72.5	126.5	0.00652	2.69	195.097	340.41	5015.059	5630.6	442	0
9	72.50	1.38	9.29	36.3	148.7	0.00652	6.06	219.8137	901.69	290.3719	27992	1	2656
10	29.00	1.00	9.29	68.0	104.3	0.00652	1.76	119.5189	183.32	2628.302	974.16	0	123
11	23.90	1.00	9.29	41.6	119.3	0.00652	1.45	60.18643	172.81	216.3055	2151.8	0	69
12	53.5	1.50	9.29	26.8	0.0	0.00652	4.86	130.1064	0	32.37621	31721	1	1160
13	53.5	148.70	1.50	26.8	74.4	0.01562	186	4986.455	13860	1240.85	7653.4	343486	44463
14	29.0	44.40	1.50	68.0	126.5	0.01562	30.2	2051.603	3816.6	45116.14	63128	4956	2114
15							0	0	0	0	0	0	0
16							0	0	0	0	0	0	0
17							0	0	0	0	0	0	0
18	29.6	1.50	1.50	14.8	13.5	0.00652	0.43	6.430576	5.8657	91.73214	1965.5	0	32
19							0	0	0	0	0	0	0
20							0	0	0	0	0	0	0
21							0	0	0	0	0	0	0
22							0	0	0	0	0	0	0
23							0	0	0	0	0	0	0
24							0	0	0	0	0	0	0
25							0	0	0	0	0	0	0
25							0	0	0	0	0	0	0
26							0	0	0	0	0	0	0
27							0	0	0	0	0	0	0
28							0	0	0	0	0	0	0
29	15.0	1.50	1.50	-7.5	89.3	0.00652	0.22	-1.65139	19.663	298.6703	16.068	0	4
30							0	0	0	0	0	0	0
31							0	0	0	0	0	0	0
32							0	0	0	0	0	0	0
33	23.9	1.00	1.50	41.6	13.5	0.00652	0.23	9.717938	3.1575	34.92553	1058	0	11
34							0	0	0	0	0	0	0
35							0	0	0	0	0	0	0
36							0	0	0	0	0	0	0
37							0	0	0	0	0	0	0
38							0	0	0	0	0	0	0
39							0	0	0	0	0	0	0
40							0	0	0	0	0	0	0
41							0	0	0	0	0	0	0
42							0	0	0	0	0	0	0
43							0	0	0	0	0	0	0
44							0	0	0	0	0	0	0
45							0	0	0	0	0	0	0
46							0	0	0	0	0	0	0
47							0	0	0	0	0	0	0
48							0	0	0	0	0	0	0

Total Floor Mass= 298 9044.935 24142 83199.16 184619 430897 51060

C. G. COORDINATES: XCG= 30.36 ft YCG= 81.04 ft Wt.= 9593

MASS MOMENTS OF INERTIA: IXX= 615516 IYY= 134259 IZZ= 749775

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

(Calc. S-0002 - Rev. 0)

SHEET: 41 OF
JOB NO.: 41-552SUBJ---CHARGE DECK ELEV. (DL+LL)
-----OPTION (1)-----

DESIGNED BY:

CHECKED BY:

DATE:

DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1	3.00	130.45	9.29	0.0	78.7	0.00466	16.9	0	1333.9	15268.31	15.107	24026	13
2	1.50	13.50	9.29	0.0	6.8	0.00466	0.88	0	5.9174	790.0427	4423.6	13	0
2a	1.50	4.75	9.29	0.0	146.3	0.00466	0.31	0	45.136	277.978	1449.2	1	0
3	29.60	1.50	10.50	14.8	6.5	0.00466	2.17	32.15288	14.121	503.26	11040	0	159
4	1.33	13.50	9.29	29.6	6.8	0.00466	0.78	23.00799	5.2468	0.137172	3922.3	12	0
5	2.83	130.45	9.29	29.6	78.7	0.00466	16	473.0683	1258.3	2.820397	14.251	22664	11
4a	1.33	4.75	9.29	29.6	146.3	0.00466	0.27	8.095405	40.02	0.048264	1285	1	0
6	1.00	148.70	9.29	53.5	74.4	0.00466	6.44	344.4026	478.62	3548.997	75.989	11862	1
7	29.60	1.50	10.50	14.8	144.0	0.00466	2.17	32.15288	312.73	503.26	9510.5	0	159
8	1.00	44.40	9.29	72.5	126.5	0.00466	1.92	139.355	243.15	3468.581	4561.4	316	0
9	72.50	1.38	9.29	36.3	148.7	0.00466	4.33	157.0098	644.06	168.1058	21781	1	1897
10	29.00	1.00	9.29	68.0	104.3	0.00466	1.26	85.37064	130.94	1810.955	882.59	0	88
11	23.90	1.00	9.29	41.6	119.3	0.00466	1.03	42.99031	123.44	137.5472	1783.2	0	49
12	53.5	1.50	9.29	26.8	0.0	0.00466	3.47	92.93311	0	37.15055	21021	1	829
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15	23.9	148.70	1.00	65.5	74.4	0.01198	42.6	2787.298	3166.3	53458.15	502.7	78472	2027
16	3.0	130.45	1.21	29.6	78.7	0.00466	2.21	65.31732	173.72	0.389417	1.9468	3129	2
17	1.5	4.75	1.21	29.5	146.3	0.00466	0.04	1.185163	5.8786	0.010867	188.73	0	0
18	29.6	1.50	9.29	14.8	13.5	0.00466	1.92	28.44764	25.949	445.2653	7943.5	0	140
19	2.8	143.95	1.21	0.0	72.0	0.00466	2.3	0	165.33	2070.109	77.558	3967	2
20	1.5	6.50	1.21	29.6	3.3	0.00466	0.05	1.6273	0.1787	0.009702	305.43	0	0
21	1.3	148.70	1.21	53.5	74.4	0.00466	1.05	56.072	77.924	577.8103	12.372	1931	0
22	1.0	15.00	1.21	72.5	111.8	0.00466	0.08	6.131978	9.4559	152.6264	97.855	2	0
23	1.3	4.75	1.21	0.0	146.3	0.00466	0.04	0	5.2124	32.10262	167.34	0	0
24	11.0	1.00	1.21	137.0	128.7	0.00466	0.06	8.49737	7.9826	709.8531	160.78	0	1
25	0.9	128.70	1.21	131.5	64.4	0.00466	0.62	82.06804	40.16	6427.002	112.66	861	0
						0.00000	0	0	0	0	0	0	0
26	1.0	20.00	1.21	142.5	138.7	0.00466	0.11	16.07001	15.641	1426.761	418.45	4	0
27	72.5	1.12	1.21	36.3	148.7	0.00466	0.46	16.59722	68.083	17.77016	2302.5	0	201
28	70.0	1.00	1.21	107.5	148.7	0.00466	0.39	42.43047	58.692	2369.45	1984.9	0	161
29	15.0	1.50	10.50	-7.5	89.3	0.00466	1.1	-8.25694	98.313	1549.835	145.96	0	21
30	78.0	0.84	1.21	92.5	59.3	0.00466	0.37	34.1733	21.908	1442.202	126.25	0	187
31						0.00466	0	0	0	0	0	0	0
32						0.00466	0	0	0	0	0	0	0
33	23.9	1.00	10.50	41.6	13.5	0.00466	1.17	48.58969	15.787	155.4623	4832.8	0	56
34	53.5	1.33	1.21	26.8	0.0	0.00466	0.4	10.73249	0	4.290375	2427.6	0	96
35	78.0	1.00	1.21	92.5	0.0	0.00466	0.44	40.6825	0	1716.907	2661.1	0	223
36	19.0	0.67	1.21	63.0	104.3	0.00466	0.07	4.522101	7.4866	78.07261	50.461	0	2
37						0.00466	0	0	0	0	0	0	0
38						0.00466	0	0	0	0	0	0	0
39						0.00466	0	0	0	0	0	0	0
40						0.00466	0	0	0	0	0	0	0
41						0.00466	0	0	0	0	0	0	0
42						0.00466	0	0	0	0	0	0	0
43						0.00466	0	0	0	0	0	0	0
44						0.00466	0	0	0	0	0	0	0
45	53.5	130.45	1.00	26.8	78.7	0.02689	188	5020.808	14776	2007.097	165.59	266169	44769
46						0.00466	0	0	0	0	0	0	0
47						0.00466	0	0	0	0	0	0	0
48						0.00466	0	0	0	0	0	0	0

Total Floor Mass= 301 9693.533 23376 101158.4 106452 413431 51091

C. G. COORDINATES: XCG= 32.19 ft YCG= 77.63 ft Wt.= 9697

MASS MOMENTS OF INERTIA: IXX= 519883 IYY= 152250 IZZ= 672133

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

Calc. S-0002, Rev. 0

SHEET: 2 OF
JOB NO.: 61552

SUBJ: CHARGE DECK ELEV. (1.4DL + 1.7LL)
OPTION (1)

DESIGNED BY:
CHECKED BY:

DATE:
DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ixo	Iyo
1	3.00	130.45	9.29	0.0	78.7	0.00652	23.7	0	1867.4	21375.63	21.149	33636	18
2	1.50	13.50	9.29	0.0	6.8	0.00652	1.23	0	8.2844	1106.06	6193.1	19	0
2a	1.50	4.75	9.29	0.0	146.3	0.00652	0.43	0	63.19	389.1692	2028.9	1	0
3	29.60	1.50	10.50	14.8	6.5	0.00652	3.04	45.01403	19.77	704.564	15456	1	222
4	1.33	13.50	9.29	29.6	6.8	0.00652	1.09	32.21119	7.3455	0.192041	5491.2	17	0
5	2.83	130.45	9.29	29.6	78.7	0.00652	22.4	662.2956	1761.6	3.948555	19.951	31730	15
4a	1.33	4.75	9.29	29.6	146.3	0.00652	0.38	11.33357	56.028	0.06757	1798.9	1	0
6	1.00	148.70	9.29	53.5	74.4	0.00652	9.01	482.1636	670.07	4968.595	106.38	16607	1
7	29.60	1.50	10.50	14.8	144.0	0.00652	3.04	45.01403	437.82	704.564	13315	1	222
8	1.00	44.40	9.29	72.5	126.5	0.00652	2.69	195.097	340.41	4856.013	6385.9	442	0
9	72.50	1.38	9.29	36.3	148.7	0.00652	6.06	219.8137	901.69	235.3481	30494	1	2656
10	29.00	1.00	9.29	68.0	104.3	0.00652	1.76	119.5189	183.32	2535.336	1235.6	0	123
11	23.90	1.00	9.29	41.6	119.3	0.00652	1.45	60.18643	172.81	192.566	2496.4	0	69
12	53.5	1.50	9.29	26.8	0.0	0.00652	4.86	130.1064	0	52.01077	29429	1	1160
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15	23.9	148.70	1.00	65.5	74.4	0.02016	71.6	4688.213	5325.7	89916.18	845.54	131989	3410
16	3.0	130.45	1.21	29.6	78.7	0.00652	3.09	91.44424	243.21	0.545183	2.7256	4381	2
17	1.5	4.75	1.21	29.5	146.3	0.00652	0.06	1.659229	8.2301	0.015214	264.22	0	0
18	29.6	1.50	9.29	14.8	13.5	0.00652	2.69	39.8267	36.328	623.3714	11121	1	196
19	2.8	143.95	1.21	0.0	72.0	0.00652	3.22	0	231.46	2898.153	108.58	5553	2
20	1.5	6.50	1.21	29.6	3.3	0.00652	0.08	2.27822	0.2501	0.013583	427.6	0	0
21	1.3	148.70	1.21	53.5	74.4	0.00652	1.47	78.5008	109.09	808.9344	17.32	2704	0
22	1.0	15.00	1.21	72.5	111.8	0.00652	0.12	8.584769	13.238	213.677	137	2	0
23	1.3	4.75	1.21	0.0	146.3	0.00652	0.05	0	7.2973	44.94366	234.27	0	0
24	11.0	1.00	1.21	137.0	128.7	0.00652	0.09	11.89632	11.176	993.7943	225.1	0	1
25	0.9	128.70	1.21	131.5	64.4	0.00652	0.87	114.8952	56.224	8997.803	157.72	1206	0
						0.00000	0	0	0	0	0	0	0
26	1.0	20.00	1.21	142.5	138.7	0.00652	0.16	22.49801	21.898	1997.465	585.82	5	0
27	72.5	1.12	1.21	36.3	148.7	0.00652	0.64	23.23611	95.316	24.87822	3223.5	0	281
28	70.0	1.00	1.21	107.5	148.7	0.00652	0.55	59.40265	82.169	3317.23	2778.8	0	226
29	15.0	1.50	10.50	-7.5	89.3	0.00652	1.54	-11.5597	137.64	2169.769	204.34	0	29
30	78.0	0.84	1.21	92.5	59.3	0.00652	0.52	47.84262	30.671	2019.082	176.74	0	262
31						0.00000	0	0	0	0	0	0	0
32						0.00000	0	0	0	0	0	0	0
33	23.9	1.00	10.50	41.6	13.5	0.00652	1.64	68.02557	22.102	217.6473	6766	0	78
34	53.5	1.33	1.21	26.8	0.0	0.00652	0.56	15.02549	0	6.006525	3398.6	0	134
35	78.0	1.00	1.21	92.5	0.0	0.00652	0.62	56.9555	0	2403.67	3725.6	0	312
36	19.0	0.67	1.21	63.0	104.3	0.00652	0.1	6.330941	10.481	109.3017	70.646	0	3
37						0.00466	0	0	0	0	0	0	0
38						0.00466	0	0	0	0	0	0	0
39						0.00466	0	0	0	0	0	0	0
40						0.00466	0	0	0	0	0	0	0
41						0.00466	0	0	0	0	0	0	0
42						0.00466	0	0	0	0	0	0	0
43						0.00466	0	0	0	0	0	0	0
44						0.00466	0	0	0	0	0	0	0
45	53.5	130.45	1.00	26.8	78.7	0.03901	272	7282.08	21431	2911.054	240.17	386046	64932
46						0.00466	0	0	0	0	0	0	0
47						0.00466	0	0	0	0	0	0	0
48						0.00466	0	0	0	0	0	0	0

Total Floor Mass= 443 14609.89 34363 156797.6 149182 614342 74355

C. G. COORDINATES: XCG= 32.98 ft YCG= 77.56 ft Wt.= 14266

MASS MOMENTS OF INERTIA: IXX= 763524 IYY= 231153 IZZ= 994677

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

Calc. 5-0002, Rev. 0

SHEET: 25 OF
JOB NO.: 41552SUBJ: 1ST FLOOR (DL+LL)
OPTION (1)

DESIGNED BY:

DATE:

CHECKED BY:

DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	8.96	14.8	6.5	0.00466	1.85	27.43713	12.05	5026.611	11532	0	135
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	8.96	14.8	144.0	0.00466	1.85	27.43713	266.86	5026.611	6361.8	0	135
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	8.96	29.6	78.7	0.00466	16.3	483.672	1286.4	22699.2	721.47	23172	12
17	1.5	4.75	8.96	29.5	146.3	0.00466	0.3	8.776085	43.531	415.4869	1105.4	1	0
18							0	0	0	0	0	0	0
19	2.8	143.95	8.96	0.0	72.0	0.00466	17	0	1224.3	76062.88	3051.8	29372	11
20	1.5	6.50	8.96	29.6	3.3	0.00466	0.41	12.05009	1.3231	565.5223	2745.3	1	0
21	1.3	148.70	8.96	53.5	74.4	0.00466	7.76	415.2108	577.03	1387.612	942.45	14301	1
22	1.0	15.00	8.96	72.5	111.8	0.00466	0.63	45.40704	70.021	19.84208	437.51	12	0
23	1.3	4.75	8.96	0.0	146.3	0.00466	0.26	0	38.597	1179.56	980.08	0	0
24	11.0	1.00	7.75	137.0	128.7	0.00466	0.4	54.42531	51.128	1953.758	745.87	0	4
25	0.9	128.70	7.75	131.5	64.4	0.00466	4	525.6424	257.22	16696.07	1766.1	5517	0
			8.96			0.00000	0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00466	0.72	102.9278	100.18	4131.329	2054.3	24	0
27	72.5	1.12	8.96	36.3	148.7	0.00466	3.39	122.9017	504.15	3179.068	13598	0	1485
28	70.0	1.00	7.75	107.5	148.7	0.00466	2.53	271.7654	375.92	4173.011	10139	0	1032
29	15.0	1.50	8.96	-7.5	89.3	0.00466	0.94	-7.04592	83.893	5196.229	14.511	0	18
30	78.0	0.84	7.75	92.5	59.3	0.00466	2.37	218.8786	140.32	1554.217	1608.2	0	1200
31						0.00466	0	0	0	0	0	0	0
32						0.00466	0	0	0	0	0	0	0
33						0	0	0	0	0	0	0	0
34	53.5	1.33	8.96	26.8	0.0	0.00466	2.97	79.47365	0	4782.46	21652	0	709
35	78.0	1.00	7.75	92.5	0.0	0.00466	2.82	260.5697	0	1850.258	20530	0	1428
36	19.0	0.67	7.75	63.0	104.3	0.00466	0.46	28.96387	47.951	6.890492	164.75	0	14
37						0.00466	0	0	0	0	0	0	0
38	80.0	1.00	7.75	112.5	181.7	0.00466	2.89	325.035	524.97	6015.227	26810	0	1541
39	29.6	148.70	1.00	68.3	74.4	0.01273	56	3827.837	4166.9	114.3824	6805.8	103270	4092
40	78.0	104.30	0.50	92.5	52.2	0.01856	75.5	6981.908	3940.1	49577.25	83046	68426	38268
41	19.0	44.40	1.00	63.0	126.5	0.01273	10.7	676.7172	1358.8	160.9907	18171	1765	323
42	59.0	44.40	0.50	102.0	126.5	0.01856	24.3	2479.069	3074.5	29992.34	41116	3993	7050
43	80.0	33.00	0.67	112.5	165.2	0.01560	27.6	3104.446	4558.7	57452.12	175860	2504	14717
44	11.0	20.00	0.50	137.0	138.7	0.01856	2.04	279.6384	283.11	10038.45	5805.3	68	21
45							0	0	0	0	0	0	0
46						0.00466	0	0	0	0	0	0	0
47						0.00466	0	0	0	0	0	0	0
48						0.00466	0	0	0	0	0	0	0

Total Floor Mass= 266 20353.14 22988 309257.4 457765 252428 72198

C. G. COORDINATES: XCG= 76.49 ft YCG= 86.39 ft Wt.= 8568

MASS MOMENTS OF INERTIA: IXX= 710194 IYY= 381455 IZZ= 1091649

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

Calc. S-0002, Rev. 0

SHEET: 22 OF
JOB NO: 6152SUBJ: 1ST FLOOR (1.4DL + 1.7LL)
OPTION (1)

DESIGNED BY:

CHECKED BY:

DATE:

DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ixo	Iyo
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	8.96	14.8	6.5	0.00652	2.6	38.41198	16.87	7037.255	16145	0	189
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	8.96	14.8	144.0	0.00652	2.6	38.41198	373.61	7037.255	8906.5	0	189
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	8.96	29.6	78.7	0.00652	22.9	677.1408	1800.9	31778.88	1010.1	32441	17
17	1.5	4.75	8.96	29.5	146.3	0.00652	0.42	12.28652	60.943	581.6817	1547.5	1	0
18						0.00000	0	0	0	0	0	0	0
19	2.8	143.95	8.96	0.0	72.0	0.00652	23.8	0	1714	106488	4272.6	41121	16
20	1.5	6.50	8.96	29.6	3.3	0.00652	0.57	16.87012	1.8523	791.7313	3843.5	2	0
21	1.3	148.70	8.96	53.5	74.4	0.00652	10.9	581.2952	807.84	1942.657	1319.4	20021	1
22	1.0	15.00	8.96	72.5	111.8	0.00652	0.88	63.56986	98.029	27.77891	612.51	16	0
23	1.3	4.75	8.96	0.0	146.3	0.00652	0.37	0	54.036	1651.383	1372.1	1	0
24	11.0	1.00	7.75	137.0	128.7	0.00652	0.56	76.19543	71.579	2735.261	1044.2	0	6
25	0.9	128.70	7.75	131.5	64.4	0.00652	5.6	735.8993	360.11	23374.5	2472.6	7724	0
			8.96			0.00000	0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00652	1.01	144.0989	140.26	5783.861	2876	34	0
27	72.5	1.12	8.96	36.3	148.7	0.00652	4.75	172.0624	705.81	4450.695	19037	0	2079
28	70.0	1.00	7.75	107.5	148.7	0.00652	3.54	380.4715	526.29	5842.216	14195	0	1445
29	15.0	1.50	8.96	-7.5	89.3	0.00652	1.32	-9.86429	117.45	7274.72	20.316	0	25
30	78.0	0.84	7.75	92.5	59.3	0.00652	3.31	306.43	196.45	2175.903	2251.5	0	1680
31						0.00000	0	0	0	0	0	0	0
32						0.00000	0	0	0	0	0	0	0
33							0	0	0	0	0	0	0
34	53.5	1.33	8.96	26.8	0.0	0.00652	4.16	111.2631	0	6695.444	30313	1	992
35	78.0	1.00	7.75	92.5	0.0	0.00652	3.94	364.7976	0	2590.361	28742	0	1999
36	19.0	0.67	7.75	63.0	104.3	0.00652	0.64	40.54942	67.132	9.646689	230.65	0	19
37						0.00652	0	0	0	0	0	0	0
38	80.0	1.00	7.75	112.5	181.7	0.00652	4.04	455.049	734.95	8421.318	37535	0	2157
39	29.6	148.70	1.00	68.3	74.4	0.02016	88.7	6059.157	6595.9	181.0581	10773	163468	6477
40	78.0	104.30	0.50	92.5	52.2	0.03379	137	12713.46	7174.5	90275.93	151219	124597	69683
41	19.0	44.40	1.00	63.0	126.5	0.02016	17	1071.189	2150.9	254.8353	28764	2793	512
42	59.0	44.40	0.50	102.0	126.5	0.03379	44.3	4514.173	5598.5	54613.49	74869	7270	12838
43	80.0	33.00	0.67	112.5	165.2	0.02687	47.5	5346.922	7851.7	98952.28	302891	4313	25348
44	11.0	20.00	0.50	137.0	138.7	0.03379	3.72	509.1975	515.52	18279.16	10571	124	37
45							0	0	0	0	0	0	0
46							0	0	0	0	0	0	0
47							0	0	0	0	0	0	0
48							0	0	0	0	0	0	0

Total Floor Mass= 437 34419.03 37735 489247.3 756833 403930 125713

C. G. COORDINATES: XCG= 78.85 ft YCG= 86.45 ft Wt.= 14056

MASS MOMENTS OF INERTIA: IXX= 1160763 IYY= 614960 IZZ= 1775723

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

Calc. 5-0002, Rev. 0

SHEET: 45 OF
JOB NO.: 41552

DESIGNED BY:

DATE:

SUBJ: ---ROOF (DL+LL)

CHECKED BY:

DATE:

OPTION (1)

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	7.75	14.8	6.5	0.00466	1.6	23.73189	10.423	2398.044	8982	0	117
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	7.75	14.8	144.0	0.00466	1.6	23.73189	230.82	2398.044	6285.1	0	117
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	7.75	29.6	78.7	0.00466	14.1	418.3547	1112.7	8054.149	96.878	20043	11
17	1.5	4.75	7.75	29.5	146.3	0.00466	0.26	7.590922	37.652	147.8666	1086.6	0	0
18							0	0	0	0	0	0	0
19	2.8	143.95	7.75	0.0	72.0	0.00466	14.7	0	1058.9	42066.24	1291.2	25406	10
20	1.5	6.50	7.75	29.6	3.3	0.00466	0.35	10.42279	1.1444	200.6591	2147.4	1	0
21	1.3	148.70	7.75	53.5	74.4	0.00466	6.71	359.1388	499.1	0.005376	328.28	12369	1
22	1.0	15.00	7.75	72.5	111.8	0.00466	0.54	39.27506	60.565	196.1457	502.52	10	0
23	1.3	4.75	7.75	0.0	146.3	0.00466	0.23	0	33.385	652.3503	963.42	0	0
24	11.0	1.00	7.75	137.0	128.7	0.00466	0.4	54.42531	51.128	2771.709	890.94	0	4
25	0.9	128.70	7.75	131.5	64.4	0.00466	4	525.6424	257.22	24337.1	1154.3	5517	0
			7.75		0.00000		0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00466	0.72	102.9278	100.18	5724.977	2376.2	24	0
27	72.5	1.12	7.75	36.3	148.7	0.00466	2.93	106.3045	436.07	869.7526	13305	0	1285
28	70.0	1.00	7.75	107.5	148.7	0.00466	2.53	271.7654	375.92	7379.522	11470	0	1032
29	15.0	1.50	7.75	-7.5	89.3	0.00466	0.81	-6.09441	72.564	3020.833	51.447	0	15
30	78.0	0.84	7.75	92.5	59.3	0.00466	2.37	218.8786	140.32	3604.299	1149.8	0	1200
31	53.5	148.70	1.00	26.8	74.4	0.01211	96.3	2577.003	7167.4	68789.04	4644.1	177514	22978
32	78.0	148.70	0.86	92.5	74.4	0.00611	60.9	5632.895	4530.7	92757.53	2935.6	112210	30874
33							0	0	0	0	0	0	0
34	53.5	1.33	7.75	26.8	0.0	0.00466	2.57	68.74116	0	1834.937	17003	0	613
35	78.0	1.00	7.75	92.5	0.0	0.00466	2.82	260.5697	0	4290.832	18639	0	1428
36	19.0	0.67	7.75	63.0	104.3	0.00466	0.46	28.96387	47.951	41.73946	242.29	0	14
37	80.0	33.00	0.86	112.5	165.0	0.00611	13.9	1559.34	2287	48295.74	97004	1258	7392
38	80.0	1.00	7.75	112.5	181.7	0.00466	2.89	325.035	524.97	10066.96	29099	0	1541
39							0	0	0	0	0	0	0
40							0	0	0	0	0	0	0
41							0	0	0	0	0	0	0
42							0	0	0	0	0	0	0
43							0	0	0	0	0	0	0
44							0	0	0	0	0	0	0
45							0	0	0	0	0	0	0
46						0.00466	0	0	0	0	0	0	0
47						0.00466	0	0	0	0	0	0	0
48						0.00466	0	0	0	0	0	0	0

Total Floor Mass= 234 12608.64 19036 329898.5 221648 354355 68633

C. G. COORDINATES: XCG= 53.95 ft YCG= 81.44 ft Wt.= 7526

MASS MOMENTS OF INERTIA: IXX= 576003 IYY= 398531 IZZ= 974534

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

Calc. S-0002, Rev. 0

SHEET: 26 OF
JOB NO: 6152SUBJ: ---ROOF (1.4DL + 1.7LL)---
---OPTION (1)---

DESIGNED BY:

DATE:

CHECKED BY:

DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	7.75	14.8	6.5	0.00652	2.24	33.22464	14.592	3357.262	12575	0	164
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	7.75	14.8	144.0	0.00652	2.24	33.22464	323.15	3357.262	8799.2	0	164
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	7.75	29.6	78.7	0.00652	19.8	585.6966	1557.7	11275.81	135.63	28060	15
17	1.5	4.75	7.75	29.5	146.3	0.00652	0.36	10.62729	52.713	207.0133	1521.2	1	0
18							0	0	0	0	0	0	0
19	2.8	143.95	7.75	0.0	72.0	0.00652	20.6	0	1482.5	58892.74	1807.7	35568	14
20	1.5	6.50	7.75	29.6	3.3	0.00652	0.49	14.5919	1.6022	280.9228	3006.4	2	0
21	1.3	148.70	7.75	53.5	74.4	0.00652	9.4	502.7944	698.74	0.007526	459.6	17317	1
22	1.0	15.00	7.75	72.5	111.8	0.00652	0.76	54.98509	84.791	274.604	703.52	14	0
23	1.3	4.75	7.75	0.0	146.3	0.00652	0.32	0	46.739	913.2904	1348.8	1	0
24	11.0	1.00	7.75	137.0	128.7	0.00652	0.56	76.19543	71.579	3880.392	1247.3	0	6
25	0.9	128.70	7.75	131.5	64.4	0.00652	5.6	735.8993	360.11	34071.95	1616	7724	0
			7.75			0.00000	0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00652	1.01	144.0989	140.26	8014.968	3326.7	34	0
27	72.5	1.12	7.75	36.3	148.7	0.00652	4.11	148.8263	610.5	1217.654	18627	0	1798
28	70.0	1.00	7.75	107.5	148.7	0.00652	3.54	380.4715	526.29	10331.33	16057	0	1445
29	15.0	1.50	7.75	-7.5	89.3	0.00652	1.14	-8.53217	101.59	4229.167	72.025	0	21
30	78.0	0.84	7.75	92.5	59.3	0.00652	3.31	306.43	196.45	5046.018	1609.7	0	1680
31	53.5	148.70	1.00	26.8	74.4	0.01724	137	3667.969	10202	97910.68	6610.1	252664	32706
32	78.0	148.70	0.86	92.5	74.4	0.00888	88.6	8195.131	6591.5	134950.2	4270.9	163251	44918
33							0	0	0	0	0	0	0
34	53.5	1.33	7.75	26.8	0.0	0.00652	3.6	96.23762	0	2568.912	23805	1	858
35	78.0	1.00	7.75	92.5	0.0	0.00652	3.94	364.7976	0	6007.164	26095	0	1999
36	19.0	0.67	7.75	63.0	104.3	0.00652	0.64	40.54942	67.132	58.43524	339.21	0	19
37	80.0	33.00	0.86	112.5	165.0	0.00888	20.2	2268.637	3327.3	70264.03	141129	1830	10755
38	80.0	1.00	7.75	112.5	181.7	0.00652	4.04	455.049	734.95	14093.74	40738	0	2157
39							0	0	0	0	0	0	0
40							0	0	0	0	0	0	0
41							0	0	0	0	0	0	0
42							0	0	0	0	0	0	0
43							0	0	0	0	0	0	0
44							0	0	0	0	0	0	0
45							0	0	0	0	0	0	0
46							0	0	0	0	0	0	0
47							0	0	0	0	0	0	0
48							0	0	0	0	0	0	0

Total Floor Mass= 334 18106.9 27192 471203.5 315899 506468 98722

C. G. COORDINATES: XCG= 54.28 ft YCG= 81.52 ft Wt.= 10741

MASS MOMENTS OF INERTIA: IXX= 822367 IYY= 569925 IZZ= 1392292

Units: Kips, Feet, Second

NMSF05
UNDEFORMED
SHAPE

OPTIONS
ALL JOINTS
RESTRAINTS
WIRE FRAME

SAP90

10/16/82, Rev. 0, Job # 41552

5/1/83

<p>NMSF05 UNDEFORMED SHAPE</p>
<p>OPTIONS ALL JOINTS RESTRAINTS WIRE FRAME</p>
<p>SAP90</p>

Case: S-0002, Run: 0, Job: 41552
Date: 5-2-01

EVAL OF NMIF @ CANL

MODIFICATION OF _____

DESIGNED BY BM

DATE 3/1/95

CHECKED BY JV

DATE 3/1/95

Water Soil Pressure DISTRIBUTION

Apply C_u West, South or North walls.

$$D_2 + S_1 =$$

$$0.2 \times 36.5 = 7.3 > 5.75$$

Conservative

NMSF05

UNDEFORMED
SHAPEOPTIONS
HIDDEN LINES

SAP90

NMSF05
UNDEFORMED
SHAPE

OPTIONS
JOINT IDS
ALL JOINTS
WIRE FRAME

SAP90

9109091									
8108091									
7107091	7081	7071	7061	7051	7041	7031	7021	7011	7001
6106091	6081	6071	6061	6051	6041	6031	6021	6011	6001
5105091	5081	5071	5061	5051	5041	5031	5021	5011	5001
4104091	4081	4071	4061	4051	4041	4031	4021	4011	4001
3103091	3081	3071	3061	3051	3041	3031	3021	3011	3001
2102091	2081	2071	2061	2051	2041	2031	2021	2011	2001
1101091	1081	1071	1061	1051	1041	1031	1021	1011	1001
10191	81	71	61	51	41	31	21	11	1

File: S-0002, Rev. 0, Job # 41552

INT. 5701

NMSF05
UNDEFORMED
SHAPE

OPTIONS
JOINT IDS
ALL JOINTS
WIRE FRAME

SAP90

9109093									
8108093									
7107093	7083	7073	7063	7053	7043	7033	7023	7013	7003
6106093	6083	6073	6063	6053	6043	6033	6023	6013	6003
5105093	5083	5073	5063	5053	5043	5033	5023	5013	5003
4104093	4083	4073	4063	4053	4043	4033	4023	4013	4003
3103093	3083	3073	3063	3053	3043	3033	3023	3013	3003
2102093	2083	2073	2063	2053	2043	2033	2023	2013	2003
1101093	1083	1073	1063	1053	1043	1033	1023	1013	1003
10093	83	73	63	53	43	33	23	13	3

Calc. S-0002, Run. 0, Job # 41552 Sit. 58 a

NMSF05 UNDEFORMED SHAPE	OPTIONS JOINT IDS ALL JOINTS WIRE FRAME	SAP90
<div> <div>9100093</div> <div>8100093</div> <div>7100093</div> <div>6100093</div> <div>5100093</div> <div>4100093</div> <div>3100093</div> <div>2100093</div> <div>1100093</div> <div>10093</div> </div>	<div> <div>7083</div> <div>6083</div> <div>5083</div> <div>4083</div> <div>3083</div> <div>2083</div> <div>1083</div> <div>83</div> </div>	<div> <div>7073</div> <div>6073</div> <div>5073</div> <div>4073</div> <div>3073</div> <div>2073</div> <div>1073</div> <div>73</div> </div> <div> <div>7063</div> <div>6063</div> <div>5063</div> <div>4063</div> <div>3063</div> <div>2063</div> <div>1063</div> <div>63</div> </div> <div> <div>7053</div> <div>6053</div> <div>5053</div> <div>4053</div> <div>3053</div> <div>2053</div> <div>1053</div> <div>100053</div> </div> <div> <div>7043</div> <div>6043</div> <div>5043</div> <div>4043</div> <div>3043</div> <div>2043</div> <div>1043</div> <div>43</div> </div> <div> <div>7033</div> <div>6033</div> <div>5033</div> <div>4033</div> <div>3033</div> <div>2033</div> <div>1033</div> <div>33</div> </div>	<div> <div>702370137003</div> <div>602360136003</div> <div>502350135003</div> <div>402340134003</div> <div>302330133003</div> <div>202320132003</div> <div>102310131003</div> <div>23133</div> </div>

NMSF05
UNDEFORMED
SHAPE

OPTIONS
JOINT IDS
ALL JOINTS
WIRE FRAME

SAP90

7107094	7084	7074	7064	7054	7044	7034	7024	7014	7004
6104094	6084	6074	6064	6054	6044	6034	6024	6014	6004
5103094	5084	5074	5064	5054	5044	5034	5024	5014	5004
4102094	4084	4074	4064	4054	4044	4034	4024	4014	4004
3101094	3084	3074	3064	3054	3044	3034	3024	3014	3004
2100094	2084	2074	2064	2054	2044	2034	2024	2014	2004
1104094	1084	1074	1064	1054	1044	1034	1024	1014	1004
10494	84	74	64	54	44	34	24	14	4

Calc. S-0002, Rev. 0, Job # 41552
Sut. 6004

<p>NMSF05</p> <p>UNDEFORMED SHAPE</p>	<p>OPTIONS</p> <p>ALL JOINTS</p> <p>PROPERTY IDS</p> <p>WIRE FRAME</p>	<p>SAP90</p>

NMSF05

UNDEFORMED
SHAPE

OPTIONS

ALL JOINTS
PROPERTY IDS
WIRE FRAME

SAP90

<p>NMSF05</p> <p>UNDEFORMED</p> <p>SHAPE</p>	<p>OPTIONS</p> <p>JOINT IDS</p> <p>ALL JOINTS</p> <p>WIRE FRAME</p>	<p>SAP90</p>
	<p>7125</p> <p>* 6125</p> <p>* 5125</p> <p>* 4125</p> <p>* 7115</p> <p>* 6115</p> <p>* 5115</p> <p>* 4115</p> <p>* 7085</p> <p>* 6085</p> <p>* 5085</p> <p>* 4085</p> <p>* 7075</p> <p>* 6075</p> <p>* 5075</p> <p>* 4075</p> <p>* 7065</p> <p>* 6065</p> <p>* 5065</p> <p>* 4065</p> <p>* 7055</p> <p>* 6055</p> <p>* 5055</p> <p>* 4055</p> <p>* 7045</p> <p>* 6045</p> <p>* 5045</p> <p>* 4045</p> <p>* 7035</p> <p>* 6035</p> <p>* 5035</p> <p>* 4035</p> <p>* 7025</p> <p>* 6025</p> <p>* 5025</p> <p>* 4025</p> <p>* 7005</p> <p>* 6005</p> <p>* 5005</p> <p>* 4005</p>	<p>710095</p> <p>* 610095</p> <p>* 510095</p> <p>* 410095</p> <p>* 70895</p> <p>* 60895</p> <p>* 50895</p> <p>* 40895</p> <p>* 70795</p> <p>* 60795</p> <p>* 50795</p> <p>* 40795</p> <p>* 70695</p> <p>* 60695</p> <p>* 50695</p> <p>* 40695</p> <p>* 70595</p> <p>* 60595</p> <p>* 50595</p> <p>* 40595</p> <p>* 70495</p> <p>* 60495</p> <p>* 50495</p> <p>* 40495</p> <p>* 70395</p> <p>* 60395</p> <p>* 50395</p> <p>* 40395</p> <p>* 70295</p> <p>* 60295</p> <p>* 50295</p> <p>* 40295</p> <p>* 70095</p> <p>* 60095</p> <p>* 50095</p> <p>* 40095</p>	<p>710095</p> <p>* 610095</p> <p>* 510095</p> <p>* 410095</p> <p>* 70895</p> <p>* 60895</p> <p>* 50895</p> <p>* 40895</p> <p>* 70795</p> <p>* 60795</p> <p>* 50795</p> <p>* 40795</p> <p>* 70695</p> <p>* 60695</p> <p>* 50695</p> <p>* 40695</p> <p>* 70595</p> <p>* 60595</p> <p>* 50595</p> <p>* 40595</p> <p>* 70495</p> <p>* 60495</p> <p>* 50495</p> <p>* 40495</p> <p>* 70395</p> <p>* 60395</p> <p>* 50395</p> <p>* 40395</p> <p>* 70295</p> <p>* 60295</p> <p>* 50295</p> <p>* 40295</p> <p>* 70095</p> <p>* 60095</p> <p>* 50095</p> <p>* 40095</p>

<div><div>Z</div><div><div>Y</div><div></div></div></div>	NMSF05 UNDEFORMED SHAPE	OPTIONS JOINT IDS ALL JOINTS WIRE FRAME	SAP90																																																																	
	<table><tr><td>7128</td><td>7118</td><td>7108</td><td>7098</td><td>7088</td><td>7078</td><td>7068</td><td>7058</td><td>7048</td><td>7038</td><td>7028</td><td>7018</td><td>7008</td></tr><tr><td>* 6128</td><td>* 6118</td><td>* 6108</td><td>* 6098</td><td>* 6088</td><td>* 6078</td><td>* 6068</td><td>* 6058</td><td>* 6048</td><td>* 6038</td><td>* 6028</td><td>* 6018</td><td>* 6008</td></tr><tr><td>* 5128</td><td>* 5118</td><td>* 5108</td><td>* 5098</td><td>* 5088</td><td>* 5078</td><td>* 5068</td><td>* 5058</td><td>* 5048</td><td>* 5038</td><td>* 5028</td><td>* 5018</td><td>* 5008</td></tr><tr><td>* 4128</td><td>* 4118</td><td>* 4108</td><td>* 4098</td><td>* 4088</td><td>* 4078</td><td>* 4068</td><td>* 4058</td><td>* 4048</td><td>* 4038</td><td>* 4028</td><td>* 4018</td><td>* 4008</td></tr><tr><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td><td>*</td></tr></table>	7128	7118	7108	7098	7088	7078	7068	7058	7048	7038	7028	7018	7008	* 6128	* 6118	* 6108	* 6098	* 6088	* 6078	* 6068	* 6058	* 6048	* 6038	* 6028	* 6018	* 6008	* 5128	* 5118	* 5108	* 5098	* 5088	* 5078	* 5068	* 5058	* 5048	* 5038	* 5028	* 5018	* 5008	* 4128	* 4118	* 4108	* 4098	* 4088	* 4078	* 4068	* 4058	* 4048	* 4038	* 4028	* 4018	* 4008	*	*	*	*	*	*	*	*	*	*	*	*	*		
7128	7118	7108	7098	7088	7078	7068	7058	7048	7038	7028	7018	7008																																																								
* 6128	* 6118	* 6108	* 6098	* 6088	* 6078	* 6068	* 6058	* 6048	* 6038	* 6028	* 6018	* 6008																																																								
* 5128	* 5118	* 5108	* 5098	* 5088	* 5078	* 5068	* 5058	* 5048	* 5038	* 5028	* 5018	* 5008																																																								
* 4128	* 4118	* 4108	* 4098	* 4088	* 4078	* 4068	* 4058	* 4048	* 4038	* 4028	* 4018	* 4008																																																								
*	*	*	*	*	*	*	*	*	*	*	*	*

NMSF05 UNDEFORMED SHAPE	OPTIONS ALL JOINTS PROPERTY IDS WIRE FRAME	SAP90
<p>NMSF05</p> <p>UNDEFORMED</p> <p>SHAPE</p>	<p>OPTIONS</p> <p>JOINT IDS</p> <p>ALL JOINTS</p> <p>PROPERTY IDS</p> <p>WIRE FRAME</p>	<p>SAP90</p>
<p>7129 *</p> <p>6129 *</p> <p>5129 *</p> <p>4129 *</p>	<p>7119 *</p> <p>6119 *</p> <p>5119 *</p> <p>4119 *</p>

NMSF05

UNDEFORMED
SHAPE

OPTIONS

JOINT IDS
ALL JOINTS
PROPERTY IDS
WIRE FRAME

SAP90

7001	7002	7003	7004	7005	7006	7007	7008
6001 34	6002 34	6003 34	6004 35	6005 35	6006 35	6007 35	6008 35
5001 34	5002 34	5003 34	5004 35	5005 35	5006 35	5007 35	5008 35
4001 34	4002 34	4003 34	4004 35	4005 35	4006 35	4007 35	4008 35
3001 12	3002 12	3003 12	3004 35	3005 35	3006 35	3007 35	3008 35
2001 12	2002 12	2003 12	2004 35	2005 35	2006 35	2007 35	2008 35
1001 12	1002 12	1003 12	1004 35	1005 35	1006 35	1007 35	1008 35
1 12	2 12	3 12	4 12	5 12	6 12	7 12	8 12

NMSF05

UNDEFORMED
SHAPE

OPTIONS

JOINT IDS
ALL JOINTS
RESTRAINTS
PROPERTY IDS
WIRE FRAME

SAP90

NMSF05 UNDEFORMED SHAPE	OPTIONS JOINT IDS ALL JOINTS PROPERTY IDS WIRE FRAME	SAP90
7018 x 6018 x 5018 x 4018 x 7017 x 6017 x 5017 x 4017 x 7016 x 6016 x 5016 x 4016 x 7015 x 6015 x 5015 x 4015 x 7014 x 6014 x 5014 x 4014 x 3014 x 2014 x 1014 x 14 x 7013 6013 5013 4013 3013 2013 1013 13 12 11		

<div><div>Z</div><div>↑</div><div>↑</div><div>X</div></div>															NMSF05															UNDEFORMED SHAPE															OPTIONS															JOINT IDS ALL JOINTS PROPERTY IDS WIRE FRAME															SAP90																																												
7041 x															7042 x															7043 x															7044 30															7045 30															7046 30															7047 30															7048 30														
6041 x															6042 x															6043 x															6044 30															6045 30															6046 30															6047 30															6048 30														
5041 x															5042 x															5043 x															5044 30															5045 30															5046 30															5047 30															5048 30														
4041 x															4042 x															4043 x															4044 30															4045 30															4046 30															4047 30															4048 30														
3041 x															3042 x															3043 x															3044 x																																																																										
2041 x															2042 x															2043 x															2044 x																																																																										
1041 x															1042 x															1043 x															1044 x																																																																										
41 x															42 x															43 x															44 x

<p>NMSF05</p> <p>UNDEFORMED SHAPE</p>	<p>OPTIONS</p> <p>JOINT IDS</p> <p>ALL JOINTS</p> <p>RESTRAINTS</p> <p>PROPERTY IDS</p> <p>WIRE FRAME</p>	<p>SAP90</p>
<p>7061</p> <p>6061</p> <p>5061</p> <p>4061</p> <p>3061</p> <p>2061</p> <p>1061</p> <p>61</p>	<p>7062</p> <p>6062</p> <p>5062</p> <p>4062</p> <p>3062</p> <p>2062</p> <p>1062</p> <p>62</p>	<p>7063</p> <p>6063</p> <p>5063</p> <p>4063</p> <p>3063</p> <p>2063</p> <p>1063</p> <p>63</p>
	<p>7064</p> <p>6064</p> <p>5064</p> <p>4064</p> <p>3064</p> <p>2064</p> <p>1064</p> <p>64</p>	<p>7065</p> <p>6065</p> <p>5065</p> <p>4065</p>	<p>7066</p> <p>6066</p> <p>5066</p> <p>4066</p>
	<p>7067</p> <p>6067</p> <p>5067</p> <p>4067</p>	<p>7068</p> <p>6068</p> <p>5068</p> <p>4068</p>

NMSF05 UNDEFORMED SHAPE	OPTIONS JOINT IDS ALL JOINTS RESTRAINTS PROPERTY IDS WIRE FRAME	SAP90
	<div> <div>7071</div> <div>6071</div> <div>5071</div> <div>4071</div> <div>3071</div> <div>2071</div> <div>1071</div> <div>71</div> </div> <div> <div>7072</div> <div>6072</div> <div>5072</div> <div>4072</div> <div>3072</div> <div>2072</div> <div>1072</div> <div>72</div> </div> <div> <div>7073</div> <div>6073</div> <div>5073</div> <div>4073</div> <div>3073</div> <div>2073</div> <div>1073</div> <div>73</div> </div> <div> <div>7074</div> <div>6074</div> <div>5074</div> <div>4074</div> <div>3074</div> <div>2074</div> <div>1074</div> <div>74</div> </div> <div> <div>7075</div> <div>6075</div> <div>5075</div> <div>4075</div> <div>3075</div> <div>2075</div> <div>1075</div> <div>75</div> </div> <div> <div>7076</div> <div>6076</div> <div>5076</div> <div>4076</div> </div> <div> <div>7077</div> <div>6077</div> <div>5077</div> <div>4077</div> </div> <div> <div>7078</div> <div>6078</div> <div>5078</div> <div>4078</div> </div>

9101	9102	9103								
44	44									
8101	8102	8103								
44	44									
7101	7102	7103	7104	7105	7106	7107	7108	7109	7110	
27	27	27	27	28	28	28	28	28	28	
6101	6102	6103	6104	6105	6106	6107	6108	6109	6110	
27	27	27	27	28	28	28	28	28	28	
5101	5102	5103	5104	5105	5106	5107	5108	5109	5110	
27	27	27	27	28	28	28	28	28	28	
4101	4102	4103	4104	4105	4106	4107	4108	4109	4110	
9	9	9	9	9	9	9	9	9	9	
2101	2102	2103	2104	2105						
9	9	9	9							
1101	1102	1103	1104	1105						
9	9	9	9							
101	102	103	104	105						

NMSF05
UNDEFORMED
SHAPE

OPTIONS
JOINT IDS
ALL JOINTS
RESTRAINTS
PROPERTY IDS
WIRE FRAME

SAP90

Calc. 5-00002, Rev. 0, Job # 41552, Sat 7-8-81

<div>Z</div> <div>X</div>	NMSF05							OPTIONS					
	UNDEFORMED							JOINT IDS					
	SHAPE							ALL JOINTS					
								RESTRAINTS					
								PROPERTY IDS					
								WIRE FRAME					
		SAP90											

7125	7126	7127	7128	7129	7130
38	38	38	38	38	38
6125	6126	6127	6128	6129	6130
38	38	38	38	38	38
5125	5126	5127	5128	5129	5130
4125	4126	4127	4128	4129	4130

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M.

DATE 3/14/95

Modification Option (1).

CHECKED BY SV

DATE 3/10/95

5.2 FREQUENCY ANALYSIS

The the dimensional SAP90 model (NMSF05) was used to perform a frequency analysis to obtain natural frequencies and mode shapes of the NMSF building in its modified configuration. The results of from frequency analysis and the plots of the fundamental mode shapes are presented in the following pages. The lowest fundamental frequency of the NMSF building was equal to 9.9 hertz corresponding to a motion predominantly in the east/west direction.

In the following pages:

NMSF05 : ① Mode shapes of Modified
NMSF Building

② Frequency Run Printout
from SAP 90

1ale. S-0002, Rev. 0, Job # 41552 SWT. 31 21

Calc. 5-0002, Rev. 0, Job # 41552 S.W. 3-5

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PROGRAM:SAP90/FILE:NMSF05.RIT

4125

RITZ SYSTEM PARAMETERS

NUMBER OF EQUATIONS	-	2826
NUMBER OF MASSES	-	132
NUMBER OF RITZ VECTORS	-	10
NUMBER OF DIRECTION VECTORS	-	3

CSI / SAP90 - - FINITE ELEMENT ANALYSIS OF STRUCTURES PAGE 2
PROGRAM: SAP90/FILE: NMSF05.RIT

4125

E I G E N V A L U E S A N D F R E Q U E N C I E S

MODE NUMBER	EIGENVALUE (RAD/SEC)**2	CIRCULAR FREQ (RAD/SEC)	FREQUENCY (CYCLES/SEC)	PERIOD (SEC)
1	0.389432E+04	0.624045E+02	9.931986	0.100685
2	0.395023E+04	0.628509E+02	10.003029	0.099970
3	0.410691E+04	0.640852E+02	10.199469	0.098044
4	0.927364E+04	0.962997E+02	15.326579	0.065246
5	0.128767E+05	0.113476E+03	18.060211	0.055370
6	0.149046E+05	0.122085E+03	19.430363	0.051466
7	0.262471E+05	0.162010E+03	25.784625	0.038783
8	0.393997E+05	0.198494E+03	31.591235	0.031654
9	0.647997E+05	0.254558E+03	40.514138	0.024683
10	0.815439E+05	0.285559E+03	45.448122	0.022003

Calc. S-0002, Rev. 0, Job # 41552

Wt. 87 5'

CSI / SAP90 - - FINITE ELEMENT ANALYSIS OF STRUCTURES PAGE 3
PROGRAM: SAP90/FILE: NMSF05.RIT

4125

BASE FORCE REACTION FACTORS

MODE	PERIOD	X	Y	Z	X	Y	Z
#	(sec)	DIRECTION	DIRECTION	DIRECTION	MOMENT	MOMENT	MOMENT
1	0.101	0.253E+02-0.134E+01	0.114E+02	0.950E+03	0.162E+03-0.216E+04		
2	0.100	-0.134E+01	0.269E+02	0.592E+01-0.334E+03	-0.269E+03	0.132E+04	
3	0.098	-0.115E+02-0.599E+01	0.249E+02	0.219E+04-0.136E+04	0.684E+03		
4	0.065	0.398E+00	0.499E+01	0.114E+01	0.137E+04-0.221E+03	0.790E+02	
5	0.055	-0.994E-01	0.702E+00-0.123E+00	-0.108E+03	0.478E+02	0.186E+03	
6	0.051	0.335E+01-0.293E+00	0.207E+01	0.770E+02-0.111E+04	-0.610E+02		
7	0.039	-0.303E+00-0.348E+00	0.204E+00-0.247E+02	-0.127E+03-0.154E+04			
8	0.032	0.272E+01	0.162E+00-0.140E+00	-0.132E+02	0.117E+03-0.375E+03		
9	0.025	-0.383E+00	0.155E+01-0.204E-01	-0.477E+02-0.122E+02	0.595E+03		
10	0.022	0.176E+00	0.516E+00	0.192E+00-0.399E+01	0.155E+02-0.242E+03		

Calc. S-0002, Rev. 0, Job # 41552

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PROGRAM:SAP90/FILE:NMSF05.RIT

4125

PARTICIPATING MASS - (percent)

MODE	X-DIR	Y-DIR	Z-DIR	X-SUM	Y-SUM	Z-SUM
1	80.579	0.226	16.442	80.579	0.226	16.442
2	0.228	91.655	4.424	80.806	91.881	20.866
3	16.790	4.526	78.360	97.596	96.407	99.226
4	0.020	3.138	0.165	97.616	99.544	99.391
5	0.001	0.062	0.002	97.617	99.606	99.393
6	1.416	0.011	0.539	99.033	99.617	99.932
7	0.012	0.015	0.005	99.045	99.632	99.937
8	0.932	0.003	0.002	99.976	99.636	99.940
9	0.019	0.304	0.000	99.995	99.939	99.940
10	0.004	0.034	0.005	99.999	99.973	99.945

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M. DATE 3/10/95

Modification Option (1).

CHECKED BY J✓ DATE 3/10/95

5.3 RESPONSE SPECTRUM ANALYSIS

The response spectrum analysis was performed using Ground acceleration Response Spectrum with spectral shape of that recommended in ~~NEES-98 (1)~~ and a ZPA of 0.3g.

IRSG GUIDE 1.60

The acceleration spectra are applied in north/south, east/west and vertical directions simultaneously. The amplitude of the ground motion in vertical direction was assumed to be equal to 2/3 of the amplitude of the horizontal ground motion. The structural damping was conservatively assumed to be 7%. Damping ratios of up to 10% are allowed under DOE standards (DOE-STD-1020-94 (2)).

The results from response spectrum analysis(E) are combined with member forces due to dead loads(D), live loads(L), and lateral soil pressure loads(H) by SAP90 program. The SAP90 model designated as NMSF05 was used for this analysis. The operating level thermal stress analysis results are later added to these results to calculate the total demand for seismic load combinations:

$D + L + H + To + E$
and
 $D + L + H + To - E$

A summary of member forces and corresponding Demand/Capacity (D/C) ratios are presented in section 7.0 of this calculation.

EVALUATION OF NMSF FACILITY AT LANL
MODIFICATION OPTION (1)

SWT. 10
Job 41552
Cof: S-0002
Rev. 0

REG GUIDE 1.60

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY **B.M.**

DATE **3/13/95**

Modification Option (1).

CHECKED BY **JL**

DATE **3/10/95**

5.4 UBC STATIC LOAD ANALYSIS

To address the load criteria requirements for non-seismic load combinations recommended by UBC (4). The 3-dimensional model of the NMSF building was subjected to combinations of the dead loads(D) and live loads(L), static lateral soil pressure (Hs). A static analysis was performed. The SAP90 input data for this analysis is stored in file named NMSF51.

The results from this static analysis in then combined with those from thermal analysis due to accidental (Rare) thermal loads to compute member forces for load combination:

$$D + L + Hs + Ta$$

A summary of member forces and corresponding Demand/Capacity (D/C) ratios are presented in section 7.0 of this calculation.

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M.

DATE 3/10/95

Modification Option (1).

CHECKED BY SL

DATE 3/10/95

6.0 THERMAL STRESS ANALYSIS

A simple 2-dimensional section of the NMSF building in east/west direction was used to estimate out-of-plane bending moments of the major concrete walls adjacent to the nuclear material storage room in the basement.

The following assumptions are made for this analysis:

- 1) Uncracked concrete stiffness is conservatively used.
- 2) The thermal gradients are provided by LANL Staff (17) are not based on rigorous heat transfer analysis and as a result are probably very conservative. The following thermal gradients are used in this analysis:

Operating Condition:

- 20 Deg. F: Across the walls on lines 1 and 2 below charge deck and the charge deck itself.
- 13 Deg. F: Across the 1.5 feet slab of basement floor.
- 16 Deg. F: Across the 1st floor walls and the roof slab.

Accidental Condition:

- 40 Deg. F: Across the walls on lines 1 and 2 below charge deck and the charge deck itself.
- 13 Deg. F: Across the 1.5 feet slab of basement floor.
- 16 Deg. F: Across the 1st floor walls and the roof slab.

- 3) Only the thermal gradient loads are considered. The axial thermal stresses are neglected in this evaluation.

The thermal stresses in the walls of the storage area dominantly control the design of the walls. A more accurate estimate of the thermal loads should be obtained and used during the final design stage for these walls.

Evaluation of NMIF for LANL

DESIGNED BY BM DATE 2/9/95

Modification OPTION 1

CHECKED BY JL DATE 3/2/95

Thermal Stress Analysis Summary

Wall out-of-Plane Moments and shears (*)

WALL/SLAB	SAP90 ELEM. NO.	OPERATING COND.		ACCIDENT COND.	
		MU (FT-K)	VU (KIPS)	MU (FT-K)	VU (KIPS)
3' Wall on line (1) (Basement)	[1]	84	3.7	163	6.3
2.5' Wall on line (2) (Basement)	[6, 7]	67	2.6	135	5.7
1.5' slab (Basement Floor)	[3, 21, 22]	27	1.9	46	4.3
2.5' charge Deck	[4, 19, 20]	65	1.4	140	3.7
1.5' wall on line ① Above Deck	[2]	20	0.6	23	0.8
1.5' wall on line ② Above Deck	[8, 9]	12	0.0	5	1.6

(*) REF SAP90 FILE : HEAT32.F3F

Evaluation of NMSE @ LANL

Modification Option (1)

DESIGNED BY R.M.

DATE 1/2/70

CHECKED BY JV

DATE 3/10/95

Thermal Stress Analysis

Thermal Load Gradients: (REF. LANL/Thad Knight Notes)

It is assumed that 75 kw worth of heat is generated by the stored waste to produce the following thermal loads.

<u>Wall</u>	<u>Operating Condition</u>	<u>Accident Condition</u>
Exterior walls	20°F	40°F
Basement slab	13°F	13°
Charge Deck	20°F	40°F
Roof slab	16°F	16°

EVAL OF NMSF @ LANL
MODIFICATION OPTION (1)

DESIGNED BY BM DATE 3/10/92
CHECKED BY JV DATE 3/10/92

Thermal Gradient

ΔT Across the section
Operating Accident

1
2
3

20°F
13°
16

40°
13°
16

EVAL of NMSE & LARL

MOD OPTION 1

DESIGNED BY BM

DATE 3/10/95

CHECKED BY JL

DATE 3/10/95

SAP90 MODEL (2-D Thermal Stress Analysis)

WALL/SLAB Thicknesses:

$T = 3'$: 1

$T = 2.5$: 14, 19, 20 30" Composite Deck, 6, 7 and 8

$T = 1.5$: 3, 10, 21, 22 Base Mat., 2, 9, 17, 18

$T = 1'$: 5, 11, 12, 13, 14, 15, 16

Soil springs for a modulus of subgrade of

$k_s = 10 \text{ KIPS/FT}^3$

$K_1 = \frac{18.6}{2} \times 10 = 93 \text{ K/FT}$ $K_9 = \frac{10.5}{2} \times 10 = 53 \text{ K/FT}$

$K_2 = \frac{36.5}{2} \times 10 = 183 \text{ K/FT}$ $K_{10} = \frac{21}{2} \times 10 = 105 \text{ K/FT}$

HEAT32 FRAME OUTPUT M33 LOAD 2	MIN < 17> -0.4226E+01 AT 0.00 MAX < 1> 0.1723E+03 AT 18.60	SAP90
HEAT32 FRAME OUTPUT M33 LOAD 1	MIN < 17> -0.2030E+01 AT 0.00 MAX < 1> 0.8395E+02 AT 18.60	SAP90

LANL NMSF BUILDING - ANALYSIS FOR THERMAL STRESSES - MOD. OF SUBG Ks-1
HEAT32)

C	REV.	DATE	FILE	DESCRIPTION
C	12-	7-94	B.MOSADDAD	WEST1 ORIGIN
C	12-09-94	BM	WEST2	ADD TRIANGULAR DYN. PRESSU
C	12-12-94	BM	WEST3	ADD TRIANGULAR
C	12-14-94	BM	WEST31	ADD SURCHARGE (
C	2-4-95	BM	WEST32	ADD THERMAL LOA
C				ADD FLOORS/ROOF
C	2-8-95		Heat11	Model a Complete Slice of
C				OPERATING CONDITION
C		BM	HEAT31	ADD SOIL SPRINGS USING Ks
C	3-7-95	BM	HEAT32	UPDATE THERMAL LOADS

C
SYSTEM

L=2

JOINTS

1	X=0	Y=0
2	X=0	Y=18.6
3	X=0	Y=36.5
C		
4	X=29.6	Y=0
5	X=29.6	Y=10.5
6	X=29.6	Y=18.6
7	X=29.6	Y=21.
8	X=29.6	Y=36.8
C		
9	X=53.5	Y=0
10	X=53.5	Y=10.5
11	X=53.5	Y=21.
12	X=53.5	Y=36.5
14	X=29.6/3	Y=0
15	X=29.6/3	Y=18.6
16	X=29.6/3*2	Y=0
17	X=29.6/3*2	Y=18.6
50	X=1	Y=1

RESTRAINTS

1	17	1	R=0,0,1,1,1,0
1			R=0,1,1,1,1,0
4			R=0,1,1,1,1,0
9			R=0,1,1,1,1,0
11	12	1	R=1,0,1,1,1,0
50			R=1,1,1,1,1,1

SPRINGS

1	K=93
2	K=183
C 3	K=90
9	K=53
10	K=105

FRAME

NM=4 NL=9

1	SH-R	T=3.00,1	E=518400.*1.00	TC=1E-5
2	SH-R	T=1.50,1	E=518400.*1.00	TC=1E-5
3	SH-R	T=2.50,1.	E=518400.*1.00	TC=1E-5

4 SH=R T=1.0,1. E=518400.*1.00 TC=1E-5

C OPERATING CONDITION (THERMAL GRAD.)

```
1 T=00,20/3.0,0.      :thermal load on 3' EXTERIOR WALL(1)
```

2 T=00,13/1.5,0. :thermal load on 1.5' slab and walls(3,21,22)

3 T=00,20/2.5,0. :thermal load on 2.5' deck AND WALLS (4,19,20,6,7,8)

4 T=00,16/1.5,0. :thermal load on 1.5 ' walls (op and Acc) (2,9)

C ACCIDENT CONDITION (THERMAL GRAD.)

5 T=00,40/3.0,0. :thermal load on 3' EXTERIOR WALL

6 T=00,13/1.5,0. :thermal load on 1.5' slab

7 T=00,40/2.5,0. :thermal load on 2.5' deck AND WALL

8 T=00,40/3.0,0. :thermal load on 3.0 INTERIOR WALL(NONE)

9 T=00,16/1.0,0. :thermal load on 1.0 ROOF SLAB (OP. AND ACC.)

C

C	LC1	OPERATING
C	LC2	ACCIDENTAL

C

1 1 2 M=1,1 LP=0,50 NSL=1,5

2	2	3	M=2, 2	LP=0, 50	NSL=4, 4
---	---	---	--------	----------	----------

3 1 14 M=2,2 LP=0,50 NSL=2,6

21 14 16 M=2,2 LP=0,50 NSL=2,6

22	16	4	M=2,2	LP=0,50	NSL=2,6
----	----	---	-------	---------	---------

4	2	15	M=3,3	LP=0,50	NSL=3,7
---	---	----	-------	---------	---------

19	15	17	M=3,3	LP=0,50	NSL=3,7
----	----	----	-------	---------	---------

20 17 6 M=3,3 LP=0,50 NSL=3,7

5 3 8 M=4,4 LP=0,50 NSL=9,9

6	4	5	M=3,3	LP=0,50	NSL=3,7
---	---	---	-------	---------	---------

7	5	6	M=3,3	LP=0,50	NSL=3,7
---	---	---	-------	---------	---------

8	6	7	M=3,3	LP=0,50
---	---	---	-------	---------

9 7 8 M=2,2 LP=0,50

10	4	9	M=2,2	LP=0,50
----	---	---	-------	---------

11	5	10	M=4, 4	LP=0, 50
----	---	----	--------	----------

12	7	11	M=4, 4	LP=0, 50
----	---	----	--------	----------

13	8	12	M=4.4	LP=0.50
----	---	----	-------	---------

14	9	10	M=4.4	LP=0.50
----	---	----	-------	---------

15 10 11 M=4.4 LP=0.50

15	10	11	M=4.4	LP=0.50
16	11	12	M=4.4	LP=0.50

16	11	12	M=1.4	LP=0.50
17	14	15	M=2.2	LP=0.50

17	14	15	M=2.2	LP=0.50
18	16	17	M=2.2	LP=0.50

Int. red 5;

STRUCTURAL ANALYSIS PROGRAMS

VERSION P5.40

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Calc. S-0002, Rev. 0, Job # 41552

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 PROGRAM: SAP90/FILE: heat32.F3F
 LANL NMSF BUILDING - ANALYSIS FOR THERMAL STRESSES - MOD. OF SUBG Ks=1

FRAME ELEMENT FORCES

ELT LOAD ID COND	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
1							
1	0.000			-1.452			
	0.000	3.069	27.382				
	18.600	3.069	84.463				
	18.600			-1.452			
2	0.000			-3.788			
	0.000	6.284	45.644				
	18.600	6.284	162.527				
	18.600			-3.788			
2							
1	0.000			-0.100			
	0.000	-0.623	19.726				
	17.900	-0.623	8.574				
	17.900			-0.100			
2	0.000			-0.090			
	0.000	-0.792	22.521				
	17.900	-0.792	8.351				
	17.900			-0.090			
3							
1	0.000			2.979			
	0.000	-1.921	27.382				
	9.867	-1.921	8.426				
	9.867			2.979			
2	0.000			6.126			
	0.000	-4.341	45.644				
	9.867	-4.341	2.817				
	9.867			6.126			
4							
1	0.000			-3.684			
	0.000	-1.352	64.737				
	9.867	-1.352	51.401				
	9.867			-3.684			
2	0.000			-7.068			
	0.000	-3.698	140.006				
	9.867	-3.698	103.519				
	9.867			-7.068			
5							
1	0.000			0.622			
	0.000	-0.107	8.574				
	29.602	-0.107	5.419				
	29.602			0.622			

Calc. S-0002, Rev. 0, Job #41552

SW. 100 7

CSI / SAP90 - - FINITE ELEMENT ANALYSIS OF STRUCTURES PAGE 2
 PROGRAM: SAP90/FILE: heat32.F3F
 LANL NMSF BUILDING - ANALYSIS FOR THERMAL STRESSES - MOD. OF SUBG Ks=1

FRAME ELEMENT FORCES

ELT LOAD ID COND	DIST ENDI	1-2 PLANE		AXIAL	1-3 PLANE		AXIAL
		SHEAR	MOMENT	FORCE	SHEAR	MOMENT	TORQ
2	0.000			0.791			
	0.000	-0.098	8.351				
	29.602	-0.098	5.451				
	29.602			0.791			
6							
1	0.000			-1.276			
	0.000	2.583	23.338				
	10.500	2.583	50.458				
	10.500			-1.276			
2	0.000			-2.623			
	0.000	5.651	39.627				
	10.500	5.651	98.959				
	10.500			-2.623			
7							
1	0.000			-1.332			
	0.000	2.176	49.662				
	8.100	2.176	67.286				
	8.100			-1.332			
2	0.000			-2.724			
	0.000	4.680	97.456				
	8.100	4.680	135.366				
	8.100			-2.724			
8							
1	0.000			0.066			
	0.000	-1.029	2.093				
	2.400	-1.029	-0.376				
	2.400			0.066			
2	0.000			0.083			
	0.000	-1.622	5.188				
	2.400	-1.622	1.295				
	2.400			0.083			
9							
1	0.000			0.028			
	0.000	0.330	-0.824				
	15.800	0.330	4.397				
	15.800			0.028			
2	0.000			0.004			
	0.000	0.246	0.369				
	15.800	0.246	4.262				
	15.800			0.004			

Calc. S-0002, Rev. 0, Job # 41552

Sht. 107 of

CSI / SAP90 - - FINITE ELEMENT ANALYSIS OF STRUCTURES PAGE 3
 PROGRAM: SAP90/FILE: heat32.F3F
 LANL NMSF BUILDING - ANALYSIS FOR THERMAL STRESSES - MOD. OF SUBG Ks-1

FRAME ELEMENT FORCES

ELT	LOAD	DIST	1-2 PLANE		AXIAL	1-3 PLANE		AXIAL
ID	COND	ENDI	SHEAR	MOMENT	FORCE	SHEAR	MOMENT	TORQ
10 -----								
	1	0.000			-0.083			
		0.000	0.177	-3.451				
		23.900	0.177	0.789				
		23.900			-0.083			
	2	0.000			-0.291			
		0.000	0.454	-8.584				
		23.900	0.454	2.270				
		23.900			-0.291			
11 -----								
	1	0.000			0.407			
		0.000	0.055	-0.797				
		23.900	0.055	0.526				
		23.900			0.407			
	2	0.000			0.970			
		0.000	0.101	-1.503				
		23.900	0.101	0.908				
		23.900			0.970			
12 -----								
	1	0.000			-1.359			
		0.000	0.037	-0.448				
		23.900	0.037	0.438				
		23.900			-1.359			
	2	0.000			-1.868			
		0.000	0.079	-0.926				
		23.900	0.079	0.965				
		23.900			-1.868			
13 -----								
	1	0.000			0.954			
		0.000	-0.060	1.022				
		23.902	-0.060	-0.408				
		23.902			0.954			
	2	0.000			1.039			
		0.000	-0.073	1.189				
		23.902	-0.073	-0.556				
		23.902			1.039			
14 -----								
1	0.000			-0.021				
	0.000	-0.129	0.789					
	10.500	-0.129	-0.567					
	10.500			-0.021				

Calc. S-0002, Rev. 0, Job # 41552

Sht. 08 of

CSI / SAP90 - - FINITE ELEMENT ANALYSIS OF STRUCTURES PAGE 4
 PROGRAM: SAP90/FILE: heat32.F3F
 LANL NMSF BUILDING - ANALYSIS FOR THERMAL STRESSES - MOD. OF SUBG Ks=1

FRAME ELEMENT FORCES

ELT LOAD ID COND	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
2	0.000			-0.094			
	0.000	-0.370	2.270				
	10.500	-0.370	-1.611				
	10.500			-0.094			

15	1 0.000			0.035			
	0.000	0.196	-1.093				
	10.500	0.196	0.966				
	10.500			0.035			
2	0.000			0.007			
	0.000	0.431	-2.520				
	10.500	0.431	2.003				
	10.500			0.007			

16	1 0.000			0.072			
	0.000	-0.060	0.527				
	15.500	-0.060	-0.408				
	15.500			0.072			
2	0.000			0.086			
	0.000	-0.103	1.038				
	15.500	-0.103	-0.556				
	15.500			0.086			

17	1 0.000			1.802			
	0.000	0.312	-3.434				
	18.600	0.312	2.371				
	18.600			1.802			
2	0.000			4.297			
	0.000	0.579	-6.679				
	18.600	0.579	4.083				
	18.600			4.297			

18	1 0.000			0.947			
	0.000	0.167	-1.042				
	18.600	0.167	2.060				
	18.600			0.947			
2	0.000			2.209			
	0.000	0.187	-0.617				
	18.600	0.187	2.866				
	18.600			2.209			

CSI / SAP90 - - FINITE ELEMENT ANALYSIS OF STRUCTURES PAGE 5
 PROGRAM:SAP90/FILE:heat32.P3F
 LANL NMSF BUILDING -ANALYSIS FOR THERMAL STRESSES - MOD. OF SUBG Ks-1

FRAME ELEMENT FORCES

ELT ID	LOAD COND	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
19								
	1	0.000			-3.372			
		0.000	0.450	49.029				
		9.867	0.450	53.468				
		9.867			-3.372			
	2	0.000			-6.489			
		0.000	0.599	99.436				
		9.867	0.599	105.344				
		9.867			-6.489			
20								
	1	0.000			-3.205			
		0.000	1.397	51.408				
		9.867	1.397	65.193				
		9.867			-3.205			
	2	0.000			-6.302			
		0.000	2.807	102.479				
		9.867	2.807	130.178				
		9.867			-6.302			
21								
	1	0.000			2.667			
		0.000	-0.120	11.860				
		9.867	-0.120	10.679				
		9.867			2.667			
	2	0.000			5.547			
		0.000	-0.044	9.497				
		9.867	-0.044	9.065				
		9.867			5.547			
22								
	1	0.000			2.500			
		0.000	0.828	11.721				
		9.867	0.828	19.887				
		9.867			2.500			
	2	0.000			5.360			
		0.000	2.165	9.682				
		9.867	2.165	31.043				
		9.867			5.360			

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M. DATE 3/10/95
CHECKED BY SV DATE 3/10/95

Modification Option (1).

7.0 DEMAND VERSUS CAPACITY

7.1 WALL IN-PLANE SHEAR AND BENDING OF SHEAR

KAISER	1 alc. 5-0002, Rev. 0	SHEET	111	OF	
ENGINEER	Job # 41552	BY:	BM	DATE:	3/10/95
		CHKD:	JV	DATE:	3/12/95

SUMMARY OF IN-PLANE SHEAR D/C RATIOS (OPTION 1)

WALL SEGME	LENGTH L (FEET)	WIDTH Be(*) (FEET)	CAPACITY (Vc) (KIPS)	DEMAND (Vu) (KIPS)	(D/C) Vu/Vc
1	130.45	3	4847	1629	0.34
2	18.25	1.5	339	131	0.39
4	18.25	1.33	301	124	0.41
5	130.45	2.83	4573	1770	0.39
6	148.7	1.45	2671	1080	0.40
9	72.5	1.38	1239	1315	1.06
12	53.5	1.5	994	837	0.84
8	44.4	1	550	215	0.39
10	19	1	235	230	0.98
18	29.6	1.5	550	509	0.93
33	23.9	1	296	279	0.94
11	23.9	1	296	227	0.77
7	29.6	1.5	550	274	0.50
29	15	1.5	279	250	0.90
3	29.6	1.5	550	70	0.13
21	148.7	1.25	2302	1072	0.47
28	80	1	991	791	0.80
30	78	0.84	812	578	0.71
35	78	1	966	751	0.78
22	25	1	310	71	0.23
36	19	0.67	158	114	0.72
25	128.7	0.86	1371	826	0.60
38	80	1	991	721	0.73

$$v_c = .85 \cdot 2 \cdot \text{SQRT}(f'_c) = 108 \text{ PSI}$$

$$V_c = .8 \cdot v_c \cdot L \cdot B_e$$

B_e = Effective Wall Thickness

(*) wall 5 is 1.5' wide JV

0.73 (*)

0.4.

SAP90

NMSF05

UNDEFORMED
SHAPE

OPTIONS

ELEMENT IDS
WIRE FRAME

SAP90

NMSF05 UNDEFORMED SHAPE	OPTIONS PROPERTY IDS WIRE FRAME	SAP90
<div data-bbox="462 1071 1461 1648"> </div> <div data-bbox="511 441 1006 766"><p>NMSF BLDG. OPTION 1</p><hr/><p>WALL ID 1 Between 30" Deck ELEV. and 1st Floor.</p></div>

NMSF05 UNDEFORMED SHAPE	OPTIONS ELEMENT IDS WIRE FRAME	SAP90
<div style="text-align: center;"> <p>SAP90 SHELL ELEMENT IDS (c) 36" Deck BEBU.</p> </div>

LOS ALAMOS NMSF BUILDG. EVALUATION
OPTION 1

DESIGNED BY B/M

DATE 3/7/95

CHECKED BY JV

DATE 3/10/95

WALL IN-PLANE SHEAR

WALL : 1, 2 Line 1, Basement

SHELL ELEMENT	JOINT	LC1 F _y	LC2 F _y
1101	1	35	-13
	11	14	-21
1102	11	-40	-14
	21	-19	-37
1121	21	185	-169
	31	161	-191
1122	31	93	-82
	41	64	-112
1123	41	94	-82
	51	67	-109
1124	51	101	-74
	61	67	-106
1125	61	97	-80
	71	96	-110
1126	71	101	-79
	81	65	-110
1127	81	131	-147
	91	94	-178
1111	91	18	-15
	101	2	-31
WALL BASE SHEAR	Σ	1544	-1760

wall 2

wall 1

wall 2

REF. COMPUTER RUN: NMSF05 (LFEF)

LOS ALAMOS NMSF BUILDING EVALUATION

DESIGNED BY BM DATE 3/7/95
CHECKED BY JV DATE 3/10/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 1,2 LINE (1) ABOVE 30" DECK

SHELL ELEMENT	JOINT	LC1 FY	LC2 FY
1142	3021		-27
	31		-29
3	31		-12
	41		-14
4	41		-11
	51		-17
5	51		-11
	61		-17
6	61		-10
	71		-18
7	71		-9
	81		-19
8	81		-17
	91		-29
1107	3001		-4
	3061		-4
8	11		-4
	21		-5
1114	3091		1
	3101		-7
WALL BASE SHEAR	$V_u = \sum$		<u>267</u>

LOS ALAMOS NMSF BUILDG. EVALUATION
OPTION 1

DESIGNED BY BM DATE 3/7/95
CHECKED BY JV DATE 3/10/95

WALL IN-PLANE SHEAR

WALL: 4, 5 Line 2 (Beneath)

SHELL ELEMENT	JOINT	LC1 F _y	LC2 F _y
1251	3	19	-19
	13	-7	-34
1252	13	24	-15
	23	9	-34
1253	23	183	-194
	33	163	-217
2	33	97	-90
	43	77	-112
3	43	99	-89
	53	76	-112
4	53	100	-88
	63	76	-112
5	63	101	-88
	73	76	-112
6	73	102	-88
	83	75	-112
7	83	140	-159
	93	112	-187
1261	93	12	-9
	103	5	-23
WALL BASE SHEAR	Σ	1555 ^k	1894 ^k

#4

#4

LOS ALAMOS NMSF BUILDG EVALUATION

DESIGNED BY BM

DATE 3/4/95

CHECKED BY JV

DATE 3/10/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 5, 11 Lin 2

AT MEZZ ELEV.

SHELL ELEMENT	JOINT	LC1 F _y	LC2 F _y
1215	2023		-202
	33		-226
16	33		-82
	43		-119
17	43		-83
	53		-120
18	53		-82
	63		-122
19	63		-82
	73		-124
20	73		-82
	83		-125
21	83		-123
	93		-116
1255	2003		-13
	13		-26
1256	13		-19
	23		-30
1263	2093		-50
	2103		+57
WALL BASE SHEAR	$V_u = \Sigma$		-1883 ^k

LOS ALAMOS NMSF BUILDG EVALUATION

DESIGNED BY

BM

DATE

3/7/95

CHECKED BY

JV

DATE

3/10/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 5,4

Line 2

30" Deck Level

SHELL ELEMENT	JOINT	LC1 F _y	LC2 F _y
1222	3023		-17
	33		-15
3	33		-8
	43		-8
4	43		-7
	53		-9
5	53		-6
	63		-9
6	63		-6
	73		-10
7	73		-7
	83		-11
8	83		-9
	93		-16
1257	3003		-2
	13		-1
8	13		-2
	23		-1
1264	3093		1
	3103		-3
WALL BASE SHEAR	$V_u = \Sigma$		Small!

WALL IN-PLANE SHEAR

WALL: 6 LINE 3, Basement.

SHELL ELEMENT	JOINT	LC1 F _y	LC2 F _y
1301	4	20	-20
	14	6	-31
1302	14	24	-24
	24	12	-34
1303	24	97	-102
	34	89	-118
1304	34	53	-49
	44	44	-58
1305	44	34	-49
	54	43	-59
	54	34	-48
	64	42	-59
	64	32	-49
	74	41	-59
	74	54	-47
	84	42	-58
9	84	79	-82
	94	65	-96
1310	94	14	-10
	104	7	-23
WALL BASE SHEAR	Σ	892 ^k	1.080 ^k

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY B.M.

DATE 2/7/95

CHECKED BY JL

DATE 3/1/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 6 LINE 3 AT PIEZZ FLOOR

SHELL ELEMENT	JOINT	LC1 F _y	LC2 F _y
1321	20041		-17
	14		-25
2	141		-8
	24		-27
3	24		-104
	34		-117
4	34		-47
	44		-60
5	44		-45
	54		-61
6	54		-45
	64		-61
7	64		-44
	74		-61
8	74		-44
	84		-61
9	84		-61
	94		-50
1340	94		-45
	100		54
WALL BASE SHEAR	$V_u = \Sigma$		<u>949</u>

LOS ALAMOS NMSF BUILDG. EVALUATION
OPTION 1

DESIGNED BY BM

DATE 2/7/92

CHECKED BY JLV

DATE 2/18/92

WALL IN-PLANE SHEAR

WALL: 9 Line B (Basement)

SHELL ELEMENT	JOINT	LC1 F_x	LC2 F_x
2201	101	80	-118
	102	61	-130
2202	102	81	-134
	103	65	-149
2203	103	117	-214
	104	102	-227
2204	104	80	-167
	105	67	-176
WALL BASE SHEAR	Σ	653	1315

REF. Computer Run: NMSF05

LOS ALAMOS NMSF BULDC. EVALUATION

DESIGNED BY BM

DATE 2/7/95

CHECKED BY SV

DATE 3/10/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 9 line B 30" Deck ELEV.

SHELL ELEMENT	JOINT	LC1 F_x	LC2 F_x
2213	3101		-2
	2		-7
4	2		-3
	3		-7
5	3		-4
	4		-9
4	4		-73
	5		-112
WALL BASE SHEAR	$V_u = \Sigma$		-219 ^k

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM

DATE 3/7/95

OPTION 1

CHECKED BY SV

DATE 4/10/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN: N11005

WALL: 12

Line G (Basement)

SHELL ELEMENT	JOINT	LC1 F	LC2 F
2001	1	43	-103
	2	53	-113
2002	2	51	-117
	3	52	-126
2003	3	88	-182
	4	83	-196
WALL BASE SHEAR	$V_u = \sum$	403	837

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM DATE 3/7/95

CHECKED BY JV DATE 3/14/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 12 Line 6 @ 30" Deck ELEV.

SHELL ELEMENT	JOINT	LC1 Fx	LC2 Fx
2010	3001	19	-6
	2	18	-7
11	2	18	-6
	3	19	-6
12	3	29	-11
	4	31	-10
WALL BASE SHEAR	$V_u = \sum$	134	

LOS ALAMOS NMSF BUILDING EVALUATION

DESIGNED BY BM

DATE 5/7/95

CHECKED BY JV

DATE 1/14/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 8

Line 5 (Basement)

SHELL ELEMENT	JOINT	LC1 F _y	LC2 F _y
1451	75	40	-24
	85	30	-32
2	85	49	-61
	95	43	-69
3	25	9	-13
	105	2	-16
WALL BASE SHEAR	$V_u = \sum$	173	-215

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM

DATE 3/7/95

CHECKED BY JV

DATE 3/14/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 10 Line C+

SHELL ELEMENT	JOINT	LC1 F _x	LC2 F _x
2401	74	57	-102
	75	60	-128
WALL BASE SHEAR	$V_u = \Sigma$	117	<u>-230</u>

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM DATE 3/7/95

CHECKED BY JV DATE 3/12/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 18

1m (ft) Base

SHELL ELEMENT	JOINT	LC1 F _x	LC2 F _x
2501	21		-109
	22		-180
2502	22		-135
	23		-125
WALL BASE SHEAR	$V_u = \sum$		-509

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM

DATE 2/7/95

OPTION 1

CHECKED BY JL

DATE 1/2/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 33 line (F+1) Basement

SHELL ELEMENT	JOINT	LC1 F _x	LC2 F _x
2501	23		-131
	24		-148
WALL BASE SHEAR	$V_u = \sum$		-279

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM

DATE 2/7/95

OPTION 1

CHECKED BY JV

DATE 3/1/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 11

line c- , Basement

SHELL ELEMENT	JOINT	LC1 F _x	LC2 F _x
2301	83		-104
	84		-123
WALL BASE SHEAR	$V_u = \sum$		<u>-227</u>

LOS ALAMOS NMSF BUILDC EVALUATION

DESIGNED BY B. H. 1

DATE 2/7/95

CHECKED BY IL

DATE 3/12/95

WALL IN-PLANE SHEAR

REF. JAP90 RUN:

WALL: 7 North Concrete Baffle (Basement)

SHELL ELEMENT	JOINT	LC1 F_x	LC2 F_x
2221	91		-55
	92		-84
2222	92		-77
	93		-58
WALL BASE SHEAR	$V_u = \sum$		<u>274</u>

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM

DATE 2/7/95

CHECKED BY IV

DATE 4/19/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 7 North Baffle

ca 30" Deck RELEV.

SHELL ELEMENT	JOINT	LC1 F _x	LC2 F _x
22341	3091	2	-1
	3097	-3	-8
35	" 97	2	0
	" 92	-1	-4
36	" 92	1	-3
	" 93	-2	-5
WALL BASE SHEAR	$V_u = \sum$	Small	

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM

DATE 3/7/95

OPTION 1

CHECKED BY SV

DATE 3/1/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 29

BUTRESS

(Basement)

SHELL ELEMENT	JOINT	LC1 F _x	LC2 F _x
4401	60		-134
	61		-116
WALL BASE SHEAR	$V_u = \sum$		-250

LOS ALAMOS NMSF BLDG. EVALUATION

DESIGNED BY AM

DATE 3/7/9

CHECKED BY SV

DATE 2/12/9

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 3 SOUTH BAFFLE (6 30" DECK RL.)

SHELL ELEMENT	JOINT	LC1 F _x	LC2 F _x
4731	3011	18	-6
	12	17	-7
4732	3012	17	-6
	13	18	-6
WALL BASE SHEAR	$V_u = \sum$	70	Small

LOS ALAMOS NMSF BUILDG EVALUATION

DESIGNED BY B.M.

DATE 3/7/95

OPTION 1

CHECKED BY JV

DATE 3/10/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 21

line 3

FIRST floor

SHELL ELEMENT	JOINT	LC1 F _y	LC2 F _y
3301	4004	20	-18
	14	16	-19
2	14	24	-21
	24	18	-24
3	24	90	-98
	34	86	104
4	34	44	-48
	44	40	-51
5	44	46	-46
	54	41	-51
6	54	46	-47
	64	40	-52
7	64		-46
	74		-51
8	74		-44
	84		-53
9	84		-107
	94		-118
10	94		-48
	1041		-26
WALL BASE SHEAR	$V_u = \sum$		<u>1072</u>

LOS ALAMOS NMSF BUILDG EVALUATION

DESIGNED BY BM

DATE 3/7/95

CHECKED BY SV

DATE 3/10/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 28 line B 1st Floor

SHELL ELEMENT	JOINT	LC1 Fx	LC2 Fx
4221	4105		-109
	6		-111
2	6		-72
	7		-78
3	7		-109
	8		-118
4	8		-53
	9		-58
5	9		-38
	4110		-49
WALL BASE SHEAR	$V_u = \sum$		<u>791^k</u>

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY B.M.

DATE 3/7/95

OPTION 1

CHECKED BY JV

DATE 3/12/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 30

1ST Floor

SHELL ELEMENT	JOINT	LC1 F_x	LC2 F_x
4501	4044		-68
	45		-74
2	5		-85
	6		-89
8	6		-38
	7		-42
4	7		-89
	8		-93
WALL BASE SHEAR	$V_u = \Sigma$		578 ^k

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM

DATE 3/7/95

OPTION 1

CHECKED BY JV

DATE 3/10/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 35 Line G 1st Floor

SHELL ELEMENT	JOINT	LC1 F_x	LC2 F_x
4711	4004	50	-90
	5	53	-94
2	5		-101
	6		-105
3	4		-70
	7		-75
4	7		-105
	8		-111
WALL BASE SHEAR	$V_u = \sum$		791

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM

DATE 3/3/95

CHECKED BY SV

DATE 3/19/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 22

1ST

FLOOR

LINE 5

SHELL ELEMENT	JOINT	LC1 Fy	LC2 Fy
3051	4075	30	-33
	85	29	-38
WALL BASE SHEAR	$V_u = \Sigma$		<u>-71^k</u>

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM

DATE 3/1/95

CHECKED BY IV

DATE 3/1/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 36 line C - 1ST floor

SHELL ELEMENT	JOINT	LC1 F _x	LC2 F _x
4301	4074	39	-34
	4075	39	-60
WALL BASE SHEAR	$V_u = \sum$		-114 ^k

LOS ALAMOS NMSF BUILDG EVALUATION

DESIGNED BY BM

DATE 3/1/95

CHECKED BY JV

DATE 3/10/95

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 25

Line 7

1st Floor

SHELL ELEMENT	JOINT	LC1 F _y	LC2 F _y
3701	4008	19	-18
	18	14	-20
2	18		-21
	28		-24
3	28		-98
	38		-101
4	38		-46
	48		-50
5	48		-46
	58		-51
6	58		-46
	68		-51
7	68		-46
	78		-51
8	78		-47
	88		-52
9	88		-26
	98		-32
			-
WALL BASE SHEAR	$V_u = \Sigma$		826

LOS ALAMOS NMSF BUILDG. EVALUATION

DESIGNED BY BM DATE 3/10/05
CHECKED BY TL DATE 3/10/05

WALL IN-PLANE SHEAR

REF. SAP90 RUN:

WALL: 38 257 Floor
LINE A

SHELL ELEMENT	JOINT	LC1 F_x	LC2 F_x
4221	4105		-105
	4		-111
2	4		-54
	7		-59
3	7		-109
	8		-118
4	8		-53
	9		-58
5	9		-27
	10		-27
WALL BASE SHEAR	$V_u = \Sigma$		721

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M. DATE 3/9/95

Modification Option (1).

CHECKED BY JL DATE 3/14/95

7.2 WALL OUT-of-PLANE SHEAR AND BENDING

WALL OUT-OF-PLANE D/C Ratio Summary

WALL LOCATION	I.O.	SHEAR			BENDING MOMENT		
		Demand	Capacity	D/C	Demand	Capacity	D/C
Line (1) Basement	1	15.4	21.3	0.72	279	356	0.78
Line (2) Basement	5	—	—	—	201	287	0.70
Line (B) & (C) Basement	9	15.4	21.3	0.72	44 -31	78 232	0.56 0.13
Line (1) 1st Floor	19	19.7	18.7	1.05	129	60	2.15
Line (2) 1st Floor	16	—	—	—	80	96	0.83
Line (B) & (C) 1st Floor	27	19.7	21.3	0.92	32 -26	42 24	0.76 1.08
OTHERS				O.K. BY Inspection	10 -8	→	O.K. BY Inspection

REF: COMPUTER RUNS:

2-D SAP90 RUNS:
WEST41
EAST21

3-D/2-D SAP90 Analysis:
NMSF05
NMSF51
HEAT 32

See Demand Summary Table on page

EVALUATION OF NMSE FACILITY AT LANL

DESIGNED BY BIM DATE 2/9/95
CHECKED BY SL DATE 2/10/95

Wall Capacities

1) Wall on line 1 below charge deck.

Existing wall 1.5'

New wall 1.5'

Total Wall Thickness 3'-0"

USE #9 @ 5 in New Concrete

$$\rightarrow A_s = 1 \times 12 / 5 = 2.4 \text{ in}^2$$

$$a = A_s \cdot F_y / (.85 F'_c \times b)$$

$$= 2.4 \times 60 / (.85 \times 4 \times 12) = 3.53''$$

$$d = 36'' - 3 = 33''$$

$$M_u = .95 \cdot A_s \cdot F_y \cdot (d - a/2)$$

$$= .95 \times 2.4 \times 60 (33 - 3.53/2)$$

$$= 4273 \text{ K-in}$$

$$= \underline{356 \text{ K-FT}}$$

$$* D/c = 279/356 = 0.78 < 1.0 \text{ O.K.}$$

Notice That design of wall is Controlled by Prelim Thermal Analysis. A more accurate Thermal Analysis

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY BMDATE 3/9/95CHECKED BY SVDATE 3/10/95

Based on future Heat Transfer analysis of the concrete walls of NMSF storage area in basement should change Amount of steel needed. Current design is based on preliminary Thermal gradients across the concrete walls, furnished by LANL Staff.

2) Wall on line 2 below charge deck

Existing wall thickness	1'-0"
New " "	1'-6"
Total wall thickness	2'-6"

$$\text{USE } \#9 @ 5 \rightarrow A_s = 2.4 \text{ in}^2$$
$$a = 3.53"$$

$$d = 30 - 3 = 27"$$

$$M_u = .95 \times 2.4 \times 60 (27 - 3.53/2)$$
$$= 3452 \text{ K-in}$$
$$= 287.7 \text{ K-FT.}$$

$$D/c = 201 / 287.7 = 0.70 < 1. \quad \text{o.k.}$$

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY BM

DATE 3/9/95

CHECKED BY JL

DATE 3/12/95

check wall on line (2) Above charge Deck

This is a new wall 1-4" thick infilled between existing columns on line (2).

Local Moment due To Crane:

$$M = 30 \text{ K-FT.}$$

Load Combinations

$$M = 30 + 38 = 68 \text{ K-FT} \quad (\text{LC1})$$

$$M = 8 + 1.7 \times 38 = 73 \text{ K-FT} \quad (\text{LC2})$$

$$M = 2 + 73 = 75 \text{ K-FT} \quad (\text{Demand 1})$$

$$M = 73 + 1.4 \times 5 = 80 \text{ K-FT} \quad (\text{Demand 2})$$

M = 80 K-FT Controls

$$\text{USE \# 8 @ 6} \rightarrow A_s = 1.58 \text{ in}^2$$

$$a = 1.78 \times 60 / (85 \times 4 \times 12) = 2.32''$$

$$d = 16 - 2 = 14''$$

$$M_u = .95 \times 1.58 \times 60 \left(14 - \frac{2.32}{2}\right) = 96 \text{ K-FT.}$$

$$D/C = 80/96 = 0.83 < 1.0 \quad \text{O.K.}$$

Check wall on line (1) Above charge Deck

Crane load:

Assume a 20 Ton Bridge
Crane with 24 k of
loads per wheel.

$$e = 1'-0" + 0'-7" = 1'-7"$$

↳ Conservative

Local Moment Due To Crane load.

1) Crane Parked @ Corner

$$M = 24 \times 1.58 = 38 \text{ K-FT}$$

2) Crane Parked @ midspan (Use DAF = 2)

$$M = 2 \times (24/2) \times 1.58 = 38 \text{ K-FT.}$$

LOAD COMBINATIONS:

$$M = 39 + 38 = 77 \text{ K-FT} \quad (\text{LC1}) \quad \text{Seismic}$$

$$M = 32 + 1.7 \times 38 = \underline{97} \text{ K-FT} \quad (\text{LC2}) \quad \text{Non-Seismic}$$

$$M = 20 + 97 = 117 \text{ K-FT} \quad (\text{Demand 1}) \quad \text{Add operating Thermal}$$

$$M = 97 + 1.4 \times 23 = 129 \text{ K-FT.} \quad (\text{Demand 2}) \quad \text{Add Acc. Thermal}$$

$$M = 129 \text{ Controls}$$

Capacity $M_c = 60 \text{ K-FT.}$

$$D/C = 129/60 = 2.15 \quad \text{N.G.}$$

Need to Strengthen the wall or use a lighter
crane!

See calculation for a conceptual modification
to this wall in Sec. B.4 of this Calc.

TOP RIDING, DOUBLE GIRDER CRANE INDUSTRIAL SERVICE CLOSE HEAD ROOM, HIGH HOOK

CAPACITIES (tons)	A Span	B	C	D	E	F	G	J	Max. Whl. Load lb.	Rec. Rail Size lb/yd
3 TON	20	2'- 8"	2'-0"	—	3'-0"	2'-0"	6½"	8'-0"	7,000	30
	30	2'- 8"	2'-0"	—	3'-0"	2'-0"	6½"	8'-0"	8,000	30
	40	2'- 8"	2'-0"	—	3'-0"	2'-0"	6½"	8'-0"	9,000	30
	50	2'- 9"	2'-0"	—	3'-0"	2'-0"	6½"	9'-0"	10,000	40
	60	3'- 0"	2'-0"	—	3'-0"	2'-0"	6½"	9'-0"	11,000	40
	75	3'- 0"	2'-0"	—	3'-0"	2'-0"	6½"	12'-0"	12,000	50
5 TON	20	2'- 8"	2'-0"	—	3'-0"	2'-0"	6½"	8'-0"	10,000	40
	30	2'-10"	2'-0"	—	3'-0"	2'-0"	6½"	9'-0"	11,000	40
	40	3'- 0"	2'-0"	—	3'-0"	2'-0"	6½"	9'-0"	12,000	40
	50	3'- 3"	2'-0"	—	3'-0"	2'-0"	6½"	9'-0"	13,000	50
	60	3'- 6"	2'-0"	—	3'-0"	2'-0"	6½"	11'-0"	14,000	50
	75	3'- 6"	2'-0"	—	3'-0"	2'-0"	6½"	12'-0"	16,000	50
7½ TON	20	3'- 4"	2'-4"	—	3'-3"	2'-0"	7 "	8'-0"	11,000	40
	30	3'- 4"	2'-4"	—	3'-3"	2'-0"	7 "	9'-0"	13,000	40
	40	3'- 6"	2'-4"	—	3'-3"	2'-0"	7 "	9'-0"	14,000	40
	50	3'- 8"	2'-4"	—	3'-3"	2'-0"	7 "	9'-0"	15,000	50
	60	3'- 8"	2'-4"	—	3'-3"	2'-0"	7 "	11'-0"	17,000	50
	75	3'- 8"	2'-4"	—	3'-3"	2'-0"	7 "	13'-0"	18,000	60
10 TON	20	3'- 4"	3'-4"	—	3'-3"	2'-0"	7 "	8'-0"	13,500	40
	30	3'- 6"	3'-4"	—	3'-3"	2'-0"	7 "	9'-0"	15,000	40
	40	3'- 8"	3'-4"	—	3'-3"	2'-0"	7 "	9'-0"	16,000	50
	50	3'-10"	3'-4"	—	3'-3"	2'-0"	7 "	9'-0"	17,500	50
	60	3'-10"	3'-4"	—	3'-3"	2'-0"	7 "	11'-0"	18,500	50
	75	4'- 0"	3'-4"	—	3'-3"	2'-0"	8 "	13'-0"	20,500	60
15 TON	20	3'- 9"	3'-4"	—	3'-3"	2'-0"	7 "	9'-0"	16,000	50
	30	3'- 9"	3'-4"	—	3'-3"	2'-0"	7 "	10'-0"	18,000	50
	40	4'- 0"	3'-4"	—	3'-3"	2'-0"	7 "	10'-0"	20,000	50
	50	4'- 0"	3'-4"	—	3'-3"	2'-0"	7 "	10'-0"	21,500	60
	60	4'- 0"	3'-4"	—	3'-3"	2'-0"	7 "	12'-0"	23,500	60
	75	4'- 6"	3'-4"	—	3'-3"	2'-0"	8 "	14'-0"	26,500	60
20 TON	20	3'- 9"	3'-4"	—	3'-6"	2'-0"	7 "	9'-0"	22,000	50
	30	4'- 0"	3'-4"	—	3'-6"	2'-0"	7 "	10'-0"	24,000	50
	40	4'- 0"	3'-4"	—	3'-6"	2'-0"	7 "	10'-0"	26,500	60
	50	4'- 0"	3'-4"	—	3'-6"	2'-0"	7 "	12'-0"	29,000	60
	60	4'- 6"	3'-4"	—	3'-6"	2'-0"	8 "	13'-0"	30,500	60
	75	4'- 6"	3'-4"	—	3'-6"	2'-0"	8 "	15'-0"	31,500	60

ICF KAISER
ENGINEERS

(calc. 5-0002, Rev. 0)

JOB NO. 6152

SHEET 18 OF

EVALUATION OF NBSF FACILITY AT LANL

DESIGNED BY BM DATE 3/7/95CHECKED BY JV DATE 3/10/95

Wall Out-of-Plane Demand Summary (units: kips-FT.)

WALL (ID) location	LC1	LC2	LC3	LC4	Demand-1	Demand-2	Max. Demand
(1) line 1, Basement	53 -27	51 -33	84	163	137	279	279
(5) Line 2, Basement	38 -33	12 -10	67	135	105	201	201
(9) Line 3, Basement	21 -29	44 -31	0	0	44 -31	44 -31	44 -31
(19) line 1, 1st Floor	39 -22	32 -15	20	23	59	64	64
(16) line 2, 1st Floor	30 -29	8 -6	2	5	32	15	32
(27) line 3, 1st Floor	14 -26	32 -18	0	0	32 -26	32 -18	32 -26
Others	10 -8	7 -5	0	0	10 -8	7 -5	10 -8
REF. Computer Run SAP90 File Name.	MSFOS	MSFOS1	HEAT32	HEAT32			

(*)

(*)

LC1 = DL+LL+H ± E (OYR.) Demand 1 = LC3 + Max (LC1, LC2)

LC2 = 1.4DL+1.7H+7LL (Static) Demand 2 = LC2 + 1.4 LC4

(*) DOSE NOT INCLUDE LOCAL LOADS DUE TO 20 Tonne Bridge Crane.

Calc. S-0002, Rev. 0, Job # 41552

ShT. 160 St

M=5
Line 2
Buremment

NMSF05
SHELL
OUTPUT M22
LOAD 1

$\times 10^{-1}$
405
315
225
135
45
-45

MIN IS -0.852E+00 <JOINT 4093> MAX IS 0.376E+02 <JOINT 2093>

SAP90

Calc. S-0002, Rev. 0, Job # 41552 Sht. 163 of

NMSF05

SHELL

OUTPUT

LOAD

M11

1

$\times 10^{-2}$

675
525
375
225
75
-75

SAP90

Line 2
BASEMENT
N1=15

MIN IS -0.145E+00 <JOINT 4093> MAX IS 0.634E+01 <JOINT 63>

NMSF05

SHELL

OUTPUT

LOAD

M11

2

X 10⁻²

70
-70
-210
-350
-490
-630

SAP90

Line B
Basement
M=9

MIN IS -0.524E+01 <JOINT 2101> MAX IS 0.108E+02 <JOINT 2102>

NMSF05

SHELL

OUTPUT

M11

LOAD

1

$\times 10^{-1}$

126
90
54
18
-18
-54

SAP90

Sub. 168 of

NMSF05
SHELL
OUTPUT M22
LOAD 1

SAP90

MIN IS -0.281E+02 <JOINT 102> MAX IS 0.210E+02 <JOINT 2102>

skt. 170 d_g

NMSF05

SHELL

OUTPUT

LOAD

M11

1

$\times 10^{-1}$

70
50
30
10
-10
-30

SAP90

SWT. 171 of

Sht. 172 of

NMSF05
SHELL
OUTPUT M22
LOAD 1

SAP90

MIN IS -0.742E+01 <JOINT 6081> MAX IS 0.391E+02 <JOINT 4081>

NMSF05
SHELL
OUTPUT M22
LOAD 2

SAP90

MIN IS -0.219E+02 <JOINT 7001> MAX IS 0.135E+02 <JOINT 4081>

SWT. 174 of

SWT. 175 of

SAP90

MIN IS -0.259E+02 <JOINT 4102> MAX IS 0.143E+02 <JOINT 5102>

SAP90

SWT. 177 OK

Line B
1st Floor
M=27

NMSF05
SHELL
OUTPUT M22
LOAD 1

Sht. 179

NMSF05
SHELL
OUTPUT M22
LOAD 1

BUTRESS
M-29

MIN IS -0.673E+01 <JOINT 2060> MAX IS 0.109E+02 <JOINT 60>

SAP90

shot. 180 05

ght. 181 of

	<p>NMSF05</p> <p>SHELL</p> <p>OUTPUT M22</p> <p>LOAD 1</p>	<p>X 10⁻¹</p> <p>130</p> <p>104</p> <p>78</p> <p>52</p> <p>26</p> <p>0</p>	<p>SAP90</p>
--	--	---	--------------

MIN IS 0.264E+00 <JOINT 9092> MAX IS 0.123E+02 <JOINT 7092>

Stt. 184

$h = w$

NMSF05

SHELL

OUTPUT

LOAD

M11

2

$\times 10^{-1}$

0
-22
-44
-66
-88
-110

SAP90

MIN IS -0.105E+02 <JOINT 9092> MAX IS -0.379E+00 <JOINT 7091>

NMSF05
SHELL
OUTPUT M11
LOAD 2

$\times 10^{-1}$

36
12
-12
-36
-60
-84

gwt. 185 g

MIN IS -0.811E+01 <JOINT 2081> MAX IS 0.348E+01 <JOINT 31>

SAP90

X
Y
Z

NMSF05

SHELL

OUTPUT

LOAD

M11

1

$\times 10^{-1}$

SAP90

MIN IS -0.477E+01 <JOINT 2051> MAX IS 0.904E+01 <JOINT 81>

M=1, 5, 9, 19, 16 / 27

Sht. 186 of

SWT. 18705

NMSF05

SHELL

OUTPUT

LOAD

M11

2

$\times 10^{-1}$

33

11

-11

-33

-55

-77

others

MIN IS -0.706E+01 <JOINT 2101> MAX IS 0.305E+01 <JOINT 2103>

SAP90

SWT. 188 of

Shot. 189 of

NMSF05

SHELL

OUTPUT

M22

LOAD

I

$\times 10^{-1}$

98
70
42
14
-14
-42

SAP90

MIN IS -0.314E+01 <JOINT 2002> MAX IS 0.974E+01 <JOINT 11>

NMSF05
SHELL
OUTPUT M22
LOAD 2

$\times 10^{-1}$

52
26
0
-26
-52
-78

Others

sh. 190 of

MIN IS -0.774E+01 <JOINT 1011> MAX IS 0.432E+01 <JOINT 22>

SAP90

Sheet 191 of

NMSF51
SHELL
OUTPUT M22
LOAD 2

$\times 10^{-1}$

540
360
180
0
-180
-360

SAP90

M = 1
Line 1, Basement

MIN IS -0.325E+02 <JOINT 2081> MAX IS 0.510E+02 <JOINT 81>

M = 5

Line 2, Basement

MIN IS -0.959E+01 <JOINT 3083> MAX IS 0.117E+02 <JOINT 23>

NMSF51

SHELL

OUTPUT

LOAD

M22

2

X 10⁻¹

144
96
48
0
-48
-96

SAP90

Shot. 192 of

M = 9

Line B, Basement

MIN IS -0.310E+02 <JOINT 2102> MAX IS 0.437E+02 <JOINT 102>

	NMSF51 SHELL OUTPUT M22 LOAD 2	X 10 ⁻¹ 510 340 170 0 -170 -340	SAP90
--	---	--	-------

slat. 193 5/8

Sht. 194 of

NMSF51
SHELL
OUTPUT M22
LOAD 2

X 10⁻¹

SWT. 195

M=16

Line 2, 1ST Floor

MIN IS -0.628E+01 <JOINT 7023> MAX IS 0.823E+01 <JOINT 4093>

SAP90

NMSF51
SHELL
OUTPUT M22
LOAD 2

N=27
Line B, 1st Floor

MIN IS -0.175E+02 <JOINT 5102> MAX IS 0.321E+02 <JOINT 4102>

SAP90

Sht. 196 of

**ICF KAISER
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Calc. No. S-0002 Rev. 0

JOB NO. 41552
SHEET 198 OF

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M. DATE 3/10/99

Modification Option (1).

CHECKED BY DATE

7.3 MISCELLANEOUS EVALUATIONS

EVAL. of NMSE 2 LANE

DESIGNED BY BM

DATE 3/10/95

MODIFICATION OPTION (1)

CHECKED BY JV

DATE 3/10/95

check charge Deck

A 30" deep deck is currently (13) Proposed.

In a previous Conceptual design study (14) a 30" deep Composite deck made out of 30" deep $\frac{1}{2}$ R girders were Proposed.

In the latest Proposed design for storage are Two additional 6" thick shear walls are added below the charge deck in north/south direction. This new addition will reduce the girder spans in the charge deck by $\frac{1}{3}$. As a result a much lighter deck may be used if all other functionality criteria can be satisfied:

Try a 18" deep deck with $\frac{3}{8}$ " girders:

$$A \approx (17 + 12) \frac{3}{8} = 10.9 \text{ in}^2$$

$$I_x \approx \frac{1}{12} \frac{3}{8} \times 17^3 + 2 \times 6 \times \frac{3}{8} \times 7.625^2$$

$$\approx 153.5 + 201.6 = 415 \text{ in}^4$$

$$S_x = I_x / c = 46 \text{ in}^3$$

EVAL of NMSF @ LANK

MOD OPTIONS (1)

DESIGNED BY BM

DATE 3/10/95

CHECKED BY JV

DATE 3/12/95

Conservatively Assume Simply Supported Spans:

$$\text{REF (13)} \left\{ \begin{array}{l} \text{DL} = 715 \text{ PSF} \\ \text{LL} = 150 \text{ PSF} \\ \text{EQ} = \frac{2}{3} \times 0.7g = .47g \\ \quad \quad \quad (.7g \text{ is spectral acc. @ } 9 \text{ Hz, Conservative}) \end{array} \right.$$

① Seismic Combination

$$\begin{aligned} W &= \text{DL} + \text{LL} + \text{EQ} = 715 + 150 + (715 + .25 \times 150) \cdot .47 \\ &= 865 + 354 \approx 1220 \text{ PSF} \end{aligned}$$

18" Tubes spaced @ 6" distance
Tributary area of each girder
is 22" wide (say 24" = 2').

$$\begin{aligned} \bar{W} &= 2W = 2 \times 1220 = 2440 \text{ lb/LF} \\ &= 2.44 \text{ K/LF} \end{aligned}$$

$$M = \frac{\bar{W} l^2}{8} = \frac{2.44 \times 9.5^2}{8} = 27.5 \text{ K-FT}$$

$$V = \frac{\bar{W} l}{2} = \frac{2.44 \times 9.5}{2} = 11.6 \text{ kips}$$

$$f_b = \frac{M}{S_x} = \frac{27.5 \times 12}{46} = 7.17 \text{ ksi} < .6 \times 30 = 18 \text{ ksi}$$

$$f_v = \frac{V}{d \tau_w} = \frac{11.6}{17 \times 3/8} = 1.8 \text{ ksi} < .4 \times 30 = 12 \text{ ksi}$$

EVAL OF NMSE LANE

DESIGNED BY BM

DATE 7/13/95

MOD. OPTION (1)

CHECKED BY JV

DATE 3/10/95

check Deflection

$$\Delta = \frac{5 w l^4}{384 EI}$$

$$= \frac{5 \times 2.44 (95 \times 12)^4}{384 \times 29 \times 10^6 \times 415} = 0.00045 \text{ inch}$$

$$< \frac{l}{790} = 0.14 \text{ in.}$$

Very STIFF! o.k.

D/c Ratios (for 18" Deck)

$$\text{Bending} = \frac{7.17}{18} = 0.40$$

$$\text{Shear} = \frac{1.8}{12} = 0.15$$

EVAL of NMIF 2 LANE

MOD OPTION (1)

DESIGNED BY BM

DATE 3/10/95

CHECKED BY JL

DATE 3/10/95

BUTTRESS

In-Plane Shear Forces

Shell Element	LC1			LC2		
	F _x JOINT	F _x JOINT	V _x	F _x JOINT	F _x JOINT	V _x
4407 (7060 7061 6060 6061)	-81 77	64 78	300 k	-83 -90	-71 -56	300
4406	90 58	100 72	320	-77 -108	-54 -82	321
4405	108 51	105 38	302	-58 -116	-30 -96	300
4404	+7 6	3 3	19	-3 -3	-6 -7	-19
4403	121 64	91 74	350	-66 -122	-72 -91	351
4402	122 51	123 55	351	-130 -64	-115 -42	351
4401	130 58	106 33	327	-51 -127	-40 -109	327

Max Shear = 351 kips

$$v_c = 27 \sqrt{f'_c} = 27 \sqrt{4000} = 126 \text{ psi}$$

$$v_u = \frac{351 \times 10^3}{15 \times 1.5 \times 144} = 108 < 126 \quad \text{o.k.}$$

Concrete alone can resist the shear.

$$D/C = .86$$

EVAL of RMSE of CANL
MOD OPTION (1)

DESIGNED BY BM

DATE 3/10/95

CHECKED BY JV

DATE 3/10/95

BAFFLE WALL (SOUTH) (OPTION-1)

Shell Element	Joint	LC1 Fx	LC2 Fx
2561	21	48	-105
	22	41	-135
2562	22	68	-139
	23	48	-129

205 k - 508 k

$$v_u = \frac{508 \times 10^3}{1.5 \times 29 \times 144 \times 8} = 101 \text{ psi} < 126 \text{ o.k.}$$

$$D/c = 101/126 = 0.80$$

BAFFLE WALL (NORTH) (OPTION-1)

Shell Element	Joint	LC1 Fx	LC2 Fx
2221	91	11	-48
	92	7	-77
2222	92	46	-81
	93	24	-61

Σ 90 k .267 k

$$v_u = \frac{267 \times 1000}{1.5 \times 29 \times 144 \times 8} = 53.3 \text{ psi} < 126 \text{ o.k.}$$

$$D/c = \frac{53.3}{126} = 0.42 < 1.0$$

EVAL of NMSF @ LANL

MOD. OPTION (1)

DESIGNED BY BM DATE 3/18/95

CHECKED BY JL DATE 3/12/95

Beam Columns Under Concrete Baffles

North Baffle

Member	Load Case	shear	Mom	shear	Mom	Axial
8092	LC1	3.0	19.3	0.2	1.7	-40
	LC2	4.9	20.9	0.5	2.9	-89
8099	LC1	3.1	25.3	0.7	4.4	-36
	LC2	6.0	24.5	1.2	5.8	-95

South Baffle

Member	Load Case	shear	Mom	shear	Mom	Axial
8012	LC1	2.1	19.9	2.2	8.6	-25
	LC2	4.8	19.6	1.0	9.3	-56
8019	LC1	2.0	20.3	2.4	9.3	-28
	LC2	1.1	20.5	1.5	10.2	-64

EVAL of NMSE of LANL
MOD OPTION (1)

DESIGNED BY BM

DATE 3/10/95

CHECKED BY JLV

DATE 10/10/95

check Piers under Concrete Bottles

Demand

$$M = 25.3 \text{ K-FT}$$

$$V = 6 \text{ kips}$$

$$P = 95 \text{ kips}$$

check Compression

$$f_a = \frac{95 \times 10^3}{14 \times 14} = 485 \text{ psi} < .25 f'_c = .25 \times 4000 = 1000 \text{ psi}$$

$$D/c = 485/1000 = 0.49$$

check Shear

$$v_u = \frac{6000}{14 \times 14} = 31 \text{ psi} < .85 \times 2 \sqrt{f'_c} = .85 \times 2 \times \sqrt{4000} = 108 \text{ psi}$$

$$D/c = 31/108 = 0.29$$

O.K.

check Bending

USE 4 #8

$$A_s = 2 \times .79 = 1.58 \text{ in}^2$$

$$a = 1.58 \times 60 / (.85 \times 4 \times 18) = 1.55 \text{ in}$$

$$d = 18 - 2 = 16 \text{ in}$$

$$M_u = 0.95 \times 1.58 \times 60 (16 - 1.55/2) / 12 = 114 \text{ K-FT}$$

$$D/c = 25.3 / 114 = 0.22 \text{ O.K.}$$

LANL-B
UNDEFORMED
SHAPE

OPTIONS
JOINT IDS
ALL JOINTS
RESTRAINTS
SHRUNKEN
WIRE FRAME

SAP90

5/11/05 20605

Sht. 208 of

<p>LANL-B</p> <p>FRAME</p> <p>LOADS</p> <p>LOAD I</p>		
<p>MINIMA</p> <p>W 0.3200E+00</p> <p>P 0.0000E+00</p> <p>MAXIMA</p> <p>W 0.1270E+01</p> <p>P 0.0000E+00</p>		
<p>SAP90</p>		

<div>Y</div> <div>X</div>		LANL-A	
		FRAME	
		OUTPUT V33	
		LOAD 2	
		MIN < 11>	
		0.1397E+00	
		AT 0.00	
		MAX < 24>	
		0.1667E+02	
		AT 0.00	
		SAP90

<p>NMSF05</p> <p>UNDEFORMED</p> <p>SHAPE</p>	<p>OPTIONS</p> <p>JOINT IDS</p> <p>ELEMENT IDS</p> <p>WIRE FRAME</p>	<p>SAP90</p>
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>3093</p> <p>8093 2093</p> <p>3092 2092</p> <p>8092 2092</p> <p>3091 2091</p> <p>8091 2091</p> </div> <div style="width: 45%;"> <p>1013</p> <p>8013 13</p> <p>1012 12</p> <p>8012 12</p> <p>1011 11</p> <p>8011 11</p> </div> </div>

SAP90

SWT. 21506

LANL-A
FRAME
OUTPUT M22
LOAD 3

MIN < 19>
-0.5435E+02
AT 0.00
MAX < 10>
0.5132E+02
AT 1.75

SAP90

Sht. 216 of

LANL-A
FRAME
OUTPUT V33
LOAD 3

MIN < 11>
-0.1344E+02
AT 0.00
MAX < 24>
0.1667E+02
AT 0.00

SAP90

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Calc. No. S-0002 Rev. 0

JOB NO. 41552
SHEET 218 OF

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M.

DATE 3/1/95

Modification Option (1).

CHECKED BY JL

DATE 3/14/95

8.0 MISCELLANEOUS CALCULATIONS

**8.1 EVALUATION OF EXISTING PRECAST ROOF BEAMS FOR
ADDITIONAL DEAD LOADS**

LOS ALAMOS

NMSF BUILDING - PRECAST BEAMS.

DESIGNED BY A. Saha

DATE 3.2.95

CHECKED BY JL

DATE 3/10/95

Existing precast roof beams over (B) to (E.1) and (3) to (7).

Beam span = $10' + 59' = 69'-0$

Design load from dwg. S-3, Design Criteria Note S

Superimposed L.L. = 50 psf.

" D.L. = 40 psf (in addition to self wt).

Seismic acceleration = 0.22 g.

Vendor data about precast beam is not available.

The following has been assumed (measured from detail (25) Dwg. S-10).

Required : Total 8" thick slab

Existing = $2\frac{1}{2}" + 2\frac{1}{2}" = 5"$ thick

Additional 8 - 5" = 3" thick conc. is required.

Existing $2\frac{1}{2}"$ thick conc. weighs = $2.5 \times \frac{150}{12} \times 31^{lb}/ft^2$

Additional 3" thick conc. will weigh = $3 \times \frac{150}{12} \approx 37^{lb}/ft^2$

Weight of existing precast units = $\frac{150}{8'} \left[8' \times 2.33' - \left(8 - \frac{6.75 \times 2}{12} \right) \left(2.33' - \frac{2.5}{12} \right) \right]$
 $= \frac{150}{8'} [18.667 - 14.609] = 76.1^{lb}/ft^2$
 $\approx 76^{lb}/ft^2$

LOS ALAMOS

NMSF BUILDING - PRECAST BEAMS.

DESIGNED BY A. Saha DATE 3.6.95

CHECKED BY JLV DATE 3/10/95

Area of steel in precast beams is not available.

Assume 14- $\frac{7}{16}$ " dia.

270^k strand.

$d \approx 24$ in

$f'_c = 5000$ psi precast units } From

$f'_c = 3000$ psi Topping } S-3

$$A_{ps} = 14 \times 0.115 = 1.61 \text{ in}^2$$

$$\bar{w}_p = \frac{A_{ps} f_{pu}}{b d f'_c} = \frac{1.61}{8 \times 12 \times 24} \times \frac{270}{5} = 0.0377 \approx 0.04$$

From Table 3.9.2

$$c/d = 0.055 ; f_{ps}/f_{pu} = 0.981 ; \bar{j}_u = 0.959$$

$$c = 0.055 \times d = 0.055 \times 24 = 1.32 \text{ in.} < 2.5 \text{ in.}$$

Neutral axis lies within the flange, Rectangular Section

$$\phi M_n = \phi A_{ps} f_{pu} \bar{j}_u d$$

$$= 0.9 \times 1.61 \times 270 \times 0.959 \times 24/12 = 750.4 \text{ kft}$$

$$f_{ps} = 0.981 \times 270 = 265 \text{ ksi}$$

$$w_u = 1.4(76 + 10) + 1.7 \times 20 = 154.4 \text{ lb/ft} \approx 0.16 \text{ k/ft}$$

$$M_u = \frac{0.16 \times (69)^2}{8} = 95.2 \text{ kft/ft.} \times 8' = 762 \text{ kft for 8' width}$$

$\approx 750 \text{ kft allowable.}$

Assume 16- $\frac{7}{16}$ " dia. 270^k strand with $d \approx 24$ in.

$$A_{ps} = 16 \times 0.115 = 1.84 \text{ in}^2$$

Existing composite section:

$$\bar{w}_p = \frac{1.84}{8 \times 12 \times 26.5} \times \frac{270}{3} = 0.065$$

$$c/d = 0.087 ; f_{ps}/f_{pu} = 0.973 ; \bar{j}_u = 0.932$$

$$c = 0.087 \times 26.5 = 2.30 \text{ in.} < 2.5 \text{ in}$$

LOS ALAMOS

NM5F BUILDING - PRECAST BEAMS

DESIGNED BY A. Saher DATE 3.6.95

CHECKED BY JV DATE 3/10/95

$$\phi M_n = 0.9 \times 1.84 \times 270 \times 0.932 \times 26.5 / 12 = 920.3 \text{ Kft.}$$

$$W_u = 1.4(76 + 40) + 1.7 \times 50 = 247.4 \text{ lb/ft.} \approx 250 \text{ lb/ft.}$$

$$M_u = \frac{0.25 \times (69)^2}{8} = 148.8 \text{ Kft. / ft. width} \times 8' = 1190 \text{ Kft. for 8' width.} > 920 \text{ Kft.}$$

Reduction in L.L. due to trib. area

$$R = 0.08 (8' \times 69' - 150) = 32.2 \quad \leftarrow \text{governs.}$$

$$\text{or } R = 23.1 \left(1 + \frac{116}{50}\right) = 76.7 > 32.2$$

$$\therefore \text{L.L.} = (1 - 0.32) \times 50 = 34 \text{ lb/ft}^2$$

$$W_u = 1.4(76 + 40) + 1.7 \times 34 = 220 \text{ psf}$$

$$M_u = 1190 \times \frac{22}{25} = 1047 \text{ Kft.} > 920 \text{ Kft. Say O.K.}$$

New Composite Section:

$$\bar{w}_p = \frac{1.84}{8 \times 12 \times 29.5} \times \frac{270}{3} = 0.0585$$

$$c/d = 0.079 ; f_{ps}/f_{pu} = 0.971 ; \bar{j}_u = 0.939$$

$$c = 0.079 \times 29.5 = 2.33 \text{ in.}$$

$$\phi M_n = 0.9 \times 1.84 \times 270 \times 0.939 \times 29.5 / 12 = 1032 \text{ Kft.}$$

Increase in capacity due to increase in depth

$$= 1032 - 920 = 112 \text{ Kft. or } \frac{112}{920} \times 100 = 12.2 \%$$

Increase in load due to addition of 3" of conc.

$$= 37 \text{ lb/ft}^2 \text{ or } \frac{37}{(76 + 40 + 34)} = \frac{37}{150} \times 100 = 24.67 \%$$

Increase in load is about 12.5% more than increase in flexure capacity.

LOS ALAMOS

NMSF BUILDING - PRECAST BEAMS

DESIGNED BY A. Saha DATE 3.7.95

CHECKED BY JLV DATE 3/10/91

Shear Capacity :

Shear reinforcement in beam web is not available

Existing Condition :

$$V_u = (1.4 \times 116 + 1.7 \times 34) \times \frac{69}{2} = 7590 \text{ lb.}$$

New Condition :

$$V_u = (220 + 1.4 \times 37) \times \frac{69}{2} = 9377 \text{ lb.}$$

$$\text{Increase in shear load} = \frac{9377 - 7590}{7590} \times 100 = 23.5\%$$

Modification to existing roof beams may be requiredunless :

- (i) Existing beams have flexural capacity to carry additional 13% load.
- (ii) Existing beams have shear capacity to carry additional 24% load.

Possible solutions:

NEW CONCRETE OR STEEL BEAMS WILL BE 4'-0 OR 8'-0 O.C.
SPACING WILL BE DETERMINED DURING FINAL DESIGN.

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JOB NO. 41552
SHEET 223 OF

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M.

DATE 3/10/98

Modification Option (1).

CHECKED BY J✓

DATE 3/10/98

**8.2 PRELIMINARY DESIGN OF PENTHOUSE FOR HVAC
EQUIPMENT**

LOS ALAMOS

NMSF BUILDING - PENTHOUSE

DESIGNED BY A. Salhe DATE 2. 27. 95CHECKED BY JV DATE 3/0/95

HVAC Equipment @ Existing roof between Col. Lines
(3) to (7) and (E) to (F) or (F) to (G)

Per Burns and Roe existing drwg. S-3
design roof Live Load = 50 psf. (min.)
75 psf. (max.)

Vendor data of HVAC equipment load is not available.
But usually the dead load of such equipment is 20 psf.
which is lot less than the design L.L. = 50 psf.

∴ Major modification to roof is not expected.

However, HVAC equipment is usually supported at ends
which causes uniformly distributed line load at
perimeter of equipment. The equipment should be
laid such a way that the uniform line loads are
applied to beams, thus avoiding costly modification.
Live Load for such use can be 50 psf.

LOS ALAMOS

NMSF BUILDING - PENTHOUSE

DESIGNED BY A. Caba

DATE 2.27.95

CHECKED BY JV

DATE 3/1/95

PENTHOUSE ROOF PLAN

Beam B-1. Span = 23'-0", Unbraced L = 11'-6"

D.L. = 12 psf., L.L. = 20 psf.

$$M = \frac{wL^2}{8} = \frac{(20+12) \times 10' \times (23')^2}{8} = 21.16 \text{ kft.}$$

W10x22, unbraced L = 11'-6", $M_{all} = 34 \text{ kft.} > 21.16 \text{ kft.}$
Use.

Beam B-2

$$P = 320 \frac{\text{lb}}{\text{ft}} \times 23' = 7.4 \text{ K}$$

$$M_{max} = 7.4 \text{ K} \times 10' = 74 \text{ kft}$$

Unbraced L = 10'-0"

W14x34 good for 89 kft. $> 74 \text{ kft.}$

Col. Load = 7.4 K + Wind Load.

Provide WBx24

Lines ⑥ & ⑦, existing 8" thick wall will also carry lateral load.

Line ⑤ → New bracing

Line ③ → New bracing.

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JOB NO. 41552
SHEET 228 OF

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M. DATE 3/10/95

Modification Option (1).

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**8.3 ANALYSIS OF NMSF BUILDING INTERACTION WITH THE
BURIED TUNNEL**

Los Alamos National Lab

DESIGNED BY S. L. DATE

CHECKED BY JHA DATE 3/7/95

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3.3	Seismic Anchor Movement Loading	pp. 16

Los Alamos National Lab (LANL)

DESIGNED BY S.K. DATE 2/10/95

CHECKED BY BJA DATE 3/7/95

1.0 IntroductionBuried Tunnel Analysis

A simplified approach to evaluate the seismic vulnerability of buried R/C tunnels is presented. The procedure is adopted from the buried pipe analysis, & two types of loadings are investigated:

1. Bending & axial loading of a buried tunnel due to wave propagation
2. Bending & axial loading due to relative movement between the building & the soil @ penetration of a buried tunnel to building - Seismic Anchor movement (SAM).

LANL

DESIGNED BY S.K. DATE 2/10/95

CHECKED BY RPD DATE 2/7/96

2.0 References

1. L.K. Goen, "Soil - Structure Interaction Analysis"
PF4-ESA13-26-001, Rev 2, May 17, 1994
2. N.M. Newmark, J.A. Blume, & K.K. Kojar, "Design Response Spectra for Nuclear Power Plants", ASCE Structural Engineering meeting, San Francisco, CA, April 1973
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4. R.J. Roark & ^{W.C.}Young, "Formulas for Stress & Strain" 5th Ed.
1975, McGraw-Hill, Inc. N.Y.
- 4a. SAKURAI & TAKAHASHI, "DYNAMIC STRESSES OF UNDERGROUND PIPELINES DURING E/QS", PROCEEDINGS OF THE 4TH WCEE, SANTIAGO, CHILE, 1986
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7. C.H. Trautmann & T.D. O'Rourke, "Lateral Force - Displacement Response of Buried Pipe", ASCE Journal of Geotechnical Engineering, Vol III, No. 7, Sep. 1985
8. Drawings LA-23-B-S-1-1 - 11.1

CANL

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3.0 Analysis

3.1 Data

Configuration

[P]

LANL

DESIGNED BY S.K.

DATE 2/10/95

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DATE 2/7/95

Soil Data*

depth of Soil column = 200m (3.28) = 660'

Tunnel depth = 10'

Shear wave velocity = 760 ft/sec @ burial depth

Poisson's ratio = 0.38

Shear Modulus = $G_{max} = 1.46 \times 10^6 \text{ #/ft}^2$

From p. 8 OF REF. [1]: $G = 0.45 G_{max} = 6.57 \times 10^5 \text{ #/ft}^2$ (high strain value)

Cohesion = 0 pcf, Cohesionless

Friction angle = $\phi = 15^\circ$

} Assumed
(Appropriate for tuff.)

Moist wt. = $\gamma = 2.52 (32.2) = 81 \text{ #/ft}^3$

$PGA = 0.3g$

$PSV = \left(\frac{V_{max}}{a_{max}} \right) PGA = 98 a_g (\text{in/sec}) = 48 (.3) [2]$

= 14.4 in/sec

T = the natural period of the seismic waves

= $\frac{4H}{V_s} = \frac{4H}{V_{s|avg}} = \frac{4(660)}{1,900} \approx 1.4 \text{ sec}$

$V_{s|avg} = \text{avg. shear wave velocity} = \frac{760 + 1820 + 1345 + 995 + 2145 + 1690 + 2305 + 2825 + 3025}{9}$

= 1,900 ft/sec

* Soil Data are from [1] unless noted otherwise.

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CHECKED BY BA DATE 2/7/95

Tunnel Cross Section

(For Lines 1+3. Line 2 is similar, but has not been evaluated due to slope limit)

Tunnel Data

Bars in y direction : 11 bars T & B in each side

" X direction : 7 bars T & B in each side

$$A_s = .2 [(7 \times 4) + (9 \times 4)] = .2 (56) = 11.2 \text{ in}^2$$

$$f'_c = 4000 \text{ psi}$$

$$E_c = 57,000 \sqrt{f'_c} = 3.6 \times 10^6 \text{ psi}$$

$$E_s = 29 \times 10^6 \text{ psi}$$

$$f_y = 60 \text{ ksi}$$

$$A = 10(11) - 9(8) = 38 \text{ ft}^2$$

$$I_{xx} = \frac{1}{12} \{ 10(11)^3 - 9(8)^3 \} = 623.2 \text{ ft}^4$$

$$I_{yy} = \frac{1}{12} \{ 11(10)^3 - 9(8)^3 \} = 532.2 \text{ ft}^4$$

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CHECKED BY B.D. DATE 3/7/95

3.2 Wave Propagation Loading

(i) Axial Loads:

$$\epsilon_a = \pm \frac{v}{c} = \frac{14.4}{760(12)} = 1.6 \times 10^{-3} \text{ in/in [3]}$$

Assume concrete cracks & only the rebar carries axial load

$$F_a = 1.6 \times 10^{-3} (29 \times 10^3) (11.2 \text{ in}^2) = 520 \text{ k}$$

[4a]

Using the empirical relationship of Sakurai and Takahashi, the max. axial load from the axial strain cannot exceed

$$F_{a \text{ max}} = fL/4 \text{ [4a] where } f = \text{friction force per unit length of pipe}$$

$L = \text{wave length of seismic waves}$

Assuming the friction coeff. of 0.5,

$$\sigma = \gamma h = 81(10) = 810 \text{ psf}$$

$$f = 810(0.5)(11+10)(2) = 17,010 \text{ \#/ft.}$$

Checking soil-soil failure just away from the pipe,

$$\tau = \sigma \tan \phi$$

$$= 810 \tan 15^\circ = 217 \text{ psf}$$

$$f = 217(11+10)(2) = 9,114 \text{ \#/ft}$$

$$\therefore \text{Use } f = 9,114 \text{ \#/ft}$$

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$$L = T L = 1.4 (760) \quad [3]$$

$$= 1,064'$$

$$F_{max} = SL/4 = (9,114)(1,064)/4 \approx 2,420^k$$

Note that $F_{max} > F_a$

$$\therefore \text{Use } F_a = 520^k$$

(ii) Moment & Shear Loads:

Assume resultant seismic wave is causing only horizontal motions for moment & shear. If we assume that the concrete does not crack,

$$\epsilon_b = \pm \frac{R a}{c^2} \quad [3]$$

$$= \pm \frac{12(5)(.3)(386.4)}{\{760(12)\}^2} = 8.36 \times 10^{-5} \text{ in/in}$$

Strain Compatibility Determination of M & V :

The tunnel is assumed to deflect as a sinusoidal wave. From the wave eqn, we get:

$$y = \Delta' \sin\left(\frac{\pi x}{L/2}\right) \quad [3]$$

$$y'' = -\Delta' \left(\frac{2\pi}{L}\right)^2 \sin\left(\frac{\pi x}{L/2}\right), \quad y''' = -\Delta' \left(\frac{2\pi}{L}\right)^3 \cos\left(\frac{\pi x}{L/2}\right)$$

$$M = EI y'' \quad + \quad V = EI y'''$$

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@ the extreme fiber, $\sigma = \frac{Mc_1}{I}$. c_1 = the distance from the neutral axis

Then, $\bar{\epsilon} = E y'' c_1 / I$, $\epsilon = y'' c_1$

$$\Delta' = y'' / \left(\frac{2\pi}{L}\right)^2, \quad y'' = \frac{M}{EI} = \frac{\epsilon}{c_1}$$

$$\Delta' = \frac{M}{EI \left(\frac{2\pi}{L}\right)^2} = \frac{\epsilon}{c_1 \left(\frac{2\pi}{L}\right)^2}$$

$$= \frac{8.36 \times 10^{-5}}{5(12) \left\{ \frac{2\pi}{1064(12)} \right\}^2} \approx 5.75''$$

Then $y''_{max} = \Delta' \left(\frac{2\pi}{L}\right)^2 = (5.75/12) \left(\frac{2\pi}{1064}\right)^2 = 1.672 \times 10^{-5} \text{ 1/ft.}$

$$\epsilon_{max} = y''_{max} c_1 = 1.672 \times 10^{-5} (5) = 8.36 \times 10^{-5} \quad \checkmark$$

$$\epsilon_{max} \ll \epsilon_{allow, concrete} = .003$$

LA 11L

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Unbraced

$$E_c = 8.36 \times 10^{-5}$$

$$E_{s'} = 1.672 \times 10^{-5} (5'-4 \frac{1}{12}) = 7.80 \times 10^{-5}$$

$$f_c = 8.36 \times 10^{-5} (3.6 \times 10^3) = .30 \text{ K}$$

$$f_{s'} = 7.80 \times 10^{-5} (29 \times 10^3) = 2.26 \text{ K}$$

$$C_c = \frac{1}{2} (.30) (5'12) (132) = 1188 \text{ K}$$

$$C_{s'} = 2.26 (4.4) = 9.94 \text{ K}$$

$$M = CL = 1188 \left(\frac{2}{3} \right) (5') + 9.94 \left(5 - \frac{4}{12} \right)$$

$$= \underline{4,006 \text{ K'}}$$

Mcr

$$f_c = 2.5 \sqrt{f_c'} = 2.5 \sqrt{4000} = 474 \text{ psi}$$

Ignoring rebars,

$$M_u = \frac{f_c I}{c} = \frac{.474 (144) (537)}{5} = \underline{7,276 \text{ K'}}$$

$$\therefore \underline{M < M_u} \quad \checkmark$$

LANL

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Cross Section Evaluation

Tension & Compression Steel

The strain is $2.80 \times 10^{-5} = \epsilon_s$

$$\epsilon_y = F_y / E_s = .002, \quad \epsilon_y > \epsilon_s$$

$\therefore$ Rebars do not yield.

$$\sigma_{As} = \epsilon E_s = (2.80 \times 10^{-5}) (29 \times 10^3) = 2.3 \text{ ksi}$$

Adding the stress due to the axial load,

$$\sigma_{As, \text{total}} = 2.3 + \frac{520}{11.2} = 46.9 \text{ ksi} < \sigma_y = 60 \text{ ksi}$$

Concrete

$f_c' = 4 \text{ ksi}$ & assume linear σ - ϵ up to $\sigma = .45 f_c'$

$$\epsilon_c \Big|_{\text{linear limit}} = .45(4) / 3.6 \times 10^3 = .0005 \text{ in/in}$$

$$\epsilon_c \Big|_{\text{L.R.}} > \epsilon_{c, \text{max}} = 8.36 \times 10^{-5}$$

Adding the stress due to the axial load,

$$\begin{aligned} \epsilon_{c, \text{total}} &= 8.36 \times 10^{-5} + \frac{520}{10(4)(144)(3.6 \times 10^3)} \\ &= 9.27 \times 10^{-5} < \epsilon_{c, \text{allow}} = .03 \end{aligned}$$

$\therefore$ If we assume that the concrete does not crack, concrete strain & steel stresses are w/in the allowable.

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If we assume that the concrete cracks, 1st we determine the neutral axis. For convenience, we'll ignore rebars in the y direction, and lump the top & bottom rebars.

$$n = \frac{E_s}{E_c} = 8.1$$

$$n A_{s1} (x - 4) + b \cdot x \left(\frac{x}{2} \right) = n A_s (d - x)$$

$$8.1 (4.4) (x - 4) + (132) x^2 / 2 = 8.1 (4.4) (116 - x)$$

$$35.64 x - 142.56 + 66 x^2 - 4,134.24 + 35.64 x = 0$$

$$66 x^2 + 71.28 x - 4,276.8 = 0$$

$$x^2 + 1.08 x - 64.8 = 0$$

$$x = \frac{-1.08 \pm \sqrt{(1.08)^2 + 4(64.8)}}{2}, \quad x = 7.53''$$

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CHECKED BY JPT DATE 3/7/9

$$\epsilon_b^c = \frac{7.53 (.3) (386.4)}{\sum 160 (12) \}^2} = 1.05 \times 10^{-5} \text{ in/in}$$

$$y''_{\max} = \frac{\epsilon_b^c}{c_1} = 1.393 \times 10^{-6} \text{ in/in}$$

$$\epsilon_{\max} = y''_{\max} c_1 = \frac{\epsilon_b}{\left(\frac{2\pi}{L}\right)^2} \cdot \Delta = \epsilon_b^c$$

$$= 1.05 \times 10^{-5}$$

The extreme tensile strain is 2.6×10^{-5} in/in.

$$\epsilon_y = F_y / E_s = .002, \quad \epsilon_y > \epsilon_{A5}$$

∴ Tensile rebar has not yielded.

$$\sigma_{A5} = \epsilon E_s = (1.51 \times 10^{-4}) (29 \times 10^3) = 4.38 \text{ ksi}$$

Adding the stress due to the axial load,

$$\sigma_{A5, \text{total}} = 4.38 + \frac{520}{11.2} = 50.2 \text{ ksi} < \sigma_y = 60 \text{ ksi}$$

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Concrete

$$f'_c = 4 \text{ ksi}$$

Assuming linear σ - ϵ up to $\sigma = .45 f'_c$,

$$\epsilon_c \Big|_{\text{linear limit}} = .45(4) / 3.6 \times 10^3 = .0005 \text{ in/in}$$

$$\epsilon_c \text{ s.s.} > \epsilon_{c \text{ max}} = 1.05 \times 10^{-5}$$

So, the compressive concrete stresses are w/in the linear elastic zone.

Adding a stress due to the axial load,

$$\begin{aligned} \epsilon_{c, \text{total}} &= 1.05 \times 10^{-6} + \frac{520^k}{10(11)(144)(3.6 \times 10^3)} \\ &= 1.02 \times 10^{-5} << \epsilon_{c \text{ allow}} \end{aligned}$$

$\therefore$ If we assume that the concrete cracks, concrete compressive strain & tensile steel stress are w/in the allowable.

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Forces

$$C_c = \frac{1}{2} (.0378) (7.53) (132) = 18.786 \text{ K}$$

$$C_{s'} = .1427 (4.4) = .628 \text{ K}$$

$$T = 4.379 (4.4) = 19.268 \text{ K}$$

$$M = Cl = Tl = C_{s'} (l - 4) + C_c \left(l - \frac{1}{3} (7.53) \right)$$

$$= .628 (116 - 4) + 18.786 \left[116 - \frac{1}{3} (7.53) \right]$$

$$= \underline{183.5 \text{ K'}}$$

L A N L

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$$I_G = I_{conc} + I_{As'} + I_{As}$$

$$I_{conc} = \frac{1}{3} (132) (7.53)^3 = .906 \text{ ft}^4$$

$$I_{As'} = n A_s' d'^2 = 8.1 (4.4) (7.53 - 4)^2 = .0214 \text{ ft}^4$$

$$I_{As} = n A_s d^2 = 8.1 (4.4) (116 - 7.53)^2 = 20.222 \text{ ft}^4$$

$$I_G \approx 21.15 \text{ ft}^4$$

$$M = EI_G y''_{max} = (3.6 \times 10^3) (144) (21.15) (1.393 \times 10^{-6}) (12)$$

$$= 183.3 \text{ K}' \quad \checkmark$$

Now, calculate shear,

$$y'''_{max} = \Delta' \left(\frac{2\pi}{L} \right)^3 = \frac{E}{C_1} \cdot \frac{1}{\left(\frac{2\pi}{L} \right)^2} \left(\frac{2\pi}{L} \right)^3$$

$$= \frac{E}{C_1} \cdot \left(\frac{2\pi}{L} \right) = 1.393 \times 10^{-6} (12) \left(\frac{2\pi}{760} \right)$$

$$= 1.38 \times 10^{-9}$$

$$V = EI y''' = (3.6 \times 10^3) (144) (21.15) (1.38 \times 10^{-9})$$

$$= 1.51 \text{ K}$$

$$\therefore \begin{aligned} M &= 183.5 \text{ K}' \\ V &= 1.51 \text{ K} \\ F_a &= 520 \text{ K} \end{aligned}$$

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3.3. Seismic Anchor movement (SAM) Loading

Loads are induced in buried tunnel @ penetrations to building due to relative movement betw. the building & the soil.

(i) Axial DirectionAssume $\delta_{axial} = .1''$

$$P = \sqrt{2EA f \delta_{axial}} \quad [5]$$

$$= 2 (3.6 \times 10^6) (38.144) \left(9.114\right) (0.1)$$
$$= 1729^K$$

$$l_p = \frac{1729}{9.114} = 189' > l_{max} = 160' \text{ (lim 1)}$$

$$So, P_{max} = f l_{max}$$

$$= (9.114) (160) \approx 1,460^K$$

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(ii) Lateral Direction

In the case of relative movement betw. the building & soil in the direction transverse to the tunnel, loads are determined assuming the tunnel as a beam supported on elastic foundation w/ a fixed end @ the connection to the building.

Calculating k [6]

$$k_R = C_k N_R D W^{(2802)} \left[N_R \leq 3, \left\{ \begin{array}{l} H/D \approx 10/10 = 1 \\ \text{From Fig. 8 of [1]} \end{array} \right. \right]$$

$$= 50 (3) (120) (81) \left(\frac{1}{1728} \right)^{0.6} \left[C_k = 50 \right]$$

$$= 844 \text{ psf}$$

$$\beta = \left(\frac{k_R}{4EI} \right)^{\frac{1}{4}} = \left[\frac{(844)}{4(3.6 \times 10^6)(21.15)(12)^4} \right]^{\frac{1}{4}}$$

$$= .0034 \text{ 1/in} \quad [4]$$

$$\beta l = .0034 (100)(12) = 4.08 < 6 ; \text{ Finite length.}$$

Use a finite beam formula.

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Table 7 Case 6 of fixed end left & free right [4]

$$a=0=x, \quad y_A=\theta_A=0$$

$$C_1 = \cosh \beta l \cos \beta l = \cosh(4.1) \cos(4.1) = -17.35$$

$$\begin{aligned} C_{a2} &= \cosh \beta(l-a) \sin \beta(l-a) + \sinh \beta(l-a) \cos \beta(l-a) \\ &= \cosh(4.1) \sin(4.1) + \sinh(4.1) \cos(4.1) \\ &= -24.694 - 17.338 = -42.03 \end{aligned}$$

$$\begin{aligned} C_{a3} &= \sinh \beta(l-a) \sin \beta(l-a) = \sinh(4.1) \sin(4.1) \\ &= -24.68 \end{aligned}$$

$$\begin{aligned} C_{11} &= \sinh^2 \beta l - \sin^2 \beta l = \sinh^2(4.1) - \sin^2(4.1) \\ &= 909.1 \end{aligned}$$

$$2 + C_{11} = 911.1$$

$$\begin{aligned} C_4 &= \cosh \beta l \sin \beta l - \sinh \beta l \cos \beta l \\ &= \cosh(4.1) \sin(4.1) - \sinh(4.1) \cos(4.1) \\ &= -24.694 + 17.338 = -7.36 \end{aligned}$$

$$C_2 = \cosh \beta l \sin \beta l + \sinh \beta l \cos \beta l = -24.694 - 17.338 = -42.03$$

$$K_1 = \frac{C_1 C_{a2} + C_4 C_{a3}}{2 + C_{11}} = \frac{-17.35(-42.03) + (-7.36)(-24.68)}{911.1} = 1.0$$

$$K_2 = \frac{2 C_1 C_{a3} - C_2 C_{a2}}{2 + C_{11}} = \frac{2(-17.35)(-24.68) - (-42.03)(-42.03)}{911.1}$$

$$= 1.0$$

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CHECKED BY A. Laha DATE 7/15/95

Assume $\Delta_0 = .1''$

$$R_A = \Delta_0 4EI\beta^3 k_1$$

$$= (.1) 4 (3.6 \times 10^6) (21.15)(12)^4 (.0034)^3 (1.0)$$

$$\approx \underline{24.82 \text{ K}}$$

$$M_A = \Delta_0 2EI\beta^2 k_2$$

$$= (.1) 2 (3.6 \times 10^6) (21.15)(12)^4 (.0034)^2 (1.0)$$

$$\approx 3,650 \text{ K}'' = \underline{304.2 \text{ K}'}$$

Design Forces

SRSS Lateral Forces

$$M = \sqrt{2} (304.2) = 430.2 \text{ K}'$$

$$V = \sqrt{2} (24.82) = 35.1 \text{ K}$$

Axial Force

$$P = 1460 \text{ K}$$

Cross Section Evaluation

Concrete

$$\epsilon_{max} = y''_{max} c_1 = \frac{M}{EI_c} \cdot c_1 = \frac{430.2(12)}{(3.6 \times 10^6)(21.15)(12)^4} (2.53)$$

$$= 2.46 \times 10^{-5} < \epsilon_{allow} = .003$$

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DESIGNED BY S.K. DATE 2/13/95

CHECKED BY A. Saha DATE 5/15/95

Adding the axial strain,

$$\epsilon_{c, total} \Big|_{max} = \frac{1,460}{11(10)144(3.6 \times 10^3)} + 2.46 \times 10^{-5}$$

$$= 5.02 \times 10^{-5} < \epsilon_{allow}$$

Steel

$$\epsilon_{AS} = 3.27 \times 10^{-6} (116 - 7.53) = 3.55 \times 10^{-4} < \epsilon_y = .002$$

Tensile rebar has not yielded.

∴ Due to SAM Loading, concrete compressive strain & tensile steel stress are w/o the allowed.

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ENGINEERS**

Calc. No. S-0002 Rev. 0

JOB NO. 41552
SHEET 251 OF

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M.

DATE 2/1/95

Modification Option (1).

CHECKED BY SV

DATE 3/1/95

8.4 EVALUATION OF INTERIOR WALLS IN ADMIN AREA

LOS ALAMOS

NMSF BUILDING - PARTITION WALLS

DESIGNED BY A. Salhe DATE 3.9.95

CHECKED BY JL DATE 3/10/95

12" CONCRETE WALLS:

T.O.C. EXIST. FIRST FLOOR = EL. 7302'-0

T.O.C. " ROOF = EL. 7316'-6 1/2 (T.O. SLAB)

$$\begin{aligned}\text{Height of walls} &= (14'-6\frac{1}{2}") - 5" (\text{slab thickness}) \\ &= 14'-1\frac{1}{2}"\end{aligned}$$

For additional self wt. of walls, the existing first floor members (slabs, beams etc.) need to be checked if the new walls do not line up with wall below.

by inspection,
12" thick wall is o.k. for seismic load perpendicular to the walls. The walls do not carry seismic load along the length of the wall from the building (except seismic load due to self weight).

∴ Provide minimum horizontal and vertical reinf.

$$\text{Min. Vert. } A_s = 0.0012 \times 12 \times 12 = 0.1728 \text{ in}^2/\text{ft.}$$

↑ 60 ksi. reinf. and #5 or smaller bar.

$$\text{Min. Horiz. } A_s = 0.002 \times 12 \times 12 = 0.288 \text{ in}^2/\text{ft.}$$

Maximum spacing = 18 inches.

Two layers of reinf. reqd. for walls greater than 10 inches thick.

$$\text{Vert. provide } \#4 @ 18" \text{ E.F. } A_s = 0.2667 \text{ in}^2/\text{ft.} > 0.173 \text{ in}^2$$

$$\text{Horiz. provide } \#4 @ 15" \text{ E.F. } A_s = 0.32 \text{ in}^2/\text{ft.} > 0.288 \text{ in}^2$$

Vert. #4 @ 18", E.F.

HORIZ. #4 @ 15", E.F.

Additional #5 bars @ doors and window openings will be reqd.

LOS ALAMOS

NMSF BUILDING - PARTITION WALLS

DESIGNED BY A. Saha

DATE 3.9.95

CHECKED BY JH

DATE 3/10/95

6" THICK MASONRY WALL Height = 14'-1 1/2"

Assume all cells grouted wt. $\approx 70 \text{ lbs/ft}^2$

For seismic load of 0.3 g, Load = $0.3 \times 70 = 21 \text{ lbs/ft}^2$

Try #4 @ 16" O.C. vertical reinf. @ $\frac{1}{4}$ of wall

$d \approx 2.75 \text{ in.}$, $A_s = 0.20 \times 12/16 = 0.15 \text{ in}^2/\text{ft}$

$f'_m = 1500 \text{ psi}$, $F_y = 60 \text{ ksi}$. with special inspection

$$P = \frac{A_s}{bd} = \frac{0.15}{12 \times 2.75} = 0.0045$$

$$K = 83 \quad n_p = 0.117 \quad j = 0.873$$

$$M_{all} = K b d^2 = 83 \times \frac{12 \times (2.75)^2}{12} = 628 \text{ ft. lbs./ft.}$$

$$M_{actual} = \frac{21 \times (14.125)^2}{8} = 524 \text{ ft. lbs./ft.} < 628 \text{ ft. lbs./ft.}$$

$$\text{Total } A_s \text{ reqd.} = 0.002 \times 6 \times 12 = 0.144 \text{ in}^2/\text{ft.} < 0.15 \text{ in}^2/\text{ft.}$$

$$\text{Horiz reinf. provide Min } A_s = 0.0007 \times 6 \times 12 = 0.05 \text{ in}^2/\text{ft.}$$

Provide #4 @ 32" O.C. ($A_s = 0.075 \text{ in}^2/\text{ft.}$)

Note: in title design stage dynamic amplification should be accounted for.

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Calc. No. **S-0002** Rev. 0

JOB NO. 41552
SHEET 254 OF

EVALUATION OF NMSF FACILITY AT LANL

DESIGNED BY B.M. DATE 3/10/95

Modification Option (1).

CHECKED BY J ✓ DATE 3/10/95

**8.5 CONCEPTUAL RETROFIT DESIGN, WEST EXTERIOR
WALL**

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CONCEPTUAL DESIGN

WEST WALL SEISMIC EVALUATION

 DESIGNED BY BM DATE 3/10/95

 CHECKED BY JL DATE 3/10/95

Note that per Table 2-4 of DOE-STD-1020-94, the Inelastic Energy Absorption Factor, F_u , for shear wall (i.e. wall) is 1.75. This can be used to reduce the moment demand value. However, this is conditioning on good seismic detailing practice per UBC code requirements. In this conceptual design, a value of $F_u=1.0$ was used based on the following considerations:

- 1) A high conc. compressive strength value of 7,500 psi based on field test results was used.
- 2) The reinforcing steel for the existing wall is quite low and does not meet the seismic reinforcing detailing requirements.

It is suggested that in the final engineering designs of the upgrades, a value of F_u larger than 1.0 may be used if reasonable justification can be provided with careful engineering considerations.

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CONCEPTUAL DESIGN

WEST WALL SEISMIC EVALUATION

DESIGNED BY C.K. Wong

DATE 3-8-95

CHECKED BY SV

DATE 3/1/95

PROPOSED SEISMIC UPGRADE TO THE WEST WALL

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(calc. 4-0002, Rev. 0)

JOB No. 41552

SHEET 257 OF

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CONCEPTUAL DESIGN

WEST WALL SEISMIC EVALUATION

DESIGNED BY C. K. Wong DATE 3-8-95

CHECKED BY J ✓ DATE 1/14/97

DET. "A"

(NOT TO SCALE)

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CONCEPTUAL DESIGN

WEST WALL SEISMIC EVALUATION

DESIGNED BY C.K. Wong DATE 3-8-94

CHECKED BY JLV DATE 3/14/94

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CONCEPTUAL DESIGN

DESIGNED BY C.K. Wong DATE 3-8-95
CHECKED BY JL DATE 3/14/95

WEST WALL

The wall between the 1st floor and the roof (spanning vertically, will be critical and controlling the design:

Using the following approx. evaluation

Conservatively use approx uniform load.

Dynamic + Static soil pressure (See attached slit.)

$$P_{T(AVG)} = \frac{1.27 + 1.21 + 1.15 + 1.12}{4} = \frac{4.75}{4} \approx 1.20 \text{ ksf.}$$

Seismic selfweight effect of wall.

Peak g value from NUREG/CA-9800 Spectrum
= 0.81 g.

$$W = 1.33' (150) \times 0.81 \times 1.5 \\ = 0.24 \text{ k/ft.}$$

← equiv. static factor

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CONCEPTUAL DESIGN

WEST WALL SEISMIC EVALUATION

DESIGNED BY C.K. Wong DATE 3-5-95

CHECKED BY JV DATE 3/10/95

Pressure due to 250 psf surcharge load

$$K_o = 1 - \sin \phi$$

$$= 0.426$$

$\phi = 35^\circ$ Per Reference to

MERRICK REPORT ON
VOLCANIC TUFF @ LOS
ALAMOS.

$$P_{sur} = 0.426 \times 0.25 = 0.106 \text{ Ksf.}$$

CRANE LOADINGS DUE TO 20-TON CRANE

Lateral force. = 20%. (Trolley + Lift)

PER AISC 9th Ed

For span A $\approx 30'$ ft.

Allow 1'-0" from RAIL TO WALL

Max. Wheel load = 24 kip. @ 10'-0" spacing.

Reference Catalog.
CRANE HOIST.
Pg. 13.
rail @ 50' / yd.

Impact load = 25%

PER AISC. 9th Ed.

Per Wheel Load.

$$P_v = 1.25 \times 24^k = 30^k$$

$$P_h = 0.20 \times 24^k = 4.8^k \text{ (Seismic)}$$

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CONCEPTUAL DESIGN

WEST WALL SEISMIC EVALUATION

DESIGNED BY C.K. Wong DATE 3-8-95

CHECKED BY JV DATE 3/10/95

$$R_A = \frac{3wl}{8} = \frac{1.546(3)(18.5)}{8} = 10.7^k$$

$$V_B = \frac{5wl}{8} = \frac{5(1.546)(18.5)}{8} = 17.9^k$$

MAX.

$$-M_B = \frac{wl^2}{8} = \frac{1.546(18.5)^2}{8} = 66.1 \text{ k-ft/ft.}$$

INTERIOR SIDE:

$$+M_D = \frac{9}{128} wl^2 = 37.2 \text{ k-ft/ft.} > 21.6 \text{ k-ft/ft.} \leftarrow \text{No Good}$$

Check Shear.

$$V = R_A = 10.7^k < 20.8 \text{ kips.}$$

O.K. CONSERVATIVE

Exterior Side:

$$-M_B = 66.1 \text{ k-ft/ft.} < 97.27 \text{ k-ft/ft.} \text{ O.K.}$$

$$V_B = 17.9^k < 23.7 \text{ kips (Conservative)}$$

$$\begin{aligned} -M_E &= 10.7^k (14.33') - \frac{1}{2} (1.546) (14.33')^2 \\ &= 153.33 - 158.73 = -5.40 \text{ k-ft/ft} < 52.87 \text{ k-ft/ft} \end{aligned}$$

O.K.
Shear O.K. by
Inspection.

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CONCEPTUAL DESIGN

WEST WALL SEISMIC EVALUATION

DESIGNED BY C. L. Wong DATE 3-8-95

CHECKED BY JV DATE 3/12/95

WEST WALL

REF: DOE DRG NO.
LA-2J-B.S.B.1

SECT. X

LANL - NMSF

CONCEPTUAL DESIGN

WEST WALL SEISMIC EVALUATION

DESIGNED BY C.K. WONG DATE 3-9-95

CHECKED BY JV DATE 3/17/95

MOMENT CAPACITY OF THE WALL

1'-4" WALL

$$d = 12.1" - 0.3" ; 2\phi \sqrt{f'_c} = 147 \text{ psi}$$

$$V_u = 11.8" (12) (0.147) = 20.8 \text{ kip}$$

$$\phi M_u = \phi A_s (60) j d$$

INTR SIDE:

$$a = \frac{A_s (60)}{0.85 (7.5) (12)} = 0.324"$$

$$M_u = 0.9 (0.413) (60) (11.8 - \frac{0.324}{2}) / 12$$

$$= 21.63 \text{ k-ft/ft}$$

Exterior Side:-

$$a = \frac{1.05 (60)}{0.85 (7.5) (12)} = 0.82"$$

$$M_u = 0.9 (1.05) (60) (11.6 - 0.41) / 12$$

$$= 52.87 \text{ k-ft/ft}$$

For 1'-6" WALL

$$a = 1.33"$$

$$M_u = 0.9 (1.69) (60) (14.1 - 0.64 - 0.67) / 12$$

$$= 97.27 \text{ k-ft/ft}$$

$$V_u = 13.46" (12") (0.147) = 23.7 \text{ kips}$$

$$\text{MAX. COVER} = 3.9"$$

PER TEST REPORT by "CTL"

AVG. CONC. STRENGTH

$$f'_c = 7510 \text{ psi}$$

(Say use 7000 psi)

For +M

$$w / \# 5 @ 9"$$

$$A_s = \frac{12}{9} (0.31) \text{ in}^2$$

$$= 0.413 \text{ in}^2$$

$$w / \# 8 @ 9" \text{ c.c.}$$

$$A_s = \frac{12}{9} (0.79)$$

$$= 1.05 \text{ in}^2$$

$$w / \# 10 @ 9" \text{ c.c.}$$

$$A_s = \frac{12}{9} (1.27 \text{ in}^2)$$

$$= 1.69 \text{ in}^2$$

LANL - NMSE

CONCEPTUAL DESIGN

DESIGNED BY C.K. Wory DATE 3-8-95

CHECKED BY J✓ DATE 3/14/95

Estimate Roof Diaphragm Shear Capacity:

Assume $d = 0.8(l) = 0.8(30'-4" + 24'-8") = 44 \text{ ft.}$

$$V_u = 44(12')(12')(0.147) = 931 \text{ kips.}$$

Crane Girder:

FOR 20-TON TRAVELLING
CRANE

Try 30'-0" span

Max reaction @ Support

$$R_{ev} = 30^k + \frac{20}{30} \times 30 = 50^k \text{ kips}$$

$$R_{eh} = 4.8^k + \frac{4.8}{30} \times 20 = 8^k \text{ kips}$$

Distribute over 3'-0" width on wall.

$$\frac{R_{ev}}{3} = \frac{50}{3} = 16.67^k$$

$$\frac{R_{eh}}{3} = \frac{8}{3} = 2.67^k$$

Girder max. moment.

$$R_{ev} = 60^k - 40^k = 20^k$$

$$R_{eh} = 9.6^k - 6.4^k = 3.2^k$$

$$R_{fv} = \frac{30}{2} + \frac{30 \times 25}{30} = 40^k$$

$$R_{fh} = \frac{4.8}{30} \times 40 = 6.4^k$$

$$M_{A(max)} = 40^k \times 15 - 30 \times 10 = 300^k \text{ k-ft}$$

$$M_{B(max)} = 6.4^k \times 15 - 4.8 \times 10 = 48^k \text{ k-ft}$$

LANL - NMSE

CONCEPTUAL DESIGN

DESIGNED BY C.K. Worley DATE 3-8-91

CHECKED BY JV

DATE 3/14/91

Crane Girder: cont'd.

w/ A36 steel.

$$F_b = 0.6(36) = 22 \text{ ksi}$$

$$S = \frac{M_A}{F_b} = \frac{300 \times 12}{22} = 164 \text{ in}^3.$$

Try W24 X 117

Check bending stress. (Assume properly braced)

$$f_{ma} = \frac{300 \times 12}{291} = 12.4 \text{ ksi}$$

 f_a is negligible.
(axial stress)

$$f_{mb} = \frac{48 \times 12}{46.5} = 12.4 \text{ ksi}$$

$$\frac{12.4}{22} + \frac{12.4}{22} = 1.13 > 1.0$$

 $\therefore$ Use

W24 X 131

 ←

$$S_x = 329 \text{ in}^3$$

$$S_y = 53 \text{ in}^3$$

LANL - NMSF

CONCEPTUAL DESIGN

DESIGNED BY CKW DATE 3/10/55

CHECKED BY JL DATE 3/10/55

EVALUATION FOR CRANE LOAD EFFECTS.

Axial stress in wall (assume distribute over 2'-0" WIDTH)

$$f_a = \frac{50 \times 1000}{24" \times 16"} = 130 \text{ psi} \ll 7,500 \text{ psi} = f'_c$$

effect on concrete
wall is small
(1.7% f'_c)

Moment transmits to buttress.

$$\begin{aligned} M &= 50^k \times \frac{20''}{12} + (2.0' + \frac{20''}{12}) \times 8^k \\ &= 83.3^k\text{-ft} + 29.3^k\text{-ft} = 112.7^k\text{-ft} \end{aligned}$$

LANL - NMSF

CONCEPTUAL DESIGN

DESIGNED BY C. L. Wong DATE 3-5-95

CHECKED BY J. L. DATE 3/10/95

In this evaluation, it is shown that the existing design of the west wall is not adequate. It is overstressed in moment when subjected to soil pressure (static + seismic) load along.

For the interior side, the moment capacity is 21.6 K-ft/ft (based on $f'_c = 7500 \text{ psi}$, from test results). Whereas, the moment demand is 37.2 K-ft/ft .

$$\frac{\text{Demand}}{\text{Capacity}} = \frac{D}{C} = \frac{37.2}{21.6} = 1.72 > 1.0.$$

Thermal gradient loading will further increase the overstressed condition. Therefore, provide horizontal beam to stiffen the wall at the crane bracket support location. Based on the 2-D SAP computer analysis results (Run LANL-B), the moment reduced to 6.55 K-ft/ft . This will provide adequate moment margin.

ICF KAISER
ENGINEERS

Calc. 4-0062, Rev. 0

LAND - NMSF

CONCEPTUAL DESIGN

DESIGNED BY C.K. Wong

DATE 3-2-95

SHEET 269 OF

Job No. 2552

HORIZONTAL WF Stiffener (for wall)

$$W = \frac{19}{2} (1.2 \text{ k/ft}) = 11.4 \text{ k/ft}$$

$$V = \frac{30}{2} (11.4) = 171 \text{ kips}$$

$$\text{Reaction on Butress} = 2 \times 171 \text{ kips} = 342 \text{ kips}$$

Use 21" wide beam

and $f'_c = 6000 \text{ psi}$ Concrete.

$$R_2 = \frac{P a}{2L^2 + b(L+a)}$$

$$R_2 = \frac{350(8)}{2(19)^2 + 11(27)} = 208 \text{ kips}$$

$$= 0.20411 (1019) = 208 \text{ kips}$$

Depth of Butress

$$d = \frac{1.7(208)}{30(0.264)} = 44.6 \text{ in.}$$

So we use

21" x 40"

BUTRESS

Max M. (conservatively assume simple span) + provide stirrups.

$$M = \frac{350(1.7)(8 \times 11)}{19} + 83.3 \text{ k-ft} \times 1.7 = 2756 \text{ k-ft} + 142 \text{ k-ft} = 2898 \text{ k-ft}$$

LANL - NMSE

CONCEPTUAL DESIGN

DESIGNED BY C.K. Wong DATE 3-8-95

CHECKED BY JLV DATE 3/10/95

HORIZ. WF Stiffener

$$M = \frac{11.4 \text{ k/ft} (30)^2}{8} = 1283 \text{ k-ft}$$

$$F_b = 0.75 F_y = 27 \text{ ksi}$$

$$S_{\text{req'd}} = \frac{1283 \times 12}{27} = 570 \text{ in}^3$$

Use W27 x 217

$$S = 624 \text{ in}^3$$

$$I = 8870$$

LANL - NMSE

CONCEPTUAL DESIGN

DESIGNED BY C K Wong DATE 2-2-95

CHECKED BY JL DATE 3/10/95

The following sheets contains the 2-D SAP analysis of the West wall subjected to seismic, soil pressure and crane loadings.

LINL - NMSE

CONCEPTUAL DESIGN

WEST WALL - SAP MODEL / ANALYSIS

DESIGNED BY S. Luo

DATE 7/1/91

CHECKED BY JV

DATE 3/14/91

UNITS ARE IN KIPS & FT.

ght. 273 o/h

<p>LANL-A</p> <p>FRAME</p> <p>LOADS</p> <p>LOAD I</p>	<p>MINIMA</p> <p>W 0.3200E+00</p> <p>P 0.0000E+00</p> <p>MAXIMA</p> <p>W 0.1270E+01</p> <p>P 0.0000E+00</p>	<p>SAP90</p>

LANL-A
FRAME
OUTPUT M22
LOAD I

MIN < 19>
-0.3114E+02
AT 1.25
MAX < 10>
0.4883E+02
AT 1.75

SAP90

5ht. 279 0/

LANL-A
FRAME
OUTPUT M22
LOAD 2

MIN < 24>
-0.2784E+02
AT 0.00
MAX < 18>
0.3959E+01
AT 1.84

SAP90

skt. 280 03

slit. 28103

LANL-A FRAME OUTPUT V33 LOAD 2	
MIN < 11> 0.1397E+00 AT 0.00 MAX < 24> 0.1667E+02 AT 0.00	
SAP90

LANL-A
FRAME
OUTPUT V33
LOAD 3

MIN < 11>
-0.1344E+02
AT 0.00
MAX < 24>
0.1667E+02
AT 0.00

SAP90

LANL-B
UNDEFORMED
SHAPE

OPTIONS
JOINT IDS
ALL JOINTS
RESTRAINTS
SHRUNKEN
WIRE FRAME

SAP90

<p>LANL-B</p> <p>FRAME</p> <p>LOADS</p> <p>LOAD 1</p>	<p>MINIMA</p> <p>W 0.3200E+00</p> <p>P 0.0000E+00</p> <p>MAXIMA</p> <p>W 0.1270E+01</p> <p>P 0.0000E+00</p>	<p>SAP90</p>

slut. 28761

LANL-B
 FRAME
 OUTPUT M22
 LOAD 1

MIN < 5>
 -0.2320E+02
 AT 0.44
 MAX < 10>
 0.2743E+02
 AT 1.75

SAP90

461. 288 5/8

ght. 289 5/8

LANL - NMSF CONCEPTUAL DESIGN
C WEST WALL SEISMIC EVALUATION
C UNITS: ft, kips
C FILE: LANL-A

SYSTEM
L=2

JOINTS

5 X=	0.000 Y=	0.000 Z=	0.000
20 X=	0.000 Y=	5.250 Z=	0.000 G=5,20,5
35 X=	0.000 Y=	10.50 Z=	0.000 G=20,35,5
55 X=	0.000 Y=	17.50 Z=	0.000 G=35,55,5
60 X=	0.000 Y=	18.60 Z=	0.000
70 X=	0.000 Y=	21.00 Z=	0.000 G=60,70,5
75 X=	0.000 Y=	21.68 Z=	0.000
90 X=	0.000 Y=	26.159 Z=	0.000 G=75,90,5
95 X=	0.000 Y=	28.00 Z=	0.000
105 X=	0.000 Y=	31.33 Z=	0.000 G=95,105,5
120 X=	0.000 Y=	36.499 Z=	0.000 G=105,120,5
98 X=	1.670 Y=	28.000 Z=	0.000

RESTRAINTS

5,55,50 R=1,1,1
120 R=1,1,1,0,1,0

C MATERIALS

FRAME

NM=3 NL=23

1 SH=R T=1,1.5 E=7108340 W=0.216 M=0.216/32.2 :1.5' X 1' SECTION
2 SH=R T=1,1.33 E=7108340 W=0.192 M=0.192/32.2 :1.33' X 1' SECTION
3 SH=R T=8,8 E=7108340 W=0.0 M=0.0/32.2 :RIGID MEMBER

1 TRAP=0,0,0,1.749,0,0.320
2 TRAP=0,0,0.320,1.749,0,0.640
3 TRAP=0,0,0.640,1.749,0,0.960
4 TRAP=0,0,0.960,1.749,0,0.980
5 TRAP=0,0,0.980,1.749,0,1.000
6 TRAP=0,0,1.000,1.749,0,1.020
7 TRAP=0,0,1.020,1.749,0,1.042
8 TRAP=0,0,1.042,1.749,0,1.063
9 TRAP=0,0,1.063,1.749,0,1.085
10 TRAP=0,0,1.085,1.749,0,1.106
11 TRAP=0,0,1.106,1.099,0,1.120
12 TRAP=0,0,1.120,1.199,0,1.135
13 TRAP=0,0,1.135,1.199,0,1.150
14 TRAP=0,0,1.150,0.679,0,1.155
15 TRAP=0,0,1.155,1.492,0,1.173
16 TRAP=0,0,1.173,1.492,0,1.192
17 TRAP=0,0,1.192,1.492,0,1.210
18 TRAP=0,0,1.210,1.840,0,1.230
19 TRAP=0,0,1.230,1.664,0,1.250
20 TRAP=0,0,1.250,1.664,0,1.270
21 TRAP=0,0,1.270,1.722,0,0.990
22 TRAP=0,0,0.990,1.722,0,0.710
23 TRAP=0,0,0.710,1.722,0,0.430

1	5	10	M=	1	LP=	3,0	NSL= 1
2	10	15	M=	1	LP=	3,0	NSL= 2
3	15	20	M=	1	LP=	3,0	NSL= 3
4	20	25	M=	1	LP=	3,0	NSL= 4
5	25	30	M=	1	LP=	3,0	NSL= 5
6	30	35	M=	1	LP=	3,0	NSL= 6
7	35	40	M=	1	LP=	3,0	NSL= 7
8	40	45	M=	1	LP=	3,0	NSL= 8
9	45	50	M=	1	LP=	3,0	NSL= 9
10	50	55	M=	1	LP=	3,0	NSL=10
11	55	60	M=	1	LP=	3,0	NSL=11
12	60	65	M=	1	LP=	3,0	NSL=12
13	65	70	M=	1	LP=	3,0	NSL=13
14	70	75	M=	1	LP=	3,0	NSL=14

ShT. 290 of

15	75	80	M=	2	LP=	3,0	NSL=15
16	80	85	M=	2	LP=	3,0	NSL=16
17	85	90	M=	2	LP=	3,0	NSL=17
18	90	95	M=	2	LP=	3,0	NSL=18
19	95	100	M=	2	LP=	3,0	NSL=19
20	100	105	M=	2	LP=	3,0	NSL=20
21	105	110	M=	2	LP=	3,0	NSL=21
22	110	115	M=	2	LP=	3,0	NSL=22
23	115	120	M=	2	LP=	3,0	NSL=23
24	95	98	M=	3	LP=	2,0	

LOADS

98 L=2 F=2.67,-16.67

COMBO

1 C=1.0,0;
2 C=0.0,1
3 C=1.0,1.0

SELECT

NT=1 ID=5,120,5
NT=2 ID=5,120,5
NT=5 ID=1,24,1

Sht. 29' of

```

      $$$$$$ $$$$$$$$ $$$$$$ $$$$$$ $$$$$$
    $$$$$$$$ $$$$$$$$ $$$$$$$$ $$$$$$$$ $$$$$$$$
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STRUCTURAL ANALYSIS PROGRAMS

VERSION P5.40

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EDWARD L. WILSON

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LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST END1	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
1							
1	0.000			0.000			
	0.000	0.000	0.000		-3.542	0.000	
	1.749	0.000	0.000		-3.262	-6.032	
	1.750	0.000	0.000		-3.262	-6.035	
	1.750			0.000			
2	0.000			0.000			
	0.000	0.000	0.000		0.142	0.000	
	1.750	0.000	0.000		0.142	0.249	
	1.750			0.000			
3	0.000			0.000			
	0.000	0.000	0.000		-3.400	0.000	
	1.749	0.000	0.000		-3.120	-5.783	
	1.750	0.000	0.000		-3.120	-5.786	
	1.750			0.000			
2							
1	0.000			0.000			
	0.000	0.000	0.000		-3.262	-6.035	
	1.749	0.000	0.000		-2.423	-11.088	
	1.750	0.000	0.000		-2.423	-11.091	
	1.750			0.000			
2	0.000			0.000			
	0.000	0.000	0.000		0.142	0.249	
	1.750	0.000	0.000		0.142	0.499	
	1.750			0.000			
3	0.000			0.000			
	0.000	0.000	0.000		-3.120	-5.786	
	1.749	0.000	0.000		-2.280	-10.590	
	1.750	0.000	0.000		-2.280	-10.592	
	1.750			0.000			
3							
1	0.000			0.000			
	0.000	0.000	0.000		-2.423	-11.091	
	1.749	0.000	0.000		-1.023	-14.186	
	1.750	0.000	0.000		-1.023	-14.187	
	1.750			0.000			
2	0.000			0.000			
	0.000	0.000	0.000		0.142	0.499	
	1.750	0.000	0.000		0.142	0.748	
	1.750			0.000			
3	0.000			0.000			
	0.000	0.000	0.000		-2.280	-10.592	

LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST END1	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	1.749	0.000	0.000		-0.881	-13.438	
	1.750	0.000	0.000		-0.881	-13.439	
	1.750			0.000			
4							
1	0.000			0.000			
	0.000	0.000	0.000		-1.023	-14.187	
	1.059	0.000	0.000		0.000	-14.730	
	1.749	0.000	0.000		0.673	-14.498	
	1.750	0.000	0.000		0.673	-14.498	
	1.750			0.000			
2	0.000			0.000			
	0.000	0.000	0.000		0.142	0.748	
	1.750	0.000	0.000		0.142	0.997	
	1.750			0.000			
3	0.000			0.000			
	0.000	0.000	0.000		-0.881	-13.439	
	0.913	0.000	0.000		0.000	-13.842	
	1.749	0.000	0.000		0.816	-13.501	
	1.750	0.000	0.000		0.816	-13.501	
	1.750			0.000			
5							
1	0.000			0.000			
	0.000	0.000	0.000		0.673	-14.498	
	1.749	0.000	0.000		2.405	-11.811	
	1.750	0.000	0.000		2.405	-11.809	
	1.750			0.000			
2	0.000			0.000			
	0.000	0.000	0.000		0.142	0.997	
	1.750	0.000	0.000		0.142	1.246	
	1.750			0.000			
3	0.000			0.000			
	0.000	0.000	0.000		0.816	-13.501	
	1.749	0.000	0.000		2.547	-10.565	
	1.750	0.000	0.000		2.547	-10.563	
	1.750			0.000			
6							
1	0.000			0.000			
	0.000	0.000	0.000		2.405	-11.809	
	1.749	0.000	0.000		4.171	-6.064	
	1.750	0.000	0.000		4.171	-6.060	
	1.750			0.000			
2	0.000			0.000			
	0.000	0.000	0.000		0.142	1.246	

LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST END1	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
	1.750	0.000	0.000		0.142	1.496	
	1.750			0.000			
3	0.000			0.000			
	0.000	0.000	0.000		2.547	-10.563	
	1.749	0.000	0.000		4.314	-4.568	
	1.750	0.000	0.000		4.314	-4.564	
	1.750			0.000			
7							
1	0.000			0.000			
	0.000	0.000	0.000		4.171	-6.060	
	1.749	0.000	0.000		5.974	2.807	
	1.750	0.000	0.000		5.974	2.813	
	1.750			0.000			
2	0.000			0.000			
	0.000	0.000	0.000		0.142	1.496	
	1.750	0.000	0.000		0.142	1.745	
	1.750			0.000			
3	0.000			0.000			
	0.000	0.000	0.000		4.314	-4.564	
	1.749	0.000	0.000		6.117	4.552	
	1.750	0.000	0.000		6.117	4.558	
	1.750			0.000			
8							
1	0.000			0.000			
	0.000	0.000	0.000		5.974	2.813	
	1.749	0.000	0.000		7.815	14.866	
	1.750	0.000	0.000		7.815	14.874	
	1.750			0.000			
2	0.000			0.000			
	0.000	0.000	0.000		0.142	1.745	
	1.750	0.000	0.000		0.142	1.994	
	1.750			0.000			
3	0.000			0.000			
	0.000	0.000	0.000		6.117	4.558	
	1.749	0.000	0.000		7.958	16.861	
	1.750	0.000	0.000		7.958	16.868	
	1.750			0.000			
9							
1	0.000			0.000			
	0.000	0.000	0.000		7.815	14.874	
	1.749	0.000	0.000		9.694	30.180	
	1.750	0.000	0.000		9.694	30.190	
	1.750			0.000			

LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
2	0.000			0.000			
	0.000		0.000		0.142	1.994	
	1.750	0.000	0.000		0.142	2.244	
	1.750			0.000			
3	0.000			0.000			
	0.000	0.000	0.000		7.958	16.868	
	1.749	0.000	0.000		9.836	32.423	
	1.750	0.000	0.000		9.836	32.433	
10	1.750			0.000			
1	0.000			0.000			
	0.000	0.000	0.000		9.694	30.190	
	1.749	0.000	0.000		11.610	48.814	
	1.750	0.000	0.000		11.610	48.825	
2	1.750			0.000			
	0.000			0.000			
	0.000	0.000	0.000		0.142	2.244	
	1.750	0.000	0.000		0.142	2.493	
3	1.750			0.000			
	0.000	0.000	0.000		9.836	32.433	
	1.749	0.000	0.000		11.752	51.306	
	1.750	0.000	0.000		11.752	51.318	
11	1.750			0.000			
1	0.000			0.000			
	0.000	0.000	0.000		-13.576	48.825	
	1.099	0.000	0.000		-12.353	34.576	
	1.100	0.000	0.000		-12.353	34.563	
2	1.100			0.000			
	0.000			-7.648			
	0.000	0.000	0.000		0.140	2.493	
	1.100	0.000	0.000		0.140	2.646	
3	1.100			-7.648			
	0.000	0.000	0.000		-13.437	51.318	
	1.099	0.000	0.000		-12.214	37.222	
	1.100	0.000	0.000		-12.214	37.210	
12	1.100			-7.648			
1	0.000			0.000			
	0.000	0.000	0.000		-12.353	34.563	

Sht. 297 of

LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST END1	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	1.199	0.000	0.000		-11.001	20.560	
	1.200	0.000	0.000		-11.001	20.549	
	1.200			0.000			
2	0.000			-7.648			
	0.000	0.000	0.000		0.140	2.646	
	1.200	0.000	0.000		0.140	2.814	
	1.200			-7.648			
3	0.000			-7.648			
	0.000	0.000	0.000		-12.214	37.210	
	1.199	0.000	0.000		-10.862	23.374	
	1.200	0.000	0.000		-10.862	23.364	
	1.200			-7.648			
13							
1	0.000			0.000			
	0.000	0.000	0.000		-11.001	20.549	
	1.199	0.000	0.000		-9.631	8.178	
	1.200	0.000	0.000		-9.631	8.169	
	1.200			0.000			
2	0.000			-7.648			
	0.000	0.000	0.000		0.140	2.814	
	1.200	0.000	0.000		0.140	2.982	
	1.200			-7.648			
3	0.000			-7.648			
	0.000	0.000	0.000		-10.862	23.364	
	1.199	0.000	0.000		-9.492	11.160	
	1.200	0.000	0.000		-9.492	11.150	
	1.200			-7.648			
14							
1	0.000			0.000			
	0.000	0.000	0.000		-9.631	8.169	
	0.679	0.000	0.000		-8.849	1.894	
	0.680	0.000	0.000		-8.849	1.886	
	0.680			0.000			
2	0.000			-7.648			
	0.000	0.000	0.000		0.140	2.982	
	0.680	0.000	0.000		0.140	3.077	
	0.680			-7.648			
3	0.000			-7.648			
	0.000	0.000	0.000		-9.492	11.150	
	0.679	0.000	0.000		-8.709	4.971	
	0.680	0.000	0.000		-8.709	4.962	
	0.680			-7.648			

FRAME ELEMENT FORCES

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
			SHEAR	MOMENT		SHEAR	MOMENT	
15								
1	0.000				0.000			
	0.000		0.000	0.000		-8.849	1.886	
	1.492		0.000	0.000		-7.112	-10.025	
	1.493		0.000	0.000		-7.112	-10.032	
	1.493				0.000			
2	0.000				-7.648			
	0.000		0.000	0.000		0.140	3.077	
	1.493		0.000	0.000		0.140	3.285	
	1.493				-7.648			
3	0.000				-7.648			
	0.000		0.000	0.000		-8.709	4.962	
	1.492		0.000	0.000		-6.973	-6.740	
	1.493		0.000	0.000		-6.973	-6.747	
	1.493				-7.648			
16								
1	0.000				0.000			
	0.000		0.000	0.000		-7.112	-10.032	
	1.492		0.000	0.000		-5.348	-19.331	
	1.493		0.000	0.000		-5.348	-19.336	
	1.493				0.000			
2	0.000				-7.648			
	0.000		0.000	0.000		0.140	3.285	
	1.493		0.000	0.000		0.140	3.494	
	1.493				-7.648			
3	0.000				-7.648			
	0.000		0.000	0.000		-6.973	-6.747	
	1.492		0.000	0.000		-5.208	-15.837	
	1.493		0.000	0.000		-5.208	-15.842	
	1.493				-7.648			
17								
1	0.000				0.000			
	0.000		0.000	0.000		-5.348	-19.336	
	1.492		0.000	0.000		-3.556	-25.982	
	1.493		0.000	0.000		-3.556	-25.985	
	1.493				0.000			
2	0.000				-7.648			
	0.000		0.000	0.000		0.140	3.494	
	1.493		0.000	0.000		0.140	3.702	
	1.493				-7.648			
3	0.000				-7.648			
	0.000		0.000	0.000		-5.208	-15.842	

LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST END1	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	1.492	0.000	0.000		-3.416	-22.280	
	1.493	0.000	0.000		-3.416	-22.283	
	1.493			-7.648			
18							
1	0.000			0.000			
	0.000	0.000	0.000		-3.556	-25.985	
	1.840	0.000	0.000		-1.311	-30.469	
	1.841	0.000	0.000		-1.311	-30.470	
	1.841			0.000			
2	0.000			-7.648			
	0.000	0.000	0.000		0.140	3.702	
	1.841	0.000	0.000		0.140	3.959	
	1.841			-7.648			
3	0.000			-7.648			
	0.000	0.000	0.000		-3.416	-22.283	
	1.840	0.000	0.000		-1.172	-26.510	
	1.841	0.000	0.000		-1.172	-26.511	
	1.841			-7.648			
19							
1	0.000			0.000			
	0.000	0.000	0.000		-1.311	-30.470	
	1.061	0.000	0.000		0.000	-31.167	
	1.664	0.000	0.000		0.752	-30.940	
	1.665	0.000	0.000		0.752	-30.939	
	1.665			0.000			
2	0.000			9.022			
	0.000	0.000	0.000		2.810	-23.879	
	1.665	0.000	0.000		2.810	-19.201	
	1.665			9.022			
3	0.000			9.022			
	0.000	0.000	0.000		1.498	-54.350	
	1.664	0.000	0.000		3.562	-50.144	
	1.665	0.000	0.000		3.562	-50.141	
	1.665			9.022			
20							
1	0.000			0.000			
	0.000	0.000	0.000		0.752	-30.939	
	1.664	0.000	0.000		2.849	-27.948	
	1.665	0.000	0.000		2.849	-27.945	
	1.665			0.000			
2	0.000			9.022			
	0.000	0.000	0.000		2.810	-19.201	
	1.665	0.000	0.000		2.810	-14.523	

LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
	1.665	SHEAR	MOMENT	9.022	SHEAR	MOMENT	
3	0.000			9.022			
	0.000	0.000	0.000		3.562	-50.141	
	1.664	0.000	0.000		5.658	-42.474	
	1.665	0.000	0.000		5.658	-42.468	
	1.665			9.022			
21							
1	0.000			0.000			
	0.000	0.000	0.000		2.849	-27.945	
	1.722	0.000	0.000		4.795	-21.295	
	1.723	0.000	0.000		4.795	-21.290	
	1.723			0.000			
2	0.000			9.022			
	0.000	0.000	0.000		2.810	-14.523	
	1.723	0.000	0.000		2.810	-9.682	
	1.723			9.022			
3	0.000			9.022			
	0.000	0.000	0.000		5.658	-42.468	
	1.722	0.000	0.000		7.604	-30.980	
	1.723	0.000	0.000		7.604	-30.972	
	1.723			9.022			
22							
1	0.000			0.000			
	0.000	0.000	0.000		4.795	-21.290	
	1.722	0.000	0.000		6.258	-11.705	
	1.723	0.000	0.000		6.258	-11.698	
	1.723			0.000			
2	0.000			9.022			
	0.000	0.000	0.000		2.810	-9.682	
	1.723	0.000	0.000		2.810	-4.841	
	1.723			9.022			
3	0.000			9.022			
	0.000	0.000	0.000		7.604	-30.972	
	1.722	0.000	0.000		9.068	-16.548	
	1.723	0.000	0.000		9.068	-16.539	
	1.723			9.022			
23							
1	0.000			0.000			
	0.000	0.000	0.000		6.258	-11.698	
	1.722	0.000	0.000		7.240	-0.007	
	1.723	0.000	0.000		7.240	0.000	
	1.723			0.000			

SUT. 20105

LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
2	0.000			9.022			
	0.000	0.000	0.000		2.810	-4.841	
	1.723	0.000	0.000		2.810	0.000	
	1.723			9.022			
3	0.000			9.022			
	0.000	0.000	0.000		9.068	-16.539	
	1.722	0.000	0.000		10.050	-0.010	
	1.723	0.000	0.000		10.050	0.000	
	1.723			9.022			
24	-----						
1	0.000			0.000			
	0.000	0.000	0.000		0.000	0.000	
	1.670	0.000	0.000		0.000	0.000	
	1.670			0.000			
2	0.000			2.670			
	0.000	0.000	0.000		16.670	-27.839	
	1.670	0.000	0.000		16.670	0.000	
	1.670			2.670			
3	0.000			2.670			
	0.000	0.000	0.000		16.670	-27.839	
	1.670	0.000	0.000		16.670	0.000	
	1.670			2.670			

Shit. 2025

LANL - NMSF CONCEPTUAL DESIGN
C WEST WALL SEISMIC EVALUATION (with modifacaiton - add support at node 95)
C UNITS: ft, kips
C FILE: LANL-B

SYSTEM
L=2

JOINTS

5 X=	0.000	Y=	0.000	Z=	0.000
20 X=	0.000	Y=	5.250	Z=	0.000 G=5,20,5
35 X=	0.000	Y=	10.50	Z=	0.000 G=20,35,5
55 X=	0.000	Y=	17.50	Z=	0.000 G=35,55,5
60 X=	0.000	Y=	18.60	Z=	0.000
70 X=	0.000	Y=	21.00	Z=	0.000 G=60,70,5
75 X=	0.000	Y=	21.68	Z=	0.000
90 X=	0.000	Y=	26.159	Z=	0.000 G=75,90,5
95 X=	0.000	Y=	28.00	Z=	0.000
105 X=	0.000	Y=	31.33	Z=	0.000 G=95,105,5
120 X=	0.000	Y=	36.499	Z=	0.000 G=105,120,5
98 X=	1.670	Y=	28.000	Z=	0.000

RESTRAINTS

5,55,50	R=1,1,1
120	R=1,1,1,0,1,0
95	R=1,1,1

C MATERIALS

FRAME

NM=3 NL=23

1	SH=R	T=1,1.5	E=7108340	W=0.216	M=0.216/32.2	:1.5' X 1' SECTION
2	SH=R	T=1,1.33	E=7108340	W=0.192	M=0.192/32.2	:1.33' X 1' SECTION
3	SH=R	T=8,8	E=7108340	W=0.0	M=0.0/32.2	:RIGID MEMBER

1	TRAP=0,0,	0,1.749,0,0.320
2	TRAP=0,0,0.320,	1.749,0,0.640
3	TRAP=0,0,0.640,	1.749,0,0.960
4	TRAP=0,0,0.960,	1.749,0,0.980
5	TRAP=0,0,0.980,	1.749,0,1.000
6	TRAP=0,0,1.000,	1.749,0,1.020
7	TRAP=0,0,1.020,	1.749,0,1.042
8	TRAP=0,0,1.042,	1.749,0,1.063
9	TRAP=0,0,1.063,	1.749,0,1.085
10	TRAP=0,0,1.085,	1.749,0,1.106
11	TRAP=0,0,1.106,	1.099,0,1.120
12	TRAP=0,0,1.120,	1.199,0,1.135
13	TRAP=0,0,1.135,	1.199,0,1.150
14	TRAP=0,0,1.150,	0.679,0,1.155
15	TRAP=0,0,1.155,	1.492,0,1.173
16	TRAP=0,0,1.173,	1.492,0,1.192
17	TRAP=0,0,1.192,	1.492,0,1.210
18	TRAP=0,0,1.210,	1.840,0,1.230
19	TRAP=0,0,1.230,	1.664,0,1.250
20	TRAP=0,0,1.250,	1.664,0,1.270
21	TRAP=0,0,1.270,	1.722,0,0.990
22	TRAP=0,0,0.990,	1.722,0,0.710
23	TRAP=0,0,0.710,	1.722,0,0.430

1	5	10	M=	1	LP=	3,0	NSL= 1
2	10	15	M=	1	LP=	3,0	NSL= 2
3	15	20	M=	1	LP=	3,0	NSL= 3
4	20	25	M=	1	LP=	3,0	NSL= 4
5	25	30	M=	1	LP=	3,0	NSL= 5
6	30	35	M=	1	LP=	3,0	NSL= 6
7	35	40	M=	1	LP=	3,0	NSL= 7
8	40	45	M=	1	LP=	3,0	NSL= 8
9	45	50	M=	1	LP=	3,0	NSL= 9
10	50	55	M=	1	LP=	3,0	NSL=10
11	55	60	M=	1	LP=	3,0	NSL=11
12	60	65	M=	1	LP=	3,0	NSL=12
13	65	70	M=	1	LP=	3,0	NSL=13

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14	70	75	M=	1	LP=	3,0	NSL=14
15	75	80	M=	2	LP=	3,0	NSL=15
16	80	85	M=	2	LP=	3,0	NSL=16
17	85	90	M=	2	LP=	3,0	NSL=17
18	90	95	M=	2	LP=	3,0	NSL=18
19	95	100	M=	2	LP=	3,0	NSL=19
20	100	105	M=	2	LP=	3,0	NSL=20
21	105	110	M=	2	LP=	3,0	NSL=21
22	110	115	M=	2	LP=	3,0	NSL=22
23	115	120	M=	2	LP=	3,0	NSL=23
24	95	98	M=	3	LP=	2,0	

LOADS

98 L=2 F=0.0,0.0

COMBO

1 C=1.0,0,

SELECT

NT=1 ID=5,120,5

NT=2 ID=5,120,5

NT=5 ID=1,24,1

LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
			SHEAR	MOMENT		SHEAR	MOMENT	
1								
1	1	0.000			0.000			
		0.000	0.000	0.000		-4.765	0.000	
		1.749	0.000	0.000		-4.485	-8.170	
		1.750	0.000	0.000		-4.485	-8.175	
		1.750			0.000			
2								
1	1	0.000			0.000			
		0.000	0.000	0.000		-4.485	-8.175	
		1.749	0.000	0.000		-3.645	-15.366	
		1.750	0.000	0.000		-3.645	-15.369	
		1.750			0.000			
3								
1	1	0.000			0.000			
		0.000	0.000	0.000		-3.645	-15.369	
		1.749	0.000	0.000		-2.246	-20.603	
		1.750	0.000	0.000		-2.246	-20.605	
		1.750			0.000			
4								
1	1	0.000			0.000			
		0.000	0.000	0.000		-2.246	-20.605	
		1.749	0.000	0.000		-0.549	-23.055	
		1.750	0.000	0.000		-0.549	-23.056	
		1.750			0.000			
5								
1	1	0.000			0.000			
		0.000	0.000	0.000		-0.549	-23.056	
		0.559	0.000	0.000		0.000	-23.209	
		1.749	0.000	0.000		1.182	-22.507	
		1.750	0.000	0.000		1.182	-22.506	
		1.750			0.000			
6								
1	1	0.000			0.000			
		0.000	0.000	0.000		1.182	-22.506	
		1.749	0.000	0.000		2.949	-18.899	
		1.750	0.000	0.000		2.949	-18.896	
		1.750			0.000			
7								
1	1	0.000			0.000			
		0.000	0.000	0.000		2.949	-18.896	
		1.749	0.000	0.000		4.752	-12.168	
		1.750	0.000	0.000		4.752	-12.163	
		1.750			0.000			

LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT ID	LOAD COMB	DIST END1	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
			SHEAR	MOMENT		SHEAR	MOMENT	
8								
	1	0.000			0.000			
		0.000	0.000	0.000		4.752	-12.163	
		1.749	0.000	0.000		6.593	-2.248	
		1.750	0.000	0.000		6.593	-2.242	
		1.750			0.000			
9								
	1	0.000			0.000			
		0.000	0.000	0.000		6.593	-2.242	
		1.749	0.000	0.000		8.471	10.926	
		1.750	0.000	0.000		8.471	10.934	
		1.750			0.000			
10								
	1	0.000			0.000			
		0.000	0.000	0.000		8.471	10.934	
		1.749	0.000	0.000		10.387	27.420	
		1.750	0.000	0.000		10.387	27.431	
		1.750			0.000			
11								
	1	0.000			0.000			
		0.000	0.000	0.000		-8.049	27.431	
		1.099	0.000	0.000		-6.825	19.256	
		1.100	0.000	0.000		-6.825	19.249	
		1.100			0.000			
12								
	1	0.000			0.000			
		0.000	0.000	0.000		-6.825	19.249	
		1.199	0.000	0.000		-5.474	11.874	
		1.200	0.000	0.000		-5.474	11.869	
		1.200			0.000			
13								
	1	0.000			0.000			
		0.000	0.000	0.000		-5.474	11.869	
		1.199	0.000	0.000		-4.104	6.125	
		1.200	0.000	0.000		-4.104	6.121	
		1.200			0.000			
14								
	1	0.000			0.000			
		0.000	0.000	0.000		-4.104	6.121	
		0.679	0.000	0.000		-3.321	3.600	
		0.680	0.000	0.000		-3.321	3.597	
		0.680			0.000			

LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
			SHEAR	MOMENT		SHEAR	MOMENT	
15								
	1	0.000			0.000			
		0.000	0.000	0.000		-3.321	3.597	
		1.492	0.000	0.000		-1.584	-0.066	
		1.493	0.000	0.000		-1.584	-0.068	
		1.493			0.000			
16								
	1	0.000			0.000			
		0.000	0.000	0.000		-1.584	-0.068	
		1.341	0.000	0.000		0.000	-1.133	
		1.492	0.000	0.000		0.180	-1.119	
		1.493	0.000	0.000		0.180	-1.119	
		1.493			0.000			
17								
	1	0.000			0.000			
		0.000	0.000	0.000		0.180	-1.119	
		1.492	0.000	0.000		1.972	0.483	
		1.493	0.000	0.000		1.972	0.485	
		1.493			0.000			
18								
	1	0.000			0.000			
		0.000	0.000	0.000		1.972	0.485	
		1.840	0.000	0.000		4.217	6.172	
		1.841	0.000	0.000		4.217	6.177	
		1.841			0.000			
19								
	1	0.000			0.000			
		0.000	0.000	0.000		-5.623	6.177	
		1.664	0.000	0.000		-3.560	-1.468	
		1.665	0.000	0.000		-3.560	-1.472	
		1.665			0.000			
20								
	1	0.000			0.000			
		0.000	0.000	0.000		-3.560	-1.472	
		1.664	0.000	0.000		-1.463	-5.656	
		1.665	0.000	0.000		-1.463	-5.657	
		1.665			0.000			
21								
	1	0.000			0.000			
		0.000	0.000	0.000		-1.463	-5.657	
		1.253	0.000	0.000		0.000	-6.547	
		1.722	0.000	0.000		0.483	-6.432	
		1.723	0.000	0.000		0.483	-6.431	
		1.723			0.000			

LANL - NMSF CONCEPTUAL DESIGN

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
22							
1	0.000			0.000			
	0.000	0.000	0.000		0.483	-6.431	
	1.722	0.000	0.000		1.946	-4.271	
	1.723	0.000	0.000		1.946	-4.269	
	1.723			0.000			
23							
1	0.000			0.000			
	0.000	0.000	0.000		1.946	-4.269	
	1.722	0.000	0.000		2.928	-0.003	
	1.723	0.000	0.000		2.928	0.000	
	1.723			0.000			
24							
1	0.000			0.000			
	0.000	0.000	0.000		0.000	0.000	
	1.670	0.000	0.000		0.000	0.000	
	1.670			0.000			

LANL

EVALUATION OF NMSF FACILITY AT LANL

Modification Option (1).

DESIGNED BY B.M.

DATE 5/8/95

CHECKED BY JV

DATE 5/29/95

8.6 Additional Analyses and Evaluations of NMSF Structure**8.6.1 References**

- 1) LANL Review Comments on the submittal of 90% documents for seismic evaluation of as-built and modified NMSF facility.

8.6.2 Re-Analysis using 3-D Model

This additional Analysis was performed to study the impact of new structural components that were added to the scope of modifications. these new components consist of two 1.5 foot thick reinforced concrete walls under the proposed charge deck in north/south and four buttresses, 2.5'X4' in cross section, at the west exterior wall. These walls and buttresses were not included in the SAP90 model of the structure used for analysis of the modified structure. The objective of this analysis was to study the impact of including these walls and buttresses in the model on the structural evaluation results for NMSF building. Also as part of this analysis effort the floor mass calculations were revised to reflect the followings:

- 1) The live load of the charge deck was increased to 250 psf from 150 psf.
- 2) The dead loads of the charge deck and roof slabs were revised to reflect the latest drawings including the weight of the new rooftop equipment penthouse.

The Following summarizes the result of this study. The detail of calculations are presented in the following pages.

- 1) As expected the impact on the dynamic characteristics of the structure was not significant. The rigid box like structure of the NMSF building primarily goes through rigid body translational and rocking motion with slight change in the fundamental frequencies due to addition of new masses and rigidities of the additional walls and buttresses..
- 2) Addition of new walls and buttresses adds to the load carrying capacity of the lateral load resisting system of the building. The addition of buttresses reduces the out-of-plane demand on the west wall and additional new walls help reduce the demand on adjacent walls which already had a comfortable margin of safety against reaching their ultimate capacity under the postulated DBE criteria.

NMSP (L) LNAL
EVALUATION OF NMSP FACILITY M LNAL
Modification Option (1)

DESIGNED BY BM

DATE 4/24/95

CHECKED BY JL

DATE 5/1/95

MODIFICATION TO SAP90 MODEL

- 1) Addition of Two 1'-6" Basement walls in N/S Dir.
[REF: ICF KAISER 50% Drawing sheet A7, March 16, 95]
- 2) Addition of 4 1/2" BUTRESSES on the west wall.

PLAN - Change Deck ELEV.

- 3) Remove BUTRESSES on line (D)
- Shell Elements 4401 → 4407

Stack 4'
(1-slab) Landing 6'

(1-slab) Landing 8'
Stack 5'

Wall Length = 12.7'

LAJL

EVALUATION of NMSP FACILITY AT LAJL
MODIFICATION options (1)

DESIGNED BY KM DATE 5/1/95

CHECKED BY JT DATE 5/1/95

New Baknet walls (Element/Node)

New Nodes

New Caissons

LMNL

EVALUATION OF NMSF FACILITY M. LMNL

ALSO FOR 2.1 OPTION 1

DESIGNED BY BMT

DATE 2/8/94

CHECKED BY BM

DATE 4/26/95

MODIFIED

1 FLOOR MASS CALCULATION SUMMARY

<u>FLOOR</u>	<u>$M_x = M_y = M_z$</u>	<u>M_{xx}</u>	<u>M_{yy}</u>	<u>M_{zz}</u>
Basement	160 143	327.962 305.525	69,676 64,665	397639 374,690
30" Deck	309 256	521085 446,907	132037 119,241	653122 566,113
1st Floor	156	424,312	254,411	678,723
Roof	229.8 228	563549 560,438	392029 386,887	955579 947,305

FLOOR C.G. Coordinates

<u>FLOOR</u>	<u>$\bar{X}$</u>	<u>$\bar{Y}$</u>	<u>$\bar{Z}$</u>
Basement	27.83 29.55	80.32 80.76	0
30" Deck	28.82 30.02	77.83 77.79	18.5'
1st Floor	66.87	85.37	21.0
Roof	53.93 53.47	80.99 81.34	36.5'

EVALUATION OF NMCF FACILITY AT LANL
Modification Option (1)

DESIGNED BY Bm DATE 4/24/92
CHECKED BY JL DATE 5/1/92

Charge Deck Mass

REF: Kaiser Drawings sheets P6,

$$\text{TOTAL AREA} = (150 - \frac{127}{12} - 5 - 8) (7 + 7.67 + 7) - 522 (\pi \cdot 1.5^2 / 4) \\ \approx 1830 \text{ FT}^2$$

$$\text{Concrete} = \frac{30}{12} \times 1830 \times 0.15 = 686^k$$

$$\text{Steel } 1/2" \text{ Top \& Bot} = (\frac{.5}{12} \times 1830 \times 0.490) \times 2 = 75^k$$

$$\text{Steel } 1/2" \text{ Web} = (\frac{30 \times 1}{144} \times 127 \times 0.490) (3 \times 4) = 136^k$$

$$\text{Dry Wells (522)} = (\pi \cdot 1.5 \times \frac{.5}{12} \times 17 \times 0.49) (522) = 854^k$$

2ndary Tub & Contents (2^k Per well):

$$= (2) (522) = 1044^k$$

$$\text{Concrete shield Blocks} = \left(\left(\frac{225^2}{4} \times \pi \times 8 + \frac{17^2}{4} \times \pi \times 26 \right) \frac{0.15}{12} \right) (522) \\ = (0.788^k) (522) = 412^k$$

$$\text{TOTAL Dead Loads} = 3227^k$$

$$\text{Eq. Unif. Load} = 3227 / (127 \times 29.6) = 0.866^k / \text{FT}^2$$

$$\text{Live Loads (250 PSF)} = 0.25^k / \text{FT}^2$$

$$\text{USE 25\% of L.L. in Masses} = 0.25 \times 0.25 = 0.0625^k / \text{FT}^2$$

$$\text{Equiv unif mass} = (.866 + 0.0625) / 32.2 = 0.0286^k - \text{FT}^{-2}$$

EVALUATION OF NMSP FACILITY AT LARL
MODIFICATION OPTION (1)

DESIGNED BY BM DATE 4/24/96

CHECKED BY JL DATE 5/1/96

Charge Deck Mass/D.L. Calculation Summary:

$$\begin{aligned} \text{D.L.} &= 0.860 \quad \text{K.F}^{-2} \\ \text{L.L.} &= 0.250 \quad \text{K.F}^{-2} \\ (W_1) \text{ D.L.} + \text{L.L.} &= 1.110 \quad \text{K.F}^{-2} \\ (W_2) 1.4\text{DL} + 1.7\text{LL} &= 1.629 \quad \text{K.F}^{-2} \\ (M) \text{ Mass} &= (0.86 + 0.25 \times 25) / 32.2 \\ (\text{Unif Area} \text{ Mass}) &= 0.02865 \quad \text{K.F}^{-2} \cdot \text{S}^2 \end{aligned}$$

Dead WT. / Mass of Equipment Penthouse:

$$\begin{aligned} \text{D.L. (Penthouse)} &= 20 \text{ PSF (Conservative)} \\ \text{D.L. (HVAC Equip)} &= 20 \text{ PSF (")} \\ \hline \text{TOTAL} &= 40 \text{ PSF} \end{aligned}$$

$$\begin{aligned} \text{L.L.} &= 50 \text{ PSF} \\ \text{Unif. Mass} &= \frac{(0.04 + 0.25 \times 0.05)}{32.2} = 0.00163 \\ \text{DL} + \text{LL} &= 0.09 \text{ (KSF)} \\ 1.4\text{DL} + 1.7\text{LL} &= 0.062 \text{ (KSF)} \end{aligned}$$

EVALUATION OF NMSP FACILITY @ LHL
 ICF KAISER
 ENGINEERS

CALC 5-0002 REV. 0
 SHEET: 37 OF
 JOB NO: 4552
 DESIGNED BY: DATE:
 CHECKED BY: DATE:

SUBJE ---Basement Floor Mass
 OPTION (1)

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1	3.00	130.45	9.29	0.0	78.7	0.00466	16.94	0	1333.9	13124.72	42.758	24026	13
2	1.50	13.50	9.29	0.0	6.8	0.00466	0.877	0	5.9174	679.1249	4744.7	13	0
2a	1.50	4.75	9.29	0.0	146.3	0.00466	0.308	0	45.136	238.9513	1344.1	1	0
3	29.60	1.50	9.29	14.8	6.5	0.00466	1.922	28.44764	12.494	326.4974	10474	0	140
4	1.33	13.50	9.29	29.6	6.8	0.00466	0.777	23.00799	5.2468	2.426688	4207	12	0
5	2.83	130.45	9.29	29.6	78.7	0.00466	15.98	473.0683	1258.3	49.89522	40.335	22664	11
4a	1.33	4.75	9.29	29.6	146.3	0.00466	0.273	8.095405	40.02	0.853835	1191.7	1	0
6	1.00	148.70	9.29	53.5	74.4	0.00466	6.437	344.4026	478.62	4240.916	229.33	11862	1
7	29.60	1.50	9.29	14.8	144.0	0.00466	1.922	28.44764	276.69	326.4974	7782.6	0	140
8	1.00	44.40	9.29	72.5	126.5	0.00466	1.922	139.365	243.15	3834.92	4099.4	316	0
9	72.50	1.38	9.29	36.3	148.7	0.00466	4.331	157.0098	644.06	306.8483	20253	1	1897
10	29.00	1.00	9.29	68.0	104.3	0.00466	1.255	85.37064	130.94	2025.519	722.02	0	88
11	23.90	1.00	9.29	41.6	119.3	0.00466	1.035	42.99031	123.44	194.6757	1572.2	0	49
12	53.5	1.50	9.29	26.8	0.0	0.00466	3.474	92.93311	0	4.075483	22412	1	829
13	53.5	148.70	1.50	26.8	74.4	0.00616	73.51	1966.349	5465.3	86.23213	2618.7	135450	17533
14	29.0	44.40	1.50	68.0	126.5	0.00616	11.9	809.0248	1505	19195.07	25374	1955	834
15			1.50			0.00466	0	0	0	0	0	0	0
16			1.50			0.00466	0	0	0	0	0	0	0
17			1.50			0.00466	0	0	0	0	0	0	0
18	29.6	1.50	1.50	14.8	13.5	0.00466	0.31	4.593269	4.1898	52.71755	1385.7	0	23
19			1.50			0.00466	0	0	0	0	0	0	0
20			1.50			0.00466	0	0	0	0	0	0	0
21			1.50			0.00466	0	0	0	0	0	0	0
22			1.50			0.00466	0	0	0	0	0	0	0
23			1.50			0.00466	0	0	0	0	0	0	0
24			1.50			0.00466	0	0	0	0	0	0	0
25			1.50			0.00466	0	0	0	0	0	0	0
26			1.50			0.00466	0	0	0	0	0	0	0
27			1.50			0.00466	0	0	0	0	0	0	0
28			1.50			0.00466	0	0	0	0	0	0	0
29	15.0	1.50	1.50	-6.5	89.3	0.00466	0.157	-1.02229	14.045	185.3897	12.687	0	3
30			1.50			0.00466	0	0	0	0	0	0	0
31			1.50			0.00466	0	0	0	0	0	0	0
32			1.50			0.00466	0	0	0	0	0	0	0
33	23.9	1.00	1.50	41.6	13.5	0.00466	0.167	6.941385	2.2553	31.43311	745.88	0	8
34			1.50			0.00466	0	0	0	0	0	0	0
35			1.50			0.00466	0	0	0	0	0	0	0
36			1.50			0.00466	0	0	0	0	0	0	0
37			1.50			0.00466	0	0	0	0	0	0	0
38			1.50			0.00466	0	0	0	0	0	0	0
39			1.50			0.00466	0	0	0	0	0	0	0
40			1.50			0.00466	0	0	0	0	0	0	0
41						0.00466	0	0	0	0	0	0	0
42						0.00466	0	0	0	0	0	0	0
43			0.00			0.00466	0	0	0	0	0	0	0
44			0.00			0.00466	0	0	0	0	0	0	0
45			0.00			0.00466	0	0	0	0	0	0	0
46	1.5	127.00	9.29	9.9	78.5	0.00466	8.247	81.84542	630.9	2652.205	120.26	11085	2
47	1.5	127.00	9.29	19.7	78.5	0.00466	8.247	162.4661	630.9	545.5199	120.26	11085	2
48			9.29			0.00466	0	0	0	0	0	0	0

Total Floor Mass= 180 4453.126 12850 48104.48 109493 218469 21572

C. G. COORDINATES: XCG= 27.83 ft YCG= 80.32 ft WL= 5152

MASS MOMENTS OF INERTIA: IXX= 327962 IYY= 66676 IZZ= 397639

Units: Kips, Feet, Second

New 1'-6" walls
 in Basement

CAL 5-0002, REV 0

ICF KAISER
ENGINEERS

SHEET: 318 OF
JOB NO.: 41512

DESIGNED BY:

DATE:

CHECKED BY:

DATE:

SUBJE ---Basement Floor Mass
OPTION (1)

(DL+LL)

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1	3.00	130.45	9.29	0.0	78.7	0.00466	16.94	0	1333.9	13124.72	42.758	24026	13
2	1.50	13.50	9.29	0.0	6.8	0.00466	0.877	0	5.9174	679.1249	4744.7	13	0
2a	1.50	4.75	9.29	0.0	146.3	0.00466	0.308	0	45.136	238.9513	1344.1	1	0
3	29.60	1.50	9.29	14.8	6.5	0.00466	1.922	28.44764	12.494	326.4974	10474	0	140
4	1.33	13.50	9.29	29.6	6.8	0.00466	0.777	23.00799	5.2468	2.426688	4207	12	0
5	2.83	130.45	9.29	29.6	78.7	0.00466	15.98	473.0683	1258.3	49.89522	40.335	22664	11
4a	1.33	4.75	9.29	29.6	146.3	0.00466	0.273	8.095405	40.02	0.853835	1191.7	1	0
6	1.00	148.70	9.29	53.5	74.4	0.00466	6.437	344.4026	478.62	4240.916	229.33	11862	1
7	29.60	1.50	9.29	14.8	144.0	0.00466	1.922	28.44764	276.69	326.4974	7782.6	0	140
8	1.00	44.40	9.29	72.5	126.5	0.00466	1.922	139.355	243.15	3834.92	4099.4	316	0
9	72.50	1.38	9.29	36.3	148.7	0.00466	4.331	157.0098	644.06	306.8483	20253	1	1897
10	29.00	1.00	9.29	68.0	104.3	0.00466	1.255	85.37064	130.94	2025.519	722.02	0	88
11	23.90	1.00	9.29	41.6	119.3	0.00466	1.035	42.99031	123.44	194.6757	1572.2	0	49
12	53.5	1.50	9.29	26.8	0.0	0.00466	3.474	92.93311	0	4.075483	22412	1	829
13	53.5	148.70	1.50	26.8	74.4	0.01004	119.8	3205.527	8909.6	140.575	4269	220809	28583
14	29.0	44.40	1.50	68.0	126.5	0.01004	19.4	1318.866	2453.5	31291.66	41364	3186	1359
15		1.50				0.00466	0	0	0	0	0	0	0
16		1.50				0.00466	0	0	0	0	0	0	0
17		1.50				0.00466	0	0	0	0	0	0	0
18	29.6	1.50	1.50	14.8	13.5	0.00466	0.31	4.593269	4.1898	52.71755	1385.7	0	23
19		1.50				0.00466	0	0	0	0	0	0	0
20		1.50				0.00466	0	0	0	0	0	0	0
21		1.50				0.00466	0	0	0	0	0	0	0
22		1.50				0.00466	0	0	0	0	0	0	0
23		1.50				0.00466	0	0	0	0	0	0	0
24		1.50				0.00466	0	0	0	0	0	0	0
25		1.50				0.00466	0	0	0	0	0	0	0
25		1.50				0.00466	0	0	0	0	0	0	0
26		1.50				0.00466	0	0	0	0	0	0	0
27		1.50				0.00466	0	0	0	0	0	0	0
28		1.50				0.00466	0	0	0	0	0	0	0
29	15.0	1.50	1.50	-6.5	89.3	0.00466	0.157	-1.02229	14.045	185.3897	12.687	0	3
30		1.50				0.00466	0	0	0	0	0	0	0
31		1.50				0.00466	0	0	0	0	0	0	0
32		1.50				0.00466	0	0	0	0	0	0	0
33	23.9	1.00	1.50	41.6	13.5	0.00466	0.167	6.941385	2.2553	31.43311	745.88	0	8
34		1.50				0.00466	0	0	0	0	0	0	0
35		1.50				0.00466	0	0	0	0	0	0	0
36		1.50				0.00466	0	0	0	0	0	0	0
37		1.50				0.00466	0	0	0	0	0	0	0
38		1.50				0.00466	0	0	0	0	0	0	0
39		1.50				0.00466	0	0	0	0	0	0	0
40		1.50				0.00466	0	0	0	0	0	0	0
41						0.00466	0	0	0	0	0	0	0
42						0.00466	0	0	0	0	0	0	0
43		0.00				0.00466	0	0	0	0	0	0	0
44		0.00				0.00466	0	0	0	0	0	0	0
45		0.00				0.00466	0	0	0	0	0	0	0
46	1.5	127.00	9.29	9.9	76.5	0.00466	8.247	81.64542	630.9	2652.205	120.26	11085	2
47	1.5	127.00	9.29	19.7	76.5	0.00466	8.247	162.4861	630.9	545.5169	120.26	11085	2
48		9.29				0.00466	0	0	0	0	0	0	0

Total Floor Mass= 213.8 6202.146 17243 60255.42 127134 305080 33147

C. G. COORDINATES: XCG= 29.01 ft YCG= 80.64 ft Wt.= 8885

MASS MOMENTS OF INERTIA: IXX= 432194 IYY= 93402 IZZ= 525596

CALL NO 50002, REV. 0

ICF KAISER
ENGINEERS

SHEET: 319 OF
JOB NO.: 6152

SUBJE —Basement Floor Mass (1.4DL + 1.7LL) —								DESIGNED BY:			DATE:		
OPTION (1)								CHECKED BY :			DATE:		
ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1	3.00	130.45	9.29	0.0	78.7	0.00652	23.72	0	1867.4	18374.6	59.861	33636	18
2	1.50	13.50	9.29	0.0	6.8	0.00652	1.227	0	8.2844	950.7748	6642.6	19	0
2a	1.50	4.75	9.29	0.0	146.3	0.00652	0.432	0	63.19	334.5319	1881.7	1	0
3	29.60	1.50	9.29	14.8	6.5	0.00652	2.691	39.8267	17.491	457.0963	14664	1	196
4	1.33	13.50	9.29	29.6	6.8	0.00652	1.088	32.21119	7.3455	3.397363	5889.8	17	0
5	2.83	130.45	9.29	29.6	78.7	0.00652	22.37	662.2956	1761.6	69.85331	56.469	31730	15
4a	1.33	4.75	9.29	29.6	146.3	0.00652	0.383	11.33357	56.028	1.195368	1668.4	1	0
6	1.00	148.70	9.29	53.5	74.4	0.00652	9.012	482.1636	670.07	5937.282	321.06	16607	1
7	29.60	1.50	9.29	14.8	144.0	0.00652	2.691	39.8267	387.37	457.0963	10896	1	196
8	1.00	44.40	9.29	72.5	126.5	0.00652	2.691	195.097	340.41	5368.888	5739.1	442	0
9	72.50	1.38	9.29	36.3	148.7	0.00652	6.064	219.8137	901.69	429.5876	28355	1	2656
10	29.00	1.00	9.29	68.0	104.3	0.00652	1.758	119.5189	183.32	2835.727	1010.8	0	123
11	23.90	1.00	9.29	41.6	119.3	0.00652	1.449	60.18643	172.81	272.546	2201.1	0	69
12	53.5	1.50	9.29	26.8	0.0	0.00652	4.864	130.1064	0	5.705676	31377	1	1160
13	53.5	148.70	1.50	26.8	74.4	0.01562	186.4	4986.455	13860	218.6757	6640.8	343486	44463
14	29.0	44.40	1.50	68.0	126.5	0.01562	30.17	2051.603	3816.6	48676.7	64345	4956	2114
15							0	0	0	0	0	0	0
16							0	0	0	0	0	0	0
17							0	0	0	0	0	0	0
18	29.6	1.50	1.50	14.8	13.5	0.00652	0.434	6.430576	5.8657	73.80457	1939.9	0	32
19							0	0	0	0	0	0	0
20							0	0	0	0	0	0	0
21							0	0	0	0	0	0	0
22							0	0	0	0	0	0	0
23							0	0	0	0	0	0	0
24							0	0	0	0	0	0	0
25							0	0	0	0	0	0	0
25							0	0	0	0	0	0	0
26							0	0	0	0	0	0	0
27							0	0	0	0	0	0	0
28							0	0	0	0	0	0	0
29	15.0	1.50	1.50	-6.5	89.3	0.00652	0.22	-1.4312	19.863	259.5456	17.761	0	4
30							0	0	0	0	0	0	0
31							0	0	0	0	0	0	0
32							0	0	0	0	0	0	0
33	23.9	1.00	1.50	41.6	13.5	0.00652	0.234	9.717938	3.1575	44.00636	1044.2	0	11
34							0	0	0	0	0	0	0
35							0	0	0	0	0	0	0
36							0	0	0	0	0	0	0
37							0	0	0	0	0	0	0
38							0	0	0	0	0	0	0
39							0	0	0	0	0	0	0
40							0	0	0	0	0	0	0
41							0	0	0	0	0	0	0
42							0	0	0	0	0	0	0
43			0.00				0	0	0	0	0	0	0
44			0.00				0	0	0	0	0	0	0
45			0.00				0	0	0	0	0	0	0
46	1.5	127.00	9.29	9.9	78.5	0.00652	11.55	114.3036	883.25	3713.087	168.36	15519	2
47	1.5	127.00	9.29	19.7	78.5	0.00652	11.55	227.4526	883.25	763.7237	168.36	15519	2
48							0	0	0	0	0	0	0
Total Floor Mass=							321	9386.911	25008	89247.82	185067	461934	51064
C. G. COORDINATES:							XCG=	29.24 ft	YCG=	80.71 ft	WL=	10336	
MASS MOMENTS OF INERTIA:							IXX=	647020	IYY=	140312	IZZ=	787332	

Units: Kips, Feet, Second

CALC. NO. 5-0002, REV. 0

ICF KAISER
ENGINEERS

SHEET: 320 OF
JOB NO.: 41552

SUBJE —CHARGE DECK ELEV.
OPTION (1)

DESIGNED BY:
CHECKED BY:

DATE:
DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1	3.00	130.45	9.29	0.0	78.7	0.00466	16.94	0	1333.9	14076.12	13.771	24026	13
2	1.50	13.50	9.29	0.0	6.8	0.00466	0.877	0	5.9174	728.3541	4429	13	0
2a	1.50	4.75	9.29	0.0	146.3	0.00466	0.308	0	45.136	256.2727	1447.4	1	0
3	29.60	1.50	10.50	14.8	6.5	0.00466	2.172	32.15288	14.121	427.2845	11053	0	159
4	1.33	13.50	9.29	29.6	6.8	0.00466	0.777	23.00799	5.2468	0.467774	3927	12	0
5	2.83	130.45	9.29	29.6	78.7	0.00466	15.98	473.0683	1258.3	9.617921	12.991	22664	11
4a	1.33	4.75	9.29	29.6	146.3	0.00466	0.273	8.095405	40.02	0.164587	1283.4	1	0
6	1.00	148.70	9.29	53.5	74.4	0.00466	6.437	344.4026	478.62	3919.706	77.889	11862	1
7	29.60	1.50	10.50	14.8	144.0	0.00466	2.172	32.15288	312.73	427.2845	9498.3	0	159
8	1.00	44.40	9.29	72.5	126.5	0.00466	1.922	139.355	243.15	3666.616	4553.4	316	0
9	72.50	1.38	9.29	36.3	148.7	0.00466	4.331	157.0098	644.06	238.8361	21755	1	1897
10	29.00	1.00	9.29	68.0	104.3	0.00466	1.255	85.37064	130.94	1926.79	879.75	0	88
11	23.90	1.00	9.29	41.6	119.3	0.00466	1.035	42.99031	123.44	167.5586	1779.5	0	49
12	53.5	1.50	9.29	26.8	0.0	0.00466	3.474	92.93311	0	14.94744	21044	1	829
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15	23.9	148.70	1.00	65.5	74.4	0.00616	21.89	1432.845	1827.7	29367.21	264.88	40339	1042
16	3.0	130.45	1.21	29.6	78.7	0.00466	2.207	65.31732	173.72	1.327962	1.7738	3129	2
17	1.5	4.75	1.21	29.5	146.3	0.00466	0.04	1.185163	5.8786	0.018346	188.49	0	0
18	29.6	1.50	9.29	14.8	13.5	0.00466	1.922	28.44764	25.949	378.0451	7954.1	0	140
19	2.8	143.95	1.21	0.0	72.0	0.00466	2.297	0	165.33	1908.47	78.703	3967	2
20	1.5	6.50	1.21	29.6	3.3	0.00466	0.055	1.6273	0.1787	0.033085	305.76	0	0
21	1.3	148.70	1.21	53.5	74.4	0.00466	1.048	56.072	77.924	638.1853	12.681	1931	0
22	1.0	15.00	1.21	72.5	111.8	0.00466	0.085	6.131978	9.4559	181.3405	97.61	2	0
23	1.3	4.75	1.21	0.0	146.3	0.00466	0.036	0	5.2124	29.59596	167.13	0	0
24	11.0	1.00	1.21	137.0	128.7	0.00466	0.062	8.49737	7.9826	725.8115	160.51	0	1
25	0.9	128.70	1.21	131.5	64.4	0.00466	0.624	82.06804	40.16	6579.367	113.38	861	0
26	1.0	20.00	1.21	142.5	138.7	0.00466	0.113	16.07001	15.841	1457.26	417.86	4	0
27	72.5	1.12	1.21	36.3	148.7	0.00466	0.458	16.59722	68.083	25.24693	2299.7	0	201
28	70.0	1.00	1.21	107.5	148.7	0.00466	0.395	42.43047	58.892	2443.156	1982.5	0	161
29	15.0	1.50	10.50	-6.5	89.3	0.00466	1.101	-7.15601	98.313	1373.737	144.88	0	21
30	78.0	0.84	1.21	92.5	59.3	0.00466	0.369	34.1733	21.908	1497.936	126.83	0	187
31						0.00466	0	0	0	0	0	0	0
32						0.00466	0	0	0	0	0	0	0
33	23.9	1.00	10.50	41.6	13.5	0.00466	1.169	48.58969	15.787	189.3827	4839.3	0	56
34	53.5	1.33	1.21	26.8	0.0	0.00466	0.401	10.73249	0	1.726223	2430.3	0	96
35	78.0	1.00	1.21	92.5	0.0	0.00466	0.44	40.6825	0	1783.258	2664	0	223
36	19.0	0.67	1.21	63.0	104.3	0.00466	0.072	4.522101	7.4866	83.83704	50.299	0	2
37						0.00466	0	0	0	0	0	0	0
38						0.00466	0	0	0	0	0	0	0
39						0.00466	0	0	0	0	0	0	0
40						0.00466	0	0	0	0	0	0	0
41						0.00466	0	0	0	0	0	0	0
42						0.00466	0	0	0	0	0	0	0
43						0.00466	0	0	0	0	0	0	0
44						0.00466	0	0	0	0	0	0	0
45	53.5	130.45	1.00	26.8	78.7	0.02865	199.9	5348.502	15741	880.2578	160.73	263541	47691
46	1.5	127.00	9.29	9.9	76.5	0.00466	8.247	81.84542	630.9	2953.478	14.554	11085	2
47	1.5	127.00	9.29	19.7	76.5	0.00466	8.247	162.4661	630.9	686.579	14.554	11085	2
48						0.00466	0	0	0	0	0	0	0

Total Floor Mass= 309.2 8911.986 24083 79005.28 108245 414840 53031

C. G. COORDINATES: XCG= 28.82 ft YCG= 77.83 ft Wt.= 9956

MASS MOMENTS OF INERTIA: IXX= 521085 IYY= 132037 IZZ= 653122

Units: Kips, Feet, Second

ICF KAISER
ENGINEERS

CALC. NO. 5-0002, REV. 0

SHEET: 321 OF
JOB NO.: 41512
DESIGNED BY:
DATE:
CHECKED BY:
DATE:

SUBJE ---CHARGE DECK ELEV. (DL+LL)
OPTION (1)

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1	3.00	130.45	9.29	0.0	78.7	0.00466	16.94	0	1333.9	14076.12	13.771	24026	13
2	1.50	13.50	9.29	0.0	6.8	0.00466	0.877	0	5.9174	728.3541	4429	13	0
2a	1.50	4.75	9.29	0.0	146.3	0.00466	0.308	0	45.136	256.2727	1447.4	1	0
3	29.60	1.50	10.50	14.8	6.5	0.00466	2.172	32.15288	14.121	427.2845	11053	0	159
4	1.33	13.50	9.29	29.6	6.8	0.00466	0.777	23.00799	5.2468	0.467774	3927	12	0
5	2.83	130.45	9.29	29.6	78.7	0.00466	15.98	473.0683	1258.3	9.617921	12.991	22664	11
4a	1.33	4.75	9.29	29.6	146.3	0.00466	0.273	8.095405	40.02	0.164587	1283.4	1	0
6	1.00	148.70	9.29	53.5	74.4	0.00466	6.437	344.4026	478.62	3919.706	77.889	11862	1
7	29.60	1.50	10.50	14.8	144.0	0.00466	2.172	32.15288	312.73	427.2845	9498.3	0	159
8	1.00	44.40	9.29	72.5	126.5	0.00466	1.922	139.355	243.15	3666.616	4553.4	316	0
9	72.50	1.38	9.29	36.3	148.7	0.00466	4.331	157.0098	644.06	238.8361	21755	1	1897
10	29.00	1.00	9.29	68.0	104.3	0.00466	1.255	85.37064	130.94	1926.79	879.75	0	88
11	23.90	1.00	9.29	41.6	119.3	0.00466	1.035	42.99031	123.44	167.5586	1779.5	0	49
12	53.5	1.50	9.29	26.8	0.0	0.00466	3.474	92.93311	0	14.94744	21044	1	829
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15	23.9	148.70	1.00	65.5	74.4	0.01198	42.59	2787.298	3166.3	57127.72	515.27	78472	2027
16	3.0	130.45	1.21	29.6	78.7	0.00466	2.207	65.31732	173.72	1.327962	1.7738	3129	2
17	1.5	4.75	1.21	29.5	146.3	0.00466	0.04	1.185163	5.8786	0.018346	188.49	0	0
18	29.6	1.50	9.29	14.8	13.5	0.00466	1.922	28.44764	25.949	378.0451	7954.1	0	140
19	2.8	143.95	1.21	0.0	72.0	0.00466	2.297	0	165.33	1908.47	78.703	3967	2
20	1.5	6.50	1.21	29.6	3.3	0.00466	0.055	1.6273	0.1787	0.033085	305.78	0	0
21	1.3	148.70	1.21	53.5	74.4	0.00466	1.048	56.072	77.924	638.1653	12.681	1931	0
22	1.0	15.00	1.21	72.5	111.8	0.00466	0.085	6.131978	9.4559	161.3405	97.61	2	0
23	1.3	4.75	1.21	0.0	146.3	0.00466	0.036	0	5.2124	29.59596	167.13	0	0
24	11.0	1.00	1.21	137.0	128.7	0.00466	0.062	8.49737	7.9826	725.8115	160.51	0	1
25	0.9	128.70	1.21	131.5	64.4	0.00466	0.624	82.06804	40.16	6579.367	113.38	861	0
						0.00000	0	0	0	0	0	0	0
26	1.0	20.00	1.21	142.5	138.7	0.00466	0.113	16.07001	15.641	1457.26	417.86	4	0
27	72.5	1.12	1.21	36.3	148.7	0.00466	0.458	16.58722	68.083	25.24693	2299.7	0	201
28	70.0	1.00	1.21	107.5	148.7	0.00466	0.395	42.43047	58.692	2443.156	1982.5	0	161
29	15.0	1.50	10.50	-6.5	89.3	0.00466	1.101	-7.15601	98.313	1373.737	144.88	0	21
30	78.0	0.84	1.21	92.5	59.3	0.00466	0.369	34.1733	21.908	1497.936	126.83	0	187
31						0.00466	0	0	0	0	0	0	0
32						0.00466	0	0	0	0	0	0	0
33	23.9	1.00	10.50	41.6	13.5	0.00466	1.169	48.58969	15.787	189.3827	4839.3	0	56
34	53.5	1.33	1.21	26.8	0.0	0.00466	0.401	10.73249	0	1.726223	2430.3	0	96
35	78.0	1.00	1.21	92.5	0.0	0.00466	0.44	40.6825	0	1783.258	2664	0	223
36	19.0	0.67	1.21	63.0	104.3	0.00466	0.072	4.522101	7.4866	83.83704	50.299	0	2
37						0.00466	0	0	0	0	0	0	0
38						0.00466	0	0	0	0	0	0	0
39						0.00466	0	0	0	0	0	0	0
40						0.00466	0	0	0	0	0	0	0
41						0.00466	0	0	0	0	0	0	0
42						0.00466	0	0	0	0	0	0	0
43						0.00466	0	0	0	0	0	0	0
44						0.00466	0	0	0	0	0	0	0
45	53.5	130.45	1.00	26.8	78.7	0.03447	240.6	6435.566	18940	1035.107	193.39	341171	57384
46	1.5	127.00	9.29	9.9	76.5	0.00652	11.55	114.3036	883.25	4134.869	20.375	15519	2
47	1.5	127.00	9.29	19.7	76.5	0.00652	11.55	227.4526	883.25	961.2106	20.375	15519	2
48						0.00466	0	0	0	0	0	0	0

Total Floor Mass= 377.1 11451.18 29306 106396.6 106540 519471 63711

C. G. COORDINATES: XCG= 30.37 ft YCG= 77.71 ft WL= 12143

MASS MOMENTS OF INERTIA: IOX= 626010 IOY= 172108 IOZ= 796118

Units: Kips, Feet, Second

SUBJE	CHARGE DECK ELEV.				(1.4DL + 1.7LL)				DESIGNED BY:			DATE:		
	OPTION (1)								CHECKED BY:			DATE:		
ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0	
1	3.00	130.45	9.29	0.0	78.7	0.00652	23.72	0	1867.4	19706.56	19.28	33636	18	
2	1.50	13.50	9.29	0.0	6.8	0.00652	1.227	0	8.2844	1019.696	6200.6	19	0	
2a	1.50	4.75	9.29	0.0	146.3	0.00652	0.432	0	63.19	358.7818	2026.4	1	0	
3	29.60	1.50	10.50	14.8	6.5	0.00652	3.041	45.01403	19.77	598.1983	15474	1	222	
4	1.33	13.50	9.29	29.6	6.8	0.00652	1.088	32.21119	7.3455	0.654884	5497.8	17	0	
5	2.83	130.45	9.29	29.6	78.7	0.00652	22.37	662.2956	1761.6	13.46509	18.187	31730	15	
4a	1.33	4.75	9.29	29.6	146.3	0.00652	0.383	11.33357	56.028	0.230422	1796.7	1	0	
6	1.00	148.70	9.29	53.5	74.4	0.00652	9.012	482.1636	670.07	5487.588	109.04	16607	1	
7	29.60	1.50	10.50	14.8	144.0	0.00652	3.041	45.01403	437.82	598.1983	13298	1	222	
8	1.00	44.40	9.29	72.5	126.5	0.00652	2.691	195.097	340.41	5133.263	6374.8	442	0	
9	72.50	1.38	9.29	36.3	148.7	0.00652	6.064	219.8137	901.69	334.3705	30457	1	2656	
10	29.00	1.00	9.29	68.0	104.3	0.00652	1.758	119.5189	183.32	2897.506	1231.7	0	123	
11	23.90	1.00	9.29	41.6	119.3	0.00652	1.449	60.18643	172.81	234.582	2491.3	0	69	
12	53.5	1.50	9.29	26.8	0.0	0.00652	4.864	130.1064	0	20.92642	29461	1	1160	
13							0	0	0	0	0	0	0	
14							0	0	0	0	0	0	0	
15	23.9	148.70	1.00	65.5	74.4	0.02016	71.63	4688.213	5325.7	96088.38	866.69	131989	3410	
16	3.0	130.45	1.21	29.6	78.7	0.00652	3.089	91.44424	243.21	1.859147	2.4834	4381	2	
17	1.5	4.75	1.21	29.5	146.3	0.00652	0.056	1.859229	8.2301	0.025684	263.89	0	0	
18	29.6	1.50	9.29	14.8	13.5	0.00652	2.691	39.8267	36.328	529.2631	11136	1	196	
19	2.8	143.95	1.21	0.0	72.0	0.00652	3.216	0	231.46	2671.858	110.18	5553	2	
20	1.5	6.50	1.21	29.6	3.3	0.00652	0.077	2.27822	0.2501	0.046318	428.09	0	0	
21	1.3	148.70	1.21	53.5	74.4	0.00652	1.467	78.5008	109.09	893.4314	17.754	2704	0	
22	1.0	15.00	1.21	72.5	111.8	0.00652	0.118	8.584789	13.238	225.8767	136.65	2	0	
23	1.3	4.75	1.21	0.0	146.3	0.00652	0.05	0	7.2973	41.43434	233.98	0	0	
24	11.0	1.00	1.21	137.0	128.7	0.00652	0.087	11.89632	11.178	1016.136	224.72	0	1	
25	0.9	128.70	1.21	131.5	64.4	0.00652	0.874	114.8952	56.224	9211.113	158.73	1206	0	
						0.00000	0	0	0	0	0	0	0	
26	1.0	20.00	1.21	142.5	138.7	0.00652	0.158	22.49801	21.898	2040.164				

CALL NO. S-0002, REJO

ICF KAISER
ENGINEERS

SHEET: 323 OF
JOB NO: 61512

								DESIGNED BY:			DATE:		
								CHECKED BY :			DATE:		
SUBJE ---ROOF-----													
OPTION (1)-----													
ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	7.75	14.8	6.5	0.00466	1.604	23.73189	10.423	2455.571	8896.8	0	117
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	7.75	14.8	144.0	0.00466	1.604	23.73189	230.82	2455.571	6356.8	0	117
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	7.75	29.6	78.7	0.00466	14.13	418.3547	1112.7	8368.301	72.331	20043	11
17	1.5	4.75	7.75	29.5	146.3	0.00466	0.257	7.590922	37.652	153.6099	1098.5	0	0
18							0	0	0	0	0	0	0
19	2.8	143.95	7.75	0.0	72.0	0.00466	14.71	0	1058.9	42794.87	1195	25406	10
20	1.5	6.50	7.75	29.6	3.3	0.00466	0.352	10.42279	1.1444	208.4858	2127.9	1	0
21	1.3	148.70	7.75	53.5	74.4	0.00466	6.713	359.1388	499.1	1.257455	295.72	12369	1
22	1.0	15.00	7.75	72.5	111.8	0.00466	0.542	39.27506	60.565	186.7547	514.33	10	0
23	1.3	4.75	7.75	0.0	146.3	0.00466	0.228	0	33.385	663.6497	974.01	0	0
24	11.0	1.00	7.75	137.0	128.7	0.00466	0.397	54.42531	51.128	2741.192	904.38	0	4
25	0.9	128.70	7.75	131.5	84.4	0.00466	3.997	525.6424	257.22	24050.32	1106.4	5517	0
			7.75			0.00000	0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00466	0.722	102.9278	100.18	5665.828	2405.8	24	0
27	72.5	1.12	7.75	36.3	148.7	0.00466	2.933	106.3045	436.07	916.9506	13446	0	1265
28	70.0	1.00	7.75	107.5	148.7	0.00466	2.528	271.7654	375.92	7254.099	11591	0	1032
29	15.0	1.50	7.75	-6.5	89.3	0.00466	0.813	-5.28182	72.564	2987.67	56.152	0	15
30	78.0	0.84	7.75	92.5	59.3	0.00466	2.366	218.6786	140.32	3519.635	1112.9	0	1200
31	53.5	148.70	1.00	26.8	74.4	0.01183	94.11	2517.522	7002	69540.53	4083.7	173416	22448
32	78.0	148.70	0.86	92.5	74.4	0.00578	57.65	5333.025	4289.5	85756.68	2501.7	106236	29231
33							0	0	0	0	0	0	0
34	53.5	1.33	7.75	26.8	0.0	0.00466	2.57	68.74116	0	1898.81	16855	0	613
35	78.0	1.00	7.75	92.5	0.0	0.00466	2.817	260.5697	0	4190.042	18478	0	1428
36	19.0	0.67	7.75	63.0	104.3	0.00466	0.46	28.96387	47.951	37.7974	249.86	0	14
37	80.0	33.00	0.86	112.5	165.0	0.00578	13.12	1476.328	2165.3	45013.12	92623	1191	6999
38	80.0	1.00	7.75	112.5	181.7	0.00466	2.889	325.035	524.97	9910.292	29305	0	1541
39							0	0	0	0	0	0	0
40							0	0	0	0	0	0	0
41							0	0	0	0	0	0	0
42							0	0	0	0	0	0	0
43							0	0	0	0	0	0	0
44							0	0	0	0	0	0	0
45							0	0	0	0	0	0	0
46						0.00466	0	0	0	0	0	0	0
47						0.00466	0	0	0	0	0	0	0
48	46.0	30.00	1.00	100.2	45.0	0.00163	2.25	225.45	101.25	4816.47	2913.9	169	397
Total Floor Mass=							229.8	12392.54	18609	325567.5	219163	344386	66462
C. G. COORDINATES:						XCG=	53.93	ft	YCG=	80.99	ft	WL=	7399
MASS MOMENTS OF INERTIA:						IXX=	563549	IYY=	392029	IZZ=	955579		

Units: Kips, Feet, Second

CALC NO. 5-0002, REV. 0

ICF KAISER
ENGINEERS

SHEET: 324 OF
JOB NO: 4152

SUBJE --ROOF (DL+LL) DESIGNED BY: DATE:
OPTION (1) CHECKED BY: DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	7.75	14.8	6.5	0.00466	1.604	23.73189	10.423	2455.571	8896.8	0	117
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	7.75	14.8	144.0	0.00466	1.604	23.73189	230.82	2455.571	8356.8	0	117
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	7.75	29.6	78.7	0.00466	14.13	418.3547	1112.7	8368.301	72.331	20043	11
17	1.5	4.75	7.75	29.5	146.3	0.00466	0.257	7.590922	37.652	153.6099	1098.5	0	0
18							0	0	0	0	0	0	0
19	2.8	143.95	7.75	0.0	72.0	0.00466	14.71	0	1058.9	42794.87	1195	25406	10
20	1.5	6.50	7.75	29.6	3.3	0.00466	0.352	10.42279	1.1444	208.4858	2127.9	1	0
21	1.3	148.70	7.75	53.5	74.4	0.00466	6.713	359.1388	499.1	1.257455	295.72	12369	1
22	1.0	15.00	7.75	72.5	111.8	0.00466	0.542	39.27506	60.565	186.7547	514.33	10	0
23	1.3	4.75	7.75	0.0	146.3	0.00466	0.228	0	33.385	663.6497	974.01	0	0
24	11.0	1.00	7.75	137.0	128.7	0.00466	0.397	54.42531	51.128	2741.192	904.38	0	4
25	0.9	128.70	7.75	131.5	64.4	0.00466	3.997	525.6424	257.22	24050.32	1106.4	5517	0
			7.75			0.00000	0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00466	0.722	102.9278	100.18	5865.828	2405.8	24	0
27	72.5	1.12	7.75	36.3	148.7	0.00466	2.933	106.3045	436.07	916.9506	13446	0	1285
28	70.0	1.00	7.75	107.5	148.7	0.00466	2.528	271.7654	375.92	7254.099	11591	0	1032
29	15.0	1.50	7.75	-6.5	89.3	0.00466	0.813	-5.28182	72.584	2967.67	56.152	0	15
30	78.0	0.84	7.75	92.5	59.3	0.00466	2.366	218.8786	140.32	3519.635	1112.9	0	1200
31	53.5	148.70	1.00	26.8	74.4	0.01211	96.35	2577.492	7168.8	71197.05	4181	177547	22983
32	78.0	148.70	0.86	92.5	74.4	0.00612	61.03	5644.898	4540.3	90771.7	2648	112449	30940
33							0	0	0	0	0	0	0
34	53.5	1.33	7.75	26.8	0.0	0.00466	2.57	68.74116	0	1898.81	16855	0	613
35	78.0	1.00	7.75	92.5	0.0	0.00466	2.817	260.5697	0	4190.042	18476	0	1428
36	19.0	0.67	7.75	63.0	104.3	0.00466	0.46	28.96387	47.951	37.7974	249.86	0	14
37	80.0	33.00	0.86	112.5	185.0	0.00612	13.89	1582.663	2291.9	47645.47	98040	1261	7408
38	80.0	1.00	7.75	112.5	181.7	0.00466	2.889	325.035	524.97	9910.292	29305	0	1541
39							0	0	0	0	0	0	0
40							0	0	0	0	0	0	0
41							0	0	0	0	0	0	0
42							0	0	0	0	0	0	0
43							0	0	0	0	0	0	0
44							0	0	0	0	0	0	0
45							0	0	0	0	0	0	0
46						0.00466	0	0	0	0	0	0	0
47						0.00466	0	0	0	0	0	0	0
48	48.0	30.00	1.00	100.2	45.0	0.00280	3.857	388.4857	173.57	8256.806	4995.3	289	680

Total Floor Mass= 237.8 13011.76 19226 338311.7 228905 354920 69399

C. G. COORDINATES: XCG= 54.73 ft YCG= 80.86 ft Wt = 7656

MASS MOMENTS OF INERTIA: IXX= 581825 IYY= 407710 IZZ= 989535

Units: Kips, Feet, Second

CALC 40. 5-0002. REV. 0

ICF KAISER
ENGINEERSSHEET: 325 OF
JOB NO.: 61512
DATE:
CHECKED BY: DATE:

									DESIGNED BY:		DATE:		
SUBJE		---ROOF		(1.4DL + 1.7L						CHECKED BY :		DATE:	
		OPTION (1)											
ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	7.75	14.8	6.5	0.00652	2.245	33.22464	14.592	3437.8	12456	0	164
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	7.75	14.8	144.0	0.00652	2.245	33.22464	323.15	3437.8	8899.5	0	164
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	7.75	29.6	78.7	0.00652	19.79	585.6966	1557.7	11715.62	101.26	28060	15
17	1.5	4.75	7.75	29.5	146.3	0.00652	0.36	10.62729	52.713	215.0538	1537.9	1	0
18							0	0	0	0	0	0	0
19	2.8	143.95	7.75	0.0	72.0	0.00652	20.6	0	1482.5	59912.82	1672.9	35568	14
20	1.5	6.50	7.75	29.6	3.3	0.00652	0.493	14.5919	1.6022	291.8802	2979.1	2	0
21	1.3	148.70	7.75	53.5	74.4	0.00652	9.398	502.7944	698.74	1.780437	414.01	17317	1
22	1.0	15.00	7.75	72.5	111.8	0.00652	0.758	54.98509	84.791	261.4566	720.06	14	0
23	1.3	4.75	7.75	0.0	146.3	0.00652	0.319	0	46.739	929.1095	1363.6	1	0
24	11.0	1.00	7.75	137.0	128.7	0.00652	0.556	76.19543	71.579	3837.668	1266.1	0	6
25	0.9	128.70	7.75	131.5	64.4	0.00652	5.596	735.8993	360.11	33670.44	1549	7724	0
			7.75			0.00000	0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00652	1.011	144.0689	140.26	7932.159	3368.1	34	0
27	72.5	1.12	7.75	36.3	148.7	0.00652	4.106	148.8263	610.5	1283.731	18824	0	1798
28	70.0	1.00	7.75	107.5	148.7	0.00652	3.539	380.4715	526.29	10155.74	16228	0	1445
29	15.0	1.50	7.75	-6.5	89.3	0.00652	1.138	-7.39455	101.59	4154.738	78.612	0	21
30	78.0	0.84	7.75	92.5	59.3	0.00652	3.313	306.43	196.45	4927.489	1558.1	0	1680
31	53.5	148.70	1.00	26.8	74.4	0.01724	137.1	3667.969	10202	101318.9	5949.9	252664	32706
32	78.0	148.70	0.86	92.5	74.4	0.00888	88.6	8195.131	8591.5	131780.2	3844.3	163251	44918
33							0	0	0	0	0	0	0
34	53.5	1.33	7.75	26.8	0.0	0.00652	3.598	96.23762	0	2658.334	23597	1	858
35	78.0	1.00	7.75	92.5	0.0	0.00652	3.944	364.7976	0	5866.058	25867	0	1999
36	19.0	0.67	7.75	63.0	104.3	0.00652	0.644	40.54942	67.132	52.91636	349.81	0	19
37	80.0	33.00	0.86	112.5	165.0	0.00888	20.17	2268.637	3327.3	69170.58	142332	1830	10755
38	80.0	1.00	7.75	112.5	181.7	0.00652	4.045	455.049	734.95	13874.41	41027	0	2157
39							0	0	0	0	0	0	0
40							0	0	0	0	0	0	0
41							0	0	0	0	0	0	0
42							0	0	0	0	0	0	0
43							0	0	0	0	0	0	0
44							0	0	0	0	0	0	0
45							0	0	0	0	0	0	0
46							0	0	0	0	0	0	0
47							0	0	0	0	0	0	0
48	46.0	30.00	1.00	100.2	45.0	0.00193	2.657	266.2457	119.57	5688.022	3441.2	199	409
Total Floor Mass=							336.2	18374.29	27312	476574.7	319424	506667	99190
C. G. COORDINATES:						XCG=	54.65	ft	YCG=	81.23	ft	WL=	10627
MASS MOMENTS OF INERTIA:						IOX=	826091	IYY=	575765	IZZ=	1401856		

Units: Kips, Feet, Second

EVALUATION of NMSG FACILITY @ LAJL
MODIFICATION options (1)

DESIGNED BY BM DATE 5/1/91

CHECKED BY J ✓ DATE 5/1/91

Additional Masses

I) Security Grille/Louver on South wall = $26,000^{16}$

II) Detection/Security Grate on outlet stack = $26,000^{16}$

DISTRIBUTE (I) over the nodes @ Roof level:

<u>NODE</u>		DL (K)	Mass ($K-F^{-1}-S^2$)
7001	25%	6.5	0.2019
7002	50%	13.0	0.4037
7003	25%	6.5	0.2019

DISTRIBUTE (II) over the nodes @ Top of stacks

NODE

(9101 → 9103) , (9091 → 9093)

$$DL = 26/6 = 4.3 \text{ K (Each Node)}$$

$$Mass = 26/6/32.2 = 0.1346 \text{ (Each Node)}$$

CALC. NO. S-0002, REV. 0

JOB NO. 41552

EVALUATION OF NMSF FACILITY

@ LAND

MODIFICATION OPTION (1)

NMSF06

UNDEFORMED
SHAPE

OPTIONS

HIDDEN LINES

SAP90

Sht. 327 of 68

NMSF06
UNDEFORMED
SHAPE

CALC NO 5-0002, REV. 0
JOB NO. 41532
EVALUATION OF NMSF
FAULT @ LARL
MODIFICATION OPTION (1)

OPTIONS
ALL JOINTS
WIRE FRAME

SAP90

Sht. 328 of

<p>NMSF06</p> <p>UNDEFORMED SHAPE</p>	<p>OPTIONS</p> <p>ELEMENT IDS</p> <p>WIRE FRAME</p>	<p>SAP90</p>
<div data-bbox="276 436 568 883"> <p>CALC. NO. 5-0002, REV. 0</p> <p>JOB NO. 41532</p> <p>EVALUATION OF HMCIF</p> <p>FACILITY (a) LARL</p> <p>MODIFICATION OPTION (1)</p> </div> <div data-bbox="316 1681 828 1734"> <p>5081 5181 5281 53815481 5581 5681</p> </div> <div data-bbox="527 1319 1039 1372"> <p>5061 5161 5261 53615461 5561 5661</p> </div> <div data-bbox="730 968 1242 1010"> <p>5041 5141 5241 53415441 5541 5641</p> </div> <div data-bbox="933 606 1453 659"> <p>5031 5131 5231 53315431 5531 5631</p> </div>

NMSF06

UNDEFORMED
SHAPE

OPTIONS

ELEMENT IDS
WIRE FRAME

SAP90

CALL NO. S.00002, REV.0
JOB NO. 41552
EVALUATION OF NMSF
FACILITY @ LAKUL
MODIFICATION OPTION (1)

1521	1518	1517	1516	1515	1514	1513
1520	1512	1511	1510	1509	1508	1507
1519	1506	1505	1504	1503	1502	1501

CALL NO. 5-0002, REV. 0
JOB NO. 41552
EVALUATION OF NMST
FACILITY @ LANDL
MODIFICATION OPTION (1)

[illegible]

NMSF06

UNDEFORMED
SHAPE

OPTIONS

PROPERTY IDS
WIRE FRAME

SAP90

CALC. NO. S-0002, REV. 0
JOB NO. 41552

EVALUATION OF NMSF
FACILITY @ LAND
MODIFICATION OPTION (1)

NMSF06
UNDEFORMED
SHAPE

OPTIONS
HIDDEN LINES

SAP90

Swt. 33205

[illegible]

OPTIONS
ELEMENT IDS
WIRE FRAME

SAP90

5/17/20

FREQ ANALYSIS

STRUCTURAL ANALYSIS PROGRAMS

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CALC. NO. 5-0002, REV. 0
JOB NO. 41552
EVALUATION OF NMCF
FACILITY @ LANL
MODIFICATIONAL OPTION (1)

URS CONSULTANTS, INC.

Sht. 335 = 5

PAGE 1
PROGRAM: SAP90/FILE: NMSF06.RIT
-SAP90 FILENAME: NM

SEISMIC ANALYSIS OF NMSF BUILDING (MODIFIED)

RITZ SYSTEM PARAMETERS

NUMBER OF EQUATIONS	=	3138
NUMBER OF MASSES	=	237
NUMBER OF RITZ VECTORS	=	10
NUMBER OF DIRECTION VECTORS	=	3

CALC. NO. 5-0002. REV. 0

JOB NO. 41552

SEISMIC ANALYSIS OF NMSF BUILDING (MODIFIED)

-SAP90 FILENAME:NM

EIGENVALUES AND FREQUENCIES

MODE NUMBER	EIGENVALUE (RAD/SEC)**2	CIRCULAR FREQ (RAD/SEC)	FREQUENCY (CYCLES/SEC)	PERIOD (SEC)
1	0.354724E+04	0.595587E+02	9.479061	0.105496
2	0.361324E+04	0.601103E+02	9.566844	0.104528
3	0.373693E+04	0.611304E+02	9.729210	0.102783
4	0.863435E+04	0.929212E+02	14.788865	0.067618
5	0.100375E+05	0.100188E+03	15.945338	0.062714
6	0.141280E+05	0.118861E+03	18.917364	0.052861
7	0.243892E+05	0.156171E+03	24.855311	0.040233
8	0.354574E+05	0.188301E+03	29.969083	0.033368
9	0.601341E+05	0.245223E+03	39.028374	0.025622
10	0.783738E+05	0.279953E+03	44.555939	0.022444

NMSF05
Results9.93
10.00
10.20
15.32
18.06
19.43
25.78
31.59
40.51
45.45

CALC. NO. S-0002, REV. 0

JOB NO WISSV

SEISMIC ANALYSIS OF NMSF BUILDING (MODIFIED)

PROGRAM:SAP90/FILE:NMSF06.RIT
-SAP90 FILENAME:NM

A S E F O R C E R E A C T I O N F A C T O R S

MODE	PERIOD	X	Y	Z	X	Y	Z
#	(sec)	DIRECTION	DIRECTION	DIRECTION	MOMENT	MOMENT	MOMENT
1	0.105	0.243E+02	0.144E+01	0.160E+02	0.121E+04	-0.298E+02	-0.192E+04
2	0.105	-0.716E+01	0.270E+02	0.816E+01	-0.133E+03	-0.482E+03	0.171E+04
3	0.103	-0.146E+02	-0.108E+02	0.232E+02	0.214E+04	-0.129E+04	0.733E+03
4	0.068	0.385E+00	0.492E+01	0.174E+01	0.145E+04	-0.254E+03	0.587E+02
5	0.063	0.981E-01	-0.520E+00	0.318E+00	0.267E+03	-0.608E+02	-0.140E+03
6	0.053	0.328E+01	-0.252E+00	0.252E+01	0.107E+03	-0.116E+04	-0.314E+02
7	0.040	-0.224E+00	-0.664E+00	0.232E+00	-0.212E+02	-0.138E+03	-0.163E+04
8	0.033	-0.276E+01	-0.109E+00	0.217E+00	0.177E+02	-0.133E+03	0.404E+03
9	0.026	-0.461E+00	0.135E+01	-0.163E-02	-0.403E+02	-0.256E+02	0.601E+03
10	0.022	0.116E+00	0.615E+00	0.180E+00	-0.130E+02	-0.505E+01	-0.113E+03

CALC. NO. 5-000V, REV. 0
JOB NO. 41532

SEISMIC ANALYSIS OF NMSF BUILDING (MODIFIED)

PARTICIPATING MASSES - (percent)

MODE	X-DIR	Y-DIR	Z-DIR	X-SUM	Y-SUM	Z-SUM
1	67.648	0.239	29.330	67.648	0.239	29.330
2	5.877	83.288	7.622	73.525	83.527	36.952
3	24.317	13.319	61.909	97.842	96.847	98.861
4	0.017	2.778	0.345	97.859	99.624	99.206
5	0.001	0.031	0.012	97.860	99.655	99.218
6	1.232	0.007	0.725	99.092	99.662	99.943
7	0.006	0.051	0.006	99.097	99.713	99.949
8	0.876	0.001	0.005	99.973	99.714	99.955
9	0.024	0.208	0.000	99.997	99.922	99.955
10	0.002	0.043	0.004	99.999	99.965	99.958

CALC. NO. S-0002, REV. 0
JOB NO. 41552

STRUCTURAL ANALYSIS PROGRAMS

VERSION P5.40

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CALC. NO. 5-0002, REV. 0

J.B. NO. 41552

URS CONSULTANTS, INC.

SEISMIC ANALYSIS OF NMSF BUILDING (MODIFIED)

Shl. 3405f
PAGE 1
PROGRAM: SAP90/FILE: NMSF06.SPC
-SAP90 FILENAME: NM

S P E C T R U M I N P U T D A T A

AMPLITUDE MULTIPLIER ----"S"-	9.660
DAMPING RATIO -----"D"-	0.070
ANGLE OF S1 WITH X-AXIS -"A"-	0.000

CALC. NO. S-0002, REV. 0

JOB NO. 41532

SEISMIC ANALYSIS OF NMSF BUILDING (MODIFIED)

SKT. 341 of

MODE NUMBER	F R E Q U E N C Y			S P E C T R A L		
	RAD./SEC	CYCLES/SEC	PERIOD-SEC (D)	ACCELERATION	VELOCITY	DISPLACEMENT
1	59.56	9.48	0.105496 (1)	21.222	0.356	0.006
			(2)	21.222	0.356	0.006
			(Z)	14.148	0.238	0.004
2	60.11	9.57	0.104528 (1)	21.099	0.351	0.006
			(2)	21.099	0.351	0.006
			(Z)	14.066	0.234	0.004
3	61.13	9.73	0.102783 (1)	20.875	0.341	0.006
			(2)	20.875	0.341	0.006
			(Z)	13.917	0.228	0.004
4	92.92	14.79	0.067618 (1)	16.029	0.172	0.002
			(2)	16.029	0.172	0.002
			(Z)	10.686	0.115	0.001
5	100.19	15.95	0.062714 (1)	15.285	0.153	0.002
			(2)	15.285	0.153	0.002
			(Z)	10.190	0.102	0.001
6	118.86	18.92	0.052861 (1)	13.719	0.115	0.001
			(2)	13.719	0.115	0.001
			(Z)	9.146	0.077	0.001
7	156.17	24.86	0.040233 (1)	11.551	0.074	0.000
			(2)	11.551	0.074	0.000
			(Z)	7.700	0.049	0.000
8	188.30	29.97	0.033368 (1)	10.263	0.055	0.000
			(2)	10.263	0.055	0.000
			(Z)	6.842	0.036	0.000
9	245.22	39.03	0.025622 (1)	9.660	0.039	0.000
			(2)	9.660	0.039	0.000
			(Z)	6.440	0.026	0.000
10	279.95	44.56	0.022444 (1)	9.660	0.035	0.000
			(2)	9.660	0.035	0.000
			(Z)	6.440	0.023	0.000

CALC. NO. S-0002, REV. 0

JOB NO. 4152

SEISMIC ANALYSIS OF NMSF BUILDING (MODIFIED)

PROGRAM:SAP90/FILE:NMSF06.SPC
-SAP90 FILENAME:NM

MODAL AMPLITUDE FACTORS

AT 0.00 AND -90.00 DEGREES

MODE	PERIOD	1-DIRECTION	2-DIRECTION	Z-DIRECTION
1	0.105	0.145368	0.008642	0.063813
2	0.105	-0.041820	0.157431	0.031750
3	0.103	-0.081378	-0.060227	0.086564
4	0.068	0.000715	0.009140	0.002149
5	0.063	0.000149	-0.000792	0.000323
6	0.053	0.003184	-0.000245	0.001629
7	0.040	-0.000106	-0.000315	0.000073
8	0.033	-0.000800	-0.000032	0.000042
9	0.026	-0.000074	0.000216	0.000000
10	0.022	0.000014	0.000076	0.000015

CALL. NO. S-0002, REV. 0

JOB NO. 41552

SEISMIC ANALYSIS OF NMSF BUILDING (MODIFIED)

MODAL CORRELATION FACTORS

	1	2	3	4	5	6	7	8	9	10
1	1.00	1.00	0.97	0.09	0.06	0.04	0.02	0.01	0.01	0.01
2	1.00	1.00	0.99	0.09	0.07	0.04	0.02	0.01	0.01	0.01
3	0.97	0.99	1.00	0.10	0.07	0.04	0.02	0.01	0.01	0.01
4	0.09	0.09	0.10	1.00	0.78	0.24	0.06	0.03	0.02	0.01
5	0.06	0.07	0.07	0.78	1.00	0.40	0.09	0.04	0.02	0.01
6	0.04	0.04	0.04	0.24	0.40	1.00	0.21	0.08	0.03	0.02
7	0.02	0.02	0.02	0.06	0.09	0.21	1.00	0.36	0.08	0.05
8	0.01	0.01	0.01	0.03	0.04	0.08	0.36	1.00	0.22	0.11
9	0.01	0.01	0.01	0.02	0.02	0.03	0.08	0.22	1.00	0.53
10	0.01	0.01	0.01	0.01	0.01	0.02	0.05	0.11	0.53	1.00

CALC. NO. S-0002, REV. 0

JOB NO. 41552

SEISMIC ANALYSIS OF NMSF BUILDING (MODIFIED)

BASE REACTION FORCES
AT 0.00 AND -90.00 DEGREES

MODE NUMBER	1-DIR FORCE	2-DIR FORCE	Z-DIR FORCE	1-DIR MOMENT	2-DIR MOMENT	Z-DIR MOMENT
1	0.13704E+05	0.81465E+03	0.90234E+04	0.67988E+06	-0.16783E+05	-0.10839E+07
2	-0.42945E+04	0.16167E+05	0.48908E+04	-0.79574E+05	-0.28905E+06	0.10284E+07
3	-0.72515E+04	-0.53668E+04	0.11570E+05	0.10642E+07	-0.64080E+06	0.36472E+06
4	0.31333E+02	0.40031E+03	0.14115E+03	0.11791E+06	-0.20640E+05	0.47754E+04
5	0.85487E+00	-0.45284E+01	0.27723E+01	0.23272E+04	-0.52949E+03	-0.12233E+04
6	0.16605E+03	-0.12779E+02	0.12740E+03	0.54247E+04	-0.58980E+05	-0.15900E+04
7	-0.18593E+01	-0.55071E+01	0.19269E+01	-0.17579E+03	-0.11419E+04	-0.13549E+05
8	-0.78587E+02	-0.31059E+01	0.61811E+01	0.50241E+03	-0.37802E+04	0.11487E+05
9	0.63401E+01	-0.18515E+02	0.22383E-01	0.55444E+03	0.35184E+03	-0.82657E+04
10	0.71480E+00	0.37872E+01	0.11101E+01	-0.79929E+02	-0.31110E+02	-0.69525E+03
CQC	0.17992E+05	0.17835E+05	0.12188E+05	0.10926E+07	0.65963E+06	0.16519E+07

CALC. NO. S-0002, REV. 0

JOB NO. 41552

<p>NMSF06</p> <p>DEFORMED SHAPE</p> <p>LOAD I</p>	<p>MINIMA</p> <p>X 0.5598E-02</p> <p>Y 0.6514E-03</p> <p>Z-0.7553E-02</p> <p>MAXIMA</p> <p>X 0.8337E-02</p> <p>Y 0.1070E-01</p> <p>Z-0.5285E-02</p>	<p>SAP90</p>
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CALC. NO. 5.0002, REV. 0

JOB NO. 41552

SWT. 346 85

EVALUATION OF NMSF FACILITY AT LAWL
MODIFICATION OPTION (1)

DESIGNED BY BM DATE 4/28/95

CHECKED BY JL DATE 5/1/95

In-plane shear and D/C Summary

WALL LOCATION	WALL I.D.	CAP.	NMSFO5*		NMSFO6*	
		C	Demand	D/C	Demand	D/C
West Wall (Base)	1	4847	1629	.34	1416	.29
"	2	339	131	.39	181	.53
Line 2 (Base)	4	301	124	.41	126	.42
"	5	2424	1770	.73	1705	.70
North wall (Base)	9	1239	1315	1.06	1518	1.24
South wall (Base)	12	994	837	.84	969	.97

(*)

NMSFO5 = ORIGINAL OPTION 1 MODEL.

NMSFO6 = MODIFIED " "

EVALUATION OF NMSE @ LANK

MODIFICATION OPTION (1)

DESIGNED BY _____ DATE _____

CHECKED BY _____ DATE _____

WALL IN-PLANE SHEAR

REF. SAP90 FILE:

WALL: 1,2

line (1) Basement

REF SAP90 FILE: NMSF05.FEF

SHELL ELEMENT	JOINT	LC1 FY	LC2 FY	LC3 F
1101	1	40.5	2	
	11	35.0	5	
1102	11	41.6	-6	
	21	29.0	-17	
1121	21	111	-38	
	31	91	-56	
1122	31	184	-105	
	41	157	-134	
23	41	96	-50	
	51	72	-73	
24	51	98	-49	
	61	71	-74	
25	61	98	-48	
	71	71	-75	
26	71	100	-49	
	81	69	-76	
27	81	150	-80	
	91	119	-107	
1111	91	27	-4	
	101	7	-20	
WALL BASE SHEAR	$V_0 = \Sigma$	1597	1068	

EVALUATION OF NMSF @ LAWL

MODIFICATION OPTION (1)

DESIGNED BY _____ DATE _____

CHECKED BY _____ DATE _____

WALL IN-PLANE SHEAR

REF. SAP90 FILE:

WALL: Line (2) Basement

REF: NMSF06.FEF

SHELL ELEMENT	JOINT	LC1 F	LC2 F	LC3 F
1251	3	25	8	
	13	13	11	
1252	13	26	8	
	23	19	21	
1201	23	208	121	
	33	188	139	
2	33	104	58	
	43	87	79	
3	43	106	59	
	53	86	79	
4	53	106	58	
	63	85	79	
5	63	107	58	
	73	86	80	
6	73	107	59	
	83	84	80	
7	83	185	77	
	93	167	94	
1201	93	36	17	
	103	7	17	
WALL BASE SHEAR	$V_0 = \Sigma$	1831	1202	

#4 126

#5 1705

EVALUATION OF NMSE @ LANL

Modification option (1)

DESIGNED BY _____ DATE _____

CHECKED BY _____ DATE _____

WALL IN-PLANE SHEAR

REF. SAP90 FILE:

WALL: (12) line G Buena Vista

REF: NMSFOG.FEF

SHELL ELEMENT	JOINT	LC1 F _x	LC2 F _x	LC3 F
2001	1	63	125	
	2	53	137	
2	2	71	134	
	3	62	141	
3	3	101	208	
	4	96	222	
WALL BASE SHEAR	$V_0 = \Sigma$	446	969	

EVALUATION OF NMSE @ LANE

Modification option (1)

DESIGNED BY _____ DATE _____

CHECKED BY _____ DATE _____

WALL IN-PLANE SHEAR

REF. SAP90 FILE:

WALL: (9) line B (Base at level)

REF NMSE06.FEF

SHELL ELEMENT	JOINT	LC1 Fx	LC2 Fx	LC3 F
2201	101	84	142	
	102	66	153	
2	102	91	156	
	103	77	170	
3	103	132	249	
	104	120	259	
4	104	93	191	
	105	81	198	
WALL BASE SHEAR	$V_0 = \Sigma$	944	1518	

EVALUATION OF NMSE @ LAWL

MODIFIED SECTION (1)

DESIGNED BY _____ DATE _____

CHECKED BY _____ DATE _____

WALL IN-PLANE SHEAR

REF. SAP90 FILE:

WALL: Line (1) Basement

REF: NMSF61.FEE (STATIC)

SHELL ELEMENT	JOINT	LC1 Fy	LC2 Fy	LC3 F
1101	1	14	34	
	11	1	34	
2	11	17	27	
	21	9	12	
1121	21	21	58	
	31	13	32	
2	31	20	64	
	41	19	23	
3	41	17	30	
	51	19	2	
4	51	18	30	
	61	20	1	
5	61	19	39	
	71	20	0	
6	71	23	39	
	81	21	2	
7	81	5	60	
	91	48	19	
1111	81	3	19	
	101	19	8	
	11		4	
WALL BASE SHEAR	$V_0 = \Sigma$	346	545	

WALL OUT-OF-PLANE D/C Ratio Summary

WALL LOCATION	I.D.	SHEAR			BENDING MOMENT		
		Demand	Capacity	D/C	Demand	Capacity	D/C
Line (1) Basement	1	15.4	21.3	0.72	274 281	356	0.78 0.79 ✓
Line (2) Basement	5	—	—	—	201 206	287	0.70 0.72 ✓
Line (B) & (G) Basement	9	15.4	21.3	0.72	444 3135	78	0.58 0.15 ✓
Line (1) 1st Floor	19	19.7	18.7	1.05	129	60	2.15
Line (2) 1st Floor	10	—	—	—	80	96	0.83
Line (B) & (G) 1st Floor	27	19.7	21.3	0.92	246 -26	42	0.75 1.08 ✓
OTHERS					10	→	O.K. BY Inspection

REF: COMPUTER RUNS:

2-D SAP90 RUNS:
WEST41
EAST21

3-D/2-D SAP90 ANALYSIS
NMSF02
NMSF51
HEAT 32

See Demand Summary Table on Page —

ICF KAISER ENGINEERS

CALC. NO. S-0002, REV 0

EVALUATION OF NMSF FACILITY @ LAKELAND
MODIFICATION OPTION (1)

JOB NO. —
SHEET 2 OF 3

DESIGNED BY BM
CHECKED BY JL

DATE 3/8/95
DATE 3/1/95

ICF KAISER
ENGINEERS

CALC NO. 4-0002, REV. 0

JOB No. 41552
SHEET 354 OF 354

EVALUATION of NMSF FACILITY @ LADLE
ALTERNATIVE option (1)

DESIGNED BY BM DATE 3/7/91
CHECKED BY JV DATES 1/1/91

WALL OUT-OF-PLANE Demand Summary (units: kips, FT.)

WALL (ID) Location	LC1	LC2	LC3	LC4	Demand-1	Demand-2	Max. Demand
(1) line 1, Basement	75.9 -27.2	54.53 -35.32	84	163	137 ✓	274 281	274 281
(5) line 2, Basement	33.43 -13.11	12.12 -10.13	67	135	105 110	201 206	201 206
(9) line 3, Basement	71.2 -79.8	44.49 -34.35	0	0	44.49 -24.35	44.49 -24.35	44.49 -24.35
(14) line 1, 1st Floor	34.59 -42.24	34.43 -10.20	20	23	71 63	64 75	64 75
(16) line 2, 1st Floor	30.32 -34.31	8.12 -6.10	2	5	32 35	19	32 35
(27) line 3, 1st Floor	16.24 -36.20	34.40 -10.24	0	0	32.46 -26.6	32.46 -18	32.46 -26.6
Others	10 -8	7.8 -5.6	0	0	10 -8	7.8 -5.6	10 -8
REF. Computer Run SAP90 File Name.	5 NMSF05	6 NMSF10	7 NMSF20	8 NMSF30			

NEW WALL 46/47
LC1 = DL+LL+H ± E (OYN.) Demand 1 = LC3 + Max (LC1, LC2)
LC2 = 1.40L + 1.7H + 7.1L (STATIC) Demand 2 = LC2 + 1.4 LC4
(*) DOSE NOT INCLUDE LOCAL LOADS DUE TO 20 TONE BRIDGE CRANE.

EVALUATION of NMSF FACILITY @ LAKELAND
MODIFICATIONS OPTION (1)

DESIGNED BY AM

DATE 5/1/91

CHECKED BY JL

DATE 5/1/91

Wall - at - af - Plane DemandNew walls in Basement (wall I.D.'s 46 & 47)

$$LC1 : DL + LL + H \pm E \quad [REF: NMSF06]$$

$$LC2 : 1.4DL + 1.7H + 1.7LL \quad [REF: NMSF01]$$

$$LC3 : \text{Thermal operating} \quad [REF: HEAT 32]$$

$$LC4 : \quad \quad \quad \text{Accidental} \quad [REF: \quad \quad \quad]$$

$$\text{Demand 1} = LC3 + \text{Max}(LC1, LC2)$$

$$\text{Demand 2} = LC2 + 1.4 LC4$$

$$LC1 : \quad \text{Max Mom.} \quad = 5.6 \quad \text{K-FT.}$$

$$LC2 : \quad \quad \quad \quad = 3.2 \quad \quad \quad$$

$$LC3 : \quad \quad \quad \quad = 3.4 \quad \quad \quad$$

$$LC3 : \quad \quad \quad \quad = 6.7 \quad \quad \quad$$

$$D1 : \quad \quad \quad \quad = 3.4 + 5.6 = 9.1 \quad \text{K-FT}$$

$$D2 : \quad \quad \quad \quad = 3.2 + 1.4 \times 6.7 = \underline{\underline{12.6}} \quad \text{K-FT}$$

$$D = 12.6$$

$$\text{Wall Thickness} = 1'-6"$$

$$\text{Use Min Steel, } A_s = \frac{200}{60,000} \times 12 \times 18$$

$$= 0.7 \text{ in}^2 \quad (\#6 @ 6)$$

$$A = 2 \times .44 = .88 \text{ in}^2$$

EVALUATION of NMSP FACILITY M LANE
TRAFFIC OPTION (1)

DESIGNED BY PM DATE 5/1/95
CHECKED BY JLV DATE 5/1/95

Moment Capacity:

$$a = \frac{.88 \times 60}{.85 \times 4 \times 12} = .66" \quad , \quad d = 18 - 3 = 15"$$

$$\begin{aligned} M_u &= .95 \times .88 \times 60 \left(15 - \frac{.66}{2} \right) \\ &= 736 \text{ K-in} \\ &= 61 \text{ K-FT.} \end{aligned}$$

$$D/c = 12.6 / 61 = 0.21 \quad \text{O.K.}$$

Sht. 357 of

CALC NO. 6.0002, REV. 0
 JOB NO. 41552

M=1
 line 1
 Basement

NMSF06
 SHELL
 OUTPUT M22
 LOAD 1

MIN IS -0.172E+02 <JOINT 2071> MAX IS 0.528E+02 <JOINT 81>

SAP90

CALC NO. 5-0002, REV. 0
 JOB NO. 41552

M1 = 1

NMSF06

SHELL

OUTPUT

M22

LOAD

2

$\times 10^{-1}$

SWT. 358 of

SAP90

MIN IS -0.243E+02 <JOINT 3091> MAX IS 0.138E+02 <JOINT 51>

CALC. NO. 13-00002, REV. 0
 For 10 YIKKZ

M=5
 Live2
 Base2

NMSF06

SHELL

OUTPUT

LOAD

M22

1

$\times 10^{-1}$

450
 360
 270
 180
 90
 0

SAP90

MIN IS 0.207E+00 <JOINT 1053> MAX IS 0.427E+02 <JOINT 63>

Shr. 359 ok

CALC. NO. 5.0002, REV. 0
 JOB NO. U1822

M=5

MIN IS -0.409E+02 <JOINT 2093> MAX IS -0.325E+00 <JOINT 1063>

NMSF06

SHELL

OUTPUT

LOAD

M22

2

$\times 10^{-1}$

SAP90

M=9
line B
Bachman

CALC NO. 5-0002, REV. 0
JOB NO. 41552

MIN IS -0.205E+02 <JOINT 2102> MAX IS 0.290E+02 <JOINT 102>

NMSF06
SHELL
OUTPUT M22
LOAD 1

$\times 10^{-1}$

SAP90

skt. 36155

NMSF06

SHELL

OUTPUT M22

LOAD

2

$X \cdot 10^{-1}$

330
220
110
0
-110
-220

Sheet 362 of

SAP90

M=9

CALC. NO. 5-0002, REV. 0
JOB. NO. 41552

MIN IS -0.211E+02 <JOINT 2102> MAX IS 0.282E+02 <JOINT 102>

M=19
 1 mile
 155 EUR

CALC. NO. 5.0002, REV. 0
 JOB NO. 41552

MIN IS -0.703E+01 <JOINT 6051> MAX IS 0.394E+02 <JOINT 4071>

NMSF06

SHELL

OUTPUT

M22

LOAD

1

X 10⁻¹

400
 300
 200
 100
 0
 -100

SWT. 363

SAP90

M=19

CALC. NO. 5-0002, REV. 0
JOB NO. 41552

MIN IS -0.240E+02 <JOINT 7001> MAX IS 0.112E+02 <JOINT 4051>

NMSF06
SHELL
OUTPUT M22
LOAD 2

X 10⁻¹

120
40
-40
-120
-200
-280

Sht. 364 of

SAP90

Sheet 385 of 5

M = 16
line 2
1st floor

CALC. NO 5-0002, REV 0
JOB NO. 41032

NMSF06
SHELL
OUTPUT M72
LOAD 1

X 16

SAP90

MIN IS 0.348E+01 <JOINT 6023> MAX IS 0.328E+02 <JOINT 4093>

M=16

CALC NO. 5-0002, REV. 0

JOB NO. 41552 ✓

MIN IS -0.312E+02 <JOINT 7013> MAX IS -0.263E+01 <JOINT 5023>

NMSF06

SHELL

OUTPUT

LOAD

M22

2

$\times 10^{-1}$

SAP90

shot. 3660's

M=27

line B

1st FMR

CALC. NO. 5-0002, REV. 0
JOB NO. 41552

nmsf06

SHELL

OUTPUT

LOAD

M22

1

$\times 10^{-1}$

270

180

90

0

-90

-180

Sheet 367 of

SAP90

MIN IS -0.137E+02 <JOINT 5102> MAX IS 0.265E+02 <JOINT 4102>

M=27

CALC NO. 5.0002, REV. 0
JOB NO. 41K52

MIN IS -0.143E+02 <JOINT 5102> MAX IS 0.259E+02 <JOINT 4102>

nmsr06
SHELL
OUTPUT M22
LOAD 2

$\times 10^{-1}$

SAP90

4ht. 368 of

Sht. 369 of

NMSF06

SHELL

OUTPUT

LOAD

M22

1

$\times 10^{-2}$

SAP90

$M = 410, 47$
new 1.5' walls
below change
deck

CALC. NO. 5-0002, REV. 10

JOB NO. 41532

MIN IS 0.435E+00 <JOINT 2046> MAX IS 0.664E+01 <JOINT 22>

NMSF06

SHELL

OUTPUT

LOAD

M22

2

$\times 10^{-2}$

SAP90

$M = 116,117$

CALC. NO. 5-0002, REV. 0
JOB NO. 41552

MIN IS -0.556E+01 <JOINT 3026> MAX IS -0.494E+00 <JOINT 1042>

stack
M=44

CALC. NO 5-0002, REV. 0
JOB NO. 41552

NMSF06

SHELL

OUTPUT

LOAD

M22

1

$\times 10^{-1}$

SWT. 371 of

SAP90

MIN IS -0.193E+00 <JOINT 8102> MAX IS 0.174E+02 <JOINT 7102>

Sht. 372 of

$M_{xx} = M$

CALC. NO. 5-0002, REV. 5
 JOB, NO. 41532

SAP90

W = 1
Line 1
8, 0, 0, 0, 0, 0

CALC NO. 5-0000, REV. 0
 JOB NO. 41552

MIN IS -0.323E+02 <JOINT 2051> MAX IS 0.525E+02 <JOINT 71>

NMSF61
 SHELL
 OUTPUT M22
 LOAD 2

SAP90

Sht. 373 of

NMSF61
SHELL
OUTPUT M22
LOAD 2

SAP90

Al-S
Line 2,
Barent

CALC. NO. 5-0002, REV. 0
JOB NO. 41552

MIN IS -0.129E+02 <JOINT 3083> MAX IS 0.169E+02 <JOINT 43>

NMSF61
SHELL
OUTPUT M22
LOAD 2

SAP90

MIN IS -0.200E+02 <JOINT 6051> MAX IS 0.429E+02 <JOINT 4051>

CALC. NO. 5-0002, REV. 0
JOB NO. 41552

pl = 16

line 2

1st floor

Calc. No. 5-0002, Rev. 0

Job No. 4155V

MIN IS -0.994E+01 <JOINT 7013> MAX IS 0.119E+02 <JOINT 4093>

SWT. 378 ck

NMSF61

SHELL

OUTPUT

M22

LOAD

2

$\times 10^{-1}$

450
300
150
0
-150
-300

SAP90

M=27

112113

1st F1R

CALC. NO. 5-0002, REV. 0

JOB NO. 41552

MIN IS -0.238E+02 <JOINT 5102> MAX IS 0.445E+02 <JOINT 4102>

CALC. No. 5-0002, REV. 0
 JOB, No. 01552

nmsf61
 SHELL
 OUTPUT M22
 LOAD 1

$\times 10^{-2}$

SAP90

MIN IS -0.509E+00 <JOINT 3026> MAX IS 0.478E+00 <JOINT 22>

SWT. 37906

CALC. NO. 5-0007, REV. 0
 FOR 10. 4155V

nmsf61

SHELL

OUTPUT

M22

LOAD

2

$\times 10^{-2}$

330

220

110

0

-110

-220

SAP90

26>

MAX IS 0.320E+01 <JOINT

MIN IS -0.198E+01 <JOINT 3022>

Sht. 380 of

Sh. 381 63

NMSF61

SHELL

OUTPUT

LOAD

M22

2

$\times 10^{-1}$

96
64
32
0
-32
-64

EVALUATION of NMSF FACILITY M LARL
MODIFICATION OPTION (1)

DESIGNED BY BM DATE 5/1/95
CHECKED BY JL DATE 5/1/95

check Buttrresses

Max. Mom = 283.1 K-FT
" Shear = 30.8 kips

Shear
$$V_c = 2 \times \sqrt{4000} \times (2.5 \times 4 \times 144) \times 10^{-3} = 182^k > 30.8 \text{ O.K.}$$

$$\text{Shear } D/c = \frac{30.8}{182} = 0.17$$

Bending

Use minimum steel

$$\rho = \frac{f_y}{200} = \frac{60}{200} = .3\%$$

$$A_s = \frac{.3}{100} \times 30 \times 48 = 4.32 \text{ in}^2$$

$$a = \frac{4.32 \times 60}{.85 \times 4 \times 12} = 6.35 \text{ in}, d = 48 - 4 = 44''$$

$$M_u = .9 \times 4.32 \times 60 \left(44 - \frac{6.35}{2} \right)$$

$$= 9524 \text{ K-in}$$

$$= 794 \text{ K-FT} > 283.1 \text{ K-FT. O.K.}$$

Sht. 384 55

9015WU

FRAME

OUTPUT M33

LOAD 2

MIN < 5281>

-0.1424E+03

AT 0.00

MAX < 5031>

0.1648E+02

AT 0.00

SAP90

CALL. NO. 5-0007, RECD
JOB NO. 41522
EXAMINATION OF NARS
PROPERTY AT UVAL

CALC NO. 6-0002, REV. 0

Job No. 41 ESR

EVALUATION OF NUCLEAR FACILITY (6) L&N

nmsf06

FRAME

OUTPUT

LOAD

V22

I

MIN < 5481 >

-0.1354E+02

AT 0.00

MAX < 5241 >

0.2521E+02

AT 0.00

SAP90

<p>nmsf06</p> <p>FRAME</p> <p>OUTPUT V22</p> <p>LOAD 2</p>	<p>MIN < 5081 ></p> <p>-0.3079E+02</p> <p>AT 0.00</p> <p>MAX < 5231 ></p> <p>0.1284E+02</p> <p>AT 0.00</p>	<p>SAP90</p>
---	--	--	--------------

CALC. NO. S-0002, REV. 0

JOB NO. 41552

EVALUATION OF NODAL DISPLACEMENT AT EACH LEVEL

EVALUATION OF NUCF FACILITY AT LANL
MODIFICATIONS OPTION (1)

DESIGNED BY BM

DATE 5/8/95

CHECKED BY JL

DATE 5/14/95

check ^{ROOF} / Floor In-plane shear:

- check slab strength vs amount of steel that is transferred from shear wall.

The concrete slab of the Roof, 1st floor, and Mezzanine Floor are all 1 foot deep.

Shear Capacity of 1' slab (excluding steel) can conservatively estimated as

$$V_c = 2\sqrt{f'_c} \times b \times d$$

$$= 2\sqrt{4000} \times 12 \times 12 \times 10 = 18.2 \text{ kips/L.F.}$$

The maximum shear/unit length of the wall occurs on wall on line B at Basement level: which is 18.1 k/L.F. and is less than 18.2 k/L.F.

EVALUATION OF DAMP RESISTANCE AT WALL
CONSTRUCTION OPTION (1)

DESIGNED BY RM

DATE 5/8/95

CHECKED BY JV

DATE 5/10/95

K/L.F.

Considering The 18.1 is a Conservative envelope shear value for entire structure it can be concluded that all 1 foot Slabs including MAA Roof, 1st Floor slab and Mezzanine Floor slab have significant margin of safety against in-plane Shear Failure.

CALC. NO. S-0002, REV. 0, JOB NO. 41552

KAISER ENGINEER	SHEET 389 OF 389
EVALUATION of NMSF FACILITY AT L&L	BY: BM DATE: 3/10/95
	CHKD: DATE:

BM 5/5/95

SUMMARY OF IN-PLANE SHEAR D/C RATIOS (OPTION 1)

WALL SEGME	LENGTH L (FEET)	WIDTH Be(*) (FEET)	CAPACITY (Vc) (KIPS)	DEMAND (Vu) (KIPS)	(D/C) Vu/Vc
1	130.45	3	4847	1629	0.34
2	18.25	1.5	339	131	0.39
4	18.25	1.33	301	124	0.41
5	130.45	1.5 2.83	2424 4573	1770	0.39
6	148.7	1.45	2671	1080	0.40
9	72.5	1.38	1239	1315	1.06
12	53.5	1.5	994	837	0.84
8	44.4	1	550	215	0.39
10	19	1	235	230	0.98
18	29.6	1.5	550	509	0.93
33	23.9	1	296	279	0.94
11	23.9	1	296	227	0.77
7	29.6	1.5	550	274	0.50
29	15	1.5	279	250	0.90
3	29.6	1.5	550	70	0.13
21	148.7	1.25	2302	1072	0.47
28	80	1	991	791	0.80
30	78	0.84	812	578	0.71
35	78	1	966	751	0.78
22	25	1	310	71	0.23
36	19	0.67	158	114	0.72
25	128.7	0.86	1371	826	0.60
38	80	1	991	721	0.73

$$v_c = .85 \cdot 2 \cdot \text{SQRT}(f'_c) = 108 \text{ PSI}$$

$$V_c = .8 \cdot v_c \cdot L \cdot B_e$$

Be = Effective Wall Thickness

WALL
Shear/L.F.

- 1 - 12.9
- 2 - 7.2
- 4 - 6.8
- 5 - 13.6
- 6 - 7.3
- 9 - 18.1
- 12 - 15.6
- 8 - 4.8
- 10 - 12.1
- 18 - 17.2
- 33 - 11.7
- 11 - 9.5
- 7 - 9.3
- 29 - 16.7
- 3 - 2.4
- 21 - 7.2
- 30 - 7.4
- 35 - 9.6
- 36 - 6.0
- 25 - 6.4
- 38 - 9.0

0.73 (*)

0.4. ✓

(*) wall 5 is 1.5' wide

Max
Shear = 18.1
wall #9

8.6.3 Vertical Analysis.

The objective of this analysis was to evaluate the out-of-plane response of the floor and roof slabs of the as built as well as the modified NMSF Building.

A two dimensional transverse strip of the building was modeled using SAP90 program and was subjected to 100% of the ground motion for DBE criteria in vertical direction plus DL and LL per the evaluation criteria covered earlier in this calculation. The 2-D model were analyzed for dynamic and static (UBC) load combinations. To capture a realistic level of ground acceleration the vertical soil spring were selected such that the resulting fundamental modal frequency matches that of the 3-d model. The detail of calculations and evaluations of the floor slabs, charge deck and roof slab are presented in the following pages.

The following conclusions can be drawn from the results of this analysis:

- 1) The roof slab and supporting beam on line 2 are overstressed under the vertical loadings. The roof slab and beam will be adequate, however, if the 2 foot deep top soil is removed from the roof of the building.
- 2) In the modified structure the open space between the columns on line two, between the 1st floor slab and the roof, is proposed to be infilled with new 18" concrete walls. With these walls added the roof can safely withstand the vertical loads and there is no need to remove the topside soils.
- 3) The 1st floor slab is adequate to resist out-of-pane loads.
- 4) The new 1 foot slab at mezzanine level and the new 30" composite charge deck are adequate.

EVALUATION OF NMSE FACILITY AT LANL
MODIFICATION OPTION (1)

DESIGNED BY Bm DATE 5/26/90

CHECKED BY JV DATE 5/26/90

Summary of 2D Vertical Analysis Results

Item	Max Moment (FT-K)			Max Shear (KIPS)			
	Demand	Capacity	D/C	Demand	Capacity	D/C	
MAA Roof Slab	41.9	43.7	0.96	8.5	12.9	0.66	Existing
1st Floor Slab	30.5	25.3	1.21	7.9	12.9	0.61	"
Mezz Floor Slab	32.9	33.9	.97	8.0	12.9	0.62	New Design
Charge Deck	45.7	540	0.08	10.8	38.7	0.28	"
36' Span 18x38 Beams @ MAA Area Roof	1476	1430	1.03	246	187	N.G. 1.32	Existing (1)
"				122	187	0.65	" (2)

(1) Beam inadequate with topside soil in-place.

(2) Beam o.k. with topside soils removed.

NMSF @ LAND

EVALUATION OF NMSF FACILITY @ LAND

DESIGNED BY B.M.

DATE 4/27/9

CHECKED BY J.L.

DATE 5/26/9

VERTICAL ANALYSIS OF FLOOR and ROOF SLABS
(UNITS: KIPS, FT, SEC)

1ST FLOOR / Mezz Slab (1' Concrete slabs)

$$m_{LAYS} : m = (0.15 + \frac{0.01 + 0.25 \times 0.25}{1.0}) / 32.2 = 0.00691$$

$$DL + LL : W_1 = (0.15 + 0.01 + 0.25) = 0.41$$

$$1.4DL + 1.7LL : W_2 = 1.4(0.15 + 0.01) + 1.7(0.25) = 0.649$$

NAA ROOF (1' Slab)

70% of Snow

Sail

FUTURE D.L

$$m = (0.15 + 0.7 \times 0.03 + 0.20 + 0.01) / 32.2 = 0.00562$$

$$W_1 = (0.15 + 0.03 + 0.20 + 0.01) = 0.39$$

$$W_2 = 1.4(0.15 + 0.01 + 0.20) + 1.7 \times 0.03 = 0.275$$

Basement (1.5' Slab)

$$m = 0.00691 + (\frac{0.15 \times 1.5}{32.2}) = 0.0092$$

$$W_1 = 0.410 + (0.15 \times 1.5) = 0.485$$

$$W_2 = 0.649 + (0.15 \times 1.5) \times 1.4 = 0.754$$

Charge Deck (30" Composite)

$$m = 0.02865$$

$$W_1 = 1.110 \text{ K/FT}$$

$$W_2 = 1.629 \text{ K/FT}$$

EVALUATION OF NMST FACILITY M LANE

Modification Option (1)

DESIGNED BY BM

DATE 6/6/95

CHECKED BY JL

DATE 5/24/95

Charge Deck STIFFNESS PROPS.

$$E_c = 518400 \text{ KSF}$$

$$E_s = 29000 \times 12^2 = 4176000 \text{ KSF}$$

$$E_s/E_c = 8.1$$

$$A = 2.5 \times 1 + 2 \times 1 \times \frac{.5}{12} \times 8.1 = 3.175 \text{ FT}^2$$

$$I = \frac{2.5^3}{12} + 2 \times \left(\frac{.5 \times 8.1}{12} \right) \times \left(\frac{2.5}{2} \right)^2 = 1.30 + 1.05 = 2.35 \text{ FT}^4$$

Calc. No. 5-0002, Rev. 0 Job No. 41532

Cont. 394 of

VNMSF2
UNDEFORMED
SHAPE

OPTIONS
JOINT IDS
ELEMENT IDS
ELEMENT PINS
WIRE FRAME

SAP90

CALC. NO. 5-0002, REV. 0, JOB NO. : 41552

Sht. 395 of

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2) *slit. 396 of*

C
C-----REV. DATE-----FILE-----DESCRIPTION-----
C

4-27-95 BM VNMSF1

-ASSUME SOIL MOD. OF SUBGRADE OF 1 KSF
-adjust soil springs to match vertical
from 3-D Model (NMSF06)

C
C-----
C 4-27-95 BM TO DO:
C-----
C

SYSTEM

L=2 Z=10

JOINTS

1 X=0 Y=0
2 X=0 Y=18.6
3 X=0 Y=36.5

C

4 X=29.6 Y=0
5 X=29.6 Y=10.5
6 X=29.6 Y=18.6
7 X=29.6 Y=21.
8 X=29.6 Y=36.8

C

9 X=53.5 Y=0
10 X=53.5 Y=10.5
11 X=53.5 Y=21.
12 X=53.5 Y=36.5
14 X=29.6/3 Y=0
X=29.6/3 Y=18.6
X=29.6/3*2 Y=0
17 X=29.6/3*2 Y=18.6
20 X=1 Y=1

RESTRAINTS

1 17 1 R=0,0,1,1,1,0
1 R=0,0,1,1,1,0
4 R=0,0,1,1,1,0
9 R=0,0,1,1,1,0
14 16 2 R=0,0,1,1,1,0
09 12 1 R=1,0,1,1,1,0
50 R=1,1,1,1,1,1
1 3 1 R=1,0,1,1,1,0

C SET SOIL SPRINGS TO MATCH VERTICAL FREQUENCY OF 3D ANALYSIS
SPRINGS

1 K=0,05000/3.
4 K=0,17000/3.
9 K=0,12000/3.
14 16 2 K=0,10000/3.

FRAME

NM=7 NL=6 NSEC=5

1 SH=R T=3.00,1 E=518400.*0.75 M=.15*3/32.2 W=.15*3 : 3' WALLS
2 SH=R T=1.50,1 E=518400.*0.75 M=.15*1.5/32.2 W=1.5*.15 : 1.5' WALL
H=R T=1.00,1. E=518400.*0.75 M=.15/32.2 W=.15 : 1' WALL
3 SH=R T=1.0,1. E=518400.*0.75 M=0.01155 W=0. : 1' MAA ROOF
A=2.5*1 I=2.35,1000 E=518400 M=0.02865 W=0. : 2.5' CHARGE DECK
SH=R T=1.0,1. E=518400.*.75 M=0.00691 W=0. : 1' 1ST FLR/MEZZ FLR
7 SH=R T=1.5,1. E=518400.*.75 M=0.0092 W=0. : 1.5' BASEMENT FLOOR

1 WG=0, -0.41, 0 : 1ST FLR/MEZZ DL+LL
 2 WG=0, -0.65, 0 : " " 1.4DL+1.7LL
 3 WG=0, -0.39, 0 : MAA ROOF DL+LL
 WG=0, -0.56, 0 : " " 1.4DL+1.7LL
 WG=0, -1.11, 0 : CHARGE DECK DL+LL
 WG=0, -1.63, 0 : " " 1.4DL+1.7LL

Sht. 397 of

CALL NO. S-0002 REJ

JOB NO. 01522

C
 1 1 2 M=1,1 LP=0,50
 2 2 3 M=2,2 LP=0,50
 3 1 14 M=7,7 LP=0,50
 21 14 16 M=7,7 LP=0,50
 22 16 4 M=7,7 LP=0,50
 4 2 15 M=5,5 LP=0,50 NSL=5,6 LR=1,0,0,0,0,0
 19 15 17 M=5,5 LP=0,50 NSL=5,6
 20 17 6 M=5,5 LP=0,50 NSL=5,6 LR=0,1,0,0,0,0
 5 3 8 M=4,4 LP=0,50 NSL=3,4
 6 4 5 M=1,1 LP=0,50
 7 5 6 M=1,1 LP=0,50
 8 6 7 M=2,2 LP=0,50
 9 7 8 M=2,2 LP=0,50
 10 4 9 M=7,7 LP=0,50
 11 5 10 M=6,6 LP=0,50 NSL=1,2
 12 7 11 M=6,6 LP=0,50 NSL=1,2
 13 8 12 M=4,4 LP=0,50 NSL=3,4
 14 9 10 M=3,3 LP=0,50
 15 10 11 M=3,3 LP=0,50
 16 11 12 M=3,3 LP=0,50
 17 14 15 M=2,2 LP=0,50 LR=0,1,0,0,0,0
 18 16 17 M=2,2 LP=0,50 LR=0,1,0,0,0,0

REG. GUIDE 1.60 (REV.1, 73) RESPONSE SPECTRUM (Sa vs. FREQ); 1.0g; 7% DAMPING

C TOTAL 87 POINTS

SPEC

A=0 S=0.3*32.2*1.5 D=0.07

C

C	TP	Sax	Say	Saz			
0.014286	0	0.666667	0	:	70	1	
0.015385	0	0.666667	0	:	65	1	
0.016667	0	0.666667	0	:	60	1	
0.018182	0	0.666667	0	:	55	1	
0.02	0	0.666667	0	:	50	1	
0.022222	0	0.666667	0	:	45	1	
0.025	0	0.666667	0	:	40	1	
0.027778	0	0.666667	0	:	36	1	
0.029412	0	0.666667	0	:	34	1	
0.030303	0	0.666667	0	:	33	1	
0.032258	0	0.69349	0	:	31	1.040235	
0.035714	0	0.739487	0	:	28	1.109231	
0.04	0	0.7943	0	:	25	1.19145	
0.045455	0	0.86102	0	:	22	1.29153	
0.05	0	0.914387	0	:	20	1.37158	
0.055556	0	0.977238	0	:	18	1.465857	
0.058824	0	1.013125	0	:	17	1.519687	
0.0625	0	1.052628	0	:	16	1.578942	
0.066667	0	1.096376	0	:	15	1.644564	
0.068966	0	1.120081	0	:	14.5	1.680121	
0.071429	0	1.145157	0	:	14	1.717735	
0.074074	0	1.171737	0	:	13.5	1.757606	
0.076923	0	1.199973	0	:	13	1.79996	

0.08	0	1.230039	0	:	12.5	1.845058	Sht. 398 of
0.083333	0	1.262132	0	:	12	1.893198	
0.086957	0	1.296483	0	:	11.5	1.944725	CALC NO. 4.0002
0.090909	0	1.33336	0	:	11	2.00004	REV. 0
0.095238	0	1.373076	0	:	10.5	2.059614	
0.1	0	1.416003	0	:	10	2.124004	
0.105263	0	1.462579	0	:	9.5	2.193868	JOB NO. 4155
0.111111	0	1.513333	0	:	9	2.27	
0.117647	0	1.525595	0	:	8.5	2.288393	
0.125	0	1.53871	0	:	8	2.308065	
0.129032	0	1.545623	0	:	7.75	2.318434	
0.133333	0	1.552795	0	:	7.5	2.329192	
0.137931	0	1.560245	0	:	7.25	2.340367	
0.142857	0	1.567994	0	:	7	2.351991	
0.148148	0	1.576066	0	:	6.75	2.364099	
0.153846	0	1.584487	0	:	6.5	2.37673	
0.16	0	1.593285	0	:	6.25	2.389927	
0.166667	0	1.602495	0	:	6	2.403742	
0.173913	0	1.612153	0	:	5.75	2.418229	
0.181818	0	1.622302	0	:	5.5	2.433453	
0.190476	0	1.632993	0	:	5.25	2.449489	
0.2	0	1.644281	0	:	5	2.466421	
0.208333	0	1.653785	0	:	4.8	2.480677	
0.217391	0	1.663752	0	:	4.6	2.495628	
0.227273	0	1.674227	0	:	4.4	2.51134	
0.238095	0	1.685259	0	:	4.2	2.527889	
0.25	0	1.696909	0	:	4	2.545363	
0.263158	0	1.709242	0	:	3.8	2.563863	
0.277778	0	1.72234	0	:	3.6	2.58351	
0.289855	0	1.73272	0	:	3.45	2.59908	
0.30303	0	1.743629	0	:	3.3	2.615444	
0.31746	0	1.755119	0	:	3.15	2.632678	
0.333333	0	1.767251	0	:	3	2.650876	
0.344828	0	1.77573	0	:	2.9	2.663595	
0.357143	0	1.78455	0	:	2.8	2.676825	
0.37037	0	1.793737	0	:	2.7	2.690605	
0.384615	0	1.80332	0	:	2.6	2.70498	
0.4	0	1.813333	0	:	2.5	2.72	
0.416667	0	1.755149	0	:	2.4	2.632724	
0.434783	0	1.696475	0	:	2.3	2.544713	
0.454545	0	1.637286	0	:	2.2	2.455929	
0.47619	0	1.577553	0	:	2.1	2.366329	
0.5	0	1.517245	0	:	2	2.275867	
0.526316	0	1.456327	0	:	1.9	2.184491	
0.555556	0	1.394761	0	:	1.8	2.092141	
0.588235	0	1.332503	0	:	1.7	1.998754	
0.625	0	1.269503	0	:	1.6	1.904254	
0.666667	0	1.205706	0	:	1.5	1.808559	
0.714286	0	1.141047	0	:	1.4	1.711571	
0.769231	0	1.075452	0	:	1.3	1.613178	
0.833333	0	1.008833	0	:	1.2	1.51325	
0.909091	0	0.941087	0	:	1.1	1.411631	
1	0	0.872089	0	:	1	1.308134	
1.111111	0	0.801687	0	:	0.9	1.202531	
1.25	0	0.729691	0	:	0.8	1.094537	
1.428571	0	0.655857	0	:	0.7	0.983785	
1.666667	0	0.579862	0	:	0.6	0.869793	
2	0	0.501264	0	:	0.5	0.751896	
2.5	0	0.419415	0	:	0.4	0.629123	
3.333333	0	0.333296	0	:	0.3	0.499944	

4	0	0.288119	0	:	0.25 0.432178
5	0	0.184396	0	:	0.2 0.276594
6.666667	0	0.103723	0	:	0.15 0.155584
10	0	0.046099	0	:	0.1 0.069149

sh. 3-95

COMBO

1 C=1,0 D=1
 2 C=1,0 D=-1
 3 C=0,1
 4 C=0,0 D=1

D... + I
 D... - E
 MOD 11.700
 E

CALC. NO. S-0002, REV. 0

JOB NO. 41582

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF1)

R I T Z S Y S T E M P A R A M E T E R S

sht. 001 of

NUMBER OF EQUATIONS	=	41
NUMBER OF MASSES	=	25
NUMBER OF RITZ VECTORS	=	10
NUMBER OF DIRECTION VECTORS	=	2

CALC. NO: S-0002, REV. 0

JOB NO: 4152

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF1)

E I G E N V A L U E S A N D F R E Q U E N C I E S

Sht. 402 of

MODE MBER	EIGENVALUE (RAD/SEC)**2	CIRCULAR FREQ (RAD/SEC)	FREQUENCY (CYCLES/SEC)	PERIOD (SEC)
1	0.306951E+04	0.554032E+02	8.817687	0.113408
2	0.501209E+04	0.707961E+02	11.267554	0.088750
3	0.636291E+04	0.797678E+02	12.695443	0.078768
4	0.122092E+05	0.110495E+03	17.585855	0.056864
5	0.738465E+05	0.271747E+03	43.249913	0.023121
6	0.871656E+05	0.295238E+03	46.988609	0.021282
7	0.101422E+06	0.318468E+03	50.685768	0.019729
8	0.129779E+06	0.360248E+03	57.335317	0.017441
9	0.149116E+06	0.386156E+03	61.458578	0.016271
10	0.360255E+06	0.600213E+03	95.526813	0.010468

CALC. NO: 5-0002. REV. 0

JOB NO. 4152

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF1)

Sht. 403 of

BASE FORCE REACTION FACTORS

MODE #	PERIOD (sec)	X DIRECTION	Y DIRECTION	Z DIRECTION	X MOMENT	Y MOMENT	Z MOMENT
1	0.113	0.223E-02	0.959E+00	0.000E+00	0.000E+00	0.000E+00	-0.737E+00
2	0.089	-0.107E-04	0.145E+01	0.000E+00	0.000E+00	0.000E+00	0.393E+02
3	0.079	-0.423E-02	0.619E+00	0.000E+00	0.000E+00	0.000E+00	0.370E+02
4	0.057	0.139E-02	0.296E+00	0.000E+00	0.000E+00	0.000E+00	0.346E+01
5	0.023	0.194E+00	-0.194E-02	0.000E+00	0.000E+00	0.000E+00	-0.101E+02
6	0.021	0.101E+01	0.312E-02	0.000E+00	0.000E+00	0.000E+00	-0.252E+02
7	0.020	0.826E+00	-0.107E-01	0.000E+00	0.000E+00	0.000E+00	-0.671E+01
8	0.017	-0.383E+00	-0.554E-01	0.000E+00	0.000E+00	0.000E+00	-0.125E+01
9	0.016	-0.420E+00	0.421E-01	0.000E+00	0.000E+00	0.000E+00	0.380E+01
10	0.010	0.222E+00	0.202E-01	0.000E+00	0.000E+00	0.000E+00	-0.254E+01

CALC. NO. S-0002, REV. 0

JOB NO. 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF1)

Sht. 404

P A R T I C I P A T I N G M A S S - (percent)

MODE	X-DIR	Y-DIR	Z-DIR	X-SUM	Y-SUM	Z-SUM
1	0.000	26.360	0.000	0.000	26.360	0.000
2	0.000	59.970	0.000	0.000	86.329	0.000
3	0.001	10.981	0.000	0.001	97.311	0.000
4	0.000	2.517	0.000	0.001	99.828	0.000
5	1.736	0.000	0.000	1.737	99.828	0.000
6	47.496	0.000	0.000	49.233	99.828	0.000
7	31.531	0.003	0.000	80.764	99.832	0.000
8	6.784	0.088	0.000	87.548	99.920	0.000
9	8.151	0.051	0.000	95.699	99.970	0.000
10	2.273	0.012	0.000	97.972	99.982	0.000

CALC. NO. 5-0002, REV. 0

JOB NO. 41552

CALC NO 5-0002, REV 0 JOB NO: 41522

SWT. 405

VNMSF2 MODE SHAPE MODE I	MINIMA X-0.1708E-02 Y-0.1085E+00 Z 0.0000E+00 MAXIMA X 0.5417E-02 Y 0.1106E+01 Z 0.0000E+00
SAP90

CALC NO. S-0002, REV. 0

JOB NO. 41552

VNMSF2

MODE
SHAPE

MODE 2

MINIMA

X $-0.5471E-02$

Y $0.4151E-01$

Z $0.0000E+00$

MAXIMA

X $0.2047E-02$

Y $0.9067E+00$

Z $0.0000E+00$

SAP90

slit. 406

CALC NO. 5-0002, REV D JOB NO. 4155~

SHT. 407 of 6

VNMSF2

MODE

SHAPE

MODE

3

MINIMA

X-0.1191E-01

Y-0.9183E-01

Z 0.0000E+00

MAXIMA

X 0.2086E-02

Y 0.1398E+01

Z 0.0000E+00

SAP90

CALC NO. S-0002, REV. 0

JOB NO. 41552

VNMSF2

MODE
SHAPE

MODE 4

MINIMA

X-0.1014E-01

Y-0.3777E+00

Z 0.0000E+00

MAXIMA

X 0.2774E-01

Y 0.9214E+00

Z 0.0000E+00

SLT. 408 of 4

SAP90

CALC. NO. 5-0002, REV. 0 JOB NO. 41552

VNMSF2

MODE

SHAPE

MODE

5

MINIMA

X-0.3000E+00

Y-0.7687E+00

Z 0.0000E+00

MAXIMA

X 0.1005E+01

Y 0.9063E+00

Z 0.0000E+00

SAP90

Sht. 409 of

Calc. No: 5-0002, Rev. 0, JOB NO. 41552

UNMSF2

FRAME

OUTPUT

LOAD

M33

1

MIN < 5>

-0.1575E+02

AT 14.80

MAX < 4>

0.4573E+02

AT 9.87

SAP90

Sheet 410 of 4

CALC. NO. 5-0002, REV. 0 JOB NO. 41552

STAT. 4/1/81

CALC NO: 5-0002, REV. 0 JOB NO. 4155 ✓

Y ↑ X →	
VNMSF2	
FRAME	M33
OUTPUT	
LOAD	3
MIN < 8>	-0.2517E+02
AT 2.40	
MAX < 5>	0.4188E+02
AT 29.60	
SAP90	

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
1								
	1	0.000			1.344			
		0.000	-0.057	18.975				
		4.650	-0.057	11.440				
		9.300	-0.057	3.907				
		13.950	-0.057	-3.623				
		18.600	-0.057	-10.597				
		18.600			1.344			
	2	0.000			-19.776			
		0.000	-1.620	-9.655				
		4.650	-1.620	-9.922				
		9.300	-1.620	-10.190				
		13.950	-1.620	-10.461				
		18.600	-1.620	-11.288				
		18.600			-19.776			
	3	0.000			-13.354			
		0.000	-1.201	6.602				
		4.650	-1.201	1.018				
		9.300	-1.201	-4.567				
		13.950	-1.201	-10.151				
		18.600	-1.201	-15.736				
		18.600			-13.354			
	4	0.000			10.560			
		0.000	0.782	14.315				
		4.650	0.782	10.681				
		9.300	0.782	7.048				
		13.950	0.782	3.419				
		18.600	0.782	0.346				
		18.600			10.560			
2								
	1	0.000			-0.176			
		0.000	2.063	-10.597				
		4.475	2.063	-1.567				
		8.950	2.063	7.603				
		13.425	2.063	16.809				
		17.900	2.063	26.026				
		17.900			-0.176			
	2	0.000			-11.057			
		0.000	1.908	-11.288				
		4.475	1.908	-2.550				
		8.950	1.908	6.048				
		13.425	1.908	14.610				
		17.900	1.908	23.160				
		17.900			-11.057			

CALC NO. S-0002 REJ D
JOB NO. 4152

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
3	0.000			-8.070			
	0.000	2.856	-15.736				
	4.475	2.856	-2.957				
	8.950	2.856	9.822				
	13.425	2.856	22.600				
	17.900	2.856	35.379				
	17.900			-8.070			
4	0.000			5.440			
	0.000	0.078	0.346				
	4.475	0.078	0.492				
	8.950	0.078	0.778				
	13.425	0.078	1.099				
	17.900	0.078	1.433				
	17.900			5.440			
3	-----						
1	0.000			0.159			
	0.000	1.582	18.975				
	2.467	1.582	11.316				
	4.933	1.582	3.685				
	7.400	1.582	2.107				
	9.867	1.582	5.981				
	9.867			0.159			
2	0.000			-0.983			
	0.000	-3.107	-9.655				
	2.467	-3.107	-5.759				
	4.933	-3.107	-1.890				
	7.400	-3.107	-4.074				
	9.867	-3.107	-11.710				
	9.867			-0.983			
3	0.000			-0.680			
	0.000	-1.084	6.602				
	2.467	-1.084	3.929				
	4.933	-1.084	1.256				
	7.400	-1.084	-1.417				
	9.867	-1.084	-4.089				
	9.867			-0.680			
4	0.000			0.571			
	0.000	2.345	14.315				
	2.467	2.345	8.538				
	4.933	2.345	2.788				
	7.400	2.345	3.091				
	9.867	2.345	8.845				
	9.867			0.571			

CALC. NO. S-0002 K=1.0

JOB NO. 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
4								
1		0.000			-0.855			
		0.000	-0.841	0.000				
		2.467	1.897	1.302				
		4.933	4.635	9.358				
		7.400	7.373	24.168				
		9.867	10.111	45.731				
		9.867			-0.855			
2		0.000			-1.943			
		0.000	-6.358	0.000				
		2.467	-3.620	-12.305				
		4.933	-0.882	-17.856				
		7.400	1.856	-16.654				
		9.867	4.594	-8.698				
		9.867			-1.943			
3		0.000			-2.201			
		0.000	-5.284	0.000				
		2.467	-1.263	-8.075				
		4.933	2.757	-6.233				
		7.400	6.778	5.527				
		9.867	10.799	27.205				
		9.867			-2.201			
4		0.000			0.544			
		0.000	2.758	0.000				
		2.467	2.758	6.804				
		4.933	2.758	13.607				
		7.400	2.758	20.411				
		9.867	2.758	27.215				
		9.867			0.544			
5								
1		0.000			0.603			
		0.000	-5.515	26.026				
		7.400	-2.629	-5.585				
		14.801	0.257	-15.751				
		22.201	3.142	-3.178				
		29.602	6.028	30.756				
		29.602			0.720			
2		0.000			-0.954			
		0.000	-5.714	23.160				
		7.400	-2.829	-6.976				
		14.801	0.057	-15.843				
		22.201	2.943	-4.737				
		29.602	5.829	27.721				
		29.602			-0.837			

CALL. NO. S-0002

JOB NO. 4112

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
3	0.000			-0.228			
	0.000	-8.068 ←	35.379 ←				
	7.400	-3.924	-8.995				
	14.801	0.220	-22.703 ←				
	22.201	4.363	-5.745				
	29.602	8.507 ←	41.878 ←				
	29.602			-0.060			
4	0.000			0.778			
	0.000	0.100	1.433				
	7.400	0.100	0.695				
	14.801	0.100	0.046				
	22.201	0.100	0.780				
	29.602	0.100	1.517				
	29.602			0.778			
6	-----						
1	0.000			-4.625			
	0.000	-0.539	6.158				
	2.625	-0.539	2.242				
	5.250	-0.539	-1.669				
	7.875	-0.539	-5.563				
	10.500	-0.539	-9.262				
	10.500			-4.625			
2	0.000			-44.859			
	0.000	-1.494	-4.196				
	2.625	-1.494	-5.616				
	5.250	-1.494	-7.040				
	7.875	-1.494	-8.481				
	10.500	-1.494	-10.118				
	10.500			-44.859			
3	0.000			-37.117			
	0.000	-1.639	1.827				
	2.625	-1.639	-2.476				
	5.250	-1.639	-6.780				
	7.875	-1.639	-11.083				
	10.500	-1.639	-15.387				
	10.500			-37.117			
4	0.000			20.117			
	0.000	0.477	5.177				
	2.625	0.477	3.929				
	5.250	0.477	2.686				
	7.875	0.477	1.459				
	10.500	0.477	0.428				
	10.500			20.117			

Static load Contr.

CALC NO. 5-0002, REV. 1

JOB NO. 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
7							
1	0.000			-4.120			
	0.000	-2.158	11.615				
	2.025	-2.158	6.829				
	4.050	-2.158	2.062				
	6.075	-2.158	-2.575				
	8.100	-2.158	-7.006				
	8.100			-4.120			
2	0.000			-35.223			
	0.000	-2.369	10.422				
	2.025	-2.369	6.042				
	4.050	-2.369	1.641				
	6.075	-2.369	-2.889				
	8.100	-2.369	-7.625				
	8.100			-35.223			
3	0.000			-29.075			
	0.000	-3.572	17.496				
	2.025	-3.572	10.262				
	4.050	-3.572	3.028				
	6.075	-3.572	-4.207				
	8.100	-3.572	-11.441				
	8.100			-29.075			
4	0.000			15.552			
	0.000	0.105	0.596				
	2.025	0.105	0.393				
	4.050	0.105	0.210				
	6.075	0.105	0.157				
	8.100	0.105	0.309				
	8.100			15.552			
8							
1	0.000			-4.194			
	0.000	-3.448	-7.006				
	0.600	-3.448	-9.093				
	1.200	-3.448	-11.174				
	1.800	-3.448	-13.250				
	2.400	-3.448	-15.324				
	2.400			-4.194			
2	0.000			-27.878			
	0.000	-3.786	-7.625				
	0.600	-3.786	-9.878				
	1.200	-3.786	-12.138				
	1.800	-3.786	-14.402				
	2.400	-3.786	-16.668				
	2.400			-27.878			

CALL NO. S-0002, REV 0

JOB NO. 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
3	0.000			-23.775			
	0.000	-5.720	-11.441				
	0.600	-5.720	-14.873				
	1.200	-5.720	-18.305				
	1.800	-5.720	-21.737				
	2.400	-5.720	-25.168				
	2.400			-23.775			
4	0.000			11.842			
	0.000	0.169	0.309				
	0.600	0.169	0.392				
	1.200	0.169	0.482				
	1.800	0.169	0.576				
	2.400	0.169	0.672				
	2.400			11.842			
9	-----						
1	0.000			-2.502			
	0.000	0.265	3.565				
	3.950	0.265	3.987				
	7.900	0.265	4.855				
	11.850	0.265	5.876				
	15.800	0.265	6.915				
	15.800			-2.502			
2	0.000			-19.671			
	0.000	0.075	2.657				
	3.950	0.075	3.580				
	7.900	0.075	4.058				
	11.850	0.075	4.382				
	15.800	0.075	4.688				
	15.800			-19.671			
3	0.000			-15.909			
	0.000	0.183	5.308				
	3.950	0.183	6.031				
	7.900	0.183	6.754				
	11.850	0.183	7.476				
	15.800	0.183	8.199				
	15.800			-15.909			
4	0.000			8.585			
	0.000	0.095	0.454				
	3.950	0.095	0.204				
	7.900	0.095	0.399				
	11.850	0.095	0.747				
	15.800	0.095	1.113				
	15.800			8.585			

CALC. NO. S-0002, REV. 1

JOB NO 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
10							
1	0.000			0.950			
	0.000	0.012	4.065				
	5.975	0.012	2.090				
	11.950	0.012	0.117				
	17.925	0.012	-1.041				
	23.900	0.012	-0.975				
	23.900			0.950			
2	0.000			0.168			
	0.000	-0.331	-1.257				
	5.975	-0.331	-1.188				
	11.950	-0.331	-1.120				
	17.925	-0.331	-1.868				
	23.900	-0.331	-3.839				
	23.900			0.168			
3	0.000			0.906			
	0.000	-0.241	2.067				
	5.975	-0.241	0.626				
	11.950	-0.241	-0.816				
	17.925	-0.241	-2.257				
	23.900	-0.241	-3.698				
	23.900			0.906			
4	0.000			0.391			
	0.000	0.171	2.661				
	5.975	0.171	1.639				
	11.950	0.171	0.619				
	17.925	0.171	0.413				
	23.900	0.171	1.432				
	23.900			0.391			
11							
1	0.000			1.838			
	0.000	-4.987	21.712				
	5.975	-2.537	-1.766				
	11.950	-0.087	-10.603				
	17.925	2.362	-3.817				
	23.900	4.812	17.616				
	23.900			1.838			
2	0.000			0.656			
	0.000	-5.154	19.706				
	5.975	-2.705	-2.773				
	11.950	-0.255	-10.618				
	17.925	2.195	-4.811				
	23.900	4.645	15.622				
	23.900			0.656			

CALC. NO. S-0002 REV -

JOB NO 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
3	0.000			1.933			
	0.000	-8.042 ←	32.883 ←				
	5.975	-4.158	-3.567				
	11.950	-0.275	-16.811 ←				
	17.925	3.609	-6.850				
	23.900	7.493 ←	26.317 ←				
	23.900			1.933			
4	0.000			0.591			
	0.000	0.084	1.003				
	5.975	0.084	0.503				
	11.950	0.084	0.007				
	17.925	0.084	0.497				
	23.900	0.084	0.997				
	23.900			0.591			
12							
1	0.000			-3.601			
	0.000	-4.873	20.050				
	5.975	-2.423	-2.667				
	11.950	0.027	-10.744				
	17.925	2.476	-3.313				
	23.900	4.926	18.803				
	23.900			-3.601			
2	0.000			-3.973			
	0.000	-5.027	18.164				
	5.975	-2.577	-3.632				
	11.950	-0.127	-10.795				
	17.925	2.322	-4.191				
	23.900	4.772	17.004				
	23.900			-3.973			
3	0.000			-5.903			
	0.000	-7.866 ←	30.476 ←				
	5.975	-3.982	-4.920				
	11.950	-0.098	-17.110 ←				
	17.925	3.785	-6.095				
	23.900	7.669 ←	28.126 ←				
	23.900			-5.903			
4	0.000			0.186			
	0.000	0.077	0.943				
	5.975	0.077	0.483				
	11.950	0.077	0.026				
	17.925	0.077	0.439				
	23.900	0.077	0.900				
	23.900			0.186			

CALL NO S-0002 REV 3
JOB NO 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
13								
	1	0.000			0.959			
		0.000	-5.087	24.391				
		5.975	-2.757	0.116				
		11.951	-0.427	-10.226				
		17.926	1.903	-6.048				
		23.902	4.233	12.282				
		23.902			0.842			
	2	0.000			-0.725			
		0.000	-5.228	22.482				
		5.975	-2.898	-0.955				
		11.951	-0.568	-10.480				
		17.926	1.762	-6.678				
		23.902	4.092	10.818				
		23.902			-0.842			
	3	0.000			0.130			
		0.000	-7.402	33.678				
		5.975	-4.056	-0.555				
		11.951	-0.710	-14.795				
		17.926	2.635	-9.044				
		23.902	5.981	16.700				
		23.902			-0.038			
	4	0.000			0.842			
		0.000	0.070	0.954				
		5.975	0.070	0.535				
		11.951	0.070	0.127				
		17.926	0.070	0.315				
		23.902	0.070	0.732				
		23.902			0.842			
14								
	1	0.000			-6.025			
		0.000	1.070	-0.975				
		2.625	1.070	0.739				
		5.250	1.070	2.454				
		7.875	1.070	4.590				
		10.500	1.070	7.398				
		10.500			-6.025			
	2	0.000			-21.455			
		0.000	0.653	-3.839				
		2.625	0.653	-1.030				
		5.250	0.653	1.780				
		7.875	0.653	4.167				
		10.500	0.653	5.881				
		10.500			-21.455			

CALC. NO. S.0002, REV 2

JOB NO. 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
3	0.000			-21.143			
	0.000	1.343	-3.698				
	2.625	1.343	-0.174				
	5.250	1.343	3.350				
	7.875	1.343	6.875				
	10.500	1.343	10.399				
	10.500			-21.143			
4	0.000			7.715			
	0.000	0.209	1.432				
	2.625	0.209	0.884				
	5.250	0.209	0.337				
	7.875	0.209	0.211				
	10.500	0.209	0.759				
	10.500			7.715			

15							
1	0.000			-3.433			
	0.000	1.888	-9.738				
	2.625	1.888	-5.088				
	5.250	1.888	-0.310				
	7.875	1.888	4.644				
	10.500	1.888	9.599				
	10.500			-3.433			
2	0.000			-14.590			
	0.000	1.771	-10.221				
	2.625	1.771	-5.266				
	5.250	1.771	-0.440				
	7.875	1.771	4.210				
	10.500	1.771	8.860				
	10.500			-14.590			
3	0.000			-13.650			
	0.000	2.942	-15.918				
	2.625	2.942	-8.195				
	5.250	2.942	-0.472				
	7.875	2.942	7.250				
	10.500	2.942	14.973				
	10.500			-13.650			
4	0.000			5.579			
	0.000	0.058	0.241				
	2.625	0.058	0.089				
	5.250	0.058	0.065				
	7.875	0.058	0.217				
	10.500	0.058	0.370				
	10.500			5.579			

CALC. NO. S-0002. REV. 0

JOB NO. 4152

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE	AXIAL
16		SHEAR	MOMENT		SHEAR	TORQ
1	0.000			-1.038		
	0.000	1.386	-8.142			
	3.875	1.386	-3.401			
	7.750	1.386	1.540			
	11.625	1.386	6.910			
	15.500	1.386	12.282			
	15.500			-1.038		
2	0.000			-7.287		
	0.000	1.223	-9.205			
	3.875	1.223	-3.834			
	7.750	1.223	1.337			
	11.625	1.223	6.078			
	15.500	1.223	10.818			
	15.500			-7.287		
3	0.000			-5.981		
	0.000	1.926	-13.153			
	3.875	1.926	-5.689			
	7.750	1.926	1.774			
	11.625	1.926	9.237			
	15.500	1.926	16.700			
	15.500			-5.981		
4	0.000			3.125		
	0.000	0.081	0.532			
	3.875	0.081	0.216			
	7.750	0.081	0.102			
	11.625	0.081	0.416			
	15.500	0.081	0.732			
	15.500			3.125		
17						
1	0.000			-5.177		
	0.000	0.406	4.836			
	4.650	0.406	3.627			
	9.300	0.406	2.418			
	13.950	0.406	1.209			
	18.600	0.406	0.000			
	18.600			-5.177		
2	0.000			-20.553		
	0.000	-0.260	-7.549			
	4.650	-0.260	-5.661			
	9.300	-0.260	-3.774			
	13.950	-0.260	-1.887			
	18.600	-0.260	0.000			
	18.600			-20.553		

CALC. NO. 5-0002 REV. 0

JOB NO. 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
3	0.000			-18.856			
	0.000	0.101	-1.883				
	4.650	0.101	-1.412				
	9.300	0.101	-0.941				
	13.950	0.101	-0.471				
	18.600	0.101	0.000				
	18.600			-18.856			
4	0.000			7.688			
	0.000	0.333	6.193				
	4.650	0.333	4.644				
	9.300	0.333	3.096				
	13.950	0.333	1.548				
	18.600	0.333	0.000				
	18.600			7.688			
18	-----						
1	0.000			-6.583			
	0.000	0.167	4.118				
	4.650	0.167	3.089				
	9.300	0.167	2.059				
	13.950	0.167	1.030				
	18.600	0.167	0.000				
	18.600			-6.583			
2	0.000			-18.930			
	0.000	-0.221	-3.101				
	4.650	-0.221	-2.326				
	9.300	-0.221	-1.551				
	13.950	-0.221	-0.775				
	18.600	-0.221	0.000				
	18.600			-18.930			
3	0.000			-18.809			
	0.000	-0.048	0.890				
	4.650	-0.048	0.668				
	9.300	-0.048	0.445				
	13.950	-0.048	0.223				
	18.600	-0.048	0.000				
	18.600			-18.809			
4	0.000			6.174			
	0.000	0.194	3.610				
	4.650	0.194	2.707				
	9.300	0.194	1.805				
	13.950	0.194	0.902				
	18.600	0.194	0.000				
	18.600			6.174			

CALC. NO. S-0002, REV. 0

JOB NO. 4152

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT	LOAD	DIST	1-2 PLANE		AXIAL	1-3 PLANE		AXIAL
ID	COMB	ENDI	SHEAR	MOMENT	FORCE	SHEAR	MOMENT	TORQ
19								
1		0.000			-1.056			
		0.000	-5.013	45.731				
		2.467	-2.275	34.328				
		4.933	0.463	29.683				
		7.400	3.201	31.797				
		9.867	5.939	40.671				
		9.867			-1.056			
2		0.000			-1.596			
		0.000	-6.010	-8.698				
		2.467	-3.272	-17.734				
		4.933	-0.534	-20.020				
		7.400	2.204	-15.558				
		9.867	4.942	-4.348				
		9.867			-1.596			
3		0.000			-2.100			
		0.000	-8.057	27.205				
		2.467	-4.036	12.290				
		4.933	-0.016	7.292				
		7.400	4.005	12.213				
		9.867	8.026	27.050				
		9.867			-2.100			
4		0.000			0.270			
		0.000	0.498	27.215				
		2.467	0.498	26.031				
		4.933	0.498	24.852				
		7.400	0.498	23.678				
		9.867	0.498	22.510				
		9.867			0.270			
20								
1		0.000			-1.259			
		0.000	-5.035	40.671				
		2.467	-2.297	20.373				
		4.933	0.441	6.828				
		7.400	3.179	0.037				
		9.867	5.917	0.000				
		9.867			-1.259			
2		0.000			-1.448			
		0.000	-9.598	-4.348				
		2.467	-6.860	-13.392				
		4.933	-4.122	-15.681				
		7.400	-1.384	-11.218				
		9.867	1.354	0.000				
		9.867			-1.448			

CALC. NO. S-0002, REV. 0
JOB NO. 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

SIT. 427 5

R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
3	0.000			-2.147			
	0.000	-10.783	27.050				
	2.467	-6.762	5.411				
	4.933	-2.742	-6.310				
	7.400	1.279	-8.114				
	9.867	5.300	0.000				
	9.867			-2.147			
4	0.000			0.095			
	0.000	2.281	22.510				
	2.467	2.281	16.882				
	4.933	2.281	11.255				
	7.400	2.281	5.627				
	9.867	2.281	0.000				
	9.867			0.095			
21							
1	0.000			-0.174			
	0.000	0.150	1.551				
	2.467	0.150	1.526				
	4.933	0.150	1.502				
	7.400	0.150	1.481				
	9.867	0.150	1.463				
	9.867			-0.174			
2	0.000			-0.795			
	0.000	-0.015	-4.568				
	2.467	-0.015	-4.211				
	4.933	-0.015	-3.855				
	7.400	-0.015	-3.502				
	9.867	-0.015	-3.152				
	9.867			-0.795			
3	0.000			-0.781			
	0.000	0.093	-2.207				
	2.467	0.093	-1.978				
	4.933	0.093	-1.750				
	7.400	0.093	-1.522				
	9.867	0.093	-1.293				
	9.867			-0.781			
4	0.000			0.310			
	0.000	0.083	3.059				
	2.467	0.083	2.868				
	4.933	0.083	2.679				
	7.400	0.083	2.492				
	9.867	0.083	2.307				
	9.867			0.310			

CALC. NO. S-0002 REV J

JOB NO. 41512

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS OF ROOF - (VNMSF2)

R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
22							
1	0.000			-0.324			
	0.000	1.478	2.357				
	2.467	1.478	0.820				
	4.933	1.478	2.518				
	7.400	1.478	6.054				
	9.867	1.478	9.672				
	9.867			-0.324			
2	0.000			-0.591			
	0.000	-0.721	-5.064				
	2.467	-0.721	-1.657				
	4.933	-0.721	-1.486				
	7.400	-0.721	-3.154				
	9.867	-0.721	-4.902				
	9.867			-0.591			
3	0.000			-0.733			
	0.000	0.616	-2.184				
	2.467	0.616	-0.664				
	4.933	0.616	0.855				
	7.400	0.616	2.375				
	9.867	0.616	3.894				
	9.867			-0.733			
4	0.000			0.133			
	0.000	1.100	3.711				
	2.467	1.100	1.238				
	4.933	1.100	2.002				
	7.400	1.100	4.604				
	9.867	1.100	7.287				
	9.867			0.133			

CALC. NO. S-0002, REV. 0
JOB NO. U155L

ADJST IN LANE

DESIGNED BY

BM

DATE 4/30/95

CHECKED BY

JL

DATE 5/1/95

check 1200f slab (MAX AREA)

STEEL	①	#8 29	⑤	#8 29	②	⑬	#7 29	③
		#7 218 X2				#6 218 X2		
MOM: (F-K)	35.4	22.7	41.9	33.7	14.8	16.7		
Shear (K)	8.1		8.5	7.4		6.0		
Mu	43.7	33.9	43.7	43.7	25.3	33.9		
Vu	12.9 ^k	(concrete only)						
Mom/Mu	0.81 ✓	0.67 ✓	0.96 ✓	0.77 ✓	0.58 ✓	0.49 ✓		
Shear/Vu	0.63		0.66	0.57		0.47		

O.K.

EVALUATION of NMSF & LANE

DESIGNED BY BM

DATE 4/30/95

CHECKED BY JL

DATE 5/1/95

CHECK:

1' slab on first floor

STEEL

		#6 @ 9	12	#8 @ 9
			#6 @ 9	
M (F-K)	30.5	17.1	28.1	
V (K)	7.9		7.7	
M _u	25.3	25.3	43.7	
V _u	12.9	(concrete only)		
M/M _u	1.21 ✓	0.68 ✓	0.63 ✓	
V/V _u	0.61 ✓		0.60 ✓	

O.K.

ICF KAISER ENGINEERS CALC. NO. S-0002. REV. 0	
EVALUATION of HMF FACILITY AT LAUL Modification of Option (1)	DESIGNED BY <u>BM</u> DATE <u>8/20/85</u> CHECKED BY <u>JV</u> DATE <u>8/1/85</u>
SHEET 23 OF 23	

DESIGN NEW MEZ2 Floor

M 32.9 16.8 26.3

V 8.0

MU 33.9 25.3 33.9

VU 12.9

M/MU 0.97 0.66

V/VU 0.62

✓ 0.58 ✓

✓ 0.78

0-K.

ICF KAISER
ENGINEERS

CALC. NO. 5-0002. EDO

EVALUATION OF EXIST. FACILITY M LAL

Modifications proposed (C)

DESIGNED BY

Bm

DATE 4/30/79

CHECKED BY

✓

DATE 5/1/79

SHEET 4320F

JOB NO.

41552

New Charge Deck

M 0 17.9 45.7 45.7 29.7 42.7 40.7 15.7 0

V

6.4 10.8 8.1 8.0 10.8 5.9

Mu

540 K-FT (Steel alone)

V

38.7 KIPS (Concrete alone)

$$M/M_u = 45.7/540 = 0.08$$

$$V/V_u = 10.8/38.7 = 0.28$$

O.K.

EVALUATION OF NMSP FACILITY @ LANL
MODIFICATION OPTIONS (1)

DESIGNED BY BM DATE 1/30/75

CHECKED BY JV DATE 5/1/75

Change Deck Capacity

Steel Alone (ELASTIC)

$$M_U = (.5 \times .6 \times 60 \times 12) \times 30 / 12 = 540 \text{ K-FT / L.F.}$$

Concrete alone

$$V_U = .85 \times 2 \times \sqrt{4000} \times 12 \times 30 / 1000 = 38.7 \text{ KIPS / L.F.}$$

CALC. NO. 5-0002, REV. 3

KAISER
ENGINEER

JOB NO. 41552-056-03

SHEET 434 of 5

DESIGNED BY:

DATE:

CHECKED BY:

DATE:

EVALUATION of NMSF FACILITY M LANL

ROOF AND FLOOR SLAB CAPACITIES (MODIFIED NMSF BLDG)

SLAB SECTION	Rebar	As	d	a	UNITS (KIPS,IN)	(FT-KIP) CAPACITY
MAA ROOF, 1ST FLOOR SLAB						
	Mu #8@9	1.053	10	1.55		43.7
	Mu #7@9	0.8	10	1.18		33.9
	Mu #6@9	0.587	10	0.86		25.3
	Vc		10			12.9
f'c= 4 ksi fy= 60 ksi						
Mu = 0.9 * As * fs * (d - a/2) , a=As * fs / (.85*f'c*b)						
Vc = 0.85 * 2 * Sqrt(f'c) * bw * d						

(*) - As Built Wall Capacities

EVALUATION of NMSE FACILITY AT LANL
MODIFICATION OPTION (1)

DESIGNED BY RM DATE 5/2/95

CHECKED BY JL DATE 5/11/95

check 30' SPAN ROOF BEAMS (RB-8)

REF: LA-ZJ-B-5-3.2
-4.1

using Tributary DL & L.L.

$$\text{Trib width} = [(30-4) + (28-8'')] / 2 = 29.5'$$

1.4 DL + 1.7 LL This L.C. Controls

$$W = 1.4 DL + 1.7 LL = 0.555 \times 29.5 = 16.4 \text{ K/L.F.}$$

$$\text{Max Pos. Mom} = \frac{wL^2}{16}$$

$$M_n = \frac{16.4 \times 30^2}{16} = 923 \text{ FT-KIP}$$

Max Neg Mom =

$$M_n = \frac{wL^2}{10} = 1476 \text{ FT-KIP}$$

Positive Mom:

$$A_s = 9 \times 1 = 9 \text{ in}^2$$

$$b = 30/4 = 7.5$$

$$a = \frac{9 \times 60}{0.85 \times 4 \times 7.5 \times 12} = 1.76", d = 38 - 8 = 30" \text{ Cons.}$$

$$M_u = 0.9 \times 9 \times 60 \times \left(30 - \frac{1.76}{2}\right) = 14,153 \text{ K-in} = 1179 \text{ K-FT}$$

$$D/C = 923 / 1179 = 0.78 \text{ O.K.}$$

EVALUATION OF NMCF FACILITY M LAWL
MODIFICATION OPTION (1)

DESIGNED BY RM DATE 5/2/91

CHECKED BY JV DATE 5/14/91

check Neg. Mom. Capacity.

$$A_s = 6 \times 1 + 6 \times 1.27 = 13.62 \text{ in}^2$$

$$a = \frac{13.62 \times 60}{0.85 \times 4 \times 18} = 13.35"$$

$$d \approx 30" \text{ Conser.}$$

$$M_u = 0.9 \times 13.62 \times 60 (30 - 13.6/2)$$

$$= 17155 \text{ K-in}$$

$$= 1430 \text{ K-FT}$$

$$D/C = 1476/1430 = 1.03 \quad \text{OK}$$

EVALUATION OF NMSP FACILITY AT LANL
MODIFICATION OPTION (1)

DESIGNED BY

B. M.

DATE 5/2/90

CHECKED BY

J. ✓

DATE 5/6/90

check shear of Roof Beams

Vertical STirrups #3 @ 3

$$\begin{aligned}
 V_n &= V_c + V_s \\
 &= 2\sqrt{f'_c} b w d + \frac{A_v f_y d}{s} \\
 &= 2\sqrt{4000} \times 18 \times (38-5) \times 16.4 + \frac{.11 \times 2 \times 60 \times 33}{3} \\
 &= 75.1 + 145.2 = 220.3 \text{ Kips}
 \end{aligned}$$

$$V_n = \frac{30}{2} \times 16.4 = 246 > 0.85 \times 220.3 = 187$$

N.G.

IF Remove Top Soil:

$$W = 0.275$$

$$V_n = 15 \times (0.275 \times 29.5) = 122 \text{ Kips} < 187 \text{ O.K.}$$

∴ Roof beam is AS-BUILT structure only
O.K. if TOP soil is Removed.

In The modified structure shear walls
are added between supporting columns and
TOP Soil need not be removed.

EVALUATION OF NMSF FACILITY AT LANL
Modification Option (1).

DESIGNED BY B.M.

DATE

CHECKED BY

DATE

5/20/95
5/26/95**8.6.4 Evaluation of wall on line 2**

The 2-D model used in the vertical analysis was used to perform a 2-D lateral analysis. The objective of this analysis was to estimate the out-of-plane bending and shear demand on the wall on line 2. In the modified structure the thickness of this wall is increased to 18" below the 1st floor and a new 18" wall is added above the first floor to fill the space between existing columns. The seismically induced lateral loads are estimated as an equivalent static load using peak ground acceleration of 0.8g. Lateral soil pressure is included and weight of the Administration building is lumped at the line 3. The detail of calculations are presented in the following pages.

EVALUATION OF NMSF FACILITY @ LANL
Modification option (1)

DESIGNED BY BM DATE 5/26/96
CHECKED BY JL DATE 5/26/96

2D Equivalent Static Analysis of NMSF Facility

- USE a Transverse Strip of NMSF Bldg
- Neglect Stiffness of Admin Area
- Lump mass of Admin area to MAA Bldg.
- Perform Equivalent lateral static analysis using Peak spectral acceleration.
- Include lateral Soil Pressure computed earlier
- Investigate adequacy of Basement wall on line 2

Static-Dyn. Soil Press

Load Cases Analyzed {

a

$DL + LL + E + H$

$1.4DL + 1.7LL + 1.7H$

DESIGNED BY Bm

DATE 5/26/91

CHECKED BY JZ

DATE 5/26/91

Summary of 2-D Horizontal Analysis Results (*)

Wall location	SAP ELEM. #	Moment, K-FT			Shear, Kips			Comments
		Demand	Capacity	D/C	Demand	Capacity	D/C	
	1	24.3			4.7			
	2	79.6			6.6			
	6	23.9			4.3			
	7	10.6			2.3			
	8	131.3	150	.88	35.1	46.4	.76	
	9	128.7			15.0			
	17	8.6			2.1			
	18	7.8			2.0			

REF: HNMSF2.F3F

(*) These results do not include thermal gradient load effects. See next sheet for complete load combination (marked up values only)

EVALUATION OF NMST FACILITY AT LARIL
MODIFICATION OPTION C17

DESIGNED BY BM DATE 5/26/91
CHECKED BY JL DATE 5/24/91

Lateral Soil Pressure.

$$F_1 = \left(\left(\frac{10}{2} - 7 \right) \times .9 + \frac{7}{2} \times .9 \right) + \left(.432 + \frac{18.5 + 9}{36.5} \times .432 \right) \frac{9}{2} + 9 \times .075$$

$$= 4.95 + 3.409 + .075 = 9.034 \text{ kips/LF}$$

$$F_2 = \left(\frac{18 + 18.5}{2} \right) \times .9 + \left(\left(\frac{18.5 + 9}{36.5} \right) \times .432 + \frac{18.5}{2} \times \frac{.432}{36.5} \right) \times \frac{18 + 18.5}{2 \times 2} + \frac{18 + 18.5}{2} \times .075$$

$$= 16.425 + 3.969 + 1.369 = 21.763 \text{ K}$$

CALC. NO S-0002, REV. 0

JOB NO. 41552

ICF KAISER
ENGINEERS

SHEET: 442 OF
JOB NO.: 41552

SUBJE -ROOF (ADMIN AREA ONLY)							DESIGNED BY:				DATE:		
OPTION (1)							CHECKED BY :				DATE:		
ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	lx0	ly0
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	7.75	14.8	6.5	0.00466	0	0	0	0	0	0	117
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	7.75	14.8	144.0	0.00466	0	0	0	0	0	0	117
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	7.75	29.6	78.7	0.00466	0	0	0	0	0	20043	11
17	1.5	4.75	7.75	29.5	146.3	0.00466	0	0	0	0	0	0	0
18							0	0	0	0	0	0	0
19	2.8	143.95	7.75	0.0	72.0	0.00466	0	0	0	0	0	25406	10
20	1.5	6.50	7.75	29.6	3.3	0.00466	0	0	0	0	0	1	0
21	1.3	148.70	7.75	53.5	74.4	0.00466	0	0	0	0	0	12369	1
22	1.0	15.00	7.75	72.5	111.8	0.00466	0.542	39.27506	60.565	373.2398	247.77	10	0
23	1.3	4.75	7.75	0.0	146.3	0.00466	0	0	0	0	0	0	0
24	11.0	1.00	7.75	137.0	128.7	0.00466	0.397	54.42531	51.128	581.269	582.33	0	4
25	0.9	128.70	7.75	131.5	64.4	0.00466	3.997	525.6424	257.22	4287.725	2715.4	5517	0
			7.75			0.00000	0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00466	0.722	102.9278	100.18	1382.822	1684.1	24	0
27	72.5	1.12	7.75	36.3	148.7	0.00466	0	0	0	0	0	0	1285
28	70.0	1.00	7.75	107.5	148.7	0.00466	2.528	271.7654	375.92	193.6201	8588.5	0	1032
29	15.0	1.50	7.75	-6.5	89.3	0.00466	0	0	0	0	0	0	15
30	78.0	0.84	7.75	92.5	59.3	0.00466	2.366	218.8786	140.32	92.38755	2290.7	0	1200
31	53.5	148.70	1.00	26.8	74.4	0.00000	0	0	0	0	0	0	0
32	78.0	148.70	0.86	92.5	74.4	0.00578	57.65	5333.025	4289.5	2251.043	14785	106236	29231
33							0	0	0	0	0	0	0
34	53.5	1.33	7.75	26.8	0.0	0.00466	0	0	0	0	0	0	613
35	78.0	1.00	7.75	92.5	0.0	0.00466	2.817	260.5697	0	109.9852	23028	0	1428
36	19.0	0.67	7.75	63.0	104.3	0.00466	0.46	28.96387	47.951	587.5323	88.652	0	14
37	80.0	33.00	0.86	112.5	165.0	0.00578	13.12	1476.328	2165.3	2481.591	73004	1191	6999
38	80.0	1.00	7.75	112.5	181.7	0.00466	2.889	325.035	524.97	546.3583	24076	0	1541
39							0	0	0	0	0	0	0
40							0	0	0	0	0	0	0
41							0	0	0	0	0	0	0
42							0	0	0	0	0	0	0
43							0	0	0	0	0	0	0
44							0	0	0	0	0	0	0
45							0	0	0	0	0	0	0
46						0.00466	0	0	0	0	0	0	0
47						0.00466	0	0	0	0	0	0	0
48	48.0	30.00	1.00	100.2	45.0	0.00183	2.25	225.45	101.25	4.740399	4640.4	169	397
Total Floor Mass=							89.75	8862.285	8114.3	12892.11	155731	170970	44014
C. G. COORDINATES:							XCG=	98.75 ft	YCG=	90.41 ft	Wt.=	2890	
MASS MOMENTS OF INERTIA:							IXX=	326701	IYY=	56906	IZZ=	363607	
Units: Kips, Feet, Second							FOR 1 FOOT STRIP, MASS=						
								0.5983	WT=	19.27	KIPS		

CALC NO. 5-0007, REV 3

ICF KAISER
ENGINEERS

SHEET: 443 OF
JOB NO.: 4-552

SUBJE -ROOF (ADMIN AREA ONLY) DL+L
OPTION (1)

DESIGNED BY:
CHECKED BY:

DATE:
DATE:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X^2	M*Y^2	Ix0	Iy0
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	7.75	14.8	6.5	0.00466	0	0	0	0	0	0	117
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	7.75	14.8	144.0	0.00466	0	0	0	0	0	0	117
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	7.75	29.6	78.7	0.00466	0	0	0	0	0	20043	11
17	1.5	4.75	7.75	29.5	146.3	0.00466	0	0	0	0	0	0	0
18							0	0	0	0	0	0	0
19	2.8	143.95	7.75	0.0	72.0	0.00466	0	0	0	0	0	25406	10
20	1.5	6.50	7.75	29.6	3.3	0.00466	0	0	0	0	0	1	0
21	1.3	148.70	7.75	53.5	74.4	0.00466	0	0	0	0	0	12369	1
22	1.0	15.00	7.75	72.5	111.8	0.00466	0.542	39.27506	60.565	373.2398	247.77	10	0
23	1.3	4.75	7.75	0.0	146.3	0.00466	0	0	0	0	0	0	0
24	11.0	1.00	7.75	137.0	128.7	0.00466	0.397	54.42531	51.128	581.269	582.33	0	4
25	0.9	128.70	7.75	131.5	64.4	0.00466	3.997	525.6424	257.22	4287.725	2715.4	5517	0
			7.75				0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00466	0.722	102.9278	100.18	1382.622	1684.1	24	0
27	72.5	1.12	7.75	36.3	148.7	0.00466	0	0	0	0	0	0	1285
28	70.0	1.00	7.75	107.5	148.7	0.00466	2.528	271.7654	375.92	193.6201	8588.5	0	1032
29	15.0	1.50	7.75	-6.5	89.3	0.00466	0	0	0	0	0	0	15
30	78.0	0.84	7.75	92.5	59.3	0.00466	2.366	218.8786	140.32	92.38755	2290.7	0	1200
31	53.5	148.70	1.00	26.8	74.4	0.01211	96.35	2577.492	7158.8	499482.7	24709	177547	22983
32	78.0	148.70	0.86	92.5	74.4	0.00612	61.03	5644.898	4540.3	2382.683	15649	112449	30940
33							0	0	0	0	0	0	0
34	53.5	1.33	7.75	26.8	0.0	0.00466	0	0	0	0	0	0	613
35	78.0	1.00	7.75	92.5	0.0	0.00466	2.817	260.5897	0	109.9852	23028	0	1428
36	19.0	0.67	7.75	63.0	104.3	0.00466	0.46	28.96387	47.951	587.5323	88.652	0	14
37	80.0	33.00	0.86	112.5	165.0	0.00612	13.89	1562.663	2291.9	2626.713	77274	1261	7408
38	80.0	1.00	7.75	112.5	181.7	0.00466	2.889	325.035	524.97	546.3583	24076	0	1541
39							0	0	0	0	0	0	0
40							0	0	0	0	0	0	0
41							0	0	0	0	0	0	0
42							0	0	0	0	0	0	0
43							0	0	0	0	0	0	0
44							0	0	0	0	0	0	0
45							0	0	0	0	0	0	0
46						0.00466	0	0	0	0	0	0	0
47						0.00466	0	0	0	0	0	0	0
48	48.0	30.00	1.00	100.2	45.0	0.00280	3.857	386.4857	173.57	8.126398	7955	289	680

Total Floor Mass= 191.8 11999.02 15733 512654.9 188889 354920 69399

C. G. COORDINATES: XCG= 62.54 ft YCG= 82.01 ft Wt= 6177

MASS MOMENTS OF INERTIA: IXX= 543809 IYY= 582054 IZZ= 1125862

Units: Kips, Feet, Second FOR 1 FOOT STRIP, MASS= 1.2790 WT= 41.18 KIPS

CALL NO. S-0002. REV. 0

ICF KAISER
ENGINEERSSHEET: 444 OF
JOB NO.: 41552
DATE:
DATE:SUBJE - ROOF (ADMIN AREA ONLY) (1.4DL + 1.7LL)
OPTION (1)DESIGNED BY:
CHECKED BY:

ITEM	XD	YD	H	Xc	Yc	m	M	Xc*M	Yc*M	M*X ²	M*Y ²	Ixo	Iyo
1							0	0	0	0	0	0	0
2							0	0	0	0	0	0	0
2a							0	0	0	0	0	0	0
3	29.60	1.50	7.75	14.8	6.5	0.00652	0	0	0	0	0	0	164
4							0	0	0	0	0	0	0
5							0	0	0	0	0	0	0
4a							0	0	0	0	0	0	0
6							0	0	0	0	0	0	0
7	29.60	1.50	7.75	14.8	144.0	0.00652	0	0	0	0	0	0	164
8							0	0	0	0	0	0	0
9							0	0	0	0	0	0	0
10							0	0	0	0	0	0	0
11							0	0	0	0	0	0	0
12							0	0	0	0	0	0	0
13							0	0	0	0	0	0	0
14							0	0	0	0	0	0	0
15							0	0	0	0	0	0	0
16	3.0	130.45	7.75	29.6	78.7	0.00652	0	0	0	0	0	28080	15
17	1.5	4.75	7.75	29.5	146.3	0.00652	0	0	0	0	0	1	0
18							0	0	0	0	0	0	0
19	2.8	143.95	7.75	0.0	72.0	0.00652	0	0	0	0	0	35568	14
20	1.5	6.50	7.75	29.6	3.3	0.00652	0	0	0	0	0	2	0
21	1.3	148.70	7.75	53.5	74.4	0.00652	0	0	0	0	0	17317	1
22	1.0	15.00	7.75	72.5	111.8	0.00652	0.758	54.98509	84.791	522.5357	346.88	14	0
23	1.3	4.75	7.75	0.0	146.3	0.00652	0	0	0	0	0	1	0
24	11.0	1.00	7.75	137.0	128.7	0.00652	0.556	76.19543	71.579	813.7766	815.26	0	6
25	0.9	128.70	7.75	131.5	64.4	0.00652	5.596	735.8993	360.11	6002.815	3801.6	7724	0
			7.75			0.00000	0	0	0	0	0	0	0
26	1.0	20.00	7.75	142.5	138.7	0.00652	1.011	144.0989	140.26	1935.671	2357.7	34	0
27	72.5	1.12	7.75	36.3	148.7	0.00652	0	0	0	0	0	0	1798
28	70.0	1.00	7.75	107.5	148.7	0.00652	3.539	380.4715	526.29	271.0681	12024	0	1445
29	15.0	1.50	7.75	-6.5	89.3	0.00652	0	0	0	0	0	0	21
30	78.0	0.84	7.75	92.5	59.3	0.00652	3.313	306.43	196.45	129.3426	3207	0	1680
31	53.5	148.70	1.00	26.8	74.4	0.01724	137.1	3667.969	10202	710802.2	35163	252664	32706
32	78.0	148.70	0.86	92.5	74.4	0.00888	88.6	8195.131	6591.5	3456.124	22719	163251	44918
33							0	0	0	0	0	0	0
34	53.5	1.33	7.75	26.8	0.0	0.00652	0	0	0	0	0	1	858
35	78.0	1.00	7.75	92.5	0.0	0.00652	3.944	364.7976	0	153.9792	32239	0	1999
36	19.0	0.67	7.75	63.0	104.3	0.00652	0.644	40.54942	67.132	822.5452	124.11	0	19
37	80.0	33.00	0.86	112.5	165.0	0.00888	20.17	2268.637	3327.3	3613.401	112184	1830	10755
38	80.0	1.00	7.75	112.5	181.7	0.00852	4.045	455.049	734.95	764.9017	33707	0	2157
39							0	0	0	0	0	0	0
40							0	0	0	0	0	0	0
41							0	0	0	0	0	0	0
42							0	0	0	0	0	0	0
43							0	0	0	0	0	0	0
44							0	0	0	0	0	0	0
45							0	0	0	0	0	0	0
46							0	0	0	0	0	0	0
47							0	0	0	0	0	0	0
48	46.0	30.00	1.00	100.2	45.0	0.00193	2.657	206.2457	119.57	5.596186	5480.1	199	499

Total Floor Mass= 271.9 16956.46 22422 729497 264166 506667 99180

C. G. COORDINATES: XCG= 62.35 ft YCG= 82.45 ft Wt.= 8757

MASS MOMENTS OF INERTIA: IXX= 770636 IYY= 826687 IZZ= 1566523

Units: Kips, Feet, Second FOR 1 FOOT STRIP, MASS= 1.8130 WT= 58.38 KIPS

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS - (HNMSF3)

Sht. 445 of

C
C-----REV. DATE-----FILE-----DESCRIPTION-----

C
C 4-27-95 BM VNMSF1 -ASSUME SOIL MOD. OF SUBGRADE OF 1 KSF
C 4-28-95 BM VNMSF2 - ADJUST SOIL SPRING PROPERTIES TO MATCH
C VERTICAL FREQ. OF 3-D MODEL (NMSF06)
C 5-3-95 BM HNMSF1 -2D EQUIVALENT STATIC ANALYSIS
C - ADD LATERAL SOIL PRESSURE
C - ASSUME MAX HORIZ. PEAK ACCELERATION.
C -ANALYZE DL+LL+E+H AND 1.4DL+1.7LL+1.7H
C 5-3-95 BM HNMSF2 - CHARGE DECK WITH MOM CONNECTIONS TO WALLS
C-----

SYSTEM

L=4 Z=00

JOINTS

1 X=0 Y=0
2 X=0 Y=18.6
3 X=0 Y=36.5

C
4 X=29.6 Y=0
5 X=29.6 Y=10.5
6 X=29.6 Y=18.6
7 X=29.6 Y=21.
8 X=29.6 Y=36.8

X=53.5 Y=0
9 X=53.5 Y=10.5
11 X=53.5 Y=21.
12 X=53.5 Y=36.5
14 X=29.6/3 Y=0
15 X=29.6/3 Y=18.6
16 X=29.6/3*2 Y=0
17 X=29.6/3*2 Y=18.6
50 X=1 Y=1

CALC NO : S-0002. REV. 0

JOB NO : 41552

RESTRAINTS

1 17 1 R=0,0,1,1,1,0
1 R=1,1,1,1,1,1
4 R=1,1,1,1,1,1
9 R=1,1,1,1,1,1
14 16 2 R=1,1,1,1,1,1
11 R=1,0,1,1,1,0
50 R=1,1,1,1,1,1

FRAME

NM=7 NL=12 NSEC=5 Y=-1.0

1 SH=R T=3.00,1 E=518400.*0.75 M=.15*3/32.2 W=.15*3 : 3' WALLS
2 SH=R T=1.50,1 E=518400.*0.75 M=.15*1.5/32.2 W=1.5*.15 : 1.5' WALL
3 SH=R T=1.33,1. E=518400.*0.75 M=.15*1.33/32.2 W=.15*1.33 : 1.33' WALL
4 SH=R T=1.0,1. E=518400.*0.75 M=0.01155 W=0. : 1' MAA ROOF
5 2.5*1 I=2.35,1000 E=518400 M=0.02865 W=0. : 2.5' CHARGE DECK
6 SH=R T=1.0,1. E=518400.*.75 M=0.00691 W=0. : 1' 1ST FLR/MEZZ FLR
7 SH=R T=1.5,1. E=518400.*.75 M=0.0092 W=0. : 1.5' BASEMENT FLOOR
8 WG=0.00691*32.2*.8,-0.41,0 : 1ST FLR/MEZZ DL+LL
9 2 WG=0,-0.65,0 : " " 1.4DL+1.7LL

Sht. 4-6 of

3	WG=0.01155*32.2*.8,-0.39,0	:MAA ROOF	DL+LL
4	WG=0,-0.56,0	: " "	1.4DL+1.7LL
5	WG=0.02865*32.2*.8,-1.11,0	:CHARGE DECK	DL+LL
6	WG=0,-1.63,0	: " "	1.4DL+1.7LL
7	G=0.00691*32.2*.8,0,0	:1ST FLR/MEZZ	E
8	WG=0.01155*32.2*.8,0,0	:MAA ROOF	E
9	WG=0.02865*32.2*.8,0,0	:CHARGE DECK	E
10	WG=.15*3.0*.8,0,0	:3' WALLS	E
11	WG=.15*1.5*.8,0,0	:1.5' WALLS	E
12	WG=.15*1.33*.8,0,0	:1.33' WALLS	E

C						
1	1	2	M=1,1	LP=0,50	NSL=0,10	
2	2	3	M=3,3	LP=0,50	NSL=0,12	
3	1	14	M=7,7	LP=0,50		
21	14	16	M=7,7	LP=0,50		
22	16	4	M=7,7	LP=0,50		
4	2	15	M=5,5	LP=0,50	NSL=5,9,0,6	: LR=1,0,0,0,0,0
19	15	17	M=5,5	LP=0,50	NSL=5,9,0,6	
20	17	6	M=5,5	LP=0,50	NSL=5,9,0,6	: LR=0,1,0,0,0,0
5	3	8	M=4,4	LP=0,50	NSL=3,8,0,4	
6	4	5	M=2,2	LP=0,50	NSL=0,11	
7	5	6	M=2,2	LP=0,50	NSL=0,11	
8	6	7	M=2,2	LP=0,50	NSL=0,11	
9	7	8	M=2,2	LP=0,50	NSL=0,11	
10	4	9	M=7,7	LP=0,50		
11	5	10	M=6,6	LP=0,50	NSL=1,7,0,2	
12	7	11	M=6,6	LP=0,50	NSL=1,7,0,2	
13	8	12	M=4,4	LP=0,50	NSL=3,8,0,4	
14	9	10	M=2,2	LP=0,50	NSL=0,11	
10	10	11	M=2,2	LP=0,50	NSL=0,11	
11	11	12	M=3,3	LP=0,50	NSL=0,12	
7	14	15	M=2,2	LP=0,50	NSL=0,11	: LR=0,1,0,0,0,0
8	16	17	M=2,2	LP=0,50	NSL=0,11	: LR=0,1,0,0,0,0

CALL NO. S-0002. REV. D

JOB NO. 41552

C -----LOAD CASES -----

C	L=1	DL+LL
C	L=2	E
C	L=3	H
C	L=4	1.4DL+1.7LL

LOADS

12	F=0,-41.2,0	L=1	:ADMIN	DL+LL
12	F=.5963*32.2*.8,0.,0.	L=2	:ADMIN	E
12	F=0,-58.4,0	L=4	:ADMIN	1.4DL+1.7LL
2	F=21.76,0,0	L=3	:SOIL PRESSURE	
3	F=9.03,0,0	L=3	:SOIL PRESSURE	

COMBO

1	C=1,0,0,0	: D=1	DL+LL
2	C=0,1,0,0	:	E
3	C=0,0,1,0	:	H
4	C=1,1,1,0	:	DL+LL+E+H
5	C=0,0,1.7,1	:	1.DL+1.7LL+1.7H

CALC. NO. S-0002, REV. 0 JOB NO. 41552

CASE NO. S-0002, REV. 0 JOB LG, 41552

ht. 44303

CALC. NO. 5-0007, REV. 0, JOB NO. 41552

SLT. 409 5j

HNMSF2	
FRAME	M33
OUTPUT	
LOAD	5
MIN < 8>	
-0.9231E+02	
AT 2.40	
MAX < 5>	
0.6199E+02	
AT 29.60	
SAP90

CALL. NO. S-0002, REV. 0 JOB NO. 41532

HNMSF2
FRAME
OUTPUT V22
LOAD 4

MIN < 8>
-0.3497E+02
AT 2.40
MAX < 9>
0.1496E+02
AT 0.00

SAP90

SWT. 450 35

CALC. NO 5-0002, REV. 0, JOB NO. 41532

SUBT. 451 5/8

HNMSF2
FRAME
OUTPUT V22
LOAD 5

MIN < 8>
-0.3509E+02
AT 0.00
MAX < 4>
0.1322E+02
AT 9.87

SAP90

CALC. NO. 50002, REV. 0 JOB NO. 41552

slt. 452 ss

CALC. NO. S-0002, REV. U JOB NO. 41552

HNMSF2

DEFORMED
SHAPE

LOAD 5

MINIMA

X -0.7082E-03

Y -0.4843E-02

Z 0.0000E+00

MAXIMA

X 0.5547E-01

Y 0.0000E+00

Z 0.0000E+00

SAP90

Slt. 453 5

EVALUATION OF NMST FACILITY AT LAUL
MODIFICATION OPTION (1)DESIGNED BY BM DATE 5/26/95
CHECKED BY IV DATE 5/26/95

Design New wall on line 2

	<u>Fix-Fix Deck</u>	<u>S-S Deck</u>
$M =$	132 K-FT	124 K-FT
$V =$	35 KIPS	43 KIPS

Bending:

try #10 @ 6

$$A_s = 2 \times 1.27 = 2.54 \text{ in}^2$$

$$d = 18 - 3 = 15"$$

$$\alpha = \frac{2.54 \times 60}{0.85 \times 4 \times 12} = 3.74"$$

$$M_u = 0.9 \times 2.54 \times 60 \left(15 - \frac{3.74}{2}\right) \times \frac{1}{12}$$

$$= 150 \text{ FT-Kips/L.F.}$$

$$D/C = 0.88$$

Shear:

$$V_c = 2 \phi \sqrt{f'_c} b_w d \times 10^{-3}$$

$$= 2 \times 0.85 \sqrt{4000} \times 12 \times 18 \times 10^{-3} = 23.2 \text{ kips/L.F.}$$

Wall under Compression due to DL

USE

$$V_c = 4 \phi \sqrt{f'_c} b_w d \times 10^{-3}$$

$$= 46.4 \text{ Kips/L.F.} > 43. \text{ k}$$

$$D/C = 0.93$$

NOTE: This evaluation excludes out-of-plane demands due to thermal loads. An accurate measure of thermal loads is due to be finalized.

Sht. 456 of

FRAME ELEMENT FORCES

ELT	LOAD	DIST	1-2 PLANE		AXIAL	1-3 PLANE		AXIAL
ID	COMB	ENDI	SHEAR	MOMENT	FORCE	SHEAR	MOMENT	TORQ
1								
1		0.000			-23.706			
		0.000	0.538	-5.257				
		4.650	0.538	-2.754				
		9.300	0.538	-0.251				
		13.950	0.538	2.252				
		18.600	0.538	4.754				
		18.600			-15.336			
2		0.000			5.073			
		0.000	-2.044	3.888				
		4.650	-0.370	-1.727				
		9.300	1.304	0.443				
		13.950	2.978	10.397				
		18.600	4.652	28.135				
		18.600			5.073			
3		0.000			4.539			
		0.000	-1.489	18.817				
		4.650	-1.489	11.894				
		9.300	-1.489	4.971				
		13.950	-1.489	-1.952				
		18.600	-1.489	-8.875				
		18.600			4.539			
4		0.000			-14.093			
		0.000	-2.995	17.447				
		4.650	-1.321	7.413				
		9.300	0.353	5.163				
		13.950	2.027	10.696				
		18.600	3.701	24.014				
		18.600			-5.723			
5		0.000			-9.663			
		0.000	-1.709	24.272				
		4.650	-1.709	16.326				
		9.300	-1.709	8.379				
		13.950	-1.709	0.432				
		18.600	-1.709	-7.514				
		18.600			-9.663			
2								
1		0.000			-9.102			
		0.000	1.789	-9.415				
		4.475	1.789	-1.411				
		8.950	1.789	6.593				
		13.425	1.789	14.597				
		17.900	1.789	22.600				
		17.900			-5.531			

CALC. NO. 5-0002, REV.

Job No: 41552

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
2	0.000			1.623			
	0.000	-6.329	63.777				
	4.475	-5.615	37.054				
	8.950	-4.900	13.527				
	13.425	-4.186	-6.804				
	17.900	-3.472	-23.939				
	17.900			1.623			
3	0.000			0.685			
	0.000	-2.037	25.213				
	4.475	-2.037	16.096				
	8.950	-2.037	6.978				
	13.425	-2.037	-2.139				
	17.900	-2.037	-11.256				
	17.900			0.685			
4	0.000			-6.794			
	0.000	-6.578	79.575				
	4.475	-5.863	51.738				
	8.950	-5.149	27.098				
	13.425	-4.435	5.654				
	17.900	-3.721	-12.595				
	17.900			-3.223			
5	0.000			-6.803			
	0.000	-0.822	28.410				
	4.475	-0.822	24.730				
	8.950	-0.822	21.051				
	13.425	-0.822	17.371				
	17.900	-0.822	13.691				
	17.900			-6.803			
3	-----						
1	0.000			0.000			
	9.867			0.000			
2	0.000			0.000			
	9.867			0.000			
3	0.000			0.000			
	9.867			0.000			
4	0.000			0.000			
	9.867			0.000			
5	0.000			0.000			
	9.867			0.000			
4	-----						
1	0.000			1.250			

CALC. NO. S-0002, REV

JOB NO. 4155 ✓

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS - (HNMSF3)

Sht. 458 of

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	0.000	-6.234	14.170				
	2.467	-3.496	2.170				
	4.933	-0.758	-3.076				
	7.400	1.980	-1.568				
	9.867	4.718	6.694				
	9.867			1.250			
2	0.000			-10.980			
	0.000	3.450	-35.642				
	2.467	3.450	-27.132				
	4.933	3.450	-18.622				
	7.400	3.450	-10.112				
	9.867	3.450	-1.602				
	9.867			-10.980			
3	0.000			-22.309			
	0.000	3.855	-34.088				
	2.467	3.855	-24.579				
	4.933	3.855	-15.071				
	7.400	3.855	-5.562				
	9.867	3.855	3.946				
	9.867			-22.309			
4	0.000			-32.039			
	0.000	1.071	-55.561				
	2.467	3.809	-49.541				
	4.933	6.547	-36.768				
	7.400	9.285	-17.242				
	9.867	12.023	9.039				
	9.867			-32.039			
5	0.000			-36.105			
	0.000	-2.860	-35.924				
	2.467	1.161	-38.019				
	4.933	5.182	-30.197				
	7.400	9.202	-12.457				
	9.867	13.223	15.201				
	9.867			-36.105			
5	-----						
1	0.000			-1.845			
	0.000	-5.512	22.600				
	7.400	-2.626	-7.515				
	14.801	0.260	-16.272				
	22.201	3.146	-3.671				
	29.602	6.032	30.288				
	29.602			-1.817			
2	0.000			3.488			
	0.000	1.588	-23.939				
	7.400	1.588	-12.187				

CALL NO. 4-0002, REV 0

JOB NO. 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS - (HNMSF3)

Sht. 459.0f

F R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	14.801	1.588	-0.433				
	22.201	1.589	11.322				
	29.602	1.589	23.079				
	29.602			3.399			
3	0.000			-6.985			
	0.000	0.755	-11.256				
	7.400	0.755	-5.665				
	14.801	0.755	-0.074				
	22.201	0.755	5.517				
	29.602	0.755	11.108				
	29.602			-6.985			
4	0.000			-5.342			
	0.000	-3.169	-12.595				
	7.400	-0.283	-25.367				
	14.801	2.604	-16.779				
	22.201	5.490	13.168				
	29.602	8.376	64.475				
	29.602			-5.403			
5	0.000			-14.597			
	0.000	-6.656	13.691				
	7.400	-2.512	-20.232				
	14.801	1.632	-23.490				
	22.201	5.775	3.918				
	29.602	9.919	61.991				
	29.602			-14.429			
6	-----						
1	0.000			-33.384			
	0.000	-1.251	4.756				
	2.625	-1.251	1.471				
	5.250	-1.251	-1.815				
	7.875	-1.251	-5.100				
	10.500	-1.251	-8.385				
	10.500			-31.021			
2	0.000			-2.654			
	0.000	-0.240	4.522				
	2.625	-0.712	3.272				
	5.250	-1.185	0.781				
	7.875	-1.657	-2.949				
	10.500	-2.130	-7.920				
	10.500			-2.654			
3	0.000			0.491			
	0.000	-0.942	3.422				
	2.625	-0.942	0.951				
	5.250	-0.942	-1.521				
	7.875	-0.942	-3.993				

CALC NO. 5-0002, REV. 1

JOB NO. 41552

FRAME ELEMENT FORCES

Sht. 460 of

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	10.500	-0.942	-6.465				
	10.500			0.491			
4	0.000			-35.546			
	0.000	-2.433	12.700				
	2.625	-2.906	5.693				
	5.250	-3.378	-2.554				
	7.875	-3.851	-12.042				
	10.500	-4.323	-22.770				
	10.500			-33.183			
5	0.000			-37.108			
	0.000	-3.503	12.836				
	2.625	-3.503	3.642				
	5.250	-3.503	-5.553				
	7.875	-3.503	-14.747				
	10.500	-3.503	-23.941				
	10.500			-37.108			
7	-----						
1	0.000			-26.095			
	0.000	-2.280	10.933				
	2.025	-2.280	6.316				
	4.050	-2.280	1.699				
	6.075	-2.280	-2.918				
	8.100	-2.280	-7.536				
	8.100			-24.272			
2	0.000			-2.539			
	0.000	1.764	-7.016				
	2.025	1.399	-3.814				
	4.050	1.035	-1.350				
	6.075	0.670	0.376				
	8.100	0.306	1.364				
	8.100			-2.539			
3	0.000			0.495			
	0.000	2.147	-6.827				
	2.025	2.147	-2.480				
	4.050	2.147	1.867				
	6.075	2.147	6.214				
	8.100	2.147	10.562				
	8.100			0.495			
4	0.000			-28.138			
	0.000	1.630	-2.910				
	2.025	1.266	0.022				
	4.050	0.901	2.216				
	6.075	0.537	3.672				
	8.100	0.172	4.390				
	8.100			-26.316			

CALC NO. S-0002, REV. 0

JOB NO. 4155

Sht. 461 of

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
5	0.000			-29.301			
	0.000	0.087	5.961				
	2.025	0.087	6.138				
	4.050	0.087	6.314				
	6.075	0.087	6.490				
	8.100	0.087	6.667				
	8.100			-29.301			
8							
1	0.000			-19.932			
	0.000	-1.250	-13.475				
	0.600	-1.250	-14.225				
	1.200	-1.250	-14.975				
	1.800	-1.250	-15.725				
	2.400	-1.250	-16.475				
	2.400			-19.392			
2	0.000			1.740			
	0.000	-13.852	-41.489				
	0.600	-13.960	-49.832				
	1.200	-14.068	-58.241				
	1.800	-14.176	-66.714				
	2.400	-14.284	-75.252				
	2.400			1.740			
3	0.000			0.897			
	0.000	-19.437	7.054				
	0.600	-19.437	-4.608				
	1.200	-19.437	-16.270				
	1.800	-19.437	-27.932				
	2.400	-19.437	-39.594				
	2.400			0.897			
4	0.000			-17.295			
	0.000	-34.539	-47.910				
	0.600	-34.647	-68.665				
	1.200	-34.755	-89.486				
	1.800	-34.863	-110.371				
	2.400	-34.971	-131.321				
	2.400			-16.755			
5	0.000			-21.974			
	0.000	-35.089	-8.102				
	0.600	-35.089	-29.155				
	1.200	-35.089	-50.209				
	1.800	-35.089	-71.262				
	2.400	-35.089	-92.315				
	2.400			-21.974			

CASE NO. 6-0002, REV. 0

JOB NO. 4.552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS - (HNMSF3)

Sht. 46205

FRAME ELEMENT FORCES

ELT	LOAD	DIST	1-2 PLANE		AXIAL	1-3 PLANE		AXIAL
ID	COMB	ENDI	SHEAR	MOMENT	FORCE	SHEAR	MOMENT	TORQ

9								
	1	0.000			-14.552			
		0.000	0.395	1.668				
		3.950	0.395	3.227				
		7.900	0.395	4.787				
		11.850	0.395	6.346				
		15.800	0.395	7.906				
		15.800			-10.997			
	2	0.000			0.739			
		0.000	10.231	-87.047				
		3.950	9.520	-48.041				
		7.900	8.809	-11.842				
		11.850	8.098	21.547				
		15.800	7.387	52.129				
		15.800			0.739			
	3	0.000			0.549			
		0.000	4.336	-43.337				
		3.950	4.336	-26.209				
		7.900	4.336	-9.080				
		11.850	4.336	8.049				
		15.800	4.336	25.177				
		15.800			0.549			
	4	0.000			-13.264			
		0.000	14.962	-128.717				
		3.950	14.251	-71.022				
		7.900	13.540	-16.135				
		11.850	12.829	35.943				
		15.800	12.118	85.212				
		15.800			-9.709			
	5	0.000			-14.863			
		0.000	7.780	-69.562				
		3.950	7.780	-38.833				
		7.900	7.780	-8.103				
		11.850	7.780	22.626				
		15.800	7.780	53.355				
		15.800			-14.863			

10								
	1	0.000			0.000			
		23.900			0.000			
	2	0.000			0.000			
		23.900			0.000			
	3	0.000			0.000			
		23.900			0.000			

CALL NO. 6-0002, REV. 0

JOB NO 4155

CASE NO. 20002, REV. 0

JOB NO. 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS - (HNMSF3)

Sht. 463 of

FRAME ELEMENT FORCES

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
			SHEAR	MOMENT		SHEAR	MOMENT	
4		0.000			0.000			
		23.900			0.000			
5		0.000			0.000			
		23.900			0.000			
11								
1		0.000			1.029			
		0.000	-4.926	19.318				
		5.975	-2.477	-2.798				
		11.950	-0.027	-10.277				
		17.925	2.423	-3.119				
		23.900	4.873	18.676				
		23.900			1.029			
2		0.000			-3.894			
		0.000	-0.115	0.904				
		5.975	-0.115	0.216				
		11.950	-0.115	-0.472				
		17.925	-0.115	-1.160				
		23.900	-0.115	-1.848				
		23.900			-3.894			
3		0.000			-3.088			
		0.000	-0.004	-0.363				
		5.975	-0.004	-0.385				
		11.950	-0.004	-0.406				
		17.925	-0.004	-0.428				
		23.900	-0.004	-0.450				
		23.900			-3.088			
4		0.000			-5.953			
		0.000	-5.045	19.860				
		5.975	-2.595	-2.967				
		11.950	-0.146	-11.155				
		17.925	2.304	-4.707				
		23.900	4.754	16.379				
		23.900			-5.953			
5		0.000			-3.590			
		0.000	-7.807	29.902				
		5.975	-3.923	-5.142				
		11.950	-0.040	-16.981				
		17.925	3.844	-5.614				
		23.900	7.728	28.958				
		23.900			-3.590			
12								
1		0.000			-1.645			
		0.000	-4.840	18.143				

CALC. NO. S-0002, REV. 0

JOB NO. 41552

Sht. 464 of

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	5.975	-2.390	-3.456				
	11.950	0.060	-10.417				
	17.925	2.510	-2.741				
	23.900	4.959	19.572				
	23.900			-1.645			
2	0.000			-24.515			
	0.000	1.001	-11.795				
	5.975	1.001	-5.816				
	11.950	1.001	0.162				
	17.925	1.001	6.141				
	23.900	1.001	12.120				
	23.900			-24.515			
3	0.000			-23.773			
	0.000	0.348	-3.743				
	5.975	0.348	-1.666				
	11.950	0.348	0.412				
	17.925	0.348	2.490				
	23.900	0.348	4.567				
	23.900			-23.773			
4	0.000			-49.933			
	0.000	-3.491	2.605				
	5.975	-1.042	-10.938				
	11.950	1.408	-9.843				
	17.925	3.858	5.890				
	23.900	6.308	36.259				
	23.900			-49.933			
5	0.000			-42.868			
	0.000	-7.111	22.753				
	5.975	-3.228	-8.135				
	11.950	0.656	-15.817				
	17.925	4.540	-0.294				
	23.900	8.424	38.434				
	23.900			-42.868			
13							
1	0.000			-1.420			
	0.000	-5.002	22.382				
	5.975	-2.672	-0.548				
	11.951	-0.343	-9.556				
	17.926	1.987	-4.642				
	23.902	4.317	14.192				
	23.902			-1.627			
2	0.000			10.739			
	0.000	2.497	-29.050				
	5.975	2.497	-14.127				
	11.951	2.497	0.794				

CALC. NO. 6-0002, REV. 0

JOB NO. 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS - (HNMSF3)

Sht. 465 of

F R A M E E L E M E N T F O R C E S

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	17.926	2.497	15.714				
	23.902	2.496	30.632				
	23.902			10.650			
3	0.000			-2.672			
	0.000	1.200	-14.070				
	5.975	1.200	-6.896				
	11.951	1.200	0.277				
	17.926	1.200	7.450				
	23.902	1.200	14.624				
	23.902			-2.672			
4	0.000			6.647			
	0.000	-1.304	-20.737				
	5.975	1.025	-21.570				
	11.951	3.355	-8.484				
	17.926	5.684	18.522				
	23.902	8.014	59.448				
	23.902			6.351			
5	0.000			-6.685			
	0.000	-5.175	8.636				
	5.975	-1.829	-12.288				
	11.951	1.517	-13.219				
	17.926	4.863	5.841				
	23.902	8.208	44.894				
	23.902			-6.853			
14	-----						
1	0.000			-63.186			
	0.000	0.958	-2.858				
	2.625	0.958	-0.342				
	5.250	0.958	2.174				
	7.875	0.958	4.690				
	10.500	0.958	7.206				
	10.500			-60.824			
2	0.000			-3.248			
	0.000	1.452	-0.736				
	2.625	0.979	2.455				
	5.250	0.507	4.406				
	7.875	0.034	5.116				
	10.500	-0.438	4.586				
	10.500			-3.248			
3	0.000			-1.578			
	0.000	0.533	-1.198				
	2.625	0.533	0.201				
	5.250	0.533	1.601				
	7.875	0.533	3.000				
	10.500	0.533	4.399				

CALL. No. 5-0002, REV. 0

JOB No. 4152

Sht. 46 b5c

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
	10.500			-1.578			
4	0.000			-68.012			
	0.000	2.943	-4.793				
	2.625	2.471	2.314				
	5.250	1.998	8.180				
	7.875	1.526	12.806				
	10.500	1.053	16.191				
	10.500			-65.650			
5	0.000			-82.845			
	0.000	2.496	-7.053				
	2.625	2.496	-0.501				
	5.250	2.496	6.051				
	7.875	2.496	12.603				
	10.500	2.496	19.156				
	10.500			-82.845			

15							
1	0.000			-55.951			
	0.000	1.987	-11.470				
	2.625	1.987	-6.254				
	5.250	1.987	-1.038				
	7.875	1.987	4.178				
	10.500	1.987	9.394				
	10.500			-53.589			
2	0.000			-3.363			
	0.000	-4.332	6.434				
	2.625	-4.804	-5.557				
	5.250	-5.277	-18.788				
	7.875	-5.749	-33.259				
	10.500	-6.222	-48.971				
	10.500			-3.363			
3	0.000			-1.582			
	0.000	-2.555	4.849				
	2.625	-2.555	-1.858				
	5.250	-2.555	-8.566				
	7.875	-2.555	-15.274				
	10.500	-2.555	-21.981				
	10.500			-1.582			
4	0.000			-60.896			
	0.000	-4.900	-0.187				
	2.625	-5.372	-13.669				
	5.250	-5.845	-28.392				
	7.875	-6.317	-44.355				
	10.500	-6.790	-61.558				
	10.500			-58.533			

CALC. No. S-0002. REV. 0

JOB No. 01552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS - (HNMSF3)

Sht. 467 of

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
5	0.000			-75.117			
	0.000	-1.094	-9.802				
	2.625	-1.094	-12.672				
	5.250	-1.094	-15.543				
	7.875	-1.094	-18.413				
	10.500	-1.094	-21.284				
	10.500			-75.117			
16							
1	0.000			-48.629			
	0.000	1.572	-10.178				
	3.875	1.572	-4.085				
	7.750	1.572	2.007				
	11.625	1.572	8.100				
	15.500	1.572	14.192				
	15.500			-45.537			
2	0.000			-2.363			
	0.000	7.154	-61.091				
	3.875	6.536	-34.565				
	7.750	5.918	-10.436				
	11.625	5.299	11.296				
	15.500	4.681	30.632				
	15.500			-2.363			
3	0.000			-1.234			
	0.000	2.656	-26.549				
	3.875	2.656	-16.256				
	7.750	2.656	-5.962				
	11.625	2.656	4.331				
	15.500	2.656	14.624				
	15.500			-1.234			
4	0.000			-52.226			
	0.000	11.383	-97.817				
	3.875	10.765	-54.906				
	7.750	10.146	-14.391				
	11.625	9.528	23.727				
	15.500	8.909	59.448				
	15.500			-49.133			
5	0.000			-66.694			
	0.000	6.749	-59.718				
	3.875	6.749	-33.565				
	7.750	6.749	-7.412				
	11.625	6.749	18.741				
	15.500	6.749	44.894				
	15.500			-66.694			

CALC. NO. 4-0002, REV. 0

JOB NO. 41552

Sht. 46805

FRAME ELEMENT FORCES

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE	1-3 PLANE SHEAR	MOMENT	AXIAL TORQ
17								
1		0.000			-13.548			
		0.000	-0.091	0.809				
		4.650	-0.091	0.386				
		9.300	-0.091	-0.037				
		13.950	-0.091	-0.459				
		18.600	-0.091	-0.882				
		18.600			-9.363			
2		0.000			-4.075			
		0.000	1.765	-5.853				
		4.650	0.928	0.408				
		9.300	0.091	2.777				
		13.950	-0.746	1.254				
		18.600	-1.583	-4.161				
		18.600			-4.075			
3		0.000			-3.605			
		0.000	0.390	-3.532				
		4.650	0.390	-1.718				
		9.300	0.390	0.096				
		13.950	0.390	1.910				
		18.600	0.390	3.724				
		18.600			-3.605			
4		0.000			-21.228			
		0.000	2.064	-8.576				
		4.650	1.227	-0.924				
		9.300	0.390	2.837				
		13.950	-0.447	2.706				
		18.600	-1.284	-1.318				
		18.600			-17.043			
5		0.000			-19.724			
		0.000	0.526	-4.821				
		4.650	0.526	-2.373				
		9.300	0.526	0.076				
		13.950	0.526	2.524				
		18.600	0.526	4.972				
		18.600			-19.724			
18								
1		0.000			-17.104			
		0.000	-0.129	1.039				
		4.650	-0.129	0.438				
		9.300	-0.129	-0.164				
		13.950	-0.129	-0.765				
		18.600	-0.129	-1.366				
		18.600			-12.919			

CALC. NO. 5.0002, REV. 0

JOB NO. 41512

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS - (HNMSF3)

Sht. 46905

FRAME ELEMENT FORCES

ELT	LOAD	DIST	1-2 PLANE		AXIAL	1-3 PLANE		AXIAL
ID	COMB	ENDI	SHEAR	MOMENT	FORCE	SHEAR	MOMENT	TORQ
2		0.000			4.903			
		0.000	1.754	-5.723				
		4.650	0.917	0.486				
		9.300	0.080	2.802				
		13.950	-0.757	1.227				
		18.600	-1.594	-4.241				
		18.600			4.903			
3		0.000			0.152			
		0.000	0.335	-3.088				
		4.650	0.335	-1.530				
		9.300	0.335	0.027				
		13.950	0.335	1.584				
		18.600	0.335	3.142				
		18.600			0.152			
4		0.000			-12.048			
		0.000	1.959	-7.772				
		4.650	1.122	-0.607				
		9.300	0.285	2.666				
		13.950	-0.552	2.046				
		18.600	-1.389	-2.465				
		18.600			-7.863			
5		0.000			-18.337			
		0.000	0.403	-3.892				
		4.650	0.403	-2.018				
		9.300	0.403	-0.143				
		13.950	0.403	1.731				
		18.600	0.403	3.605				
		18.600			-18.337			

19								
1		0.000			1.159			
		0.000	-4.645	7.575				
		2.467	-1.907	-0.504				
		4.933	0.831	-1.831				
		7.400	3.569	3.597				
		9.867	6.307	15.778				
		9.867			1.159			
2		0.000			-12.563			
		0.000	-0.625	2.559				
		2.467	-0.625	1.018				
		4.933	-0.625	-0.522				
		7.400	-0.625	-2.063				
		9.867	-0.625	-3.604				
		9.867			-12.563			
3		0.000			-21.918			

CALC. NO. 5.0002, REV 0

JOB NO. 41552

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS - (HNMSF3)

Sht. 470 of 5

FRAME ELEMENT FORCES

ELT LOAD ID COMB	DIST ENDI	1-2 PLANE		AXIAL FORCE	1-3 PLANE		AXIAL TORQ
		SHEAR	MOMENT		SHEAR	MOMENT	
	0.000	0.250	0.222				
	2.467	0.250	0.838				
	4.933	0.250	1.453				
	7.400	0.250	2.069				
	9.867	0.250	2.684				
	9.867			-21.918			
4	0.000			-33.322			
	0.000	-5.020	10.357				
	2.467	-2.282	1.351				
	4.933	0.456	-0.900				
	7.400	3.194	3.602				
	9.867	5.932	14.858				
	9.867			-33.322			
5	0.000			-35.579			
	0.000	-6.502	10.229				
	2.467	-2.481	-0.850				
	4.933	1.540	-2.010				
	7.400	5.560	6.747				
	9.867	9.581	25.422				
	9.867			-35.579			
20							
1	0.000			1.030			
	0.000	-6.612	17.145				
	2.467	-3.874	4.213				
	4.933	-1.136	-1.966				
	7.400	1.602	-1.390				
	9.867	4.340	5.939				
	9.867			1.030			
2	0.000			-14.158			
	0.000	4.279	0.636				
	2.467	4.279	11.190				
	4.933	4.279	21.744				
	7.400	4.279	32.299				
	9.867	4.279	42.853				
	9.867			-14.158			
3	0.000			-21.584			
	0.000	0.402	-0.458				
	2.467	0.402	0.534				
	4.933	0.402	1.525				
	7.400	0.402	2.516				
	9.867	0.402	3.508				
	9.867			-21.584			
4	0.000			-34.711			
	0.000	-1.931	17.323				
	2.467	0.807	15.937				

CALC. No. S.0002, REV. 0

JOB No. 41512

(LANL NMSF BUILDING) 2-D VERTICAL ANALYSIS - (HNMSF3)

Sht. 471

FRAME ELEMENT FORCES

ELT LOAD	DIST	1-2 PLANE		AXIAL	1-3 PLANE		AXIAL
ID COMB	ENDI	SHEAR	MOMENT	FORCE	SHEAR	MOMENT	TORQ
	4.933	3.545	21.304				
	7.400	6.283	33.425				
	9.867	9.021	52.299				
	9.867			-34.711			
5	0.000			-35.176			
	0.000	-8.756	21.816				
	2.467	-4.735	5.178				
	4.933	-0.714	-1.543				
	7.400	3.306	1.654				
	9.867	7.327	14.769				
	9.867			-35.176			
21							
1	0.000			0.000			
	9.867			0.000			
2	0.000			0.000			
	9.867			0.000			
3	0.000			0.000			
	9.867			0.000			
4	0.000			0.000			
	9.867			0.000			
5	0.000			0.000			
	9.867			0.000			
22							
1	0.000			0.000			
	9.867			0.000			
2	0.000			0.000			
	9.867			0.000			
3	0.000			0.000			
	9.867			0.000			
4	0.000			0.000			
	9.867			0.000			
5	0.000			0.000			
	9.867			0.000			

CALC NO. 5.0002, REV. 0

JOB NO. 41552

EVALUATION OF NMST FACILITY AT LANL
MODIFICATION OPTION (1)

DESIGNED BY S. L. W. DATE 3/10/95
CHECKED BY J. C. DATE 5/1/95

DEFLECTION CALC.

$$LENGTH = 14' = 168''$$

$$WT. OF CONTENTS = 500 \# (TOTAL)$$

CROSS SECTION

$$O.D. = 18'', I.D. = 17''$$

$$t = 0.5''$$

MATERIAL = STEEL

$$E = 29 \times 10^6 \text{ PSI}$$

SECTION PROPERTIES:

$$A = \frac{\pi (O.D.^2 - I.D.^2)}{4} = \frac{\pi (18^2 - 17^2)}{4} = 27.49 \text{ in}^2$$

$$I = \frac{\pi (O.D.^4 - I.D.^4)}{64} = \frac{\pi (18^4 - 17^4)}{64} = 1053.17 \text{ in}^4$$

$$S = \frac{\pi (O.D.^4 - I.D.^4)}{32 O.D.} = \frac{\pi (18^4 - 17^4)}{32 \times 18} = 117.02 \text{ in}^3$$

WT. OF 18" STEEL PIPE w/ 1/2" WALL THICKNESS

$$= 93.45 \#/\text{FT} = 7.7875 \#/\text{in}$$

APPLIED FORCE (UNIFORMLY DISTRIBUTED LOAD)

$$W_F = (0.3 \times 1.5) \times (7.7875 + \frac{500}{168}) = 4.9437 \#/\text{in}$$

EVALUATION OF NMST FACILITY @ LANL
MODIFICATION OPTION (1)DESIGNED BY S. Liao DATE 1/1/95
CHECKED BY JL DATE 1/1/95

FOR BEAM FIXED AT ONE END, SUPPORTED AT OTHER,
SUBJECTED TO UNIFORMLY DISTRIBUTED LOAD,
THE MAX. DEFLECTION OCCURRED @

$$x = 0.4215 l = 0.4215 \times 168 = 70.81''$$

$$\begin{aligned}\Delta_{(\text{APPROX.})} &= \frac{w_F l^4}{185 EI} \\ &= \frac{4.8437 \times (168)^4}{185 \times 29 \times 10^6 \times 105317} \\ &= 0.000684''\end{aligned}$$