INDEX.

141ST FIELD ARTILLERY BATTALION
R.C.
1.0.6A.

MORPHY, MAKOFSKY, INC.

141ST JACKSON BARRACKS

REFERENCED CODES & STANDARDS

- ⇒ IBC 2003 (Building code)
- ⇒ ASCE 7-02 (Loads)
- → ACI 318-05 (Concrete)
- AISC - LRFD 3RD Edition
  & - ASD - 9TH Edition } (steel)

- UFC 4-010-01 8 OCT. 2003
- UFC 4-023-03 25 JAN 2005
- UFC 4-020-03FA 1 MAR. 2005
- ACI 530-02

	JLS	4-19-06	1

MORPHY, MAKOFSKY, INC.

APPENDIX B

DoD MINIMUM ANTITERRORISM STANDARDS FOR NEW AND EXISTING BUILDINGS

B-1 **SITE PLANNING.** Operational, logistic, and security requirements must be integrated into the overall design of buildings, equipment, landscaping, parking, roads, and other features. The most cost-effective solution for mitigating explosive effects on buildings is to keep explosives as far as possible from them. Standoff distance must be coupled with appropriate building hardening to provide the necessary level of protection to DoD personnel. The following standards detail minimum standoff distances that when achieved will allow for buildings to be built with minimal additional construction costs. Where these standoff distances cannot be achieved because land is unavailable, these standards allow for building hardening to mitigate the blast effects. Costs and requirements for building hardening are addressed in the *DoD Security Engineering Planning Manual.*

B-1.1 **Standard 1. Minimum Standoff Distances.** The minimum standoff distances apply to all new and existing (when triggered) DoD buildings covered by these standards. The minimum standoff distances are presented in Table B-1 and illustrated in Figures B-1 and B-2. Where the standoff distances in the "Conventional Construction Standoff Distance" column of Table B-1 can be met, conventional construction may be used for the buildings without a specific analysis of blast effects, except as otherwise required in these standards. Where those distances are not available, an engineer experienced in blast-resistant design should analyze the building and apply building hardening as necessary to mitigate the effects of the explosives indicated in Table B-1 at the achievable standoff distance to the appropriate level of protection. The appropriate levels of protection for each building category are shown in Table B-1, and are described in Tables 2-1 and 2-2 and in the *DoD Security Engineering Planning Manual.* For new buildings, standoff distances of less than those shown in the "Effective Standoff Distance" column in Table B-1 are not allowed. For existing buildings, the standoff distances in the "Effective Standoff Distance" column of Table B-1 will be provided except where doing so is not possible. In those cases, lesser standoff distances may be allowed where the required level of protection can be shown to be achieved through analysis or can be achieved through building hardening or other mitigating construction or retrofit as described in these standards and in the *DoD Security Engineering Design Manual.*

B-1.1.1 **Controlled Perimeter.** Measure the standoff distance from the controlled perimeter to the closest point on the building exterior or inhabited portion of the building.

B-1.1.2 **Parking and Roadways.** Standoff distances for parking and roadways are based on the assumption that there is a controlled perimeter at which larger vehicle bombs will be detected and kept from entering the controlled perimeter. Where there is a controlled perimeter, the standoff distances and explosive weight associated with parking and roadways in Table B-1 apply. If there is no controlled perimeter, assume that the larger explosive weights upon which the controlled perimeter standoff distances are based (explosive weight I from Table B-1) can access parking and roadways near

Table B-1 Minimum Standoff Distances for New and Existing Buildings

Location	Building Category	Standoff Distance or Separation Requirements			
		Applicable Level of Protection	Conventional Construction Standoff Distance	Effective Standoff Distance[1]	Applicable Explosive Weight [2]
Controlled Perimeter or Parking and Roadways without a Controlled Perimeter	Billeting	Low	45 m [3] (148 ft.)	25 m [3] (82 ft.)	I
	Primary Gathering Building	Low	45 m [3] [4] (148 ft.)	25 m [3] [4] (82 ft.)	I
	Inhabited Building	Very Low	25 m [3] (82 ft.)	10 m [3] (33 ft.)	I
Parking and Roadways within a Controlled Perimeter	Billeting	Low	25 m [3] (82 ft.)	10 m [3] (33 ft.)	II
	Primary Gathering Building	Low	25 m [3] [4] (82 ft.)	10 m [3] [4] (33 ft.)	II
	Inhabited Building	Very Low	10 m [3] (33 ft.)	10 m [3] (33 ft.)	II
Trash Containers	Billeting	Low	25 m (82 ft.)	10 m (33 ft.)	II
	Primary Gathering Building	Low	25 m (82 ft.)	10 m (33 ft.)	II
	Inhabited Building	Very Low	10 m (33 ft.)	10 m (33 ft.)	II

(1) Even with analysis, standoff distances less than those in this column are not allowed for new buildings, but are allowed for existing buildings if constructed/retrofitted to provide the required level of protection at the reduced standoff distance.
(2) See UFC 4-010-02, for the specific explosive weights (kg/pounds of TNT) associated with designations – I and II. UFC 4-010-02 is For Official Use Only (FOUO)
(3) For existing buildings, see paragraph B-1.1.2.2 for additional options.
(4) For existing family housing, see paragraph B-1.1.2.2.3 for additional options.

Figure B-1 Standoff Distances and Building Separation – Controlled Perimeter

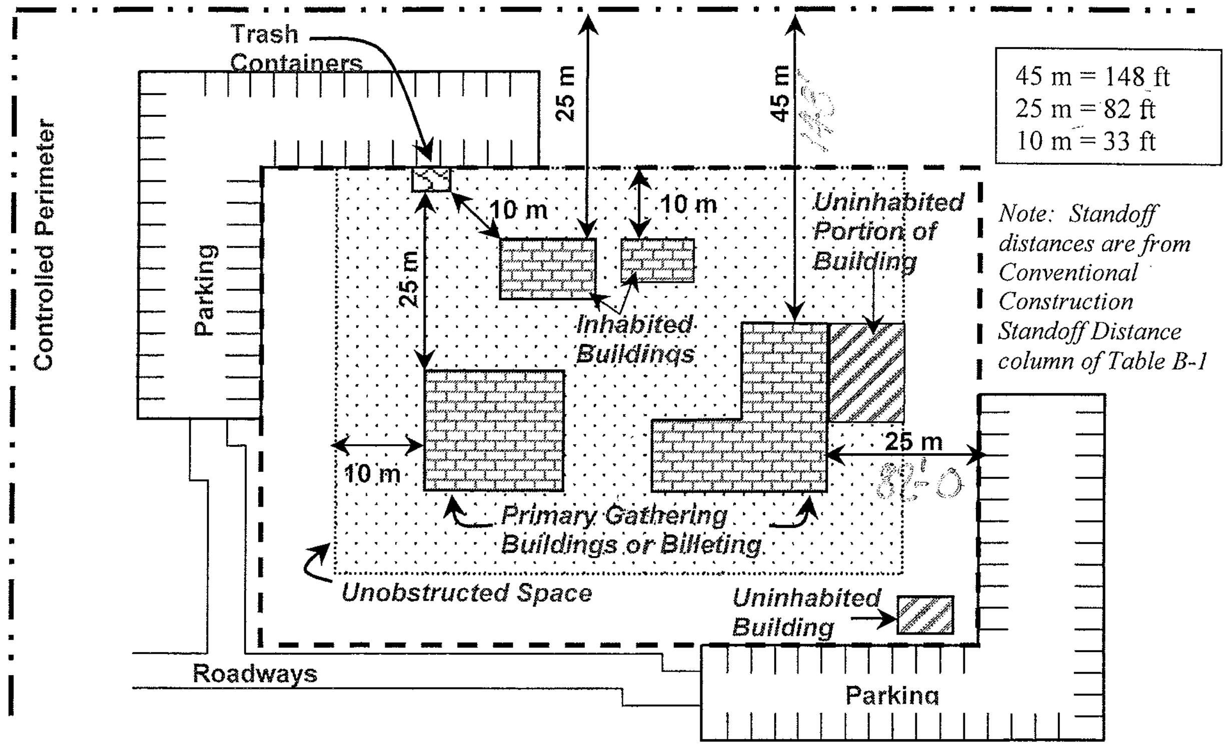
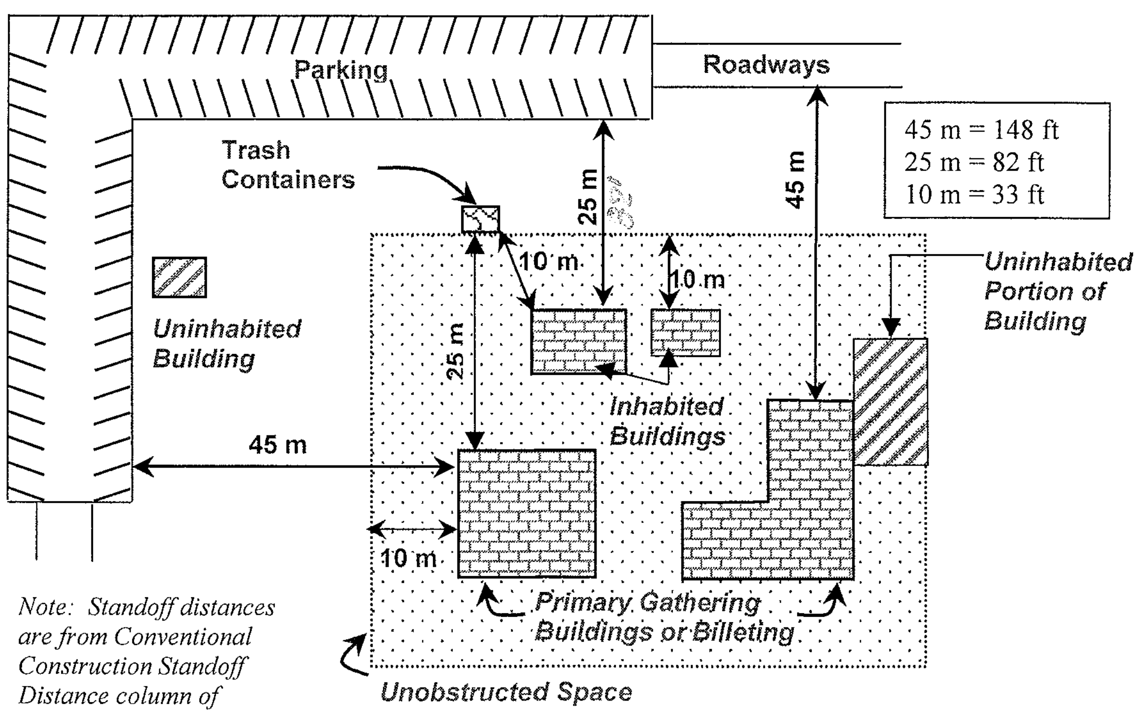


Figure B-2 Standoff Distances and Building Separation – No Controlled Perimeter



Note: Standoff distances are from Conventional Construction Standoff Distance column of Table B-1

Blast resistance design / review

(1) Building has 30 m max. frag...

=> Primary Gathering Building

(2) Building has controlled Perimeter

=> Figure B-1

- 84'0 from parking areas
- 148'0 from Perimeter

=> East & West walls to be hardened

=> glass in wall (see)

by Lower loading dock

=> hardened

JL 2-3?

MORPHY, MAKOFSKY, INC.

#1

<u>wind desig.</u>

Basic wind speed : 130 mph

I = 1.15

Exposure : B

Enclosed bldg. B

G = 0.85

$q_z = 0.00256\, K_z K_{zt} K_d V^2 I$

H = 60 + 17 = 77'

$K_{zt} = 1.0$ $K_d = 0.85$

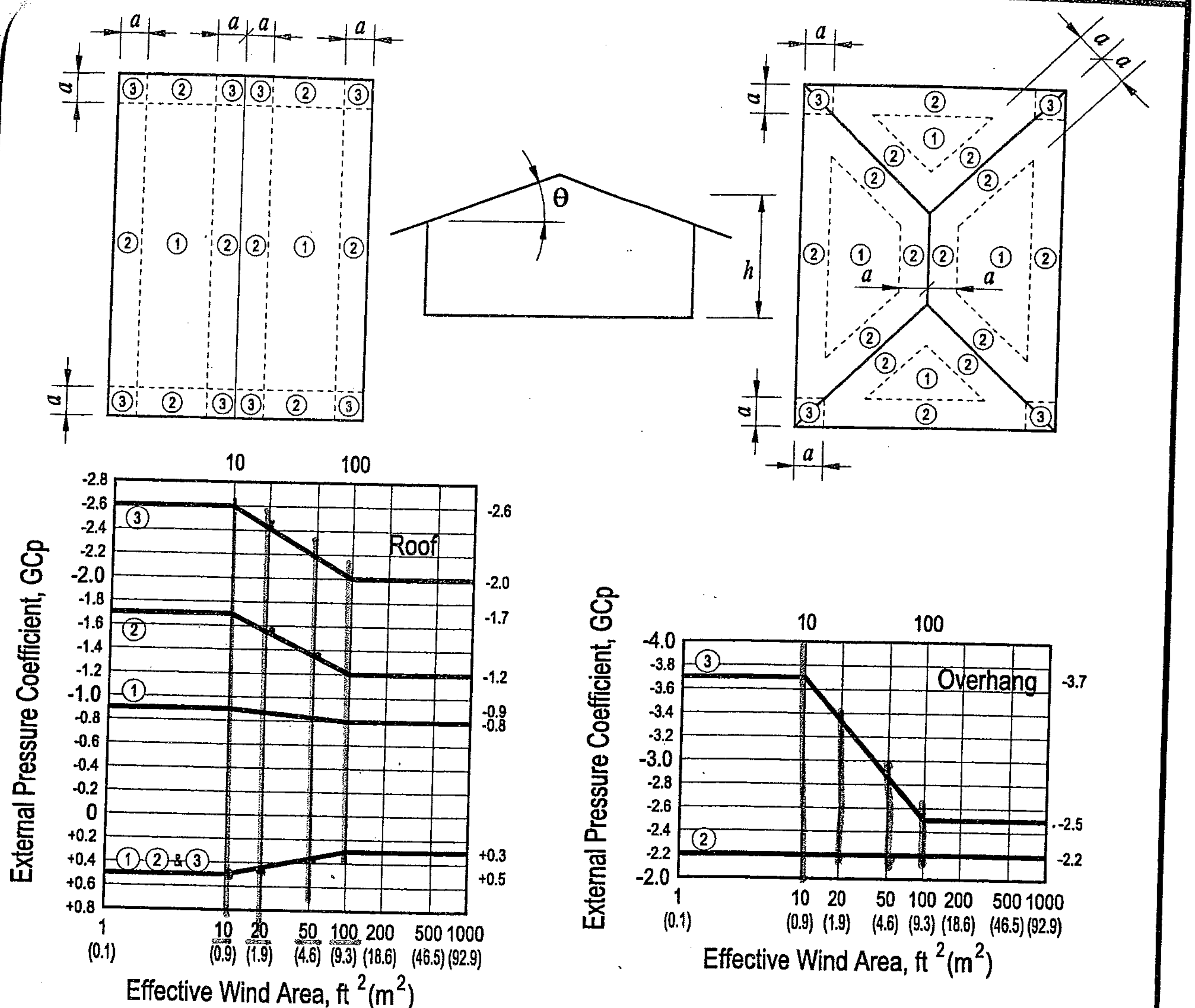
$K_z = 0.91$

$q_z = 0.00256 \times 0.91 \times 1.0 \times 0.85 \times 130^2 \times 1.15$
$= 38.5$ PSF

	JLC	7-06	WI 6

MORPHY, MAKOFSKY, INC.

Components and Cladding – Method 2		h ≤ 60 ft.
Figure 6-11C	External Pressure Coefficients, GC_p	Gable/Hip Roofs 7°< θ ≤ 27°
Enclosed, Partially Enclosed Buildings		



Notes:

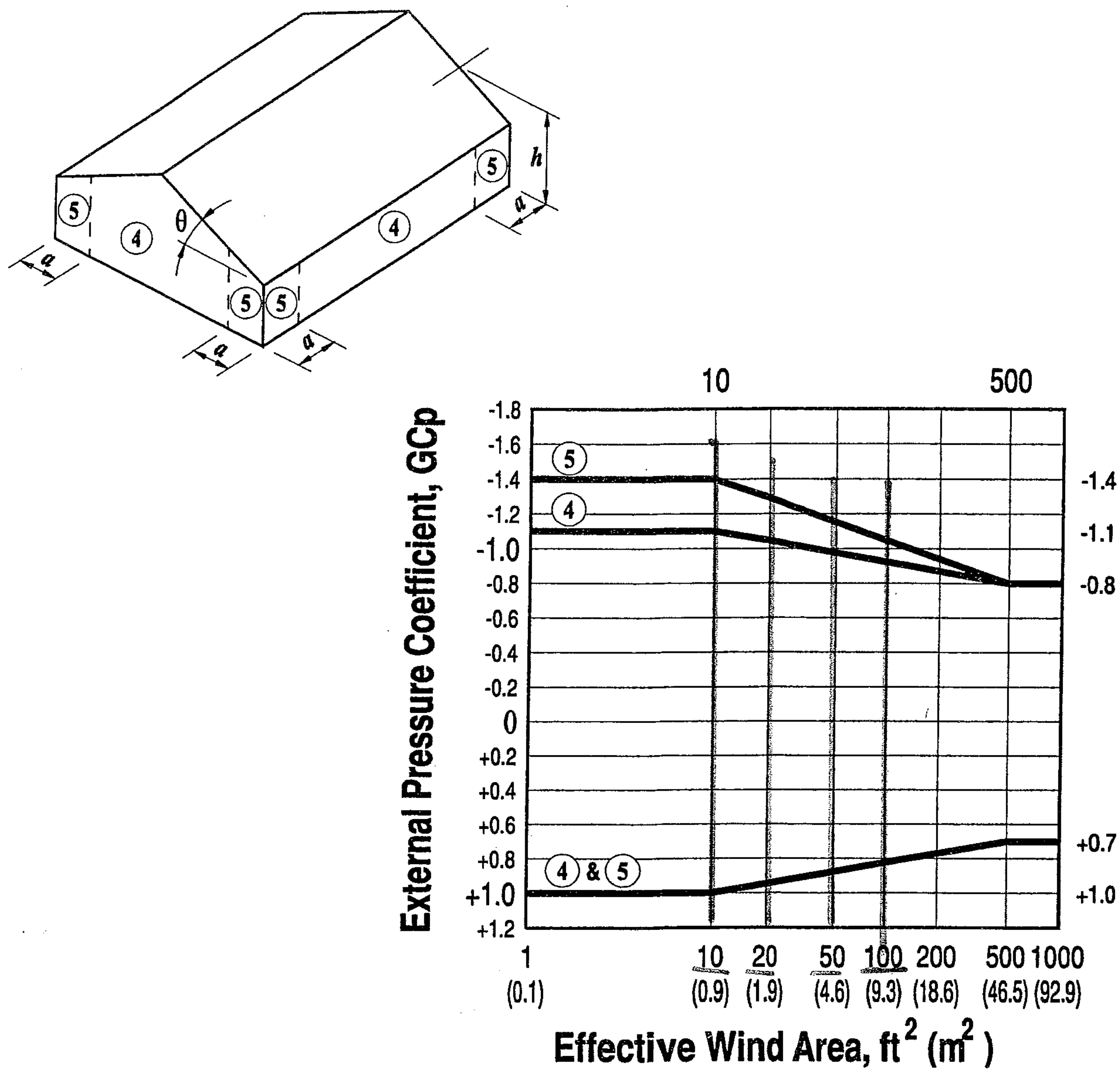
1. Vertical scale denotes GC_p to be used with q_h.
2. Horizontal scale denotes effective wind area, in square feet (square meters).
3. Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
4. Each component shall be designed for maximum positive and negative pressures.
5. Values of GC_p for roof overhangs include pressure contributions from both upper and lower surfaces.
6. For hip roofs with 7° < θ ≤ 27°, edge/ridge strips and pressure coefficients for ridges of gabled roofs shall apply on each hip.
7. For hip roofs with θ ≤ 25°, Zone 3 shall be treated as Zone 2.
8. Notation:

   a: 10 percent of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m).

   h: Mean roof height, in feet (meters), except that eave height shall be used for θ ≤ 10°.

   θ: Angle of plane of roof from horizontal, in degrees.

Components and Cladding – Method 2		h ≤ 60 ft.
Figure 6-11A	**External Pressure Coefficients, GC_{pf}**	**Walls**
Enclosed, Partially Enclosed Buildings		



Notes:

1. Vertical scale denotes GC_p to be used with q_h.
2. Horizontal scale denotes effective wind area, in square feet (square meters).
3. Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
4. Each component shall be designed for maximum positive and negative pressures.
5. Values of GC_p for walls shall be reduced by 10% when $\theta \leq 10°$.
6. Notation:
   - *a*: 10 percent of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m).
   - *h*: Mean roof height, in feet (meters), except that eave height shall be used for $\theta \leq 10°$.
   - θ: Angle of plane of roof from horizontal, in degrees.

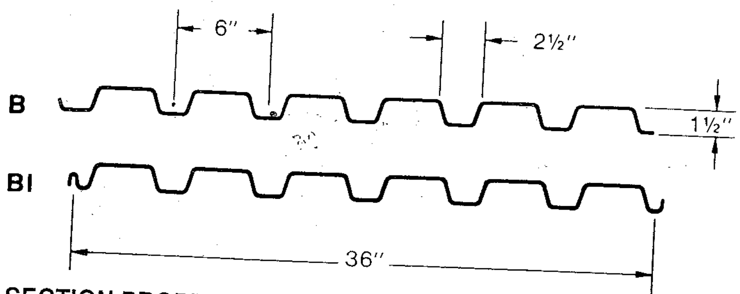
COMPONENT AND CLADDING WIND CALCULATOR

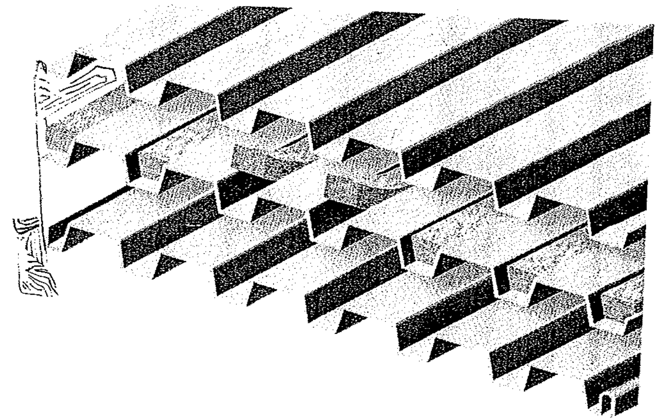
Qz = 38.5
Gcpi = 0.18

	ZONE	1		2		3		4		5	
EWA											
10		26.18	-41.58	26.18	-72.38	26.18	-107.03	45.43	-49.28	45.43	-60.83
20		25.025	-39.655	26.18	-66.605	26.18	-103.18	43.505	-47.355	43.505	-56.98
50		21.175	-38.5	26.18	-58.905	26.18	-91.63	41.58	-45.045	41.58	-51.205
100		18.48	-37.73	26.18	-53.13	26.18	-83.93	38.115	-43.505	38.115	-47.355

1.5 B, BI, BA, BIA

Maximum Sheet Length 42'-0
Extra Charge for Lengths Under 6'-0
Factory Mutual Approved (No. 0C847.AM, 0G1A4.AM, and 3Y1A6.AM) **
ICBO Approved (No.3415)





ROOF

SECTION PROPERTIES

Deck Type	Design Thick.	Weight (PSF) Ptd.	Weight (PSF) Galv.	I in^4/ft	Sp in^3/ft	Sn in^3/ft	Fy KSI
B24	0.0239	1.36	1.46	0.121	0.120	0.131	60
B22	0.0295	1.68	1.78	0.169	0.186	0.192	33
B21	0.0329	1.87	1.97	0.192	0.213	0.221	33
B20	0.0358	2.04	2.14	0.212	0.234	0.247	33
B19	0.0418	2.39	2.49	0.253	0.277	0.289	33
B18	0.0474	2.72	2.82	0.292	0.318	0.327	33
B16	0.0598	3.44	3.54	0.373	0.408	0.411	33

ACOUSTICAL INFORMATION

Deck Type	Absorption Coefficient 125	250	500	1000	2000	4000	Noise Reduction Coefficient*
1.5BA, 1.5BIA	.11	.20	.63	1.04	.66	.36	.65

* Source: Riverbank Acoustical Laboratories — RAL™ A94–185. Test was conducted with 1.5 inches of 1.65 pcf fiberglass insulation on 3 inch EPS Plaza deck for the SDI.

Type B (wide rib) deck provides excellent structural load carrying capacity per pound of steel utilized, and its nestable design eliminates the need for die-set ends.

1" or more rigid insulation is required for Type B deck.

Acoustical deck (Type BA, BIA) is particularly suitable in structures such as auditoriums, schools, and theatres where sound control is desirable. Acoustic perforations are located in the vertical webs where the load carrying properties are negligibly affected (less than 5%).

Inert, non-organic glass fiber sound absorbing batts are placed in the rib openings to absorb up to 65% of the sound striking the deck.

Batts are field installed and may require separation.

VERTICAL LOADS FOR TYPE 1.5B

Allowable Total (Dead + Live) Uniform Load (PSF) — Span (ft.-in.) C. to C. of Support

No. of Spans	Deck Type	Max. SDI Const. Span	5'-0	5'-6	6'-0	6'-6	7'-0	7'-6	8'-0	8'-6	9'-0	9'-6	10'-0
1	B 24	4'-8	66	52	42	36	30	27	24	21	20		
	B 22	5'-7	91	71	57	47	40	34	30	27	24	22	20
	B 21	6'-0	104	81	64	53	44	38	33	29	26	24	22
	B 20	6'-5	115	89	71	58	48	41	36	31	28	25	23
	B 19	7'-1	139	107	85	69	57	48	41	36	32	29	26
	B 18	7'-8	162	124	98	79	65	55	47	41	36	32	29
	B 16	8'-8	206	157	123	99	81	68	58	50	44	39	34
2	B 24	5'-10	126	104	87	74	64	55	47	41	36	32	29
	B 22	6'-11	102	85	71	61	52	46	40	35	32	28	26
	B 21	7'-4	118	97	82	70	60	52	46	41	36	33	29
	B 20	7'-9	132	109	91	78	67	59	51	46	41	36	33
	B 19	8'-5	154	127	107	91	79	69	60	53	48	43	39
	B 18	9'-1	174	144	121	103	89	78	68	60	54	48	44
	B 16	10'-3	219	181	152	130	112	97	86	76	68	61	55
3	B 24	5'-10	130	100	79	65	54	45	39	34	31	27	25
	B 22	6'-11	128	106	89	76	65	57	50	44	39	34	31
	B 21	7'-4	147	122	102	87	75	65	56	49	42	38	34
	B 20	7'-9	165	136	114	97	84	72	61	53	46	41	36
	B 19	8'-5	193	159	134	114	98	84	71	61	53	47	41
	B 18	9'-1	218	180	151	129	111	96	81	69	60	52	46
	B 16	10'-3	274	226	190	162	140	119	100	85	73	64	56

Notes:
1. Load tables are calculated using sectional properties based on the steel design thickness shown in the Steel Deck Institute (SDI) Design Manual.
2. Loads shown in the shaded areas are governed by the live load deflection not in excess of 1/240 of the span. A dead load of 10 PSF has been included.
3. ** Acoustical Deck is not covered under Factory Mutual

Main Wind Force Resisting System – Method 2		All Heights
Figure 6-6 (con't)	External Pressure Coefficients, C_p	Walls & Roofs
Enclosed, Partially Enclosed Buildings		

Wall Pressure Coefficients, C_p			
Surface	L/B	C_p	Use With
Windward Wall	All values	0.8	q_z
Leeward Wall	0-1	-0.5	q_h
	2	-0.3	
	≥4	-0.2	
Side Wall	All values	-0.7	q_h

Roof Pressure Coefficients, C_p, for use with q_h

Wind Direction	Windward									Leeward		
	Angle, θ (degrees)									Angle, θ (degrees)		
	h/L	10	15	20	25	30	35	45	≥60#	10	15	≥20
Normal to ridge for θ ≥ 10°	≤0.25	-0.7 -0.18	-0.5 0.0*	-0.3 0.2	-0.2 0.3	-0.2 0.3	0.0* 0.4	0.4	0.01 θ	-0.3	-0.5	-0.6
	0.5	-0.9 -0.18	-0.7 -0.18	-0.4 0.0*	-0.3 0.2	-0.2 0.2	-0.2 0.3	0.0* 0.4	0.01 θ	-0.5	-0.5	-0.6
	≥1.0	-1.3** -0.18	-1.0 -0.18	-0.7 -0.18	-0.5 0.0*	-0.3 0.2	-0.2 0.2	0.0* 0.3	0.01 θ	-0.7	-0.6	-0.6

Wind Direction	h/L	Horiz distance from windward edge	C_p
Normal to ridge for θ < 10 and Parallel to ridge for all θ	≤ 0.5	0 to h/2	-0.9, -0.18
		H/2 to h	-0.9, -0.18
		h to 2 h	-0.5, -0.18
		> 2h	-0.3, -0.18
	≥ 1.0	0 to h/2	-1.3**, -0.18
		> h/2	-0.7, -0.18

*Value is provided for interpolation purposes.

**Value can be reduced linearly with area over which it is applicable as follows

Area (sq ft)	Reduction Factor
≤ 100 (9.3 sq m)	1.0
200 (23.2 sq m)	0.9
≥ 1000 (92.9 sq m)	0.8

Notes:

1. Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
2. Linear interpolation is permitted for values of *L/B*, *h/L* and θ other than shown. Interpolation shall only be carried out between values of the same sign. Where no value of the same sign is given, assume 0.0 for interpolation purposes.
3. Where two values of C_p are listed, this indicates that the windward roof slope is subjected to either positive or negative pressures and the roof structure shall be designed for both conditions. Interpolation for intermediate ratios of h/L in this case shall only be carried out between C_p values of like sign.
4. For monoslope roofs, entire roof surface is either a windward or leeward surface.
5. For flexible buildings use appropriate G_f as determined by Section 6.5.8.
6. Refer to Figure 6-7 for domes and Figure 6-8 for arched roofs.
7. Notation:
   B: Horizontal dimension of building, in feet (meter), measured normal to wind direction.
   L: Horizontal dimension of building, in feet (meter), measured parallel to wind direction.
   h: Mean roof height in feet (meters), except that eave height shall be used for θ ≤ 10 degrees.
   z: Height above ground, in feet (meters).
   G: Gust effect factor.
   q_z, q_h: Velocity pressure, in pounds per square foot (N/m^2), evaluated at respective height.
   θ: Angle of plane of roof from horizontal, in degrees.
8. For mansard roofs, the top horizontal surface and leeward inclined surface shall be treated as leeward surfaces from the table.
9. Except for MWFRS's at the roof consisting of moment resisting frames, the total horizontal shear shall not be less than that determined by neglecting wind forces on roof surfaces.

#For roof slopes greater than 80°, use C_p = 0.8

Main Wind

P = q G Cp - qh G Cp - [illegible]

Roof θ = 18.4°

G = 0.85 qh = 38.5 psf Case 2 L/B = 2.8

NORTH - SOUTH DIRECTION

LEVEL	WINDWARD H	Kh	qh	G	Cp	qhGCp	LEEWARD qz	G	Cp	qhGCp	P
1-2 16.67	20.67	0.67	[illegible]	0.85	0.8	17.8	38.5	0.85	-.28	-9.2	27
2-3 14.67	35.33	.73	30.9	"	.8	21	"	"	-.28	-9.2	30.2
3-4 14.67	50	0.81	[illegible]	"	.8	23.3	"		[illegible]	-9.2	32.5
4-ATTIC	64.67	0.87	36.8	0.85	.8	25.0	"		-.28	-9.2	34.2

PSF

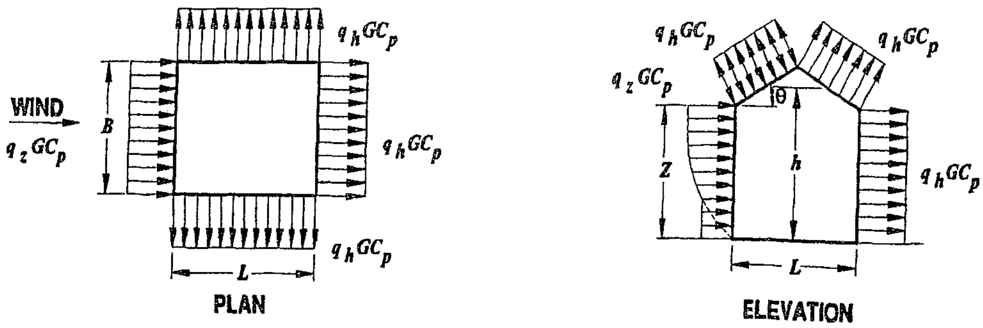
EAST-WEST DIRECTION L/B = 0.4

LEVEL	WINDWARD H	KH	qH	G	Cp	qhGCp	LEEWARD qz	G	Cp	qzGCp	P
1-2	20.67	0.62	26.2	0.85	0.8	17.8	38.5	0.85	-0.5	-16.4	34.2
2-3	35.33	0.73	30.9	"	"	21	"	"	"	"	37.4
3-4	50	0.81	[illegible]	"	"	23.3	"	"	"	"	[illegible]
4-Attic	64.67	0.87	[illegible]	"	0.8	25.0	38.5	0.85	-0.5	"	41.4

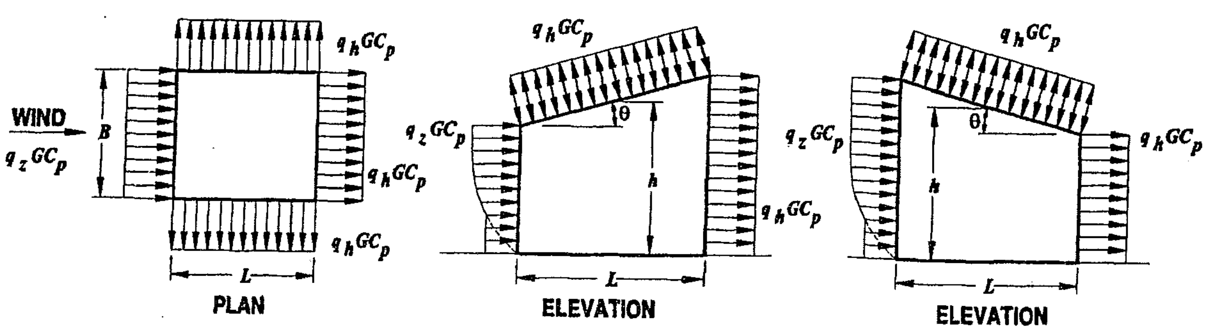
M.C	3-15-05	14

MORPHY, MAKOFSKY, INC.

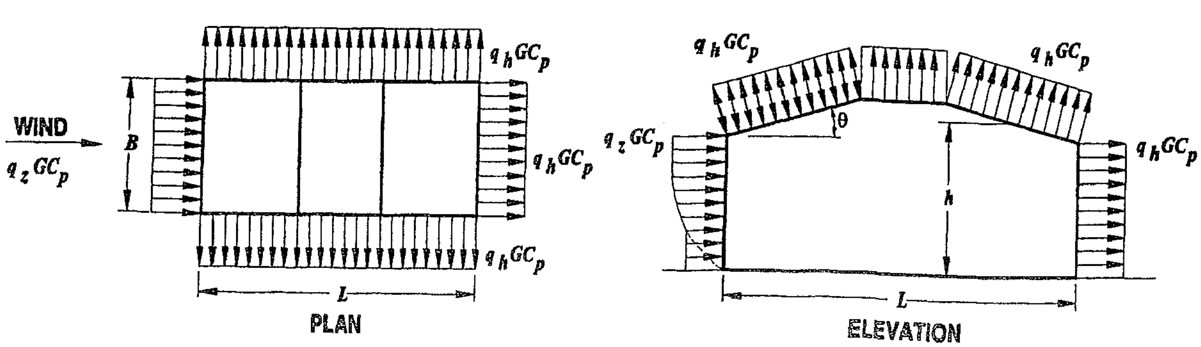
Main Wind Force Resisting System – Method 2		All Heights
Figure 6-6	External Pressure Coefficients, C_p	Walls & Roofs
Enclosed, Partially Enclosed Buildings		



GABLE, HIP ROOF



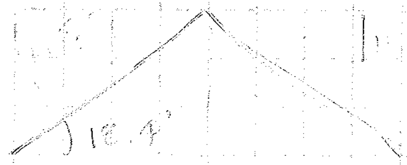
MONOSLOPE ROOF (NOTE 4)



MANSARD ROOF (NOTE 8)

Roof M.W.
N-S

W/L [illegible]



Wind. Lee.

θ = 38.

Cp = -0.5   Cp = -0.56

P = 0.46 [illegible] = 15.1 [illegible]

DIAPHRAGM TO DISTRIBUTE LOAD EQUALLY TO BD. FRAMES.

	JLS	3-16-0[illegible]	14

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 33'-0 span.

Member Size	-	w18x35
Length	(ft)	33.00
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	

2. Loading List

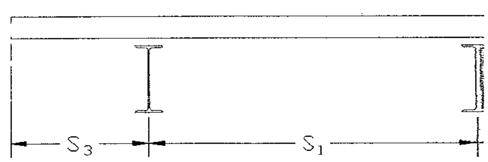
Construction Loads		
Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	

Composite Loads		
Finish	(psf)	0.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	150.0

3. Beam Spacing

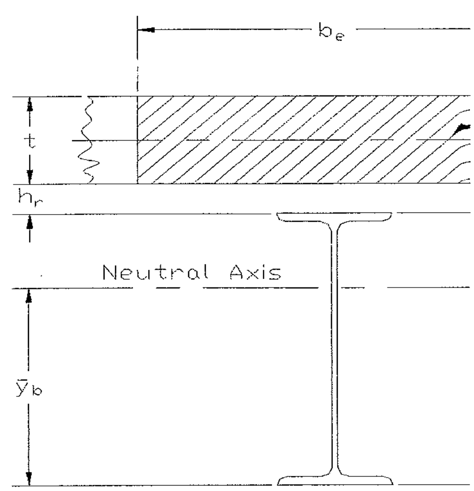
Beam Spacing - S_1	(ft)	6.23
Beam Spacing - S_2	(ft)	6.23
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)		(ASD)
Load./ Connector	(k)		(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)
Neutral Axis ($y_{\sim b}$)	(in)
Moment of Inertia	(in^4)

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 33'-0 span Beam heavy load area

Member Size	-	w18x35
Length	(ft)	33.00
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	

2. Loading List

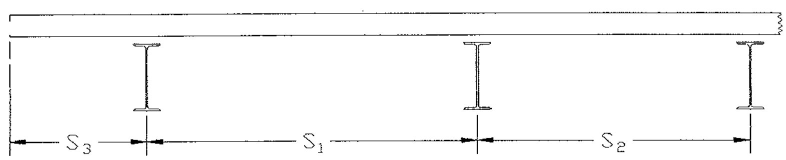
Construction Loads		
Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	

Composite Loads		
Finish	(psf)	0.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	150.0

3. Beam Spacing

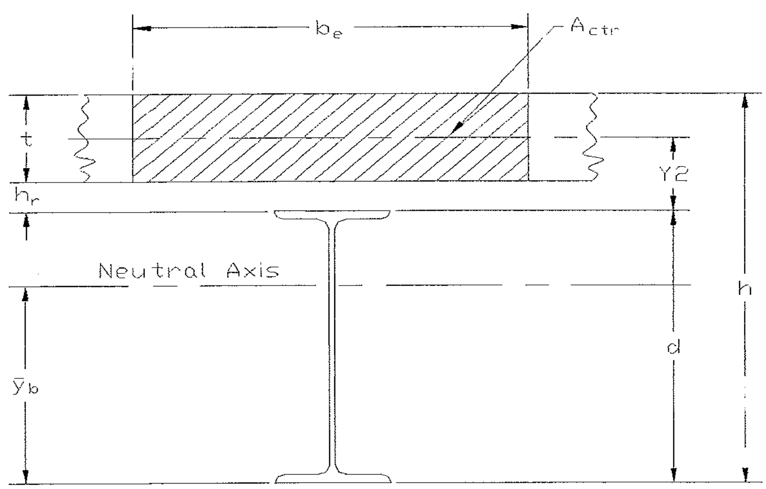
Beam Spacing - S_1	(ft)	6.23
Beam Spacing - S_2	(ft)	6.23
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)		(ASD)
Load / Connector	(k)		(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)	
Neutral Axis ($\bar{y}_b$)	(in)	
Moment of Inertia	(in^4)	

Fully Composite Beam Calculator

Location:

6. Bending Calculations (ASD Method)

Construction Loading

Load	(klf)			
Moment	(ft-k)			
Stress in Steel	(ksi)		<	ok
Deflection	(in)		1/	

Composite Loading

Load	(klf)			
Moment	(ft-k)			
Stress in Steel	(ksi)		<	ok
Stress in Concrete	(ksi)		<	ok
Deflection	(in)		1/	
DL Deflection	(in)		1/	
LL Deflection	(in)		1/	
Total Deflection	(in)		1/	

7. Shear Calculations (ASD Method)

Composite Loading

Shear	(k)			
Shear Stress in Steel	(ksi)		<	ok

8. Shear Studs (ASD Method)

Total Shear	(k)		*(steel governs)*	
Reduction Factor	-			
Maximum Diameter	(in)			ok
Studs Required	-			

9. Bending Calculations (LRFD Method)

Construction Loading

Developed Load	(klf)			
Developed Moment	(ft-k)			
Allowable Moment	(ft-k)		>	ok

Construction & Composite Loading

Developed Load	(klf)			
Developed Moment	(ft-k)			
Allowable Moment	(ft-k)		>	ok
Plastic Neutral Axis	(in)			

Note: The PNA is taken from the top of concrete.

10. Shear Calculations (LRFD Method)

Composite Loading

Developed Shear	(k)		
Allowable Shear	(ksi)		ok

11. Shear Studs (LRFD Method)

Studs Required	-	

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 22'-0 span

Member Size	-	W12x16
Length	(ft)	22.00
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	

2. Loading List

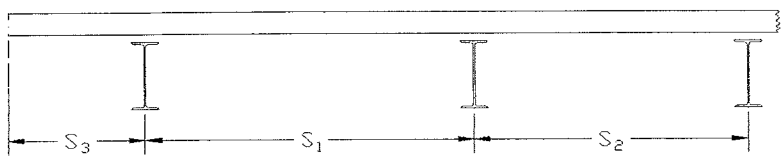
Construction Loads		
Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	

Composite Loads		
Finish	(psf)	0.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	50.0

3. Beam Spacing

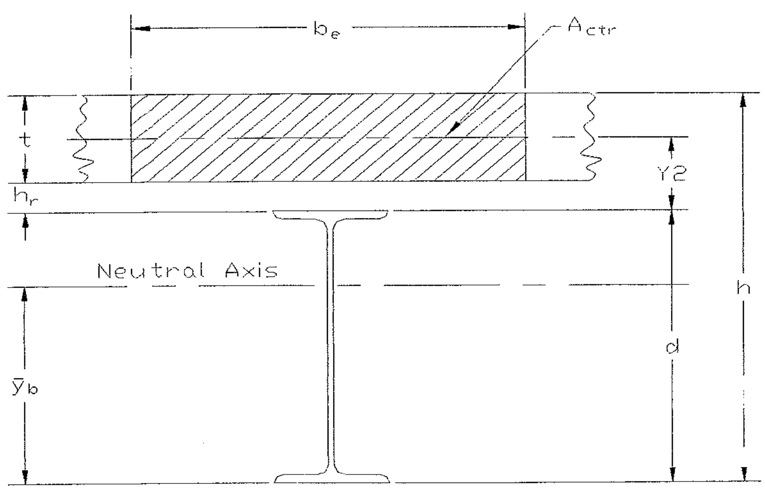
Beam Spacing - S_1	(ft)	6.67
Beam Spacing - S_2	(ft)	6.67
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)		(ASD)
Load / Connector	(k)		(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)	
Neutral Axis ($y_{\sim b}$)	(in)	
Moment of Inertia	(in^4)	

Fully Composite Beam Calculator

Location:

6. Bending Calculations (ASD Method)

Construction Loading

Load	(klf)			
Moment	(ft-k)			
Stress in Steel	(ksi)	<		ok
Deflection	(in)	1/		

Composite Loading

Load	(klf)			
Moment	(ft-k)			
Stress in Steel	(ksi)	<		ok
Stress in Concrete	(ksi)	<		ok
Deflection	(in)	1/		
DL Deflection	(in)	1/		
LL Deflection	(in)	1/		
Total Deflection	(in)	1/		

7. Shear Calculations (ASD Method)

Composite Loading

Shear	(k)			
Shear Stress in Steel	(ksi)	<		ok

8. Shear Studs (ASD Method)

Total Shear	(k)	*(steel governs)*	
Reduction Factor	-		
Maximum Diameter	(in)		no good
Studs Required	-		

9. Bending Calculations (LRFD Method)

Construction Loading

Developed Load	(klf)			
Developed Moment	(ft-k)			
Allowable Moment	(ft-k)	>		ok

Construction & Composite Loading

Developed Load	(klf)			
Developed Moment	(ft-k)			
Allowable Moment	(ft-k)	>		ok
Plastic Neutral Axis	(in)			

Note: The PNA is taken from the top of concrete.

10. Shear Calculations (LRFD Method)

Composite Loading

Developed Shear	(k)	
Allowable Shear	(ksi)	ok

11. Shear Studs (LRFD Method)

Studs Required -

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 39'-8 span

Member Size	-	w21x44
Length	(ft)	49.67
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	

2. Loading List

Construction Loads

Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	

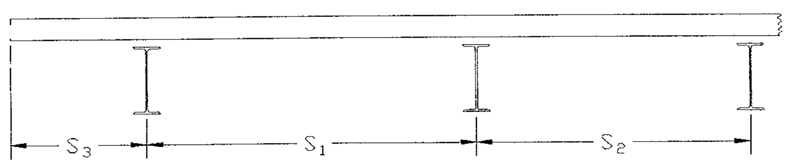
Composite Loads

Finish	(psf)	0.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	50.0

3. Beam Spacing

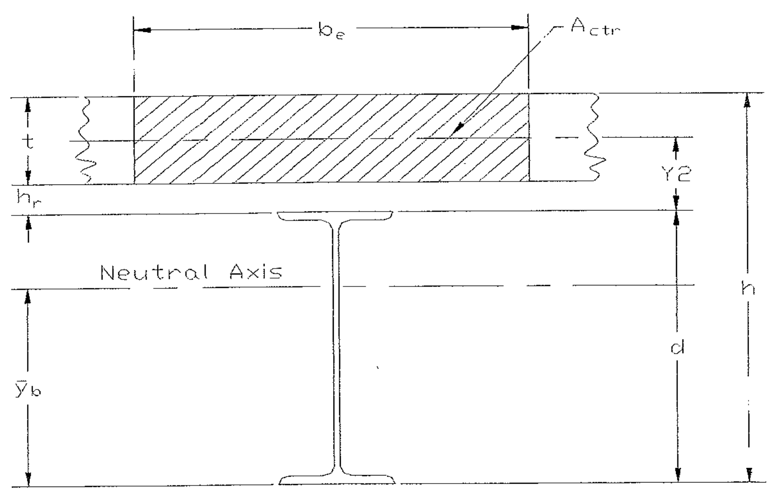
Beam Spacing - S_1	(ft)	6.67
Beam Spacing - S_2	(ft)	6.67
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)		(ASD)
Load / Connector	(k)		(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)	
Neutral Axis ($\tilde{y}_b$)	(in)	
Moment of Inertia	(in^4)	

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 27'-0 span

Member Size	-	w14x22
Length	(ft)	27.00
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	

2. Loading List

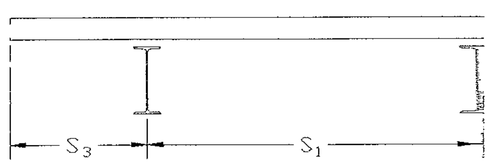
Construction Loads		
Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	

Composite Loads		
Finish	(psf)	10.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	50.0

3. Beam Spacing

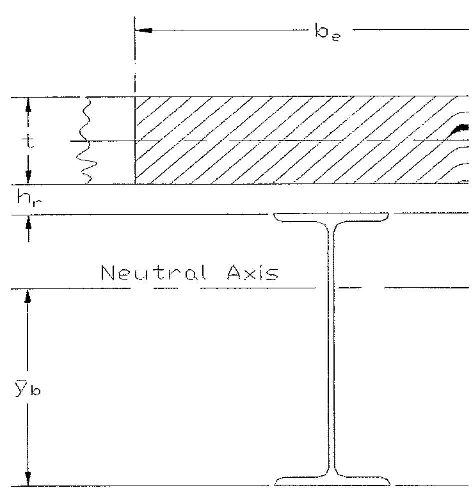
Beam Spacing - S_1	(ft)	6.67
Beam Spacing - S_2	(ft)	6.67
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)		(ASD)
Load / Connector	(k)		(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)
Neutral Axis ($y\sim_b$)	(in)
Moment of Inertia	(in^4)

Fully Composite Beam Calculator

Location:

6. Bending Calculations (ASD Method)

Construction Loading

Load	(klf)			
Moment	(ft-k)			
Stress in Steel	(ksi)		<	ok
Deflection	(in)		1/	

Composite Loading

Load	(klf)			
Moment	(ft-k)			
Stress in Steel	(ksi)		<	ok
Stress in Concrete	(ksi)		<	ok
Deflection	(in)		1/	
DL Deflection	(in)		1/	
LL Deflection	(in)		1/	
Total Deflection	(in)		1/	

7. Shear Calculations (ASD Method)

Composite Loading

Shear	(k)			
Shear Stress in Steel	(ksi)		<	ok

8. Shear Studs (ASD Method)

Total Shear	(k)		*(steel governs)*
Reduction Factor	-		
Maximum Diameter	(in)		ok
Studs Required	-		

9. Bending Calculations (LRFD Method)

Construction Loading

Developed Load	(klf)			
Developed Moment	(ft-k)			
Allowable Moment	(ft-k)		>	ok

Construction & Composite Loading

Developed Load	(klf)			
Developed Moment	(ft-k)			
Allowable Moment	(ft-k)		>	ok
Plastic Neutral Axis	(in)			

Note: The PNA is taken from the top of concrete.

10. Shear Calculations (LRFD Method)

Composite Loading

Developed Shear	(k)		
Allowable Shear	(ksi)		ok

11. Shear Studs (LRFD Method)

Studs Required	-

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 27'-0 span

Member Size	-	w14x22
Length	(ft)	27.00
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	

2. Loading List

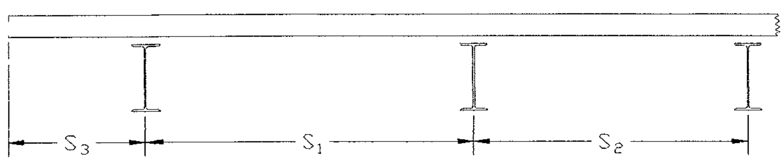
Construction Loads		
Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	[illegible]

Composite Loads		
Finish	(psf)	10.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	50.0

3. Beam Spacing

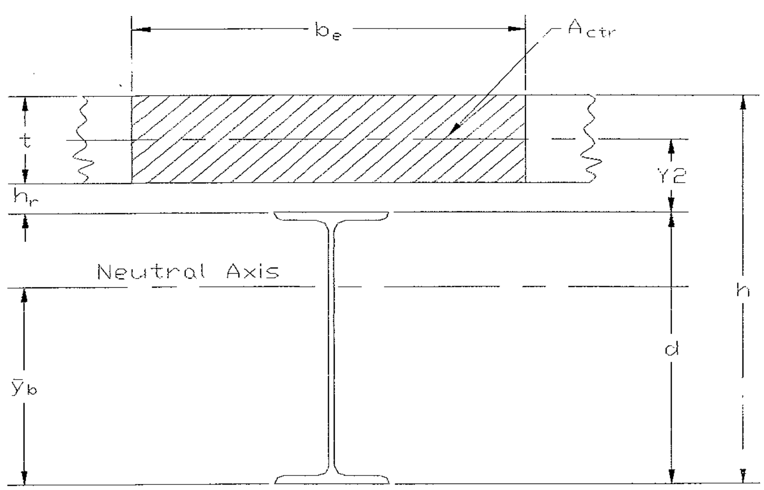
Beam Spacing - S_1	(ft)	6.67
Beam Spacing - S_2	(ft)	6.67
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	[illegible]

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)		(ASD)
Load / Connector	(k)		(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)	
Neutral Axis ($y_{\sim b}$)	(in)	
Moment of Inertia	(in^4)	

Fully Composite Beam Calculator

Location:

6. Bending Calculations (ASD Method)

Construction Loading

Load	(klf)			
Moment	(ft-k)			
Stress in Steel	(ksi)		<	ok
Deflection	(in)		1/	

Composite Loading

Load	(klf)
Moment	(ft-k)
Stress in Steel	(ksi)
Stress in Concrete	(ksi)
Deflection	(in)
DL Deflection	(in)
LL Deflection	(in)
Total Deflection	(in)

7. Shear Calculations (ASD Method)

Composite Loading

Shear	(k)			
Shear Stress in Steel	(ksi)		<	ok

8. Shear Studs (ASD Method)

Total Shear	(k)		*(steel governs)*
Reduction Factor	-		
Maximum Diameter	(in)		ok
Studs Required	-		

9. Bending Calculations (LRFD Method)

Construction Loading

Developed Load	(klf)			
Developed Moment	(ft-k)			
Allowable Moment	(ft-k)		>	ok

Construction & Composite Loading

Developed Load	(klf)
Developed Moment	(ft-k)
Allowable Moment	(ft-k)
Plastic Neutral Axis	(in)

Note: The PNA is taken from the top of concrete.

10. Shear Calculations (LRFD Method)

Composite Loading

Developed Shear	(k)		
Allowable Shear	(ksi)		ok

11. Shear Studs (LRFD Method)

Studs Required -

Fully Composite Beam Calculator

Location:

6. Bending Calculations (ASD Method)

Construction Loading

Load	(klf)				
Moment	(ft-k)				
Stress in Steel	(ksi)		<		ok
Deflection	(in)		1/		

Composite Loading

Load	(klf)				
Moment	(ft-k)				
Stress in Steel	(ksi)		<		ok
Stress in Concrete	(ksi)		<		ok
Deflection	(in)		1/		
DL Deflection	(in)		1/		
LL Deflection	(in)		1/		
Total Deflection	(in)		1/		

7. Shear Calculations (ASD Method)

Composite Loading

Shear	(k)				
Shear Stress in Steel	(ksi)		<		ok

8. Shear Studs (ASD Method)

Total Shear	(k)		*(steel governs)*	
Reduction Factor	-			
Maximum Diameter	(in)			ok
Studs Required	-			

9. Bending Calculations (LRFD Method)

Construction Loading

Developed Load	(klf)				
Developed Moment	(ft-k)				
Allowable Moment	(ft-k)		>		ok

Construction & Composite Loading

Developed Load	(klf)				
Developed Moment	(ft-k)				
Allowable Moment	(ft-k)		>		ok
Plastic Neutral Axis	(in)				

Note: The PNA is taken from the top of concrete.

10. Shear Calculations (LRFD Method)

Composite Loading

Developed Shear	(k)		
Allowable Shear	(ksi)		ok

11. Shear Studs (LRFD Method)

Studs Required	-	

Partially Composite Beam Calculator

Location:

[illegible] - 10 *

Moment of Inertia (in^4)

12. Bending Calculations (ASD Method)

Construction Loading				
Load	(klf)			
Moment	(ft-k)			
Stress in Steel	(ksi)	<		ok
Deflection	(in)	1/		

Partially Composite Loading				
Load	(klf)			
Moment	(ft-k)			
Stress in Steel	(ksi)	<		ok
Stress in Concrete	(ksi)	<		ok
Deflection	(in)	1/		
DL Deflection	(in)	1/		
LL Deflection	(in)	1/		
Total Deflection	(in)	1/		

13. Shear Calculations (ASD Method)

Composite Loading				
Shear	(k)			
Shear Stress in Steel	(ksi)	<		ok

9. Bending Calculations (LRFD Method)

Construction Loading				
Developed Load	(klf)			
Developed Moment	(ft-k)			
Allowable Moment	(ft-k)	>		ok

Construction & Composite Loading				
Developed Load	(klf)			
Developed Moment	(ft-k)			
Allowable Moment	(ft-k)	>		ok
Plastic Neutral Axis	(in)			

Note: The PNA is taken from the top of concrete.

10. Shear Calculations (LRFD Method)

Composite Loading			
Developed Shear	(k)		
Allowable Shear	(ksi)		ok

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 48'-0 span Beam OVER CLASS ROOI

Member Size	-	W24X62
Length	(ft)	48.00
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	

2. Loading List

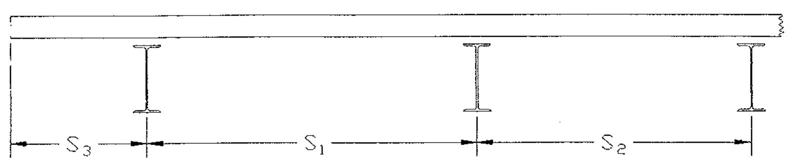
Construction Loads		
Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	

Composite Loads		
Finish	(psf)	0.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	50.0

3. Beam Spacing

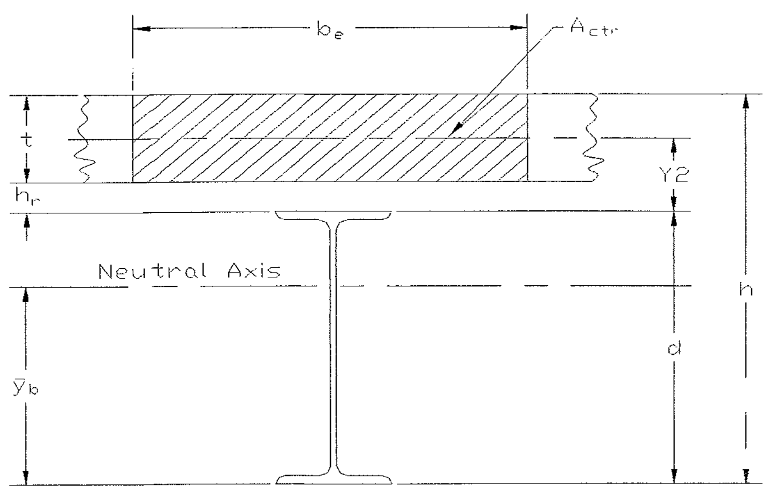
Beam Spacing - S_1	(ft)	6.67
Beam Spacing - S_2	(ft)	6.67
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)		(ASD)
Load / Connector	(k)		(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)	
Neutral Axis ($y_{\sim b}$)	(in)	
Moment of Inertia	(in^4)	

Fully Composite Beam Calculator

Location:

6. Bending Calculations (ASD Method)

Construction Loading

Load	(klf)			
Moment	(ft-k)			
Stress in Steel	(ksi)		<	ok
Deflection	(in)		1/	

Composite Loading

Load	(klf)			
Moment	(ft-k)			
Stress in Steel	(ksi)		<	ok
Stress in Concrete	(ksi)		<	ok
Deflection	(in)		1/	
DL Deflection	(in)		1/	
LL Deflection	(in)		1/	
Total Deflection	(in)		1/	

7. Shear Calculations (ASD Method)

Composite Loading

Shear	(k)			
Shear Stress in Steel	(ksi)		<	ok

8. Shear Studs (ASD Method)

Total Shear	(k)		*(concrete governs)*	
Reduction Factor	-			
Maximum Diameter	(in)			ok
Studs Required	-			

9. Bending Calculations (LRFD Method)

Construction Loading

Developed Load	(klf)			
Developed Moment	(ft-k)			
Allowable Moment	(ft-k)		>	ok

Construction & Composite Loading

Developed Load	(klf)			
Developed Moment	(ft-k)			
Allowable Moment	(ft-k)		>	ok
Plastic Neutral Axis	(in)			

Note: The PNA is taken from the top of the steel flange down.

10. Shear Calculations (LRFD Method)

Composite Loading

Developed Shear	(k)		
Allowable Shear	(ksi)		ok

11. Shear Studs (LRFD Method)

Studs Required	-	

All. ... room ... bea.

... I 49'-8 ... W21x44

II 27'

27'-0 W16x26

... beam

... 70 + 0.5 x 50 = 95 PSF

x 6.67 = 634 PLF

R = 56[k]

M = 51[k-ft]

B ...

... 18

... @ ...

MORPHY, MAKOFSKY, INC.

f. Mezzanine Floor

Total thickness 5"

HW	1.25" [illegible]		52
Deck			[illegible]
CLG			5
PART.			20
SIL			5
DL.			85
LL.		→ office	50
TL.			135 PSF

Other live loads

Loading area 75

Mech. space 125 [illegible] 50 PSF

storage

Vault:

JLS 1/06 31

421-2798

Typical floors

4½" LWC TYP 38
DECK (1½") 2
STEEL 5
CLG 5
PARTITIONS 20

DL 70
LL 50 @ office

TL 120 PSF

Typ bm. spacing 6'-8" o.c.

over classrooms span = 50'-0"

SPAN 1 : 22'-8"
2 : 27'-0"
3 : 20'-0"
4 : 27'-8"

[illegible]

JACKSON BARRACKS
MT [illegible]

JL

MORPHY, MAKOFSKY, INC.

Fully Composite Beam Calculator

OFFICE

1. General Information

Location: 2nd Floor 25'-8 span Beam ~~heavy load~~ area

Member Size	-	w14x22
Length	(ft)	25.67
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	11

2. Loading List

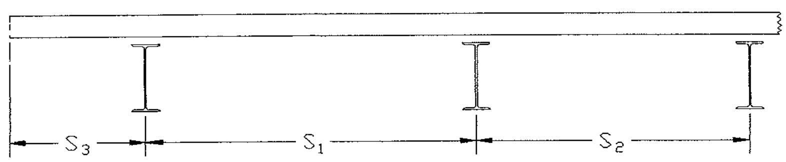
Construction Loads		
Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	22

Composite Loads		
Finish	(psf)	0.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	50.0

3. Beam Spacing

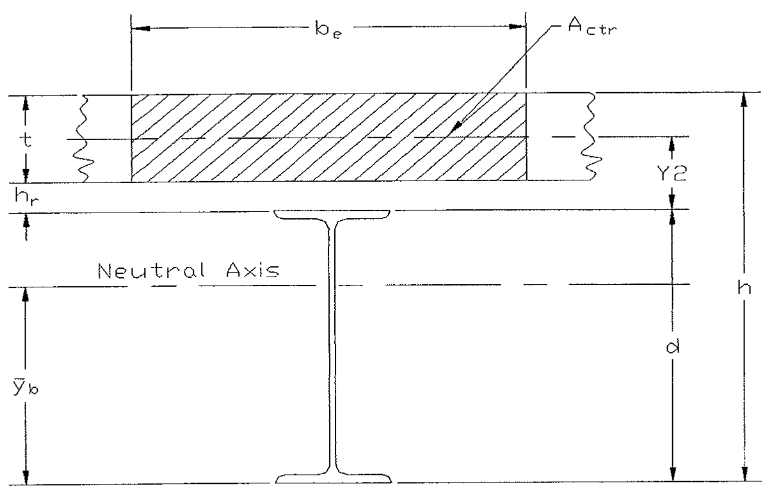
Beam Spacing - S_1	(ft)	6.23
Beam Spacing - S_2	(ft)	6.23
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	6.23

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)	11.4	(ASD)
Load / Connector	(k)	21.9	(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)	74.76
Neutral Axis ($y_{\sim b}$)	(in)	14.60
Moment of Inertia	(in^4)	720

29

Fully Composite Beam Calculator

w14x22

Location: [OFFICE.] 2nd Floor 25'-8 span Beam [illegible] area

6. Bending Calculations (ASD Method)

Construction Loading

Load	(klf)	0.27			
Moment	(ft-k)	22.5			
Stress in Steel	(ksi)	9.3	<	33.0	ok
Deflection	(in)	0.46	l/	665.8	

Composite Loading

Load	(klf)	0.47			
Moment	(ft-k)	38.5			
Stress in Steel	(ksi)	18.7	<	45	ok
Stress in Concrete	(ksi)	0.23	<	1.8	ok
Deflection	(in)	0.22	l/	1408	
DL Deflection	(in)	0.07	l/	4224	
LL Deflection	(in)	0.15	l/	2112	
Total Deflection	(in)	0.68	l/	452	

7. Shear Calculations (ASD Method)

Composite Loading

Shear	(k)	9.5			
Shear Stress in Steel	(ksi)	3.0	<	20	ok

8. Shear Studs (ASD Method)

Total Shear	(k)	162.25	*(steel governs)*		
Reduction Factor	-	1.00			
Maximum Diameter	(in)	0.8375	>	0.75	ok
Studs Required	-	15	studs each side of max. moment		

9. Bending Calculations (LRFD Method)

Construction Loading

Developed Load	(klf)	0.33			
Developed Moment	(ft-k)	27.0			
Allowable Moment	(ft-k)	124.5	>	27.0	ok

Construction & Composite Loading

Developed Load	(klf)	1.01			
Developed Moment	(ft-k)	83.1			
Allowable Moment	(ft-k)	252.4	>	83.1	ok
Plastic Neutral Axis	(in)	1.28			

Note: The PNA is taken from the top of concrete.

10. Shear Calculations (LRFD Method)

Composite Loading

Developed Shear	(k)	12.9			
Allowable Shear	(ksi)	85.3	>	12.9	ok

11. Shear Studs (LRFD Method)

Studs Required	-	15	studs each side of max. moment

30

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 25'-8 span Beam heavy load area

Member Size	-	w16x31
Length	(ft)	25.67
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	11

2. Loading List

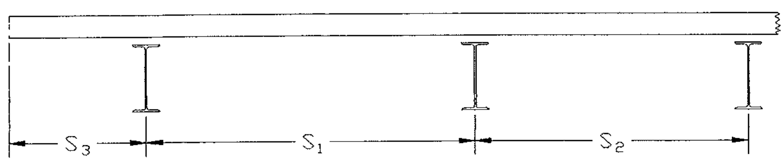
Construction Loads		
Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	31

Composite Loads		
Finish	(psf)	0.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	150.0

3. Beam Spacing

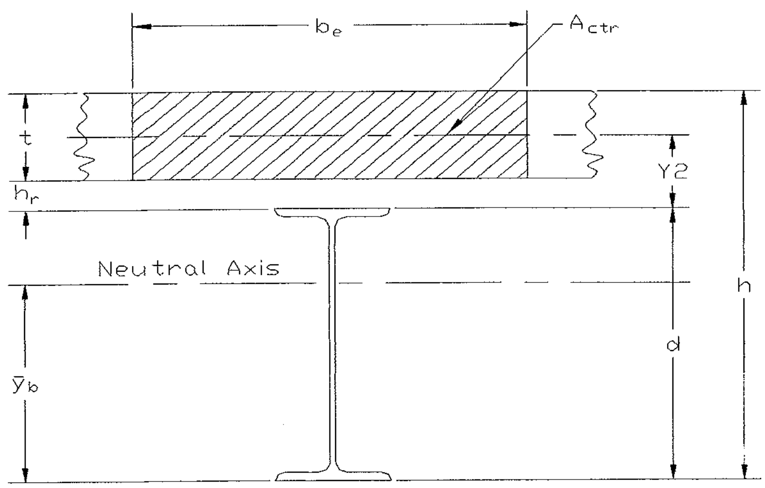
Beam Spacing - S_1	(ft)	6.23
Beam Spacing - S_2	(ft)	6.23
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	6.23

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)	11.4	(ASD)
Load / Connector	(k)	21.9	(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)	74.76
Neutral Axis ($y_{\sim b}$)	(in)	15.77
Moment of Inertia	(in^4)	1185

31

Fully Composite Beam Calculator

w16x31

Location: 2nd Floor 25'-8 span Beam heavy load area

6. Bending Calculations (ASD Method)

Construction Loading

Load	(klf)	0.28		
Moment	(ft-k)	23.3		
Stress in Steel	(ksi)	5.9	< 33.0	ok
Deflection	(in)	0.25	1/ 1215	

Composite Loading

Load	(klf)	1.09		
Moment	(ft-k)	89.8		
Stress in Steel	(ksi)	20.3	< 45	ok
Stress in Concrete	(ksi)	0.40	< 1.8	ok
Deflection	(in)	0.31	1/ 994	
DL Deflection	(in)	0.04	1/ 6955	
LL Deflection	(in)	0.27	1/ 1159	
Total Deflection	(in)	0.56	1/ 547	

7. Shear Calculations (ASD Method)

Composite Loading

Shear	(k)	17.6		
Shear Stress in Steel	(ksi)	4.0	< 20	ok

8. Shear Studs (ASD Method)

Total Shear	(k)	228	*(steel governs)*	
Reduction Factor	-	1.00		
Maximum Diameter	(in)	1.1	> 0.75	ok
Studs Required	-	20	studs each side of max. moment	

9. Bending Calculations (LRFD Method)

Construction Loading

Developed Load	(klf)	0.34		
Developed Moment	(ft-k)	27.9		
Allowable Moment	(ft-k)	202.5	> 27.9	ok

Construction & Composite Loading

Developed Load	(klf)	2.01		
Developed Moment	(ft-k)	165.9		
Allowable Moment	(ft-k)	380.9	> 165.9	ok
Plastic Neutral Axis	(in)	1.79		

Note: The PNA is taken from the top of concrete.

10. Shear Calculations (LRFD Method)

Composite Loading

Developed Shear	(k)	25.9		
Allowable Shear	(ksi)	117.9	> 25.9	ok

11. Shear Studs (LRFD Method)

Studs Required	-	21	studs each side of max. moment

32

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 49'-8 span Transfer Beam

Member Size	-	w30x132
Length	(ft)	49.67
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	11

2. Loading List

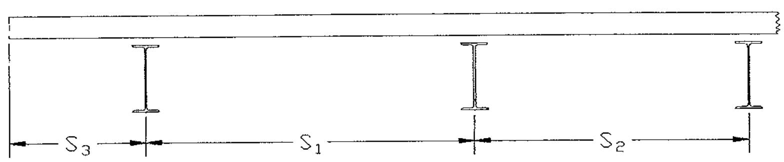
Construction Loads		
Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	132

Composite Loads		
Finish	(psf)	0.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	50.0

3. Beam Spacing

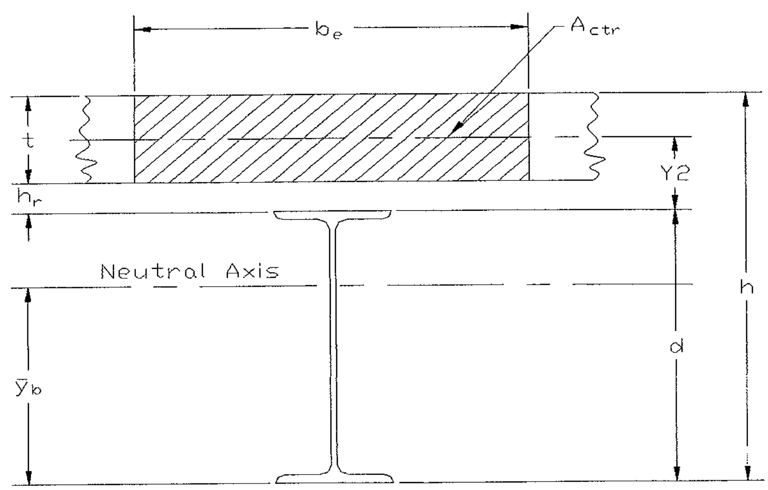
Beam Spacing - S_1	(ft)	6.67
Beam Spacing - S_2	(ft)	6.67
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	6.67

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)	11.4	(ASD)
Load / Connector	(k)	21.9	(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)	80.04
Neutral Axis ($y_{\sim b}$)	(in)	22.07
Moment of Inertia	(in^4)	10705

37

Fully Composite Beam Calculator

w30x132 **Location:** 2nd Floor 49'-8 span Transfer Beam

6. Bending Calculations (ASD Method)

Construction Loading

Load	(klf)	0.40		
Moment	(ft-k)	123.7		
Stress in Steel	(ksi)	3.9	< 33.0	ok
Deflection	(in)	0.33	1/ 1816	

Composite Loading

Load	(klf)	0.50		
Moment	(ft-k)	1344.2		
Stress in Steel	(ksi)	37.2	< 45	ok
Stress in Concrete	(ksi)	1.78	< 1.8	ok
Deflection	(in)	0.22	1/ 2701	
DL Deflection	(in)	0.07	1/ 8103	
LL Deflection	(in)	0.15	1/ 4052	
Total Deflection	(in)	0.55	1/ 1086	

7. Shear Calculations (ASD Method)

Composite Loading

Shear	(k)	22.4		
Shear Stress in Steel	(ksi)	1.2	< 20	ok

8. Shear Studs (ASD Method)

Total Shear	(k)	442.221	*(concrete governs)*	
Reduction Factor	-	1.00		
Maximum Diameter	(in)	2.5	> 0.75	ok
Studs Required	-	39	studs each side of max. moment	

9. Bending Calculations (LRFD Method)

Construction Loading

Developed Load	(klf)	0.48		
Developed Moment	(ft-k)	148.4		
Allowable Moment	(ft-k)	1638.75	> 148.4	ok

Construction & Composite Loading

Developed Load	(klf)	1.19		
Developed Moment	(ft-k)	366.5		
Allowable Moment	(ft-k)	2183.2	> 366.5	ok
Plastic Neutral Axis	(in)	0.10		

Note: The PNA is taken from the bottom of the steel flange down.

10. Shear Calculations (LRFD Method)

Composite Loading

Developed Shear	(k)	29.5		
Allowable Shear	(ksi)	503.3	> 29.5	ok

11. Shear Studs (LRFD Method)

Studs Required	-	41	studs each side of max. moment

34

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 33'-0 span Beam

Member Size	-	w16x31
Length	(ft)	33.00
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	11

2. Loading List

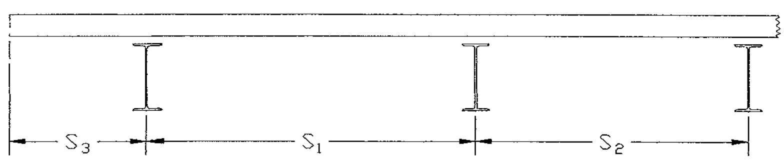
Construction Loads		
Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	31

Composite Loads		
Finish	(psf)	0.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	50.0

3. Beam Spacing

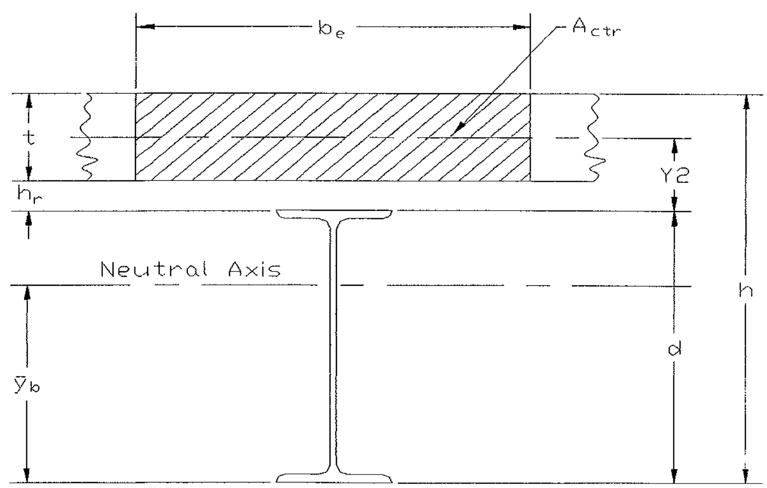
Beam Spacing - S_1	(ft)	6.67
Beam Spacing - S_2	(ft)	6.67
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	6.67

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)	11.4	(ASD)
Load / Connector	(k)	21.9	(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)	80.04
Neutral Axis ($\tilde{y}_b$)	(in)	15.93
Moment of Inertia	(in^4)	1202

25

Fully Composite Beam Calculator

w16x31 **Location:** 2nd Floor 33'-0 span Beam

6. Bending Calculations (ASD Method)

Construction Loading

Load	(klf)	0.30		
Moment	(ft-k)	40.8		
Stress in Steel	(ksi)	10.4	< 33.0	ok
Deflection	(in)	0.74	l/ 537.9	

Composite Loading

Load	(klf)	0.50		
Moment	(ft-k)	68.1		
Stress in Steel	(ksi)	21.2	< 45	ok
Stress in Concrete	(ksi)	0.29	< 1.8	ok
Deflection	(in)	0.38	l/ 1034	
DL Deflection	(in)	0.13	l/ 3101	
LL Deflection	(in)	0.26	l/ 1551	
Total Deflection	(in)	1.12	l/ 354	

7. Shear Calculations (ASD Method)

Composite Loading

Shear	(k)	13.2		
Shear Stress in Steel	(ksi)	3.0	< 20	ok

8. Shear Studs (ASD Method)

Total Shear	(k)	228	*(steel governs)*	
Reduction Factor	-	1.00		
Maximum Diameter	(in)	1.1	> 0.75	ok
Studs Required	-	20	studs each side of max. moment	

9. Bending Calculations (LRFD Method)

Construction Loading

Developed Load	(klf)	0.36		
Developed Moment	(ft-k)	49.0		
Allowable Moment	(ft-k)	202.5	> 49.0	ok

Construction & Composite Loading

Developed Load	(klf)	1.09		
Developed Moment	(ft-k)	148.0		
Allowable Moment	(ft-k)	382.8	> 148.0	ok
Plastic Neutral Axis	(in)	1.68		

Note: The PNA is taken from the top of concrete.

10. Shear Calculations (LRFD Method)

Composite Loading

Developed Shear	(k)	17.9		
Allowable Shear	(ksi)	117.9	> 17.9	ok

11. Shear Studs (LRFD Method)

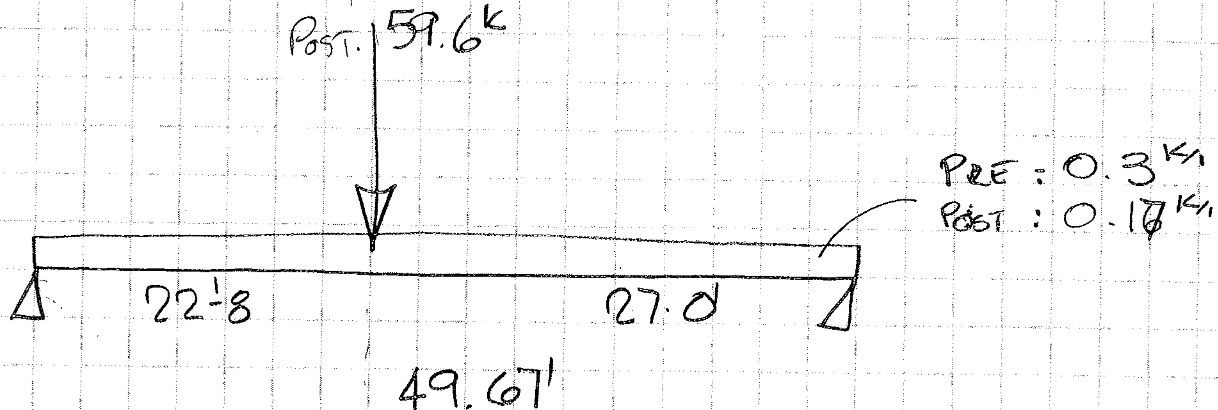
Studs Required	-	21	studs each side of max. moment

36

118

have transfer girder @ 2ND floor.

$P = 20 \times \frac{49.67}{2} \times 0.12 = \frac{119.2^k}{2} = 59.6^k$



Pcomp. moment = ~~wL²/8~~ 92.5 k' R: 7.45

= W24×55 f_b = 9.74

Post. 36.66 31.46

M = 785.05 k'

488-5323-#606

Roof & attic

SUPP	38
deck	2
CLG	5
Roof deck	2
Steel deck & INS	3
Trusses	5
TDL	55
LL (4:12)	20
TL	75

column load.

To 2ND flr. Transf bm.

$20 \times \frac{49.67}{2} \times (75 + 120) = 96.86^K$ (75 R, 120 3, 195)

$M = 1189.93$

W30x132

JLS	3-2-06	38

Gravity load investigation @ Columns

Along line 12

12-E Floor Area: $20 \times \frac{25.67}{2} = 256.7^{\square}$

2ND (Lockers)

DL	50
LL	75
TL	125

$\Rightarrow P = 32.1^K$

EXT. Wall BRICK & STUD = 50^{PSF}

H = 14.67'

$\Rightarrow w = 0.73^{K/'}$

L = 20'

$P = 14.7^K$

3RD ADMIN

DL	70
LL	50
TL	120

$\Rightarrow P = 30.8^K$

Wall same as 2ND $P = 14.7^K$

4TH ATTIC

DL	70
LL	(ROOF) 20 + (ATTIC) 10 = 30
TL	100

$\Rightarrow P = 25.7^K$

no wall

	JLS	3.13.06	39

MORPHY, MAKOFSKY, INC.

12-E CONT.

1ST.
5" SLAB 63
CONC BM. 25

DL 88
LL (STORAGE) 150

TL 238 PSF

a/o Area 1/2 of above
P = 1/2 x 256.7 x 0.238
= 30.5K

Wall. Brick 40
CMU (SOLID GROUT) 75
115 PSF
(Light wt. block fully grouted)

H = 16.67 → w/1 = 1.92K/1
x10' = 19.2K

EXT. conc wall
8" conc. x 4' = 0.4
BM 2'x2' = 0.6
1
x10'
P = 10K

TOTAL
1ST 10 + 19.2 + 30.5 = 59.7
2N 32.1 + 14.7 = 46.7
3 30.8 + 14.7 = 45.5
4 25.7 = 25.7
177.6.

180K

46K/n
4PA

JLS	3-13-06	40

MORPHY, MAKOFSKY, INC.

F-12 $A = 20 \times \frac{1}{2}(25.67' + 33') = 586.7^{\square'}$

interior col.

2^{ND} $P(w) = 0.125 \times 586.7 = 73.3^{K}$

3^{RD} $0.12 \times 586.7 = 70.4^{K}$

4^{TH} $0.1 \times 586.7 = 58.7^{K}$

1^{ST} assume 1/4 area to col fty.

$P = 0.25 \times 586.7 \times 0.238 = 35^{K}$

Tol.

1ST	35
2	73.3
3	70.4
4	58.7
	237.4K

/46K/per Pile

=> (5)-6 PA

w/LL reduction use 5PA

JLS   3-13-06   41   3

G-12

$A = 20 \times \left(\frac{33+27}{2} \right) = 600$ ☐'

2ND	600 × 0.125 =	75k
3rd	600 × 0.12 =	72
4th	600 × 0.1 =	60
1ST	150 × 0.238 =	35.7
	Total	243k

5.3 psi

26 PA

H-12

	JLS	3-13-03

42 4

MORPHY, MAKOFSKY, INC.

construction, a time effect factor λ is also included). Per the LRFD approach, the design tie strength must be greater than or equal to the required tie strength:

$$\text{Design Tie Strength} = \Phi R_n \geq \text{Required Tie Strength} \qquad \text{Equation (3-1)}$$

where Φ = Strength reduction factor
R_n = Nominal Tie Strength calculated with the appropriate material specific code, including over-strength factor Ω where applicable.

For the purposes of this UFC, all strength reduction factors, Φ, are taken as the appropriate material specific code value.

3-1.2 Required Tie Strength.

The required tie strength for horizontal and vertical ties is defined for each material type in Chapters 4 through 8. The structural elements used as ties must not only provide sufficient tie strength, but they must also be adequately connected so that the tie forces can be distributed throughout the rest of the building.

The design tie strengths are considered separately from the forces that are typically carried by each structural element due to live load, dead load, wind load, etc.; in other words, the design tie strength of the element or connection with no other loads acting must be greater than or equal to the required tie strength.

Some of the tie forces are based on the dead and live loads. In some cases, a structure may have different loads, such as a corridor load or office load, on the same floor. In such cases, use an averaged dead or live load, by computing the total force acting on the floor and dividing by the total plan area. When tie forces are based on a span L that varies along the length of a tie, the largest span in a continuous tie should be used for the tie force calculation.

3-1.3 Structural Elements and Connections With Inadequate Design Tie Strength.

If all of the structural elements and connections can be shown to provide the required tie strength, then the tie force requirement has been met. If the **vertical** design tie strength of any structural element or connection is less than the **vertical** required tie strength, the designer must either: 1) revise the design to meet the tie force requirements or 2) use the Alternate Path method to prove that the structure is capable of bridging over this deficient element. **Note that the AP method is not applied to structural elements or connections that cannot provide the *horizontal* required tie strength; in this case, the designer must redesign or retrofit the element and connection such that a sufficient design tie strength is developed.**

43

CHAPTER 3

DESIGN STRATEGIES

The progressive collapse design requirements employ two design/analysis approaches: Tie Forces (TF) and Alternate Path (AP). This chapter discusses the general procedures for these approaches.

3-1 TIE FORCES.

In the Tie Force approach, the building is mechanically tied together, enhancing continuity, ductility, and development of alternate load paths. Tie forces are typically provided by the existing structural elements and connections that are designed using conventional design procedures to carry the standard loads imposed upon the structure.

Depending upon the construction type, there are several horizontal ties that must be provided: internal, peripheral, and ties to edge columns, corner columns, and walls. Vertical ties are required in columns and load-bearing walls. Figure 3-1 illustrates these ties for frame construction. Note that these "tie forces" are not synonymous with "reinforcement ties" as defined in the 2002 version of the *Building Code Requirements for Structural Concrete* from the American Concrete Institute (ACI 318-02) for reinforced concrete design.

The load path for peripheral ties must be continuous around the plan geometry and, for internal ties, the path must be continuous from one edge to the other. Along a particular load path, different structural elements may be used to provide the required tie strength, providing that they are adequately connected; for instance, an internal tie strength may be provided by a series of beams on a beam line, provided that the connections to the intermediate elements (girders, beams or columns) can provide the required tie strength. Likewise, vertical ties must be continuous from the lowest level to the highest level. Horizontal ties to edge columns and walls do not have to be continuous, but they must be satisfactorily anchored back into the structure. For buildings that are composed of separate sub-structures or that incorporate expansion joints that create structurally independent sections, the tie force requirements are applied to each sub-structure or independent section, which are treated as separate units. Note that all tie force paths must be geometrically straight; changes in direction to accommodate openings or similar discontinuities are not allowed.

3-1.1 Load and Resistance Factor Design for Tie Forces.

Following the Load and Resistance Factor Design (LRFD) approach, the design tie strength provided by a member or its connections to other members is taken as the product of the strength reduction factor, Φ, and the nominal tie strength R_n calculated in accordance with the requirements and assumptions of applicable material specific codes, including an over-strength factor, Ω, as applicable. (Note that for wood

6x

2-2 COMMON DESIGN REQUIREMENTS.

The following sections present design requirements that are common for all levels of protection (VLLOP through HLOP), for all new and existing construction.

2-2.1 Effective Column and Wall Height.

For all Levels of Protection, all multistory vertical load-carrying elements must be capable of supporting the vertical load after the loss of lateral support at any floor level (i.e., a laterally unsupported length equal to two stories must be used in the design or analysis). Use the load combination in Section 3-2.4.1 for the design or analysis. Use the appropriate strength reduction factors and over-strength factors as specified in Chapters 4 through 8.

2-2.2 Upward Loads on Floors and Slabs.

In each bay and at all floors and the roof, the slab/floor system must be able to withstand a net upward load of the following magnitude:

$$1.0\,D + 0.5\,L$$

where D = Dead load based on self-weight only (kN/m^2 or lb/ft^2)
L = Live load (kN/m^2 or lb/ft^2)

Note that this load is applied to each bay, one at a time, i.e., the uplift loads are not applied concurrently to all bays. Design the floor system in each bay and its connections to the beams, girders, columns, capitals, etc, to carry this load. A load path from the slab to the foundation for this upward load does not need to be defined. Use the appropriate strength reduction factors and over-strength factors as specified in Chapters 4 through 8.

45

Table D-2 Required Tie Forces

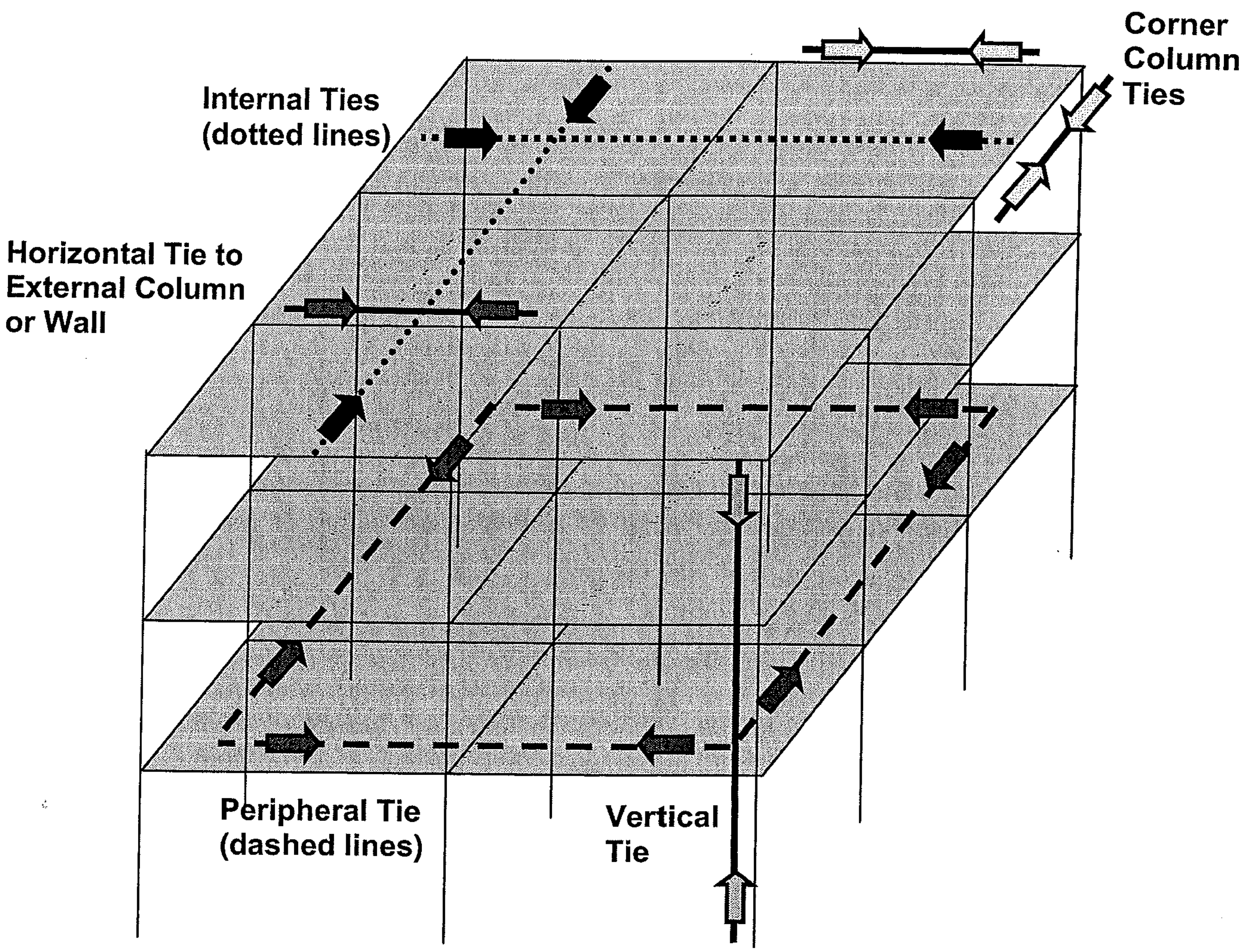
(VERTICAL SHEAR CONNECTION)

Tie type	Required Tie Force kN (kips)	Available Member/Detail	TF > TR_{req}
Peripheral ties	0.25(1.2D+1.6L)s_tL But not less than 8.4 kips 28.3 kips	Spandrel and spandrel girder (and connections)	Yes
Internal ties	0. 5(1.2DL+1.6LL)s_tL (SPAN Length) 56.5 kips	Interior beams and girders (and connections)	Yes
Horizontal ties to columns	greater of 0.01(4)(Atrib)(1.2DL+1.6LL) (AREA) or Internal tie force 56.5 kips	Interior beams, girders, spandrels and spandrel girders (and connections)	Yes
Vertical ties to columns	(Atrib)(1.2DL+1.6LL) 113 kips	Continuous column connections	Yes

As an example for a connection calculation, consider the peripheral column to beam connection illustrated in Figure D-3. This connection has been detailed for the design loads associated with the example building perimeter column to beam loads.

46

Figure 3-1 Schematic of Tie Forces in a Frame Structure



Note: The required External Column, External Wall, and Corner Column tie forces may be provided partly or wholly by the same elements that are used to meet the Peripheral or Internal tie requirement.

1-3.4 Existing Design Guidelines.

1-3.4.1 British Standards.

England was the first nation to address progressive collapse explicitly in its building standards. The development was initiated by the collapse of the Ronan Point apartment building in 1968, and further motivated by the IRA bombing campaign. The British Standards employ three design approaches for resisting progressive collapse:

- Tie Forces (TF). This indirect design approach enhances continuity, ductility, and structural redundancy by requiring "ties" to keep the structure together in the event of an abnormal loading.
- Alternate Path (AP). This direct method requires that the designer prove that the structure is capable of bridging over a removed structural element and that the resulting extent of damage does not exceed the damage limits. The missing structural element is any element that cannot provide an adequate vertical tie force.
- Specific Local Resistance (SLR). This direct method requires that, for any structural element over which the building cannot bridge, the element must be designed as a "key" or "protected" element, capable of carrying a static pressure loading of 34 kN/m^2 (5 psi).

The British have employed this combined approach for almost 30 years and the effectiveness of the strategy has been illustrated in a number of deliberate attacks on buildings, as discussed in *The UK and European Regulations for Accidental Actions* by D.B. Moore (Moore 2003). Recent proposed modifications to the British Standards and draft Eurocode standards include a risk assessment procedure that will better correlate the level of design for progressive collapse to the particular structure.

1-3.4.2 United States Civilian Standards.

While general design guidance for reducing the potential of progressive collapse are discussed in ASCE 7-02, no quantifiable or enforceable requirements are put forth. Likewise, none of the major United States building codes (e.g., International Building Code, Uniform Building Code, Building Officials and Code Administrators) nor the structural design codes (e.g., American Institute of Steel Construction, American Concrete Institute, The Masonry Society, American Iron and Steel Institute, American Forest and Paper Association) provide specific design requirements.

1-3.4.3 United States Government Standards.

Design guidelines for resisting progressive collapse have been published by the Department of Defense (DoD) in 2001, in the *Interim Antiterrorism/Force Protection Construction Standards--Guidance on Structural Requirements* (ITG 2001), and, by the U.S. General Services Administration (GSA) in 2003, in the *Progressive Collapse Analysis and Design Guidelines for New Federal Office Buildings and Major Modernization Projects* (GSA 2003), to support their building activities. Both approaches employ the AP method, but with specific modifications that are tailored for the typical threats and structures considered by each organization. This UFC replaces the previous DoD guidance (ITG 2001).

1-4 SUMMARY OF PROGRESSIVE COLLAPSE DESIGN PROCEDURE.

The design requirements presented in this UFC were developed such that two structural response modes are available to provide different levels of resistance to progressive collapse. The first level of progressive collapse design employs Tie Forces, which are based on a "catenary" response of the structure. The second level employs the Alternate Path method, in which the structural mode is "flexural", as the building must bridge across a removed element. A significant portion of the design guidelines and criteria in this UFC are based on the British Standards approach, as discussed in more detail in Appendix B.

For existing and new construction, the level of progressive collapse design for a structure is correlated to the Level of Protection (LOP) that the Project Planning Team develops and provides to the designer. At the lower LOPs [Very Low Level of Protection (VLLOP) and Low Level of Protection (LLOP)], only Indirect Design is employed, by specifying the required levels of Tie Forces. However, in the case that an adequate Tie Force cannot be developed in a vertical structural element, then the Alternate Path method is applied to verify that the structure can bridge over the deficient element. For Medium Level of Protection (MLOP) and High Level of Protection (HLOP), the Alternate Path method is also applied to verify satisfactory flexural resistance in addition to the catenary resistance provided by the Tie Forces. Finally, for MLOP and HLOP, additional ductility requirements are specified for ground floor perimeter vertical load-bearing elements, to improve the resistance to progressive collapse

It is expected that the majority of new and existing DoD facilities will be assigned VLLOP or LLOP ratings and the design to resist progressive collapse will require the application of only the Tie Force criteria. In general, these requirements will be met without much difficulty and can usually be satisfied by application of good connection detailing practice.

1-5 INSPECTION REQUIREMENTS.

Inspection requirements to verify conformance with this UFC are provided in Appendix G. These inspection requirements are modifications to the provisions of the 2003 International Building Code (2003 IBC), which cover construction documents, structural tests and special inspections for buildings that have been designed to resist progressive collapse.

1-6 SECURITY ENGINEERING UFC SERIES.

This UFC is one of a series of security engineering Unified Facilities Criteria that cover minimum standards, planning, preliminary design, and detailed design for security and antiterrorism. The manuals in this series are designed to be used

49

CHAPTER 2

PROGRESSIVE COLLAPSE DESIGN REQUIREMENTS FOR NEW AND EXISTING CONSTRUCTION

For both new and existing structures, the Project Planning Team will develop and provide the design criteria, which will include the Level of Protection, as determined by UFC 4-020-01. This LOP is used to define the corresponding level of progressive collapse design for new and existing construction as detailed in Section 2-1. Additional design requirements common to all construction types and all Levels of Protection are given in Section 2-2.

Chapter 3 "Design Strategies" provides the general requirements for applying the Tie Forces (TF) and Alternate Path (AP) approaches. The overall techniques for both the TF and AP approaches are the same for each construction type, but the details vary with material type. Chapters 4 through 8 provide the material specific design requirements. Finally, Appendix B provides insight into the development of these approaches.

2-1 DESIGN REQUIREMENTS FOR NEW AND EXISTING CONSTRUCTION.

The details of the design requirements for each LOP for new and existing construction are provided in the following sub-paragraphs.

2-1.1 Very Low Level of Protection Design Requirement.

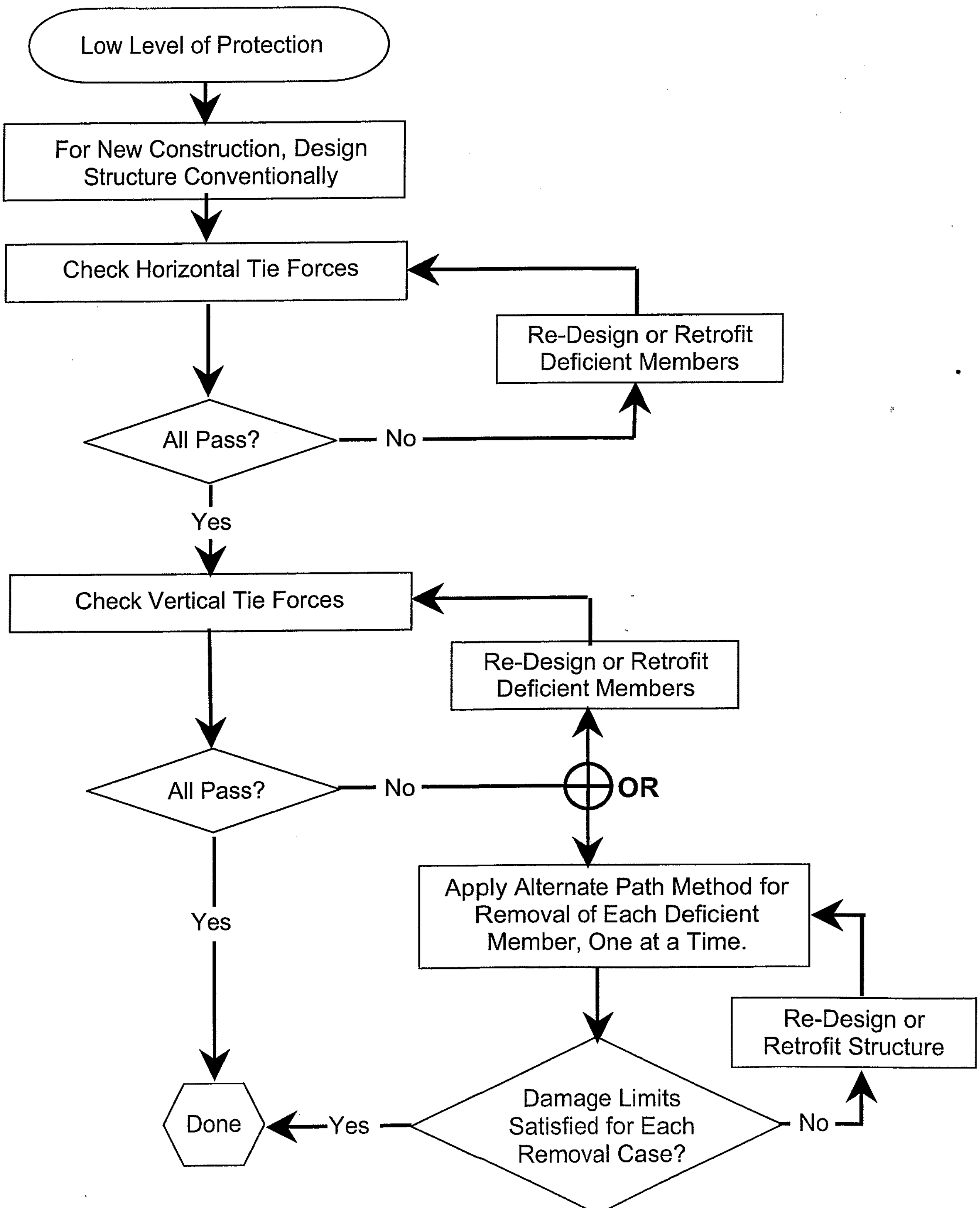
A structure with Very Low Level of Protection must provide adequate horizontal tie force capacity. The magnitudes of the horizontal tie forces vary with construction type and with location in the structure, as specified in Chapters 4 through 8. The designer cannot use the Alternate Path method to verify that the structure can bridge over an element with inadequate capacity. If a structural element does not provide the required horizontal tie force capacity, it must be re-designed in the case of new construction or retrofitted in the case of existing construction. This procedure is illustrated in the flowchart in Figure 2-1.

2-1.2 Low Level of Protection Design Requirement.

The design of a structure with a Low Level of Protection must incorporate both horizontal and vertical tie force capacities. However, if a vertical structural member cannot provide the required vertical tie force capacity, the designer must either re-design the member or use the AP method to prove that the structure can bridge over the element when it is removed. For elements with inadequate horizontal tie force capacity, the Alternate Path method cannot be used. In this case, the designer must re-design the element in the case of new construction or retrofit the element in the case of existing construction. This procedure is illustrated in the flowchart in Figure 2-2. The magnitudes and locations of each tie force vary with construction type, as shown in Chapters 4 through 8.

50

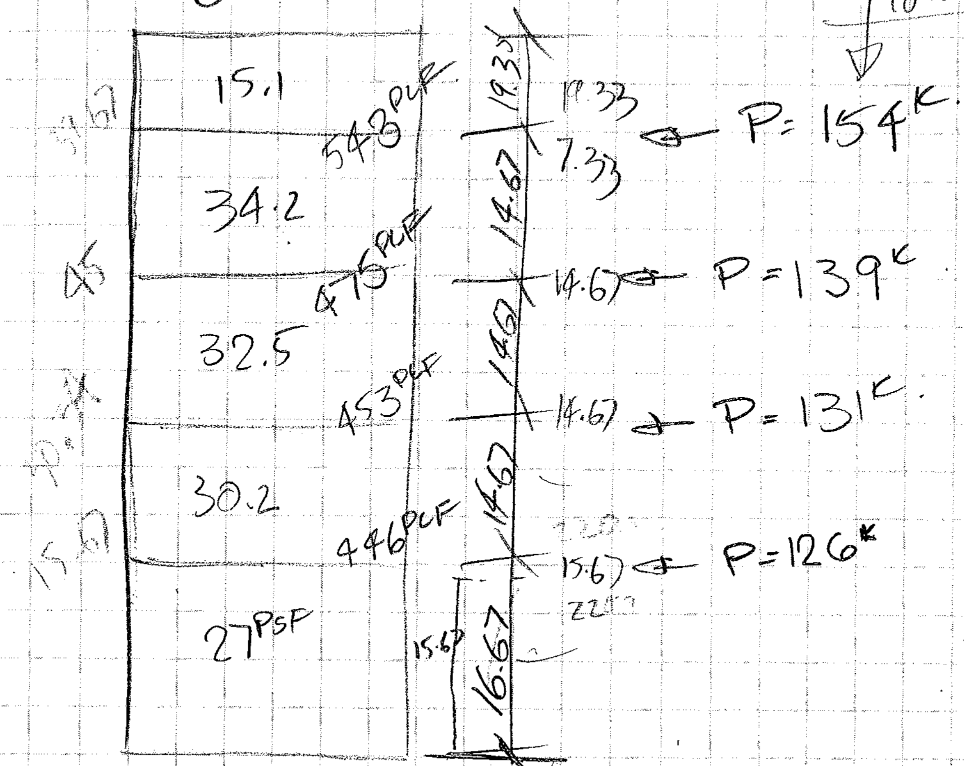
Figure 2-2 Design Process for LLOP in New and Existing Construction



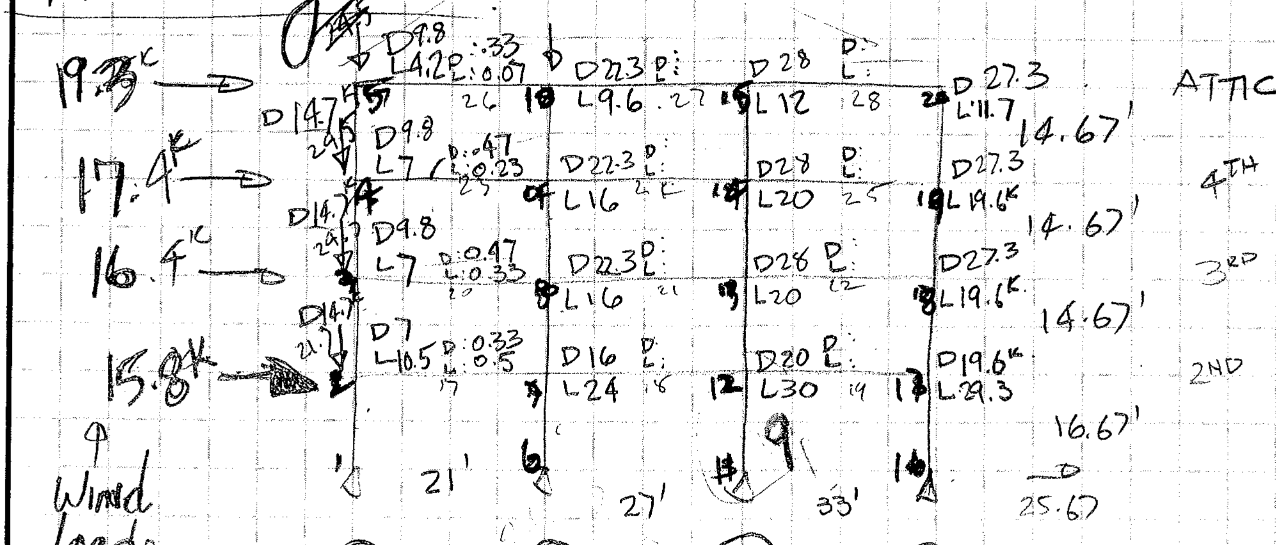
51

N-S
Total Bldg width 284' ±

Total floor loads



Frame along 11



Wind loads

1/8 of loads

$A_F = 140^{\square}$ $A_F = 320^{\square}$ $A_F = 400^{\square}$ $A_F = 391^{\square}$

$A_F = 10.5 \times 20 = 210^{\square}$

JLS | 3-16-06 | 57

```
****************************************************
*                                                  *
*           STAAD.Pro                              *
*           Version  2003    Bld 1002.US           *
*           Proprietary Program of                 *
*           Research Engineers,  Intl.             *
*           Date=    MAR 16, 2006                  *
*           Time=    16:47:38                      *
*                                                  *
*      USER ID: morphy makofsky inc                *
****************************************************
```

```
STAAD PLANE
START JOB INFORMATION
ENGINEER DATE 16-MAR-06
END JOB INFORMATION
INPUT WIDTH 79
UNIT FEET KIP
JOINT COORDINATES
1 0 0 0; 2 0 15.67 0; 3 0 30.33 0; 4 0 45 0; 5 0 59.67 0; 6 21 0 0
7 21 15.67 0; 8 21 30.33 0; 9 21 45 0; 10 21 59.67 0; 11 48 0 0; 12 48 15.67 0
13 48 30.33 0; 14 48 45 0; 15 48 59.67 0; 16 81 0 0; 17 81 15.67 0
18 81 30.33 0; 19 81 45 0; 20 81 59.67 0
MEMBER INCIDENCES
1 1 2; 2 2 3; 3 3 4; 4 4 5; 5 6 7; 6 7 8; 7 8 9; 8 9 10; 9 11 12; 10 12 13
11 13 14; 12 14 15; 13 16 17; 14 17 18; 15 18 19; 16 19 20; 17 2 7; 18 7 12
19 12 17; 20 3 8; 21 8 13; 22 13 18; 23 4 9; 24 9 14; 25 14 19; 26 5 10
27 10 15; 28 15 20
DEFINE MATERIAL START
ISOTROPIC STEEL
E 4.176E+006
POISSON 0.3
DENSITY 0.489024
ALPHA 6.5E-006
DAMP 0.03
END DEFINE MATERIAL
CONSTANTS
MATERIAL STEEL MEMB 1 TO 28
MEMBER PROPERTY AMERICAN
1 TO 4 TABLE ST W14X61
5 TO 8 13 TO 16 TABLE ST W18X76
9 TO 12 TABLE ST W18X76
17 20 23 TABLE ST W21X44
18 19 TABLE ST W24X55
21 22 24 25 TABLE ST W24X55
26 TABLE ST W16X31
27 28 TABLE ST W18X35
SUPPORTS
1 6 11 16 FIXED
LOAD 1 DEAD LOAD
JOINT LOAD
3 4 FY -24.5
5 FY -9.8
```

```
42. 2 FY -21.7
43. 8 TO 10 FY -22.3
44. 13 TO 15 FY -28
45. 18 TO 20 FY -27.3
46. 7 FY -16
47. 12 FY -20
48. 17 FY -19.6
49. MEMBER LOAD
50. 17 TO 19 26 TO 28 UNI GY -0.33
51. 20 TO 25 UNI GY -0.47
52. LOAD 2 LIVE LOAD
53. JOINT LOAD
54. 3 4 FY -7
55. 5 FY -4.2
56. 2 FY -10.5
57. 8 9 FY -16
58. 10 FY -9.6
59. 13 14 FY -20
60. 15 FY -12
61. 18 19 FY -19.6
62. 20 FY 11.7
63. 7 FY -24
64. 12 FY -30
65. 17 FY -29.3
66. MEMBER LOAD
67. 17 TO 19 UNI GY -0.5
68. 26 TO 28 UNI GY -0.07
69. 20 TO 22 UNI GY -0.33
70. 23 TO 25 UNI GY -0.23
71. LOAD 3 WIND
72. JOINT LOAD
73. 2 FX 15.8
74. 3 FX 16.4
75. 4 FX 17.4
76. 5 FX 19.3
77. LOAD COMB 4 DEAD LIVE
78. 1 1.0 2 0.7
79. LOAD COMB 5 DEAD LIVE WIND
80. 1 1.0 2 0.53 3 0.75
81. LOAD COMB 6 DEAD WIND
82. 1 0.6 3 1.0
83. LOAD COMB 7 DEAD LIVE -WIND
84. 1 1.0 2 0.53 3 -0.75
85. PERFORM ANALYSIS
```

58

P R O B L E M   S T A T I S T I C S

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =     20/     28/      4
ORIGINAL/FINAL BAND-WIDTH=      5/      5/      15 DOF
TOTAL PRIMARY LOAD CASES =     3, TOTAL DEGREES OF FREEDOM =      48
SIZE OF STIFFNESS MATRIX =        1 DOUBLE  KILO-WORDS
REQRD/AVAIL. DISK SPACE  =     12.1/ 25412.9 MB,  EXMEM = 1664.4 MB
```

86. PRINT SUPPORT REACTION ALL

65

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	0.34	96.34	0.00	0.00	0.00	-1.92
	2	0.61	40.48	0.00	0.00	0.00	-3.30
	3	-10.29	-28.06	0.00	0.00	0.00	101.74
	4	0.77	124.67	0.00	0.00	0.00	-4.23
	5	-7.05	96.74	0.00	0.00	0.00	72.64
	6	-10.09	29.74	0.00	0.00	0.00	100.59
	7	8.39	138.84	0.00	0.00	0.00	-79.97
6	1	0.25	122.32	0.00	0.00	0.00	-1.62
	2	0.39	92.69	0.00	0.00	0.00	-2.38
	3	-21.11	1.35	0.00	0.00	0.00	206.04
	4	0.52	187.20	0.00	0.00	0.00	-3.29
	5	-15.37	172.45	0.00	0.00	0.00	151.65
	6	-20.96	74.74	0.00	0.00	0.00	205.07
	7	16.28	170.44	0.00	0.00	0.00	-157.42
11	1	0.35	152.48	0.00	0.00	0.00	-2.03
	2	0.58	116.11	0.00	0.00	0.00	-3.20
	3	-21.24	6.25	0.00	0.00	0.00	205.48
	4	0.76	233.76	0.00	0.00	0.00	-4.27
	5	-15.27	218.71	0.00	0.00	0.00	150.38
	6	-21.02	97.74	0.00	0.00	0.00	204.26
	7	16.59	209.33	0.00	0.00	0.00	-157.83
16	1	-0.94	127.36	0.00	0.00	0.00	4.43
	2	-1.58	75.34	0.00	0.00	0.00	7.37
	3	-16.27	20.46	0.00	0.00	0.00	180.48
	4	-2.05	180.11	0.00	0.00	0.00	9.59
	5	-13.98	182.64	0.00	0.00	0.00	143.69
	6	-16.83	96.88	0.00	0.00	0.00	183.14
	7	10.42	151.95	0.00	0.00	0.00	-127.02

************** END OF LATEST ANALYSIS RESULT **************

87. PRINT MAXFORCE ENVELOPE NSECTION 12 LIST 1 TO 28

6 PA

$\frac{F}{6} \pm \frac{My}{I}$

$\frac{209}{6} \pm \frac{157 \times 3}{36}$ / ok

34.83 ± 13 48 / ok

$\frac{96}{6} \pm \frac{183 \times 3}{36}$

16 ± 15.25

31, 0 / ok

no tension

56

MEMBER FORCE ENVELOPE

ALL UNITS ARE KIP FEET

MAX AND MIN FORCE VALUES AMONGST ALL SECTION LOCATIONS

MEMB		FY/ FZ	DIST DIST	LD LD	MZ/ MY	DIST DIST	LD LD	FX	DIST	LD
1	MAX	10.29	0.00	3	101.74	0.00	3			
		0.00	0.00	1	0.00	0.00	1	138.84 C	0.00	7
	MIN	-8.39	15.67	7	-79.97	0.00	7			
		0.00	15.67	7	0.00	15.67	7	28.06 T	15.67	3
2	MAX	7.78	0.00	3	55.26	14.66	7			
		0.00	0.00	1	0.00	0.00	1	97.74 C	0.00	7
	MIN	-7.18	14.66	7	-60.55	14.66	3			
		0.00	14.66	7	0.00	14.66	7	17.44 T	14.66	3
3	MAX	5.39	0.00	3	43.22	14.67	7			
		0.00	0.00	1	0.00	0.00	1	56.35 C	0.00	7
	MIN	-5.35	14.67	7	-45.05	14.67	3			
		0.00	14.67	7	0.00	14.67	7	8.51 T	14.67	3
4	MAX	3.09	0.00	3	29.77	14.67	7			
		0.00	0.00	1	0.00	0.00	1	17.48 C	0.00	7
	MIN	-3.72	14.67	7	-24.87	0.00	7			
		0.00	14.67	7	0.00	14.67	7	2.35 T	14.67	3
5	MAX	21.11	0.00	3	206.04	0.00	3			
		0.00	0.00	1	0.00	0.00	1	187.20 C	0.00	4
	MIN	-16.28	15.67	7	-157.42	0.00	7			
		0.00	15.67	7	0.00	15.67	7	1.35 C	15.67	3
6	MAX	17.35	0.00	3	121.19	0.00	3			
		0.00	0.00	1	0.00	0.00	1	137.79 C	0.00	4
	MIN	-13.90	14.66	7	-133.14	14.66	3			
		0.00	14.66	7	0.00	14.66	7	0.72 C	14.66	3
7	MAX	12.07	0.00	3	82.30	14.67	7			
		0.00	0.00	1	0.00	0.00	1	87.17 C	0.00	4
	MIN	-10.05	14.67	7	-99.77	14.67	3			
		0.00	14.67	7	0.00	14.67	7	0.46 C	14.67	3
8	MAX	6.67	0.00	3	47.01	14.67	7			
		0.00	0.00	1	0.00	0.00	1	38.26 C	0.00	4
	MIN	-6.02	14.67	7	-52.25	14.67	3			
		0.00	14.67	7	0.00	14.67	7	0.30 C	14.67	3
9	MAX	21.24	0.00	3	205.48	0.00	3			
		0.00	0.00	1	0.00	0.00	1	233.76 C	0.00	4

61

	MIN	-16.59	15.67	7	-157.83	0.00	7			
		0.00	15.67	7	0.00	15.67	7	6.25 C	15.67	3
10	MAX	18.30	0.00	3	128.93	0.00	3			
		0.00	0.00	1	0.00	0.00	1	171.94 C	0.00	4
	MIN	-15.10	14.66	7	-139.30	14.66	3			
		0.00	14.66	7	0.00	14.66	7	4.08 C	14.66	3
11	MAX	12.70	0.00	3	86.76	14.67	7			
		0.00	0.00	1	0.00	0.00	1	108.74 C	0.00	4
	MIN	-10.70	14.67	7	-104.54	14.67	3			
		0.00	14.67	7	0.00	14.67	7	2.02 C	14.67	3
12	MAX	6.76	0.00	3	49.41	14.67	7			
		0.00	0.00	1	0.00	0.00	1	47.83 C	0.00	4
	MIN	-6.42	14.67	7	-51.78	14.67	3			
		0.00	14.67	7	0.00	14.67	7	0.55 C	14.67	3
13	MAX	16.83	0.00	6	183.14	0.00	6			
		0.00	0.00	1	0.00	0.00	1	182.64 C	0.00	5
	MIN	-10.42	15.67	7	-127.02	0.00	7			
		0.00	15.67	7	0.00	15.67	7	20.46 C	15.67	3
14	MAX	11.05	0.00	6	72.73	0.00	5			
		0.00	0.00	1	0.00	0.00	1	132.09 C	0.00	5
	MIN	-3.64	14.66	7	-91.35	14.66	6			
		0.00	14.66	7	0.00	14.66	7	12.65 C	14.66	3
15	MAX	8.38	0.00	5	51.19	0.00	5			
		0.00	0.00	1	0.00	0.00	1	78.97 C	0.00	5
	MIN	-1.43	14.67	7	-73.84	14.67	6			
		0.00	14.67	7	0.00	14.67	7	6.03 C	14.67	3
16	MAX	5.85	0.00	5	36.27	0.00	5			
		0.00	0.00	1	0.00	0.00	1	32.63 C	0.00	1
	MIN	1.12	14.67	2	-49.50	14.67	5			
		0.00	14.67	7	0.00	14.67	7	10.48 T	14.67	2
17	MAX	13.84	0.00	7	118.40	21.00	6			
		0.00	0.00	1	0.00	0.00	1	13.29 C	0.00	3
	MIN	-14.59	21.00	5	-113.03	0.00	3			
		0.00	21.00	7	0.00	21.00	7	10.64 T	21.00	7
18	MAX	15.42	0.00	7	146.28	27.00	6			
		0.00	0.00	1	0.00	0.00	1	9.53 C	0.00	3
	MIN	-15.63	27.00	5	-135.84	0.00	3			
		0.00	27.00	7	0.00	27.00	7	8.26 T	27.00	7
19	MAX	15.94	0.00	7	151.25	33.00	6			
		0.00	0.00	1	0.00	0.00	1	6.59 C	0.00	3
	MIN	-15.42	33.00	5	-122.25	0.00	3			
		0.00	33.00	7	0.00	33.00	7	6.78 T	33.00	7
20	MAX	13.18	0.00	7	104.58	21.00	6			
		0.00	0.00	1	0.00	0.00	1	14.01 C	0.00	3

56

MIN	-13.76	21.00	5	-94.63	0.00	3			
	0.00	21.00	7	0.00	21.00	7	10.47 T	21.00	7
21 MAX	15.22	0.00	7	133.79	27.00	6			
	0.00	0.00	1	0.00	0.00	1	8.73 C	0.00	3
MIN	-15.20	27.00	5	-117.55	0.00	3			
	0.00	27.00	7	0.00	27.00	7	6.62 T	27.00	7
22 MAX	15.78	0.00	7	137.87	33.00	5			
	0.00	0.00	1	0.00	0.00	1	3.13 C	0.00	3
MIN	-15.43	33.00	5	-104.47	0.00	3			
	0.00	33.00	7	0.00	33.00	7	2.21 T	33.00	7
23 MAX	10.65	0.00	7	75.27	21.00	6			
	0.00	0.00	1	0.00	0.00	1	15.10 C	0.00	3
MIN	-11.02	21.00	5	-65.54	0.00	3			
	0.00	21.00	7	0.00	21.00	7	11.42 T	21.00	7
24 MAX	12.58	0.00	7	98.42	0.00	7			
	0.00	0.00	1	0.00	0.00	1	9.70 C	0.00	3
MIN	-12.40	27.00	5	-81.59	0.00	3			
	0.00	27.00	7	0.00	27.00	7	7.39 T	27.00	7
25 MAX	13.24	0.00	7	108.06	33.00	5			
	0.00	0.00	1	0.00	0.00	1	3.77 C	0.00	3
MIN	-13.08	33.00	5	-71.48	0.00	3			
	0.00	33.00	7	0.00	33.00	7	3.11 T	33.00	7
26 MAX	5.46	0.00	7	32.94	21.00	5			
	0.00	0.00	1	0.00	0.00	1	16.90 C	0.00	6
MIN	-5.78	21.00	5	-24.84	0.00	3			
	0.00	21.00	7	0.00	21.00	7	10.75 T	21.00	7
27 MAX	6.49	0.00	7	43.18	27.00	5			
	0.00	0.00	1	0.00	0.00	1	10.70 C	0.00	6
MIN	-6.50	27.00	5	-27.68	0.00	3			
	0.00	27.00	7	0.00	27.00	7	4.73 T	27.00	7
28 MAX	7.26	0.00	7	51.04	0.00	7			
	0.00	0.00	1	0.00	0.00	1	5.85 C	0.00	5
MIN	-7.10	33.00	5	-24.08	0.00	3			
	0.00	33.00	7	0.00	33.00	7	1.12 C	33.00	2

********** END OF FORCE ENVELOPE FROM INTERNAL STORAGE **********

88. PRINT JOINT DISPLACEMENTS LIST 2 TO 5 17 TO 20

69

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
2	1	-0.00265	-0.03490	0.00000	0.00000	0.00000	-0.00009
	2	-0.00296	-0.01466	0.00000	0.00000	0.00000	-0.00018
	3	0.58181	0.01017	0.00000	0.00000	0.00000	-0.00257
	4	-0.00472	-0.04516	0.00000	0.00000	0.00000	-0.00022
	5	0.43214	-0.03504	0.00000	0.00000	0.00000	-0.00211
	6	0.58022	-0.01077	0.00000	0.00000	0.00000	-0.00262
	7	-0.44058	-0.05029	0.00000	0.00000	0.00000	0.00173
3	1	-0.00565	-0.05909	0.00000	0.00000	0.00000	-0.00013
	2	-0.00446	-0.02314	0.00000	0.00000	0.00000	-0.00011
	3	1.21164	0.01608	0.00000	0.00000	0.00000	-0.00216
	4	-0.00877	-0.07529	0.00000	0.00000	0.00000	-0.00021
	5	0.90072	-0.05930	0.00000	0.00000	0.00000	-0.00181
	6	1.20825	-0.01938	0.00000	0.00000	0.00000	-0.00224
	7	-0.91674	-0.08341	0.00000	0.00000	0.00000	0.00144
4	1	-0.00950	-0.07343	0.00000	0.00000	0.00000	-0.00012
	2	-0.00520	-0.02807	0.00000	0.00000	0.00000	-0.00010
	3	1.68628	0.01896	0.00000	0.00000	0.00000	-0.00154
	4	-0.01314	-0.09307	0.00000	0.00000	0.00000	-0.00019
	5	1.25245	-0.07408	0.00000	0.00000	0.00000	-0.00133
	6	1.68058	-0.02509	0.00000	0.00000	0.00000	-0.00161
	7	-1.27696	-0.10252	0.00000	0.00000	0.00000	0.00098
5	1	-0.01051	-0.07786	0.00000	0.00000	0.00000	-0.00023
	2	-0.00370	-0.02977	0.00000	0.00000	0.00000	-0.00007
	3	2.02081	0.01976	0.00000	0.00000	0.00000	-0.00129
	4	-0.01310	-0.09869	0.00000	0.00000	0.00000	-0.00028
	5	1.50313	-0.07881	0.00000	0.00000	0.00000	-0.00124
	6	2.01450	-0.02695	0.00000	0.00000	0.00000	-0.00143
	7	-1.52807	-0.10845	0.00000	0.00000	0.00000	0.00070
17	1	-0.00066	-0.03703	0.00000	0.00000	0.00000	0.00017
	2	-0.00150	-0.02191	0.00000	0.00000	0.00000	0.00029
	3	0.56080	-0.00595	0.00000	0.00000	0.00000	-0.00310
	4	-0.00171	-0.05237	0.00000	0.00000	0.00000	0.00038
	5	0.41915	-0.05311	0.00000	0.00000	0.00000	-0.00200
	6	0.56041	-0.02817	0.00000	0.00000	0.00000	-0.00300
	7	-0.42205	-0.04418	0.00000	0.00000	0.00000	0.00266
18	1	-0.00513	-0.06490	0.00000	0.00000	0.00000	0.00024
	2	-0.00564	-0.03225	0.00000	0.00000	0.00000	0.00015
	3	1.19361	-0.00939	0.00000	0.00000	0.00000	-0.00257
	4	-0.00907	-0.08748	0.00000	0.00000	0.00000	0.00034
	5	0.88709	-0.08904	0.00000	0.00000	0.00000	-0.00162
	6	1.19054	-0.04833	0.00000	0.00000	0.00000	-0.00243
	7	-0.90332	-0.07495	0.00000	0.00000	0.00000	0.00224
19	1	-0.00868	-0.08330	0.00000	0.00000	0.00000	0.00021
	2	-0.00601	-0.03579	0.00000	0.00000	0.00000	0.00012
	3	1.66632	-0.01103	0.00000	0.00000	0.00000	-0.00177
	4	-0.01288	-0.10835	0.00000	0.00000	0.00000	0.00029
	5	1.23788	-0.11054	0.00000	0.00000	0.00000	-0.00105
	6	1.66111	-0.06101	0.00000	0.00000	0.00000	-0.00164

60

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	7	-1.26160	-0.09399	0.00000	0.00000	0.00000	0.00160
20	1	-0.01790	-0.09218	0.00000	0.00000	0.00000	0.00039
	2	-0.00665	-0.03294	0.00000	0.00000	0.00000	0.00006
	3	1.99134	-0.01144	0.00000	0.00000	0.00000	-0.00149
	4	-0.02256	-0.11523	0.00000	0.00000	0.00000	0.00044
	5	1.47208	-0.11821	0.00000	0.00000	0.00000	-0.00069
	6	1.98060	-0.06675	0.00000	0.00000	0.00000	-0.00125
	7	-1.51493	-0.10105	0.00000	0.00000	0.00000	0.00154

************** END OF LATEST ANALYSIS RESULT **************

89. PRINT SECTION MAX DISPL NSECT 12 LIST 1 TO 28

61

MAX MEMBER SECTION DISPLACEMENTS

UNIT= INCH FOR FPS AND CM FOR METRIC/SI SYSTEM

MEMBER	MAX DISP	LOCATION	LOAD	L/DISPL
1	0.07707	62.68	6	2439
2	0.02444	131.94	3	7198
3	0.02269	132.03	3	7758
4	0.01315	132.03	7	13382
5	0.07226	62.68	6	2602
6	0.02452	131.94	3	7173
7	0.02352	132.03	3	7484
8	0.01035	132.03	3	17007
9	0.07070	62.68	6	2659
10	0.02486	131.94	3	7077
11	0.02434	132.03	3	7231
12	0.00946	132.03	3	18608
13	0.08213	62.68	3	2289
14	0.02154	131.94	6	8167
15	0.02251	117.36	6	7819
16	0.01244	132.03	5	14150
17	0.06429	63.00	6	3919
18	0.07683	81.00	6	4217
19	0.16707	264.00	7	2370
20	0.05609	63.00	6	4493
21	0.06913	81.00	6	4686
22	0.15355	264.00	7	2578
23	0.04131	63.00	6	6099
24	0.05276	108.00	5	6141
25	0.12346	264.00	7	3207
26	0.04605	84.00	5	5472
27	0.06662	216.00	7	4863
28	0.17232	231.00	7	2298

************ END OF SECT DISPL RESULTS ***********

```
90. PARAMETER
91. CODE AISC
92. BEAM 1 ALL
93. FYLD 7200 ALL
94. UNB 6 MEMB 17 TO 28
95. UNT 1 MEMB 17 TO 28
96. LY 2 MEMB 17 TO 28
97. LZ 2 MEMB 17 TO 28
98. LX 2 MEMB 17 TO 28
99. CHECK CODE ALL
```

62

STAAD.Pro CODE CHECKING - (AISC)
****

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1 ST	W14 X61	PASS	AISC- H1-1	0.710	7
		138.84 C	0.00	-79.97	0.00
2 ST	W14 X61	PASS	AISC- H1-1	0.476	7
		97.74 C	0.00	55.26	14.66
3 ST	W14 X61	PASS	AISC- H1-1	0.316	7
		56.35 C	0.00	43.22	14.67
4 ST	W14 X61	PASS	AISC- H1-3	0.177	7
		17.48 C	0.00	29.77	14.67
5 ST	W18 X76	PASS	AISC- H1-1	0.797	7
		170.44 C	0.00	-157.42	0.00
6 ST	W18 X76	PASS	AISC- H1-1	0.537	7
		127.63 C	0.00	106.57	14.66
7 ST	W18 X76	PASS	AISC- H1-1	0.377	7
		81.27 C	0.00	82.30	14.67
8 ST	W18 X76	PASS	AISC- H1-3	0.213	7
		36.13 C	0.00	47.01	14.67
9 ST	W18 X76	PASS	AISC- H1-1	0.887	5
		218.71 C	0.00	150.38	0.00
10 ST	W18 X76	PASS	AISC- H1-1	0.620	7
		156.86 C	0.00	114.44	14.66
11 ST	W18 X76	PASS	AISC- H1-1	0.429	7
		100.28 C	0.00	86.76	14.67
12 ST	W18 X76	PASS	AISC- H1-3	0.239	7
		45.04 C	0.00	49.41	14.67
13 ST	W18 X76	PASS	AISC- H1-1	0.787	5
		182.64 C	0.00	143.69	0.00
14 ST	W18 X76	PASS	AISC- H1-1	0.496	5
		132.09 C	0.00	-86.67	14.66
15 ST	W18 X76	PASS	AISC- H1-1	0.346	5
		78.97 C	0.00	-71.78	14.67
16 ST	W18 X76	PASS	AISC- H1-3	0.204	5
		28.20 C	0.00	-49.50	14.67
17 ST	W21 X44	PASS	AISC- H1-3	0.617	6
		13.00 C	0.00	118.40	21.00
18 ST	W24 X55	PASS	AISC- H1-3	0.530	6
		9.06 C	0.00	146.28	27.00
19 ST	W24 X55	PASS	AISC- H1-3	0.541	6
		5.78 C	0.00	151.25	33.00
20 ST	W21 X44	PASS	AISC- H1-3	0.552	6
		13.95 C	0.00	104.58	21.00
21 ST	W24 X55	PASS	AISC- H1-3	0.486	6
		8.57 C	0.00	133.79	27.00

67

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
22 ST	W24 X55	PASS	AISC- H1-3	0.487	5
		2.49 C	0.00	137.87	33.00
23 ST	W21 X44	PASS	AISC- H1-3	0.411	6
		14.97 C	0.00	75.27	21.00
24 ST	W24 X55	PASS	AISC- H1-3	0.359	6
		9.53 C	0.00	96.98	27.00
25 ST	W24 X55	PASS	AISC- H1-3	0.383	5
		2.54 C	0.00	108.06	33.00
26 ST	W16 X31	PASS	AISC- H1-3	0.353	6
		16.90 C	0.00	32.78	21.00
27 ST	W18 X35	PASS	AISC- H1-3	0.338	5
		9.57 C	0.00	43.18	27.00
28 ST	W18 X35	PASS	AISC- H1-3	0.369	5
		5.85 C	0.00	49.50	33.00

100. FINISH

```
*********** END OF THE STAAD.Pro RUN ***********

  **** DATE= MAR 16,2006   TIME= 16:47:39 ****

**********************************************************
*     For questions on STAAD.Pro, please contact :       *
*  By Email - North America  : support@reiusa.com        *
*  By Email - International  : support@reiworld.com      *
*  Tel. (USA) : 714-974-2500 ; Fax (USA) : 714-974-4771  *
**********************************************************
```

6X

2ND FL.

		Locker		Mech
4¾" floors typ.	D	50	D	50
Locker rooms	L	75.	L	150

3RD

office	D	70
	L	50

4TH

OFFICE	D	70
	L	50
ATTIC	D	50
	L	10
Roof	D	20
	L	20

EXTERIOR Wall

Brick	40
STUDS & Sheathing	10
DL.	50 PSF

	JLS	3-16-06	65

MORPHY, MAKOFSKY, INC.

Live load reduction

$R = r(A - 150)$ or $R = 23.1\left(1 + \frac{D}{L_0}\right)$ 60

K-11 $A = 140 \times 4$ $= 23.1\left(1 + \frac{50}{75}\right)$

$= 560$ ft² .67

$= 38.6$ max reduct.

$R = 0.08(560 - 150)$ 410

$= 32.8$

∴ L × 0.672

H-11 $A_{1FLR} = 320'$ $A_T = 1280$

$R = 0.08(1280 - 150) = 90.4$

⇒ max 38.6

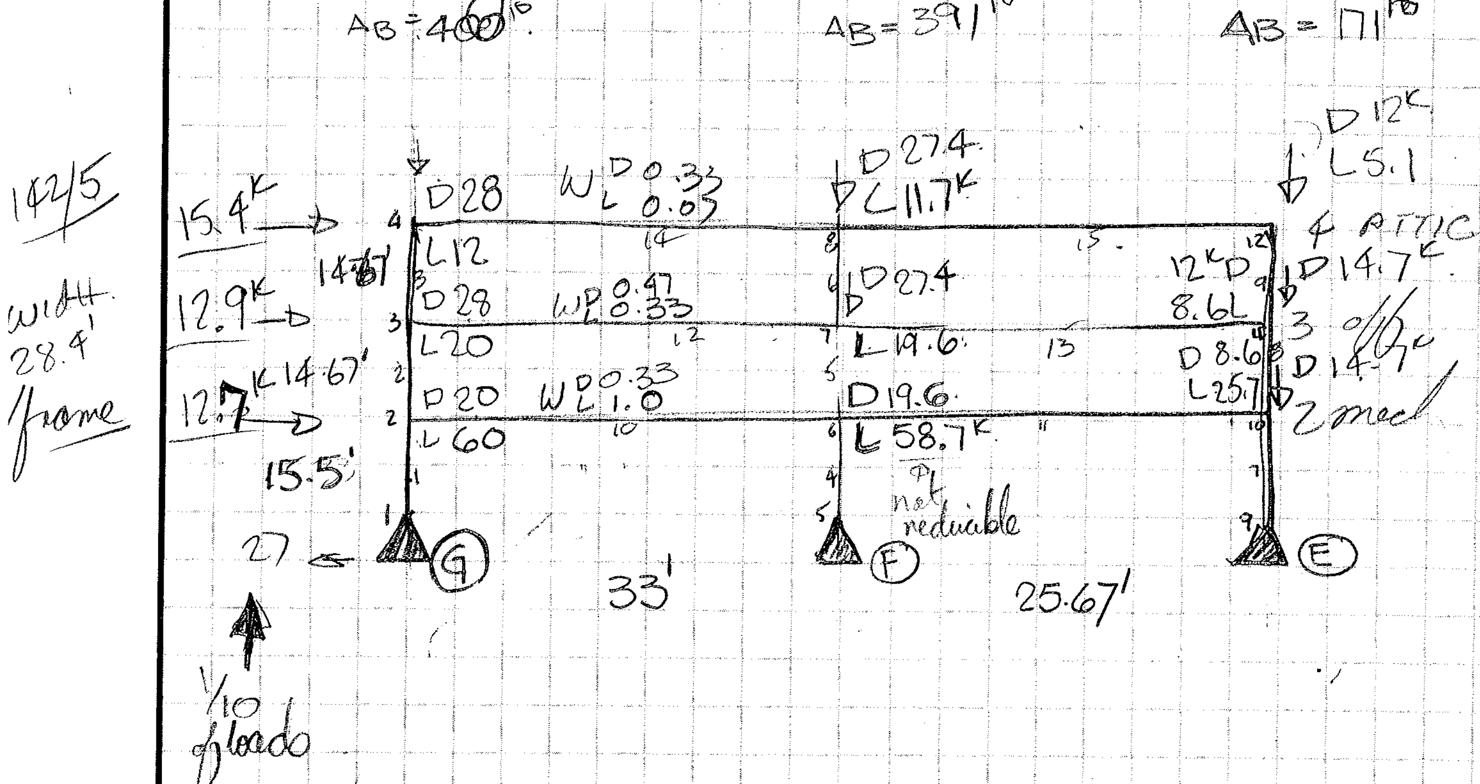
∴ L = 0.614

in model (STAAD) use 0.7 factor

66

MORPHY, MAKOFSKY, INC.

Frame along 3



	JLS	3-16-06	67

```
****************************************************
*                                                  *
*           STAAD.Pro                              *
*           Version  2003    Bld 1002.US           *
*           Proprietary Program of                 *
*           Research Engineers,  Intl.             *
*           Date=    MAR 17, 2006                  *
*           Time=    13:23:28                      *
*                                                  *
*      USER ID: morphy makofsky inc                *
****************************************************
```

```
STAAD PLANE
START JOB INFORMATION
ENGINEER DATE 17-MAR-06
END JOB INFORMATION
INPUT WIDTH 79
UNIT FEET KIP
JOINT COORDINATES
1 0 0 0; 2 0 15.5 0; 3 0 30.17 0; 4 0 44.84 0; 5 33 0 0; 6 33 15.5 0
7 33 30.17 0; 8 33 44.84 0; 9 58.67 0 0; 10 58.67 15.5 0; 11 58.67 30.17 0
12 58.67 44.84 0
MEMBER INCIDENCES
1 1 2; 2 2 3; 3 3 4; 4 5 6; 5 6 7; 6 7 8; 7 9 10; 8 10 11; 9 11 12; 10 2 6
11 6 10; 12 3 7; 13 7 11; 14 4 8; 15 8 12
DEFINE MATERIAL START
ISOTROPIC STEEL
E 4.176E+006
POISSON 0.3
DENSITY 0.489024
ALPHA 6.5E-006
DAMP 0.03
END DEFINE MATERIAL
CONSTANTS
MATERIAL STEEL MEMB 1 TO 15
MEMBER PROPERTY AMERICAN
1 TO 6 TABLE ST W18X76
7 TO 9 TABLE ST W14X61
10 12 TABLE ST W24X55
11 13 TABLE ST W21X44
14 TABLE ST W21X44
15 TABLE ST W18X40
SUPPORTS
1 5 9 FIXED
LOAD 1 DEAD
JOINT LOAD
4 FY -28
3 FY -28
2 FY -20
7 8 FY -27.4
6 FY -19.6
10 FY -23.1
11 FY -26.7
```

68

```
 42. 12 FY -12
 43. MEMBER LOAD
 44. 10 11 14 15 UNI GY -0.33
 45. 12 13 UNI GY -0.47
 46. LOAD 2 LIVE
 47. JOINT LOAD
 48. 4 FY -12
 49. 3 FY -20
 50. 2 FY -60
 51. 7 FY -19.6
 52. 8 FY -11.7
 53. 6 FY -58.7
 54. 10 FY -25.7
 55. 11 FY -8.6
 56. 12 FY -5.1
 57. MEMBER LOAD
 58. 10 11 UNI GY -1.
 59. 12 13 UNI GY -0.33
 60. 14 15 UNI GY -0.07
 61. LOAD 3 WIND
 62. JOINT LOAD
 63. 4 FX 15.4
 64. 3 FX 12.9
 65. 2 FX 12.7
 66. LOAD COMB 4 DEAD LIVE
 67. 1 1.0 2 1.0
 68. LOAD COMB 5 DAD LIVE WIND
 69. 1 1.0 2 0.75 3 0.75
 70. LOAD COMB 6 DEAD LIVE -WIND
 71. 2 0.75 3 -0.75 1 1.0
 72. LOAD COMB 7 DEAD WIND
 73. 3 1.0 1 0.6
 74. LOAD COMB 8 DEAD -WIND
 75. 1 0.6 3 -1.0
 76. PERFORM ANALYSIS
```

P R O B L E M   S T A T I S T I C S

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =     12/     15/      3
ORIGINAL/FINAL BAND-WIDTH=      4/      4/      12 DOF
TOTAL PRIMARY LOAD CASES =     3, TOTAL DEGREES OF FREEDOM =      27
SIZE OF STIFFNESS MATRIX =        1 DOUBLE  KILO-WORDS
REQRD/AVAIL. DISK SPACE  =     12.0/ 25388.9 MB,  EXMEM = 1616.3 MB
```

```
 77. PDELTA 2 ANALYSIS
++ Adjusting Displacements                              13:23:28
++ Adjusting Displacements                              13:23:28
```

69

78. PRINT MAXFORCE ENVELOPE NSECTION 30 LIST 1 TO 15

70

MEMBER FORCE ENVELOPE

ALL UNITS ARE KIP FEET

MAX AND MIN FORCE VALUES AMONGST ALL SECTION LOCATIONS

MEMB		FY/ FZ	DIST DIST	LD LD	MZ/ MY	DIST DIST	LD LD	FX	DIST	LD
1	MAX	14.92	0.00	3	162.07	0.00	3			
		0.00	0.00	1	0.00	0.00	1	208.53 C	0.00	4
	MIN	-15.48	15.50	8	-164.54	0.00	8			
		0.00	15.50	8	0.00	15.50	8	14.83 T	15.50	3
2	MAX	8.47	0.00	3	87.14	14.67	6			
		0.00	0.00	1	0.00	0.00	1	107.34 C	0.00	4
	MIN	-11.53	14.67	6	-82.07	0.00	6			
		0.00	14.67	8	0.00	14.67	8	7.84 T	14.67	3
3	MAX	4.08	0.00	3	59.39	14.67	6			
		0.00	0.00	1	0.00	0.00	1	46.41 C	0.00	4
	MIN	-6.81	14.67	6	-40.57	14.67	3			
		0.00	14.67	8	0.00	14.67	8	2.36 T	14.67	3
4	MAX	17.98	0.00	7	175.97	0.00	7			
		0.00	0.00	1	0.00	0.00	1	241.53 C	0.00	4
	MIN	-17.51	15.50	8	-173.10	0.00	8			
		0.00	15.50	8	0.00	15.50	8	0.54 C	15.50	3
5	MAX	14.33	0.00	7	104.18	14.67	8			
		0.00	0.00	1	0.00	0.00	1	122.26 C	0.00	4
	MIN	-13.22	14.67	8	-112.46	14.67	7			
		0.00	14.67	8	0.00	14.67	8	0.13 C	14.67	3
6	MAX	8.60	0.00	7	62.30	14.67	8			
		0.00	0.00	1	0.00	0.00	1	51.27 C	0.00	4
	MIN	-7.05	14.67	8	-74.51	14.67	7			
		0.00	14.67	8	0.00	14.67	8	0.09 T	14.67	3
7	MAX	8.65	0.00	7	85.51	0.00	7			
		0.00	0.00	1	0.00	0.00	1	131.98 C	0.00	4
	MIN	-8.01	15.50	8	-82.03	0.00	8			
		0.00	15.50	8	0.00	15.50	8	14.29 C	15.50	3
8	MAX	7.54	0.00	5	54.85	0.00	5			
		0.00	0.00	1	0.00	0.00	1	68.36 C	0.00	5
	MIN	-5.29	14.67	8	-55.74	14.67	5			
		0.00	14.67	8	0.00	14.67	8	7.71 C	14.67	3
9	MAX	4.79	0.00	5	30.13	0.00	5			
		0.00	0.00	1	0.00	0.00	1	22.31 C	0.00	5

MIN	-2.47	14.67	8	-40.17	14.67	5			
	0.00	14.67	8	0.00	14.67	8	2.44 C	14.67	3
10 MAX	22.46	0.00	6	184.55	33.00	5			
	0.00	0.00	1	0.00	0.00	1	6.23 C	0.00	3
MIN	-23.68	33.00	5	-119.89	0.00	3			
	0.00	33.00	8	0.00	33.00	8	6.99 T	33.00	8
11 MAX	19.76	0.00	6	131.45	0.00	6			
	0.00	0.00	1	0.00	0.00	1	2.26 C	0.00	3
MIN	-17.84	25.67	5	-83.35	0.00	3			
	0.00	25.67	8	0.00	25.67	8	2.78 T	25.67	6
12 MAX	15.69	0.00	6	132.12	33.00	5			
	0.00	0.00	1	0.00	0.00	1	8.49 C	0.00	3
MIN	-16.20	33.00	5	-92.98	0.00	3			
	0.00	33.00	8	0.00	33.00	8	8.97 T	33.00	8
13 MAX	13.41	0.00	6	91.50	0.00	6			
	0.00	0.00	1	0.00	0.00	1	2.73 C	0.00	5
MIN	-12.90	25.67	5	-66.90	0.00	3			
	0.00	25.67	8	0.00	25.67	8	2.80 T	25.67	8
14 MAX	7.88	0.00	6	63.26	33.00	5			
	0.00	0.00	1	0.00	0.00	1	13.11 C	0.00	7
MIN	-8.27	33.00	5	-40.57	0.00	3			
	0.00	33.00	8	0.00	33.00	8	9.52 T	33.00	8
15 MAX	7.00	0.00	6	46.60	0.00	6			
	0.00	0.00	1	0.00	0.00	1	4.79 C	0.00	5
MIN	-6.48	25.67	5	-31.24	0.00	3			
	0.00	25.67	8	0.00	25.67	8	2.46 T	25.67	8

********** END OF FORCE ENVELOPE FROM INTERNAL STORAGE **********

79. PRINT SUPPORT REACTION ALL

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	0.93	94.05	0.00	0.00	0.00	-4.12
	2	3.25	114.48	0.00	0.00	0.00	-14.58
	3	-14.96	-14.83	0.00	0.00	0.00	162.07
	4	4.18	208.53	0.00	0.00	0.00	-18.71
	5	-7.85	168.79	0.00	0.00	0.00	106.49
	6	14.59	191.03	0.00	0.00	0.00	-136.61
	7	-14.41	41.60	0.00	0.00	0.00	159.59
	8	15.52	71.26	0.00	0.00	0.00	-164.54
5	1	-0.40	108.95	0.00	0.00	0.00	2.40
	2	-1.41	132.58	0.00	0.00	0.00	7.75
	3	-17.74	0.54	0.00	0.00	0.00	174.54
	4	-1.80	241.53	0.00	0.00	0.00	10.14
	5	-14.76	208.79	0.00	0.00	0.00	139.11
	6	11.86	207.98	0.00	0.00	0.00	-122.69
	7	-17.98	65.91	0.00	0.00	0.00	175.97
	8	17.51	64.83	0.00	0.00	0.00	-173.10
9	1	-0.53	75.50	0.00	0.00	0.00	2.90
	2	-1.85	56.48	0.00	0.00	0.00	9.56
	3	-8.29	14.29	0.00	0.00	0.00	83.77
	4	-2.38	131.98	0.00	0.00	0.00	12.45
	5	-8.14	128.57	0.00	0.00	0.00	72.89
	6	4.30	107.14	0.00	0.00	0.00	-52.76
	7	-8.61	59.59	0.00	0.00	0.00	85.51
	8	7.97	31.01	0.00	0.00	0.00	-82.03

************** END OF LATEST ANALYSIS RESULT **************

80. PRINT JOINT DISPLACEMENTS 2 3 4 10 11 12

13

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
1	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	1	0.00161	-0.02705	0.00000	0.00000	0.00000	-0.00018
	2	0.00492	-0.03293	0.00000	0.00000	0.00000	-0.00061
	3	0.48937	0.00427	0.00000	0.00000	0.00000	-0.00269
	4	0.00652	-0.05998	0.00000	0.00000	0.00000	-0.00079
	5	0.37232	-0.04855	0.00000	0.00000	0.00000	-0.00265
	6	-0.36173	-0.05494	0.00000	0.00000	0.00000	0.00138
	7	0.49033	-0.01196	0.00000	0.00000	0.00000	-0.00279
	8	-0.48841	-0.02050	0.00000	0.00000	0.00000	0.00258
3	1	0.00724	-0.04577	0.00000	0.00000	0.00000	-0.00023
	2	0.01246	-0.04343	0.00000	0.00000	0.00000	-0.00010
	3	1.02365	0.00640	0.00000	0.00000	0.00000	-0.00205
	4	0.01970	-0.08920	0.00000	0.00000	0.00000	-0.00033
	5	0.78432	-0.07354	0.00000	0.00000	0.00000	-0.00184
	6	-0.75115	-0.08314	0.00000	0.00000	0.00000	0.00124
	7	1.02799	-0.02106	0.00000	0.00000	0.00000	-0.00219
	8	-1.01930	-0.03386	0.00000	0.00000	0.00000	0.00192
4	1	0.01756	-0.05482	0.00000	0.00000	0.00000	-0.00036
	2	0.01070	-0.04701	0.00000	0.00000	0.00000	-0.00004
	3	1.39046	0.00704	0.00000	0.00000	0.00000	-0.00147
	4	0.02826	-0.10183	0.00000	0.00000	0.00000	-0.00040
	5	1.06843	-0.08480	0.00000	0.00000	0.00000	-0.00149
	6	-1.01726	-0.09536	0.00000	0.00000	0.00000	0.00072
	7	1.40100	-0.02585	0.00000	0.00000	0.00000	-0.00169
	8	-1.37993	-0.03993	0.00000	0.00000	0.00000	0.00126
5	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	1	0.00268	-0.03134	0.00000	0.00000	0.00000	0.00004
	2	0.00553	-0.03813	0.00000	0.00000	0.00000	0.00018
	3	0.48412	-0.00016	0.00000	0.00000	0.00000	-0.00214
	4	0.00821	-0.06947	0.00000	0.00000	0.00000	0.00022
	5	0.36991	-0.06005	0.00000	0.00000	0.00000	-0.00143
	6	-0.35626	-0.05982	0.00000	0.00000	0.00000	0.00178
	7	0.48572	-0.01896	0.00000	0.00000	0.00000	-0.00212
	8	-0.48251	-0.01865	0.00000	0.00000	0.00000	0.00217

78

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
7	1	0.00791	-0.05291	0.00000	0.00000	0.00000	0.00005
	2	0.00995	-0.04983	0.00000	0.00000	0.00000	0.00003
	3	1.01649	-0.00019	0.00000	0.00000	0.00000	-0.00174
	4	0.01786	-0.10275	0.00000	0.00000	0.00000	0.00008
	5	0.77774	-0.09043	0.00000	0.00000	0.00000	-0.00124
	6	-0.74700	-0.09014	0.00000	0.00000	0.00000	0.00138
	7	1.02124	-0.03194	0.00000	0.00000	0.00000	-0.00172
	8	-1.01174	-0.03156	0.00000	0.00000	0.00000	0.00177
8	1	0.01442	-0.06314	0.00000	0.00000	0.00000	0.00008
	2	0.00964	-0.05356	0.00000	0.00000	0.00000	0.00003
	3	1.37858	-0.00017	0.00000	0.00000	0.00000	-0.00114
	4	0.02406	-0.11670	0.00000	0.00000	0.00000	0.00011
	5	1.05559	-0.10344	0.00000	0.00000	0.00000	-0.00075
	6	-1.01229	-0.10319	0.00000	0.00000	0.00000	0.00096
	7	1.38723	-0.03805	0.00000	0.00000	0.00000	-0.00109
	8	-1.36993	-0.03772	0.00000	0.00000	0.00000	0.00119
9	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	1	0.00328	-0.02705	0.00000	0.00000	0.00000	0.00015
	2	0.00590	-0.02024	0.00000	0.00000	0.00000	0.00058
	3	0.48227	-0.00512	0.00000	0.00000	0.00000	-0.00231
	4	0.00918	-0.04729	0.00000	0.00000	0.00000	0.00072
	5	0.36941	-0.04607	0.00000	0.00000	0.00000	-0.00115
	6	-0.35400	-0.03839	0.00000	0.00000	0.00000	0.00231
	7	0.48424	-0.02135	0.00000	0.00000	0.00000	-0.00222
	8	-0.48030	-0.01111	0.00000	0.00000	0.00000	0.00240
11	1	0.00826	-0.04347	0.00000	0.00000	0.00000	0.00019
	2	0.00859	-0.02665	0.00000	0.00000	0.00000	0.00011
	3	1.01441	-0.00773	0.00000	0.00000	0.00000	-0.00184
	4	0.01685	-0.07011	0.00000	0.00000	0.00000	0.00031
	5	0.77551	-0.06925	0.00000	0.00000	0.00000	-0.00110
	6	-0.74611	-0.05765	0.00000	0.00000	0.00000	0.00166
	7	1.01937	-0.03381	0.00000	0.00000	0.00000	-0.00173
	8	-1.00945	-0.01835	0.00000	0.00000	0.00000	0.00196
12	1	0.01288	-0.04887	0.00000	0.00000	0.00000	0.00029
	2	0.00908	-0.02870	0.00000	0.00000	0.00000	0.00008
	3	1.37545	-0.00856	0.00000	0.00000	0.00000	-0.00117
	4	0.02196	-0.07757	0.00000	0.00000	0.00000	0.00037
	5	1.05128	-0.07682	0.00000	0.00000	0.00000	-0.00053
	6	-1.01189	-0.06397	0.00000	0.00000	0.00000	0.00122
	7	1.38318	-0.03789	0.00000	0.00000	0.00000	-0.00100
	8	-1.36771	-0.02076	0.00000	0.00000	0.00000	0.00134

75

************** END OF LATEST ANALYSIS RESULT **************

81. PRINT SECTION MAX DISPL NSECT 30 LIST 1 TO 15

76

MAX MEMBER SECTION DISPLACEMENTS

UNIT= INCH FOR FPS AND CM FOR METRIC/SI SYSTEM

MEMBER	MAX DISP	LOCATION	LOAD	L/DISPL
1	0.07255	69.75	7	2563
2	0.02200	124.70	8	8002
3	0.01797	117.36	8	9794
4	0.06278	62.00	8	2962
5	0.02248	132.03	7	7832
6	0.02008	124.70	7	8767
7	0.06675	62.00	8	2786
8	0.02386	132.03	7	7379
9	0.02275	124.70	7	7737
10	0.23058	148.50	5	1717
11	0.12929	205.36	6	2382
12	0.14726	148.50	5	2689
13	0.08569	205.36	6	3594
14	0.13156	148.50	5	3009
15	0.06316	205.36	6	4877

************ END OF SECT DISPL RESULTS ***********

82. PARAMETER
83. CODE AISC
84. BEAM 1 ALL
85. FYLD 7200 ALL
86. LX 6 MEMB 10 TO 15
87. LY 2 MEMB 10 TO 15
88. LZ 2 MEMB 10 TO 15
89. UNB 6 MEMB 10 TO 15
90. UNT 1 MEMB 10 TO 15
91. CHECK CODE ALL

77

STAAD.Pro CODE CHECKING - (AISC)
****

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1 ST	W18 X76	PASS	AISC- H1-1	0.782	6
		191.03 C	0.00	-136.61	0.00
2 ST	W18 X76	PASS	AISC- H1-1	0.437	6
		103.58 C	0.00	87.14	14.67
3 ST	W18 X76	PASS	AISC- H1-3	0.268	6
		44.88 C	0.00	59.39	14.67
4 ST	W18 X76	PASS	AISC- H1-1	0.828	5
		208.79 C	0.00	139.11	0.00
5 ST	W18 X76	PASS	AISC- H1-1	0.475	5
		111.60 C	0.00	-95.32	14.67
6 ST	W18 X76	PASS	AISC- H1-3	0.286	5
		47.78 C	0.00	-63.52	14.67
7 ST	W14 X61	PASS	AISC- H1-1	0.646	5
		128.57 C	0.00	72.89	0.00
8 ST	W14 X61	PASS	AISC- H1-1	0.396	5
		68.36 C	0.00	-55.74	14.67
9 ST	W14 X61	PASS	AISC- H1-3	0.235	5
		22.31 C	0.00	-40.17	14.67
10 ST	W24 X55	PASS	AISC- H1-3	0.651	5
		2.86 C	0.00	184.55	33.00
11 ST	W21 X44	PASS	AISC- H2-1	0.651	6
		2.78 T	0.00	131.45	0.00
12 ST	W24 X55	PASS	AISC- H1-3	0.478	5
		7.81 C	0.00	132.12	33.00
13 ST	W21 X44	PASS	AISC- H2-1	0.451	6
		1.09 T	0.00	91.50	0.00
14 ST	W21 X44	PASS	AISC- H1-3	0.344	5
		12.23 C	0.00	63.26	33.00
15 ST	W18 X40	PASS	AISC- H2-1	0.276	6
		0.44 T	0.00	46.60	0.00

92. FINISH

78

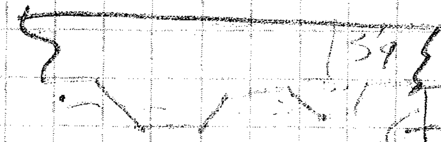
```
*********** END OF THE STAAD.Pro RUN ***********

  **** DATE= MAR 17,2006   TIME= 13:23:29 ****

*********************************************************
*     For questions on STAAD.Pro, please contact :      *
*  By Email - North America  : support@reiusa.com       *
*  By Email - International  : support@reiworld.com     *
*  Tel. (USA) : 714-974-2500 ; Fax (USA) : 714-974-4771 *
*********************************************************
```

79

3RD FLR. UPLIFT CHECK.

DL

$4\frac{3}{4}$" LT. CONC.



= 4" @ 115 PCF → 38 PSF.

DECK	2
CLG.	5
PARTITIONS	20
STL	5
DL	70
LL (OFFICE)	50

80

MORPHY, MAKOFSKY, INC.

$T_F = 1.0(70psf) + (.5)(50psf)$

$95psf$

6'-8" Spans

$= (95psf)(6.66ft) = 634 plf$

$w = 634 plf$

$M = \frac{wl^2}{8} = 86303.3$ ft-lb

$86.3^{k'}$

$S_s = 47.2 in^3$

$F_{act} = \frac{1035639 in\text{-}lb}{47.2 in^3} = 22 ksi$

80

allowable stress

$F_b = 0.66\ F_y$

W16x31

$C_b = 1.0$

$r_T = 1.39$ in

$$\sqrt{\frac{102 \times 10^3 C_b}{50{,}}} \le \frac{l}{r_T} \le \sqrt{\frac{510 \times 10^3 C_b}{50{,}0}}$$

$$45 \le 284.89 \le 100$$

$$F_b = \frac{170 \times 10^3 Cb}{(l/r_T)^2} = 2.09$$

One Brace

$$\sqrt{\frac{102 \times 10^3 Cb}{50{,}000}}$$

$$\frac{170 \times 10^3 Cb}{\left(\frac{189}{1.39}\right)^2} = 9.2$$

1/4 Braces $L_b = 8.25$ ft

$M_2 = 1035639$ in-lb

$$M_1 = \frac{(634\ plf)(8.25)\ ft}{2}(33 - 8.25) = 64727\ ft\text{-}lb$$

$M_1 = 776{,}729$ in-lb

$$C_b = 1.75 + 1.05\left(\frac{776,729}{1035639}\right) + .3\left(\frac{776,729}{1035639}\right)^2$$

$$C_b = 1.75 + .7875 + .16875$$

2.7 use 2.3

$$\sqrt{\frac{102 \times 10^3 C_b}{50}} \leq \frac{(8.25)(12)}{1.39} \leq \sqrt{\frac{510 \times 10^3 C_b}{50}}$$

$$68.5 \leq 71.2 \leq 153.2$$

use

$$F_b = \left[\frac{2}{3} - \frac{F_y (l/r_T)^2}{1530 \times 10^3 C_b}\right] F_y \leq 0.60 F_y$$

$$F_b = \left[\frac{2}{3} - .072076\right] = \underline{\underline{29.73}}$$

W24x62 50 ft Span $S_s = 131$
$r_T = 1.71$

$w = 634$ plf

$$M = \frac{wl^2}{8} = 198,125 \text{ ft-lb}$$

$$F_{act} = \frac{(198,125)(12)}{131} = 18.2 \text{ Ksi}$$

$$\sqrt{\frac{102 \times 10^3 C_b}{50}} \leq \frac{l}{r_T} \leq \sqrt{\frac{510 \times 10^3 C_b}{50}}$$

$$45 \leq 350.9 \leq 101$$

$$\frac{170 \times 10^3 \, 1.0}{(l/r_T)^2} = 1.38$$

1/4 Braces = 12.5 ft

$M_2 = 198,125$

$$M_1 = \frac{(634)(12.5)}{2}(50-12.5)$$

$M_1 = 148594$

BA

MORPHY, MAKOFSKY, INC.

$C_b = 2.3$

$$\sqrt{\frac{102 \times 10^3 (2.3)}{50}} \leq \frac{(12.5)(12)}{1.71} \leq \sqrt{\frac{510 \times 10^3 (2.3)}{50}}$$

$$68.5 \leq 87.72 \leq 153.2$$

$$F_b = \left[\frac{2}{3} - \frac{F_y \left(\frac{l}{r_T}\right)^2}{1530 \times 10^3 (2.3)}\right] F_y \leq .60 F_y$$

$$\left[\frac{2}{3} - .10933\right] F_y = 27.8 \text{ Ksi}$$

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 22'-8 span

Member Size	-	W12X22
Length	(ft)	22.67
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	11

2. Loading List

Construction Loads

Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	22

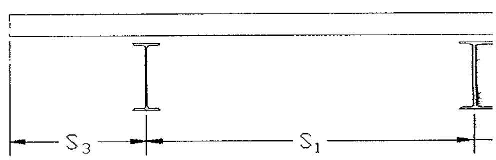
Composite Loads

Finish	(psf)	0.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	50.0

3. Beam Spacing

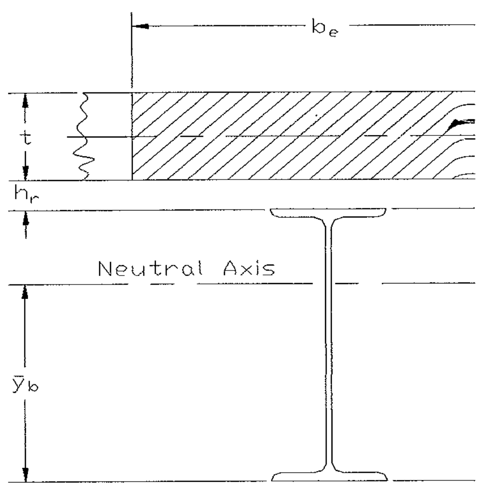
Beam Spacing - S_1	(ft)	6.67
Beam Spacing - S_2	(ft)	6.67
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	6.67

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)	11.4	(ASD)
Load / Connector	(k)	21.9	(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)	68.01
Neutral Axis ($y_{\sim b}$)	(in)	13.17
Moment of Inertia	(in^4)	596

Fully Composite Beam Calculator

1. General Information

Location: 2nd Floor 22'-8 span

Member Size	-	W12X22
Length	(ft)	22.67
f_y	(ksi)	50
f'_c	(ksi)	4
n	-	11

2. Loading List

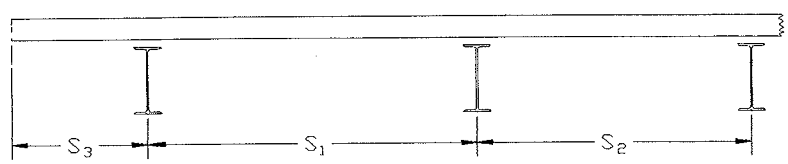
Construction Loads		
Concrete	(pcf)	115
Decking	(psf)	2.0
Beams	(psf)	0.0
Girders	(psf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Member	(plf)	22

Composite Loads		
Finish	(psf)	0.0
Ceiling	(psf)	5.0
Insulation	(psf)	0.0
Mechanical	(psf)	0.0
Partitions	(psf)	20.0
Wall	(plf)	0.0
Miscellaneous	(psf)	0.0
Miscellaneous	(plf)	0.0
Live Load	(psf)	50.0

3. Beam Spacing

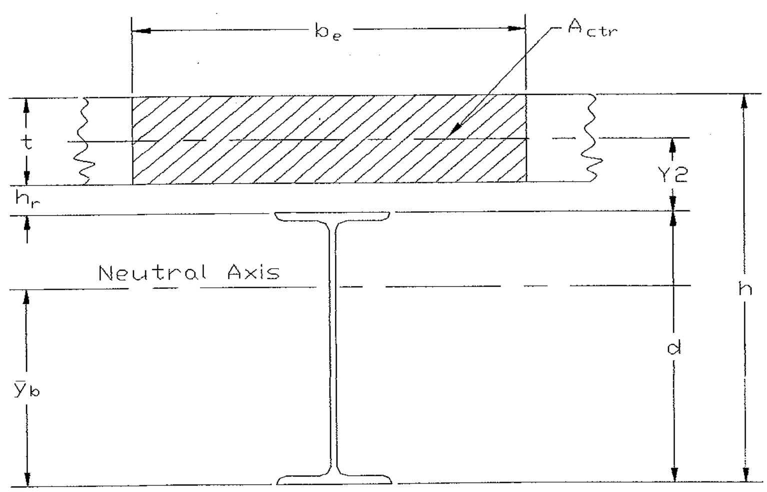
Beam Spacing - S_1	(ft)	6.67
Beam Spacing - S_2	(ft)	6.67
Edge Spacing - S_3	(ft)	0.00
Contributary Width	(ft)	6.67

(note: S_2 or S_3 must be zero.)



4. Decking

Perpendicular	(y/n)	YES	
Concrete Depth (t)	(in)	3.25	
Rib Height (h_r)	(in)	1.50	
Rib Width	(in)	1.75	
Height of Stud	(in)	3.50	
Stud Diameter	(in)	0.75	
Connectors / Rib	-	1	
Load / Connector	(k)	11.4	(ASD)
Load / Connector	(k)	21.9	(LRFD)



5. Transformed Sections

Effective Width (b_e)	(in)	68.01
Neutral Axis ($y_{\sim b}$)	(in)	13.17
Moment of Inertia	(in^4)	596

Fully Composite Beam Calculator

W12X22 **Location:** 2nd Floor 22'-8 span

6. Bending Calculations (ASD Method)

Construction Loading

Load	(klf)	0.29		
Moment	(ft-k)	18.7		
Stress in Steel	(ksi)	8.8	< 33.0	ok
Deflection	(in)	0.38	1/ 711.6	

Composite Loading

Load	(klf)	0.50		
Moment	(ft-k)	32.1		
Stress in Steel	(ksi)	17.4	< 45	ok
Stress in Concrete	(ksi)	0.23	< 1.8	ok
Deflection	(in)	0.17	1/ 1581	
DL Deflection	(in)	0.06	1/ 4742	
LL Deflection	(in)	0.11	1/ 2371	
Total Deflection	(in)	0.55	1/ 491	

7. Shear Calculations (ASD Method)

Composite Loading

Shear	(k)	9.0		
Shear Stress in Steel	(ksi)	2.8	< 20	ok

8. Shear Studs (ASD Method)

Total Shear	(k)	162	*(steel governs)*	
Reduction Factor	-	1.00		
Maximum Diameter	(in)	1.0625	> 0.75	ok
Studs Required	-	15	studs each side of max. moment	

9. Bending Calculations (LRFD Method)

Construction Loading

Developed Load	(klf)	0.35		
Developed Moment	(ft-k)	22.4		
Allowable Moment	(ft-k)	109.875	> 22.4	ok

Construction & Composite Loading

Developed Load	(klf)	1.08		
Developed Moment	(ft-k)	69.3		
Allowable Moment	(ft-k)	234.2	> 69.3	ok
Plastic Neutral Axis	(in)	1.40		

Note: The PNA is taken from the top of concrete.

10. Shear Calculations (LRFD Method)

Composite Loading

Developed Shear	(k)	12.2		
Allowable Shear	(ksi)	86.4	> 12.2	ok

11. Shear Studs (LRFD Method)

Studs Required	-	15	studs each side of max. moment

87

W24 x 62

$w = 95 \times 6.67 = 0.63^{K/'}$

$M = \frac{1}{8} \times 0.63 \times 49.67^2 = 194.3^{K'}$

$f_b = \frac{194.3 \times 12}{132} = 17.7^{ksi}$

supplied price

l/r_T $\frac{49.67 \times 0.5 \times 12}{1.68} = 177.4$

$C_b = 1.75$

$F_b = \frac{170 \times 10^3 \times 1.75}{177.4^2} = 9.45^{ksi}$

or $F_b = \frac{1 \times 10^3 \times 1.75}{24.83 \times 5.72} = 12.32^{ksi}$ no good

@ 1/4 pt. $F_b = \frac{1.75 \times 10^3}{12.5 \times 5.75} = 24.6^{ksi}$ ✓ OK

JLS 3-21-06 88

MORPHY, MAKOFSKY, INC.

W12x16

$m = \frac{1}{8} \times 0.63 \times 22.67^2 = 40.47^{k'}$

$f_b = \frac{40.47 \times 12}{17.1} = 28.4^{ksi}$

No bracing $C_b = 1.0$

$l/r_T \quad \frac{22.67 \times 12}{0.96} = 283$

$\Rightarrow F_b = \frac{170 \times 10^3}{283^2} = 2.$

or $F_b = \frac{1 \times 10^3}{22.67 \times 11.3} = 3.9$

brace @ mid pt

$l/r_T = 142$

$F_{b1} = 8.4^{ksi}$

$F_b = \frac{1 \times 10^3 \times 1.75}{11.33 \times 11.3} = 13.7^{ksi}$

Wpk

$F_b \quad 27.2^{ksi}$ ⇒ need to increase beam size

W12x22 $f_b = \frac{40.47 \times 12}{25.4} = 19.1^{ksi}$

$F_b = \frac{1 \times 10^3 \times 1.75}{11.33 \times 7.19} = 20.9^{ksi}$

	JLS	3-21-06	

W14x22

$M = \frac{1}{8} \times 0.63 \times 27^2 = 54.7^{K'}$

$f_b = \frac{54.7 \times 12}{29} = 22.6^{ksi}$

midpt $F_b = \frac{1 \times 10^3}{27 \times 8.2} = 4.5^{ksi}$ no good.

$\ell / r_T = \frac{13.5 \times 12}{1.25} = 129.6$

$F_b = \frac{170 \times 10^3 \times 1.75}{129.6^2} = 17.7^{ksi}$

or $F_b = \frac{1 \times 10^3 \times 1.75}{13.5 \times 8.2} = 15.8^{ksi}$ ✓

⇒ @ ¼ pt $F_b = 30^{ksi}$ ✓ ok.

	JLS	3-21-06	90

MORPHY, MAKOFSKY, INC.

JST AT ASSEMBLY Hall

DL	JST	5
	STRUCT. DECK	2
	INS	1
	Roof deck	2
	CLG	5
	DL	15
	LL	20
	TL	35

WIND.

end a = 10'

26
-84.
2 26
-53
1
2 18.5
-38,

$A_{jst} = 18 \times 6.33 \simeq 120$

(3.) D + .75 (D + W) = 49.5# govs dow

0.6 D - WL = 0.6 × 15 - 84 = 75 up govs

end of the section

W = .75 × 6.14 = 460 PCF   R = 92

$S_1 = 18.67'$ $S_2 = 21'$

18K3   ~~20K3~~

JLS	3/23/06	AH

91

MORPHY, MAKOFSKY, INC.

Zone @ 2

0.6D - W = 0.6×15 - 53 = 44 psf

D + .75(L+W) = 50 ⇐ gov

×6.14 = 307 plf

R 92.

S = 21' 14K3

S = ~~18.6~~ 19' (16K2)

⇒ ~~14~~ 12K3

Zone 3

⇒ 0.6×15 - 38 = 29

⇒ ~~0.6~~ 15 + .75(15+18.5) = 40 psf gov'S

w = 246 R92

S = 21' (14K1) RK3

92

	JLS	3-23-06	A12

MORPHY, MAKOFSKY, INC.

Bm @ assembly hall

(1) uplift governing case

w = ~~[struck]~~ 20× 75 = 1.5^k

s = 18.42   R = 13.8^k

M = 63.6^k' (note uplift)

W12×22 f_b = 30^ksi

Δ = 0.86 = l/257 ok for roof

l_u = 6'6

$f_b = \frac{1 \times 10^3}{6.~~14~~ \times 7.9} = 22.7^{ksi}$

NO

W14×22 f_b = 26.3 > F_b = 19.9 ✗

W16×31 f_b = 16.2^ksi < F_b = 24.9^ks ✓ OK

(2) w = 50×21 = 1.05^k R = 9.67^k

W14×22   M = 44.5^k'

Δ = 0.47 ✓ l/470

f_b = 18.4

l_u = 6.14' F_b = 19.9^k ✓ ok

	JLS	3-23-06	98

MORPHY, MAKOFSKY, INC.

(3) $w = 75 \times 11.33 : 0.85^{k/'}$ $R = 7.83^{k}$

$s = 18.42'$

W14x22 $f_b = 14.9^{ksi}$ ✓ $M = 36^{k'}$ OK

(4) $w = 50 \times 11.33 : 0.57^{k/'}$

$R = 5.3^{k}$ $M : 24.2^{k'}$

W12x16 $f_b = 17.0$ $F_b = 14.4$ or 23.7^{ks}

OK

(5) $w = 40 \times 20 = 0.8^{k/'}$

W14x22 see (3)

(6) $w = 21 \times 40 = 0.84$

W14x22.

(7) $w = 18.67'$

$w = 3.1 \times 75 = 0.23^{k/'}$

$R = 2.15^{k}$ $M = 10.1^{k'}$

Hold also frame bm.

8) $w = 3.1 \times 50 = 0.16^{k/'}$.

	JLS.	3-23-06	94

Dynamic load Case

1.2D + 0.5L + 0.2W

or

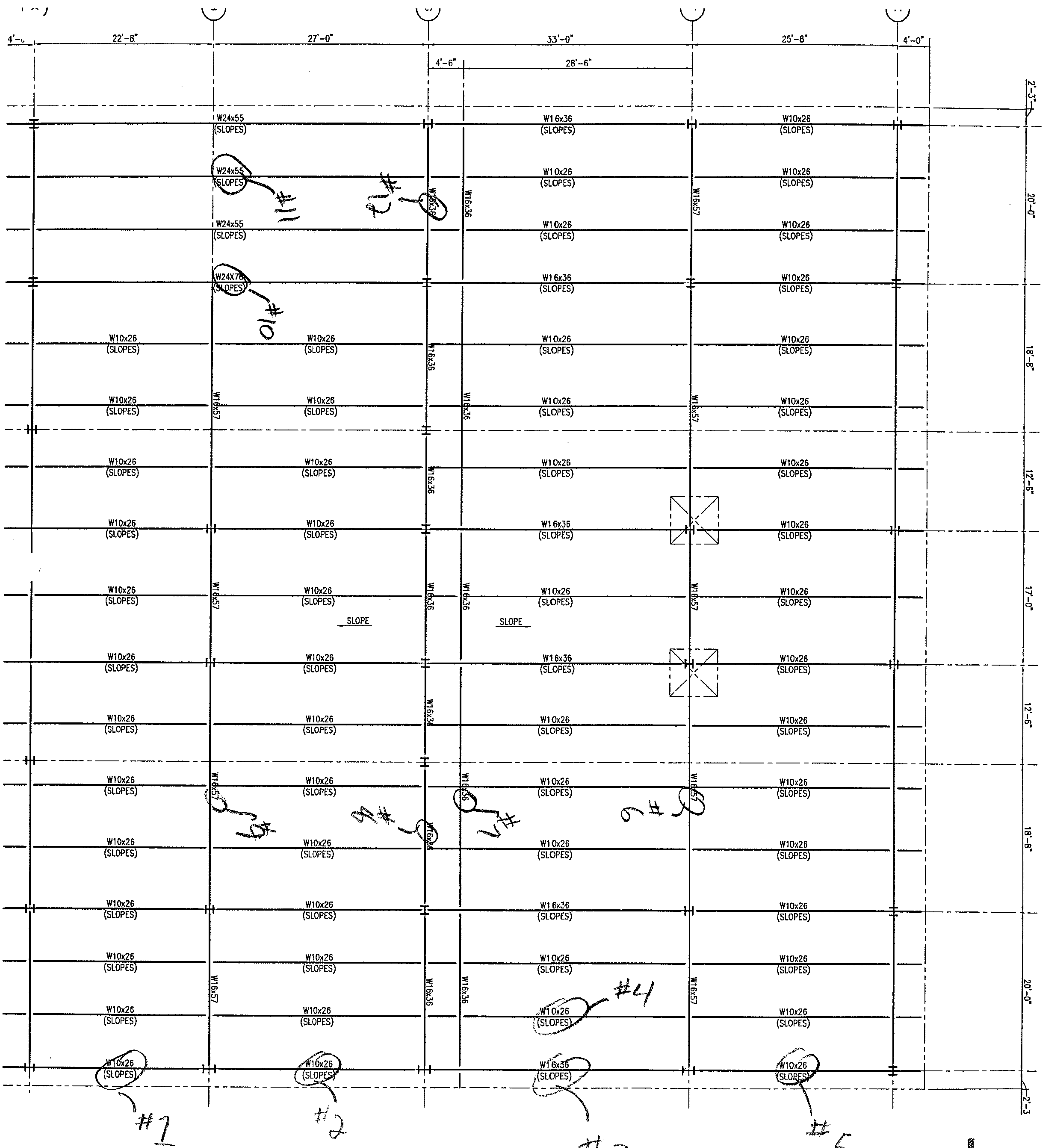
0.9D + 0.5L + 0.2W

Beams upword load

1.0D + 0.5L

95

MORPHY, MAKOFSKY, INC.



4'-0"
22'-8"
27'-0"
33'-0"
25'-8"
4'-0"
4'-6"
28'-6"
2'-3"
20'-0"
18'-8"
12'-6"
17'-0"
12'-6"
18'-8"
20'-0"
2'-3
W24x55 (SLOPES)
W16x36 (SLOPES)
W10x26 (SLOPES)
W24x76 (SLOPES)
W16x57
W16x36
SLOPE
#1
#2
#3
#4
#5
#6
#7
#8
#9
#10
#11
#12

96

DEAD

STL	5	psf
MD	2	psf
INSUL	1	psf
METAL	2	psf
MISC	5	psf

$DL = 15\,psf$

$DL_f = 15 \times 1.05 = 15.8\,psf$

$LL_f = 20 \times 1.05 = 21.1\,psf$

WIND

+18.5
-38

$D + L = 36.9$

$D + .75(L + W) = 45.5\,psf$ ← Governs

$.6D + W = 27.98$

$(45.5\,psf)(8.5\,feet) = 386.75\,plf$
390 plf

uplift

$.6D - W = .6(15.8) - (38) = -28.5\,psf$

$(28.5)(8.5) = 245\,plf$

BEAM #1

[redacted] 22'-8" Span

$$M = \frac{(390)(22.7)^2}{8} = 25.1 \text{ ft-kip}$$

$$\text{Req } S_x = \frac{(25.1)(12)}{33} = 9.2 \text{ in}^3$$

W10x12 $\quad S_x = 10.9$

$$f_b = \frac{(25.1)(12)}{10.9} = 27.63 \text{ ksi}$$

Brace at 1/4 for uplift 24 ft

$$M = \frac{(245)(22.7)^2}{8} = 15.8 \text{ ft-kip} \qquad f_b = 17.4 \text{ ksi}$$

$$68.5 \le \frac{(6)(12)}{.96} \le 153$$

$$75$$

$$F_b = \left[\frac{2}{3} - \frac{50(75)^2}{1530 \times 10^3 (1.3)}\right] 50 = 29.3 \text{ ksi}$$

O.K.

			98

W10 x 17 $S_x = 16.2$

$$f_b = \frac{(25.1)(12)}{16.2} = 18.6 \text{ ksi}$$

$$\Delta = \frac{(19.6)(22.7)^2}{10 \times 10^3} = .958 \quad \underline{o.k.}$$

$$\frac{l}{240} = 1.135$$

Use **W10 x 26** $S_x = 27.9 \text{ in}^3$

$$f_b = \frac{(25.1)(12)}{27.9} = 10.8$$

Check unbraced length ½ point $r_T = 1.54$

$$\frac{l}{r_T}\ \frac{(12)(12)}{1.54} = 93.5 \qquad C_b = 1.75$$

$$\sqrt{\frac{102 \times 10^3 (1.75)}{50}} = 59.75 \qquad \sqrt{\frac{510 \times 10^3\ 1.75}{50}} = 133.6$$

$$F_b = \left[\frac{2}{3} - \frac{F_y\ (93.5)^2}{1530 \times 10^3\ C_b}\right] 50 = 25.2$$

Brace @ ½ point

BEAM #2

[redacted] 27'-0" Span

390 plf

$$M = \frac{(390)(27)^2}{8} = 35.5 \text{ ft-kip}$$

$$\text{Req } S_x = \frac{(35.5)(12)}{33} = 13 \text{ in}^3$$

W10x15 $S_x = 13.8$

$$f_b = \frac{(35.5)(12)}{13.8} = 30.87$$

Braced at 1/4 for uplift actual length 28.5

$$M = \frac{(245)(27)^2}{8} = 22.3 \text{ ft-k}$$

$$f_b = \frac{(22.3)(12)}{13.8} = 19.4 \text{ ksi}$$

$$68.5 \le \frac{(7.125)(12)}{.99} \le 153$$

$$68.5 \le 86.4 \le 153$$

$$F_b = \left[\frac{2}{3} - \frac{50\,(86.4)^2}{1530 \times 10^3 (2.3)}\right] 50 = 28.03 \text{ ksi}$$

$$\frac{f_b \times L^2}{d \times 10^3}$$

O.K.

105

MORPHY, MAKOFSKY, INC.

$$\Delta = \frac{f_b \times L^2}{d \times 10^3}$$

W10 x 26 $S_x = 27.9$ $r_T = 1.54$

$$f_b = \frac{(35.5)(12)}{27.9} = 15.3$$

$$\frac{l}{240} = 1.35 \text{ in}$$

$$\Delta = \frac{(15.3)(27)^2}{10 \times 10^3} =$$

$$\Delta = 1.12 \text{ in} < \frac{l}{240} \quad \text{o.k.}$$

Check Unbraced length at ½ point

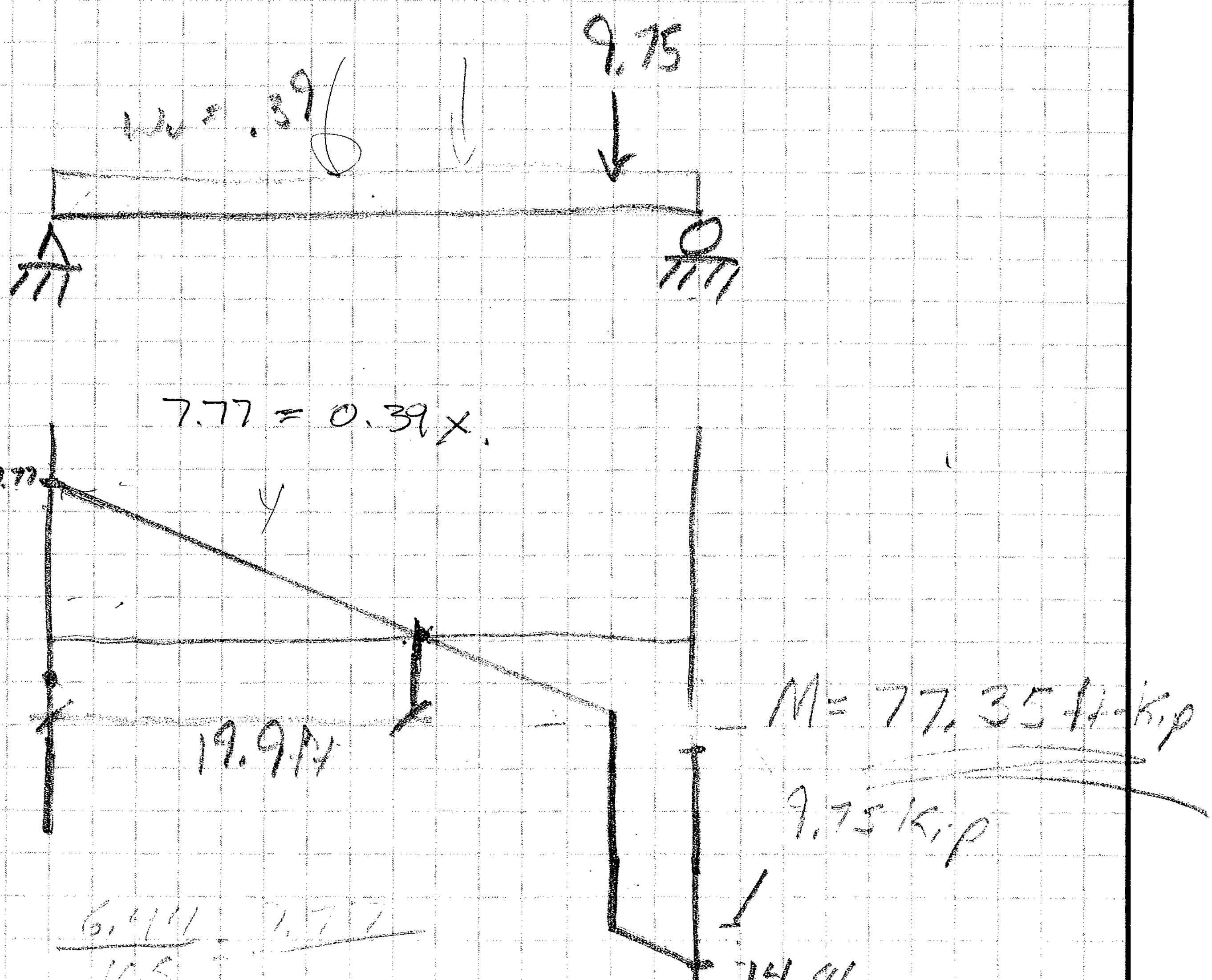
$$f_b = \frac{(22.3)(12)}{27.9} = 9.6 \text{ ksi}$$

$$\frac{l}{r_T} = 111.04$$

$$F_b = \left[\frac{2}{3} - \frac{50\,(111.04)^2}{1530 \times 10^3\, 1.75}\right] 50 = 21.8 \text{ ksi}$$

Brace @ ½ point

BEAM #3



$$\frac{77.35(12)}{33} = 28 \text{ in}^3$$

W14x22 $S_x = 28.0 \text{ in}^3$

$$f_b = \frac{77.35(12)}{29} = 32 \text{ Ksi}$$

$$\frac{l}{240} = 1.65$$

W16x36 $S_x = 56.5$

$$f_b = \frac{(77.35)(12)}{56.5} = 16.5$$

$$\frac{(16.5)(33^2)}{16 \times 10^3} = 1.12$$

Use 16x36

103

MORPHY, MAKOFSKY, INC.

$l = 30 ft$ W16 x 36 $r_T = 1.79$

Check unbraced length at ½ point

15 ft

$$\frac{(15)(12)}{r_T} = 100.6$$

$$M = \frac{(245)(28.5)^2}{8} = 24.9 \text{ ft-kips}$$

$$f_b = \frac{(24.9)(12)}{56.5} = 5.3$$

$$F_b \frac{(170 \times 10^3)}{(100.6)^2} = 16.8$$

No Braces

104

BEAM #4

28'-6" Span

$$M = \frac{(390)(28.5)^2}{8} = 39.6 \text{ ft-kip}$$

$$\text{Req } S_x = \frac{(39.6)(12)}{33} = 14.4 \text{ in}^3$$

Try W10x17 $S_x = 16.2 \text{ in}^3$

$$f_b = \frac{(39.6)(12)}{16.2} = 29.3 \text{ ksi}$$

Unbraced Length for uplift

$$M = \frac{(245)(28.5)^2}{8} = 24.9 \text{ ft-kip}$$

$$f_b = 14.5$$

Braced at 1/4   actual length = 34.8 ft

$r_T = 1.51$

$$64.5 \le \frac{(7.1)(12)}{1.01} \le 153$$

$$84.7$$

$$\left[\frac{2}{3} - \frac{50(84.7)^2}{1530 \times 10^3 C_b}\right] 50 = 28.2 \text{ ksi}$$

o.k.

105

MORPHY, MAKOFSKY, INC.

$\frac{l}{240} = 1.43$

$\Delta = \frac{(29.3)(28.5)^2}{10 \times 10^3} = 2.38$

W10x26 $S_x = 27.9$

$f_b = \frac{(39.6)(12)}{27.9} = 17.03$

$\Delta = \frac{(17.03)(28.5)^2}{10 \times 10^3} = 1.38$ in o.k.

Use W10x26 $F_b = 18.5$ $r_T = 1.54$

$\frac{l}{r_T} = \frac{(15)(12)}{1.54} = 116.9$

$F_b = \left[\frac{2}{3} - \frac{50(116.9)^2}{1530 \times 10^3 C_b}\right] = 20.6$ ksi

Brace @ ½ point

BEAM #5

$w = 390$ plf

$$M = \frac{(390)(25.7)^2}{8} = 32.2 \text{ ft-kip}$$

Req $$S_x = \frac{(32.2)(12)}{.33} = 11.8 \text{ in}^3$$

Try W10x15 $\quad S_x = 13.8 \text{ in}^3$

$$f_b = \frac{(32.2)(12)}{13.8} = 28 \text{ ksi}$$

Check Unbraced length for uplift

$$M = \frac{(245)(25.7)^2}{8} = 20.2 \text{ ft-kip} \qquad f_b = 17.6$$

$$\sqrt{\frac{(102 \times 10^3)(1.0)}{50}} \leq \frac{(25.7)12}{.99} \leq \sqrt{\frac{510 \times 10^3 (1.0)}{50}}$$

$$45.2 \leq 311.5 \leq 100.99$$

Braced at Center

$$\frac{l}{r_T} = \frac{(12.85)12}{.99} = 155.8$$

$$\frac{l}{r_T} > \sqrt{\frac{510 \times 10^3 (1.75)}{50}} = 133.6$$

$$F_b = \frac{170 \times 10^3\, 1.75}{(\ell/r_T)^2} = 12.25 \text{ ksi}$$

$$F_b = \frac{12 \times 10^3 (1.75)}{(12)(12.85)(9.25)} = 14.73 \text{ ksi}$$ No Good

Braced at 1/3 points

$C_b = 1.0$

$$F_b = \frac{170 \times 10^3 (1.0)}{(103)^2} = 15.76 \text{ ksi}$$

$$F_b = \frac{12 \times 10^3 (1.0)}{(8.56)(12)(9.25)} = 12.61$$

Braced at 1/4 points

$C_b = 1.75 + 1.05(.75) + .3(.75)^2$ $M_1 = 15.15$ $M_2 = 20.2$

$C_b = 2.3$

$$\sqrt{\frac{102 \times 10^3 (2.3)}{50}} \leq \frac{(6.78)(12)}{.99} \leq \sqrt{\frac{510 \times 10^3 (2.3)}{50}}$$

$$68.5 \leq 82.2 \leq 153$$

$$F_b = \left[\frac{2}{3} - \frac{50 (82.2)^2}{1530 \times 10^3 (2.3)}\right] 50 = 28.5 \text{ ksi}$$

o.k.

108

MORPHY, MAKOFSKY, INC.

$\Delta = \frac{f_b \, l^2}{d \times 10^3}$ $\frac{l}{240} = 1.28$

$\Delta = \frac{(28)(25.7)^2}{10 \times 10^3} = 1.85$

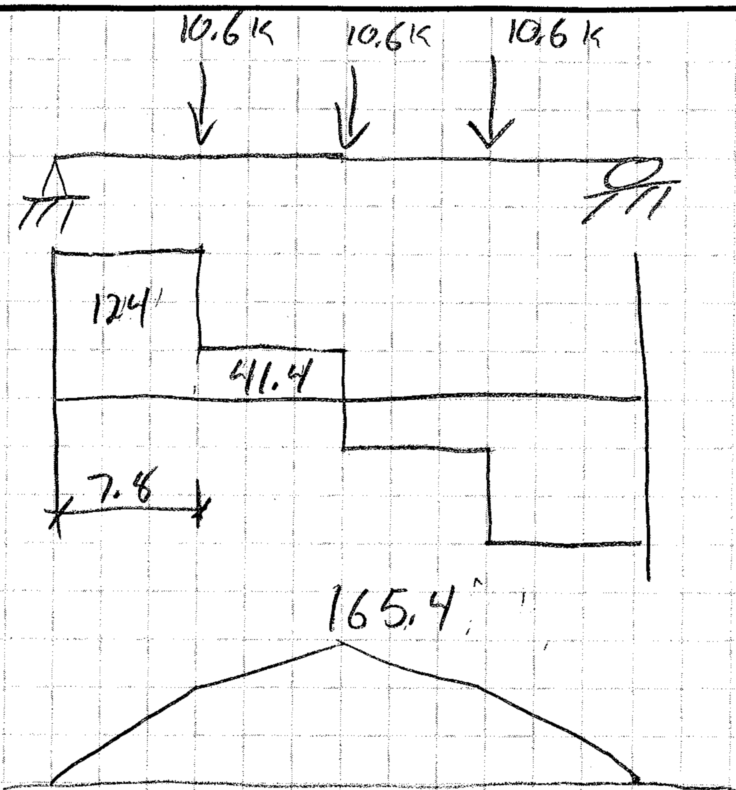
Try W10x26 $S_x = 27.9$

$= \frac{(32.2)(12)}{27.9} = 13.85$ ksi

$\Delta = \frac{(13.85)(25.7)}{10 \times 10^3} = .92$ o.k.

Brace @ ½ point

BEAM #6



Beam #8

$\frac{(10.6)3}{2} =$

15.9

$S_{x_r} = \frac{(165.4)(12)}{33} = 60.14$

Try 14 x 43 $S_x = 62.7$

$f_b = \frac{(165.4)(12)}{62.7} = 31.7$ ksi

110

MORPHY, MAKOFSKY, INC.

$$\frac{l}{240} = 1.56$$

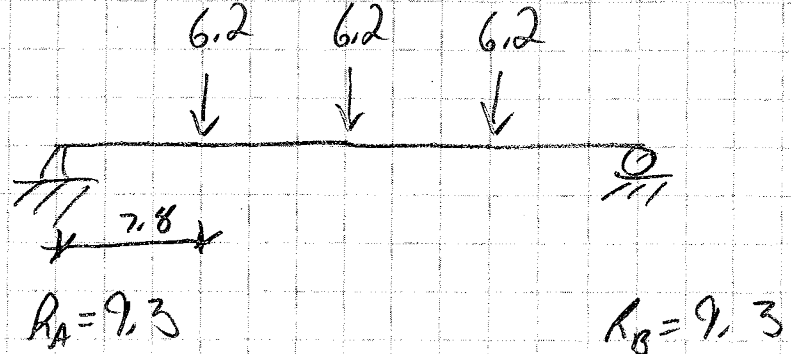
16×57 $\quad$ $S_x = 92.7$

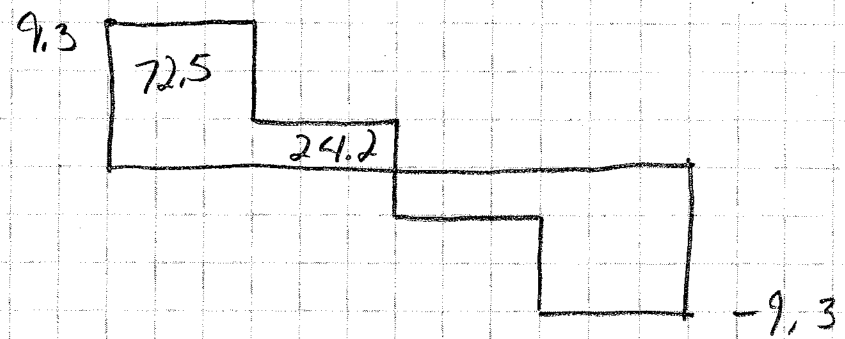
$$\frac{(165.4)(12)}{92.7} = 21.4$$

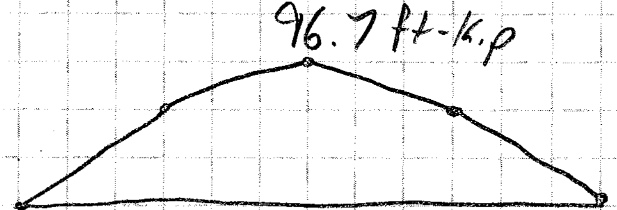
$$\frac{(21.4)(31.2)^2}{16 \times 10^3} = 1.3 \text{ in}$$

111

BEAM # 7







$$S_{x_{req}} = \frac{(96.7)(12)}{33} = 35.2 \text{ in}^3$$

Try W14x26 $\qquad S_x = 35.3$

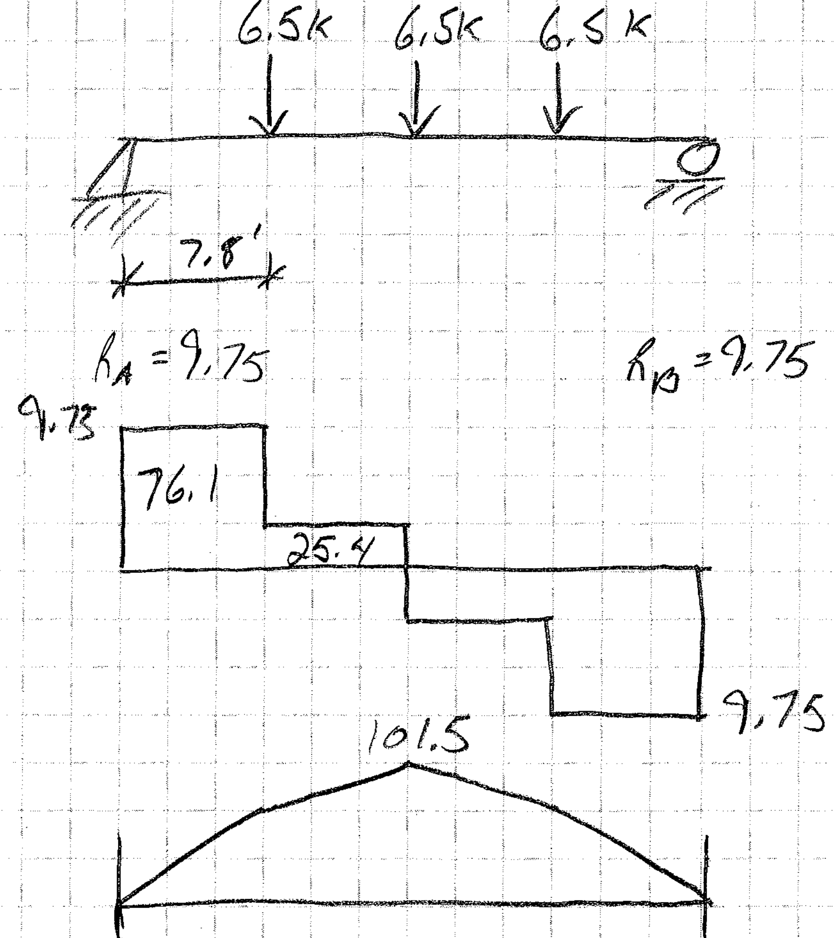
$f_b = 32.9$

Use 16x36

MORPHY, MAKOFSKY, INC.

BEAM #8

#5



$$S_{x\,req} = \frac{(101.5)(12)}{33} = 37 \text{ in}^3$$

W14x30 $S_x = 42 \text{ in}^3$

$$f_b = \frac{(101.5)(12)}{42} = 29 \text{ ksi}$$

o.k.

$\frac{l}{240} = 1.56$

$$\Delta = \frac{(29)(31.2)^2}{16 \times 10^3}$$

~~Try~~ 16 x 36 $S_x = 56.5$

$$f_b = \frac{(101.5)(12)}{56.5} = 21.6$$

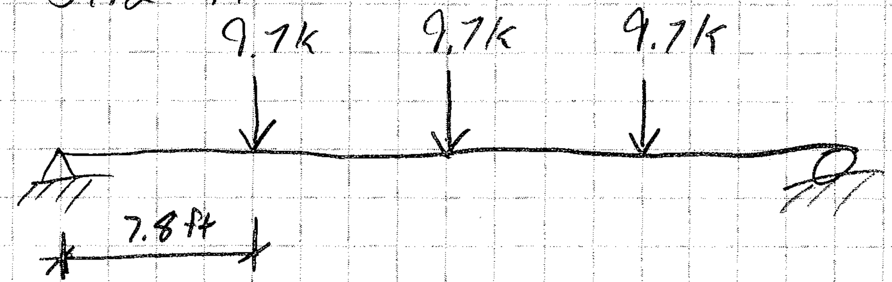
$$\Delta = \frac{(21.6)(31.2)^2}{16 \times 10^3} = 1.31 \text{ in ok}$$

Use 16 x 36

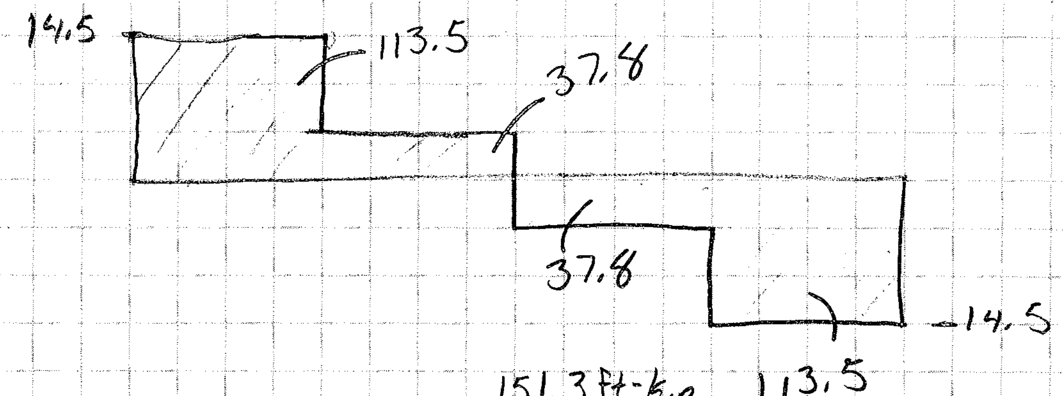
BEAM #9

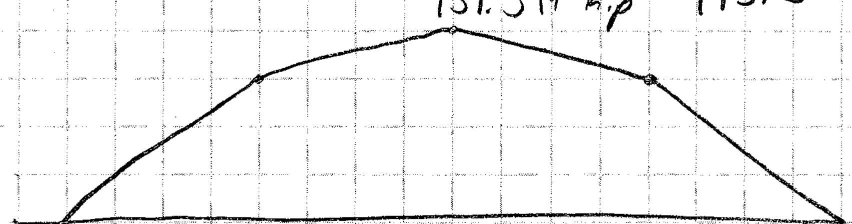
span 31.2 ft

Beam #7



$$R_A = \frac{9.7 + 9.7 + 9.7}{2} = 14.55$$





$$\text{Req } S_x = \frac{(151.3)(12)}{33} = 55.02 \text{ in}^3$$

Try 14x43 $\quad S_x = 62.7 \text{ in}^3$

$$f_b = \frac{(151.3)(12)}{62.7} = 28.9$$ o.k.

$\frac{\ell}{240} = 1.56$ in

$$\Delta = \frac{(28.09)(31.2)^2}{14 \times 10^3} = 1.95$$

Try 16x45 $\quad S_x = 72.7$

$$f_b = \frac{(151.3)(12)}{72.7} = 24.9$$

$$\frac{(24.9)(31.2)^2}{16 \times 10^3} = 1.52 \text{ in}$$

Use 16x57

			116

BEAM #10

50 ft Span

300 ft-kip

$$f_b = \frac{(300)(12)}{33} = 109$$

W24 x 76 $S_x = 176$

$$f_b = \frac{(300)(12)}{176} = 20.45 \text{ ksi}$$

$$\frac{l}{240} = 2.5$$

$$\frac{(20.45)(50)^2}{24 \times 10^3} = 2.13 \text{ in} \quad \text{o.k.}$$

Use 24 x 76

$l = 28.5$ $P = 9.2$ kips $w_u = 245$

$M = 190$ ft-kips $f_b = 12.95$

$$\frac{(28.5)(12)}{(r_T)} = 150.3$$

$r_T = 2.29$

$$\frac{170 \times 10^3 (1.75)}{(150)^2} = 13.34$$

ok no braces

118

MORPHY, MAKOFSKY, INC.

BEAM #11

Span 50'

$w_u = 390$ lb/ft

$$\frac{(.39)(50)^2}{8} = 121.9 \text{ ft-Kip}$$

$$\frac{(121.9)(12)}{33} = 44.3$$

Try W18 x35   57.6

$$\frac{(121.9)(12)}{57.6} =$$

$$f_b = 25.4 \text{ ksi}$$

Uplift

$$\frac{(.245)(50)^2}{8} = 76.6 \text{ ft-kips}$$

$$f_b = \frac{(76.6)(12)}{57.6} = 15.9$$

Braced at 1/4 points

$$68.5 \le \frac{(12.5)(12)}{1.49} \le 153$$

100.7

$$f_b = \left[\frac{2}{3} - \frac{50(100.7)^2}{1530 \times 10^3 (2.3)}\right] 50 = 26.1 \text{ ksi}$$

119

W24 x 55 $S_x = 114$

$\frac{l}{240} = 2.5$

$f_b = \frac{(121.9)(12)}{114} = 12.8$ ksi

$\Delta = \frac{(12.8)(50)^2}{24 \times 10^3} = 1.33$ o.k.

Use W24 x 55

52.4 Check braced length ½ braced

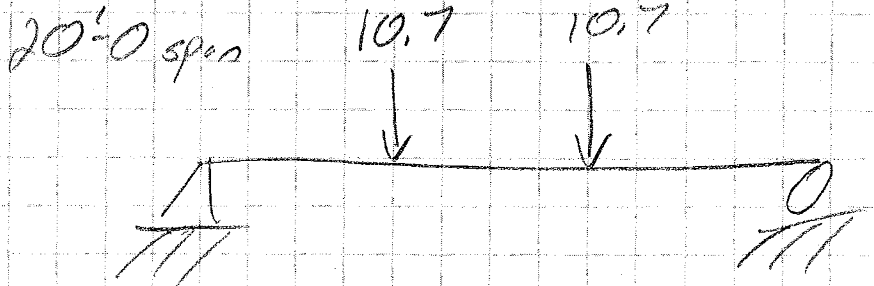
$\frac{(13.1)(12)}{1.68} = 93.57$

$f_b = 27.11$

Brace at ¼ points

			120

BEAM #12



$M = 71.69$

$$S_x = \frac{(71.69)(12)}{33} = 26.1$$

W16x36 $\qquad S_x = 56.5 \text{ in}^3$

$$\frac{l}{240} = 1$$

$$f_b = \frac{(71.7)(12)}{56.5} = 15.23$$

$$\frac{(15.23)(20)^2}{16 \times 10^3} = .38 \text{ in} \quad \text{o.k.}$$

Look at 2 floor unbrace

$L = 15.67 + 14.67 = 30.33'$

$\frac{Kl}{r} < 200$

$\Rightarrow r \geq \frac{1.0 \times 30.33 \times 12}{200}$

$= 1.82$

W14x61 $r_y = 2.45$ ✓ OK.

$\frac{Kl}{r} = 148.6$ $P_a = 174^k$ see LRFD Manual

7,8 $P = 110^k$ ✓ OK.

W18x76

$r_y = 2.61$

$\lambda_c = \frac{Kl}{r_x}\sqrt{\frac{F_y}{E}} = \frac{1.0 \times 30.33 \times 12}{2.61 \times 3.142}\sqrt{\frac{50}{29 \times 10^3}} = 1.84$

> 1.5

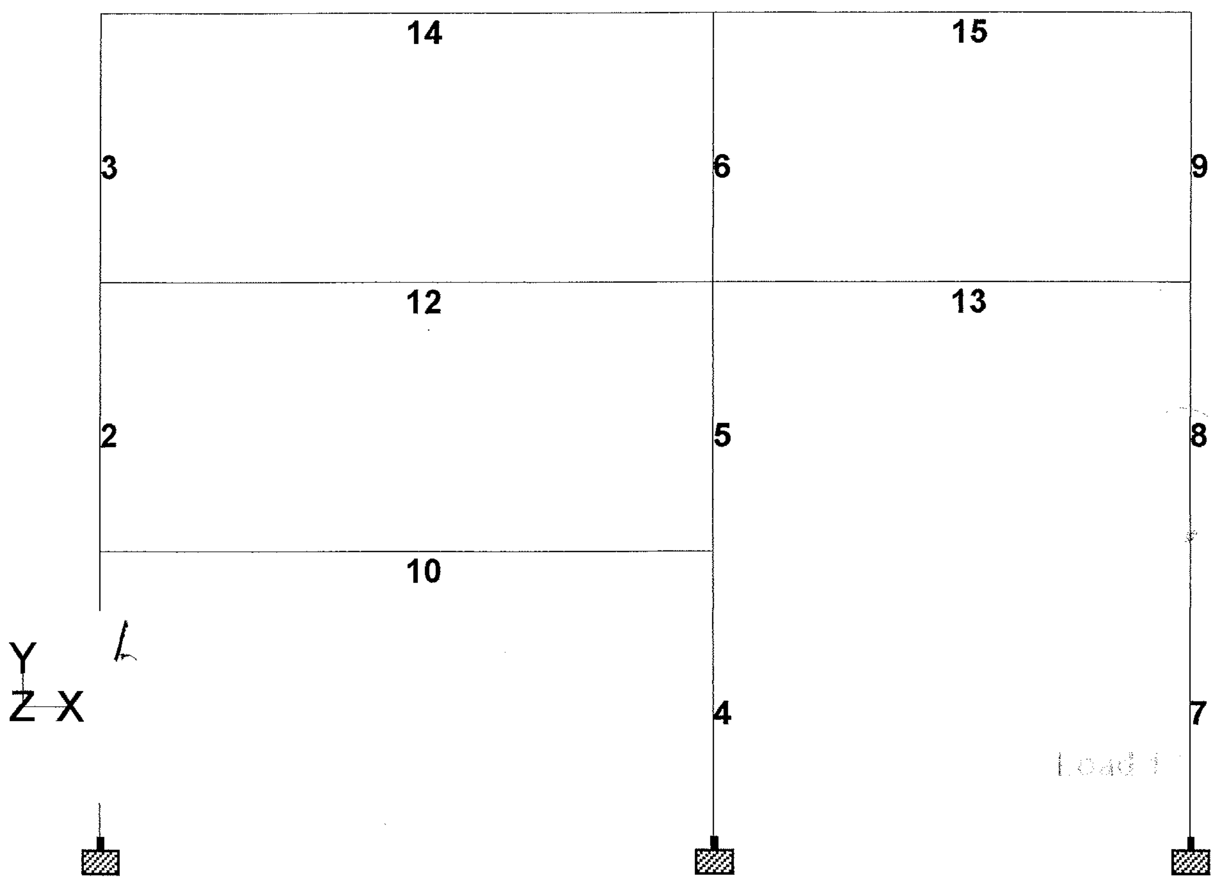
$\Rightarrow F_c = \left(\frac{0.877}{\lambda_c^2}\right) F_y = \frac{0.877}{1.84^2} \times 50 = 12.91^{ksi}$

$\phi P_n = 0.85 \times 12.91 \times 22.3 = 245^k$

	JLS	3-17-06	122

MORPHY, MAKOFSKY, INC.

Software licensed to morphy makofsky inc	Job No	Sheet No 1	Rev
	Part		
Job Title	Ref		
	By	Date 17-Mar-06	Chd
Client	File FRAME-3-M1.std	Date/Time 17-Mar-2006 15:50	



look

123

```
****************************************************
*                                                  *
*           STAAD.Pro                              *
*           Version  2003    Bld 1002.US           *
*           Proprietary Program of                 *
*           Research Engineers,  Intl.             *
*           Date=    MAR 17, 2006                  *
*           Time=    15:50: 9                      *
*                                                  *
*       USER ID: morphy makofsky inc               *
****************************************************
```

```
STAAD PLANE
START JOB INFORMATION
ENGINEER DATE 17-MAR-06
END JOB INFORMATION
INPUT WIDTH 79
UNIT FEET KIP
JOINT COORDINATES
1 0 0 0; 2 0 15.5 0; 3 0 30.17 0; 4 0 44.84 0; 5 33 0 0; 6 33 15.5 0
7 33 30.17 0; 8 33 44.84 0; 9 58.67 0 0; 10 58.67 15.5 0; 11 58.67 30.17 0
12 58.67 44.84 0
MEMBER INCIDENCES
1 1 2; 2 2 3; 3 3 4; 4 5 6; 5 6 7; 6 7 8; 7 9 10; 8 10 11; 9 11 12; 10 2 6
12 3 7; 13 7 11; 14 4 8; 15 8 12
DEFINE MATERIAL START
ISOTROPIC STEEL
E 4.176E+006
POISSON 0.3
DENSITY 0.489024
ALPHA 6.5E-006
DAMP 0.03
END DEFINE MATERIAL
CONSTANTS
MATERIAL STEEL MEMB 1 TO 10 12 TO 15
MEMBER PROPERTY AMERICAN
1 TO 6 TABLE ST W18X76
7 TO 9 TABLE ST W14X61
10 12 TABLE ST W24X55
13 TABLE ST W21X44
14 TABLE ST W21X44
15 TABLE ST W18X40
SUPPORTS
1 5 9 FIXED
LOAD 1 DEAD
JOINT LOAD
4 FY -28
3 FY -28
2 FY -20
7 8 FY -27.4
6 FY -19.6
10 FY -23.1
11 FY -26.7
```

128

```
 42. 12 FY -12
 43. MEMBER LOAD
 44. 10 14 15 UNI GY -0.33
 45. 12 13 UNI GY -0.47
 46. LOAD 2 LIVE
 47. JOINT LOAD
 48. 4 FY -12
 49. 3 FY -20
 50. 2 FY -60
 51. 7 FY -19.6
 52. 8 FY -11.7
 53. 6 FY -58.7
 54. 10 FY -25.7
 55. 11 FY -8.6
 56. 12 FY -5.1
 57. MEMBER LOAD
 58. 10 UNI GY -1.
 59. 12 13 UNI GY -0.33
 60. 14 15 UNI GY -0.07
 61. LOAD 3 WIND
 62. JOINT LOAD
 63. 4 FX 15.4
 64. 3 FX 12.9
 65. 2 FX 12.7
 66. LOAD COMB 4 DEAD LIVE WIND
 67. 1 1.2 2 0.5 3 0.2
 68. LOAD COMB 5 DEAD LIVE -WIND
 69. 1 1.2 2 0.5 3 -0.2
 70. PERFORM ANALYSIS


        P R O B L E M   S T A T I S T I C S
        -----------------------------------

  NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =     12/    14/      3
  ORIGINAL/FINAL BAND-WIDTH=     4/      3/     12 DOF
  TOTAL PRIMARY LOAD CASES =     3, TOTAL DEGREES OF FREEDOM =      27
  SIZE OF STIFFNESS MATRIX =        1 DOUBLE  KILO-WORDS
  REQRD/AVAIL. DISK SPACE  =     12.0/ 25388.4 MB,  EXMEM = 1626.6 MB


 71. PDELTA 2 ANALYSIS
++ Adjusting Displacements                          15:50:10
++ Adjusting Displacements                          15:50:10


 72. LOAD LIST 4 5
 73. PRINT MAXFORCE ENVELOPE NSECTION 30 LIST 1 TO 10 12 TO 15
```

125

MEMBER FORCE ENVELOPE

ALL UNITS ARE KIP FEET

MAX AND MIN FORCE VALUES AMONGST ALL SECTION LOCATIONS

MEMB	FY/ FZ	DIST DIST	LD LD	MZ/ MY	DIST DIST	LD LD	FX	DIST	LD
1 MAX	0.40	0.00	4	53.46	15.50	5			
	0.00	0.00	4	0.00	0.00	4	174.12 C	0.00	5
MIN	-7.13	15.50	5	-57.12	0.00	5			
	0.00	15.50	5	0.00	15.50	5	166.91 C	15.50	4
2 MAX	-2.38	0.00	4	48.32	14.67	5			
	0.00	0.00	4	0.00	0.00	4	103.43 C	0.00	5
MIN	-6.73	14.67	5	-50.42	0.00	5			
	0.00	14.67	5	0.00	14.67	5	99.99 C	14.67	4
3 MAX	-3.37	0.00	4	40.76	14.67	5			
	0.00	0.00	4	0.00	0.00	4	46.98 C	0.00	5
MIN	-4.80	14.67	5	-29.70	0.00	5			
	0.00	14.67	5	0.00	14.67	5	46.00 C	14.67	4
4 MAX	6.54	0.00	4	52.82	0.00	4			
	0.00	0.00	4	0.00	0.00	4	186.46 C	0.00	4
MIN	-0.71	15.50	5	-48.56	15.50	4			
	0.00	15.50	5	0.00	15.50	5	182.57 C	15.50	5
5 MAX	6.79	0.00	4	54.68	0.00	4			
	0.00	0.00	4	0.00	0.00	4	116.94 C	0.00	4
MIN	1.44	14.67	5	-44.99	14.67	4			
	0.00	14.67	5	0.00	14.67	5	116.83 C	14.67	5
6 MAX	2.98	0.00	4	16.40	0.00	4			
	0.00	0.00	4	0.00	0.00	4	51.95 C	0.00	5
MIN	-0.26	14.67	5	-27.29	14.67	4			
	0.00	14.67	5	0.00	14.67	5	51.88 C	14.67	4
7 MAX	1.27	0.00	4	18.60	0.00	4			
	0.00	0.00	4	0.00	0.00	4	109.59 C	0.00	4
MIN	-0.35	15.50	5	-9.12	0.00	5			
	0.00	15.50	5	0.00	15.50	5	106.27 C	15.50	5
8 MAX	1.25	0.00	4	1.66	14.67	5			
	0.00	0.00	4	-0.00	0.00	4	69.02 C	0.00	4
MIN	-0.37	14.67	5	-19.40	14.67	4			
	0.00	14.67	5	0.00	14.67	5	65.70 C	14.67	5
9 MAX	3.48	0.00	4	25.62	0.00	4			
	0.00	0.00	4	0.00	0.00	4	22.68 C	0.00	4

MIN	1.99	14.67	5	-25.40	14.67	4			
	0.00	14.67	5	0.00	14.67	5	21.64 C	14.67	5
10 MAX	16.70	0.00	5	103.89	0.00	5			
	0.00	0.00	4	0.00	0.00	4	0.25 T	0.00	4
MIN	-16.64	33.00	4	-51.67	18.70	5			
	0.00	33.00	5	0.00	33.00	5	2.14 T	33.00	5
12 MAX	12.85	0.00	5	89.91	33.00	4			
	0.00	0.00	4	0.00	0.00	4	1.59 C	0.00	4
MIN	-13.67	33.00	4	-38.22	14.30	4			
	0.00	33.00	5	0.00	33.00	5	0.64 T	33.00	5
13 MAX	11.00	0.00	5	57.67	0.00	5			
	0.00	0.00	4	0.00	0.00	4	2.23 T	0.00	4
MIN	-10.00	25.67	4	-25.22	15.40	5			
	0.00	25.67	5	0.00	25.67	5	2.35 T	25.67	5
14 MAX	7.38	0.00	5	47.47	33.00	4			
	0.00	0.00	4	0.00	0.00	4	6.45 C	0.00	4
MIN	-7.82	33.00	4	-23.47	14.30	4			
	0.00	33.00	5	0.00	33.00	5	1.73 C	33.00	5
15 MAX	6.37	0.00	5	33.55	0.00	5			
	0.00	0.00	4	0.00	0.00	4	3.48 C	0.00	4
MIN	-5.73	25.67	4	-13.56	14.55	5			
	0.00	25.67	5	0.00	25.67	5	1.99 C	25.67	5

********** END OF FORCE ENVELOPE FROM INTERNAL STORAGE **********

74. PRINT SUPPORT REACTION ALL

127

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	4	-0.41	166.91	0.00	0.00	0.00	23.51
	5	7.14	174.12	0.00	0.00	0.00	-57.12
5	4	-6.54	186.46	0.00	0.00	0.00	52.82
	5	0.70	182.57	0.00	0.00	0.00	-26.16
9	4	-1.25	109.59	0.00	0.00	0.00	18.60
	5	0.35	106.27	0.00	0.00	0.00	-9.12

************** END OF LATEST ANALYSIS RESULT **************

75. PRINT SECTION MAX DISPL NSECT 30 LIST 1 TO 10 12 TO 15

128

MAX MEMBER SECTION DISPLACEMENTS

UNIT= INCH FOR FPS AND CM FOR METRIC/SI SYSTEM

MEMBER	MAX DISP	LOCATION	LOAD	L/DISPL
1	0.02746	93.00	4	6772
2	0.00974	58.68	4	18068
3	0.01038	124.70	5	16961
4	0.02781	85.25	5	6688
5	0.01837	80.69	5	9585
6	0.00845	124.70	4	20842
7	0.02538	77.50	4	7329
8	0.02610	102.69	4	6744
9	0.00968	51.35	5	18178
10	0.17841	214.50	5	2219
12	0.12150	181.50	4	3259
13	0.08056	179.69	5	3823
14	0.12761	181.50	4	3103
15	0.05638	179.69	5	5463

************ END OF SECT DISPL RESULTS ***********

```
76. PARAMETER
77. CODE LRFD
78. BEAM 1 ALL
79. FYLD 7200 ALL
80. LX 6 MEMB 10 12 TO 15
81. LY 2 MEMB 10 12 TO 15
82. LZ 2 MEMB 10 12 TO 15
83. UNB 6 MEMB 10 12 TO 15
84. UNT 1 MEMB 10 12 TO 15
85. CHECK CODE ALL
```

129

STAAD.Pro CODE CHECKING - (LRF3)
****

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1	ST W18 X76	PASS	LRFD-H1-1A-C	0.390	5
		174.12 C	0.00	-57.12	0.00
2	ST W18 X76	PASS	LRFD-H1-1B-C	0.177	5
		103.43 C	0.00	-50.42	0.00
3	ST W18 X76	PASS	LRFD-H1-1B-C	0.113	5
		46.98 C	0.00	40.76	14.67
4	ST W18 X76	PASS	LRFD-H1-1A-C	0.404	4
		186.46 C	0.00	52.82	0.00
5	ST W18 X76	PASS	LRFD-H1-1B-C	0.196	4
		116.94 C	0.00	54.68	0.00
6	ST W18 X76	PASS	LRFD-H1-1B-C	0.092	4
		51.88 C	0.00	-27.29	14.67
7	ST W14 X61	PASS	LRFD-H1-1A-C	0.269	4
		109.59 C	0.00	18.60	0.00
8	ST W14 X61	PASS	LRFD-H1-1B-C	0.123	4
		69.02 C	0.00	-19.40	14.67
9	ST W14 X61	PASS	LRFD-H1-1B-C	0.096	4
		22.68 C	0.00	25.62	0.00
10	ST W24 X55	PASS	LRFD-H1-1B-T	0.219	5
		2.14 T	0.00	103.89	0.00
12	ST W24 X55	PASS	LRFD-H1-1B-C	0.190	4
		1.59 C	0.00	89.91	33.00

130

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
13 ST	W21 X44	PASS	LRFD-H1-1B-T	0.174	5
		2.35 T	0.00	57.67	0.00
14 ST	W21 X44	PASS	LRFD-H1-1B-C	0.149	4
		6.45 C	0.00	47.47	33.00
15 ST	W18 X40	PASS	LRFD-H1-1B-C	0.124	5
		1.99 C	0.00	33.55	0.00

************** END OF TABULATED RESULT OF DESIGN **************

86. FINISH

*********** END OF THE STAAD.Pro RUN ***********

**** DATE= MAR 17,2006 TIME= 15:50:10 ****

131

```
****************************************************
*                                                  *
*           STAAD.Pro                              *
*           Version  2003    Bld 1002.US           *
*           Proprietary Program of                 *
*           Research Engineers,  Intl.             *
*           Date=    MAR 17, 2006                  *
*           Time=    16:20:33                      *
*                                                  *
*      USER ID: morphy makofsky inc                *
****************************************************
```

```
STAAD PLANE
START JOB INFORMATION SECOND FLOOR BEAMS MISSING
ENGINEER DATE 17-MAR-06
END JOB INFORMATION
INPUT WIDTH 79
UNIT FEET KIP
JOINT COORDINATES
1 0 0 0; 2 0 15.5 0; 3 0 30.17 0; 4 0 44.84 0; 5 33 0 0; 6 33 15.5 0
7 33 30.17 0; 8 33 44.84 0; 9 58.67 0 0; 10 58.67 15.5 0; 11 58.67 30.17 0
12 58.67 44.84 0
MEMBER INCIDENCES
1 1 2; 2 2 3; 3 3 4; 4 5 6; 5 6 7; 6 7 8; 7 9 10; 8 10 11; 9 11 12; 12 3 7
13 7 11; 14 4 8; 15 8 12
DEFINE MATERIAL START
ISOTROPIC STEEL
E 4.176E+006
POISSON 0.3
DENSITY 0.489024
ALPHA 6.5E-006
DAMP 0.03
END DEFINE MATERIAL
CONSTANTS
MATERIAL STEEL MEMB 1 TO 9 12 TO 15
MEMBER PROPERTY AMERICAN
1 TO 6 TABLE ST W18X76
7 TO 9 TABLE ST W14X61
12 TABLE ST W24X55
13 TABLE ST W21X44
14 TABLE ST W21X44
15 TABLE ST W18X40
SUPPORTS
1 5 9 FIXED
LOAD 1 DEAD
JOINT LOAD
4 FY -28
3 FY -28
2 FY -20
7 8 FY -27.4
6 FY -19.6
10 FY -23.1
11 FY -26.7
```

```
42. 12 FY -12
43. MEMBER LOAD
44. 14 15 UNI GY -0.33
45. 12 13 UNI GY -0.47
46. LOAD 2 LIVE
47. JOINT LOAD
48. 4 FY -12
49. 3 FY -20
50. 2 FY -60
51. 7 FY -19.6
52. 8 FY -11.7
53. 6 FY -58.7
54. 10 FY -25.7
55. 11 FY -8.6
56. 12 FY -5.1
57. MEMBER LOAD
58. 12 13 UNI GY -0.33
59. 14 15 UNI GY -0.07
60. LOAD 3 WIND
61. JOINT LOAD
62. 4 FX 15.4
63. 3 FX 12.9
64. 2 FX 12.7
65. LOAD COMB 4 DEAD LIVE WIND
66. 1 1.2 2 0.5 3 0.2
67. LOAD COMB 5 DEAD LIVE -WIND
68. 1 1.2 2 0.5 3 -0.2
69. PERFORM ANALYSIS
```

P R O B L E M   S T A T I S T I C S

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =     12/     13/      3
ORIGINAL/FINAL BAND-WIDTH=      4/       3/      12 DOF
TOTAL PRIMARY LOAD CASES =    3, TOTAL DEGREES OF FREEDOM =      27
SIZE OF STIFFNESS MATRIX =        1 DOUBLE  KILO-WORDS
REQRD/AVAIL. DISK SPACE  =     12.0/ 25388.4 MB,  EXMEM = 1628.1 MB
```

```
 70. PDELTA 2 ANALYSIS
++ Adjusting Displacements                         16:20:33
++ Adjusting Displacements                         16:20:33

 71. LOAD LIST 4 5
 72. PRINT MAXFORCE ENVELOPE NSECTION 30 LIST 1 TO 9 12 TO 15
```

37

MEMBER FORCE ENVELOPE

ALL UNITS ARE KIP FEET

MAX AND MIN FORCE VALUES AMONGST ALL SECTION LOCATIONS

MEMB	FY/ FZ	DIST DIST	LD LD	MZ/ MY	DIST DIST	LD LD	FX	DIST	LD
1 MAX	3.18	0.00	4	48.84	0.00	4			
	0.00	0.00	4	0.00	0.00	4	157.80 C	0.00	5
MIN	-4.76	15.50	5	-63.47	0.00	5			
	0.00	15.50	5	0.00	15.50	5	153.42 C	15.50	4
2 MAX	0.66	0.00	4	42.69	14.67	5			
	0.00	0.00	4	0.00	0.00	4	103.80 C	0.00	5
MIN	-2.20	14.67	5	-10.11	14.67	4			
	0.00	14.67	5	0.00	14.67	5	99.42 C	14.67	4
3 MAX	-3.97	0.00	4	42.40	14.67	5			
	0.00	0.00	4	0.00	0.00	4	47.04 C	0.00	5
MIN	-5.44	14.67	5	-37.41	0.00	5			
	0.00	14.67	5	0.00	14.67	5	45.90 C	14.67	4
4 MAX	3.22	0.00	4	51.99	0.00	4			
	0.00	0.00	4	0.00	0.00	4	170.02 C	0.00	4
MIN	-2.52	15.50	5	-43.79	0.00	5			
	0.00	15.50	5	0.00	15.50	5	170.01 C	15.50	5
5 MAX	3.21	0.00	4	32.19	14.67	5			
	0.00	0.00	4	0.00	0.00	4	117.15 C	0.00	4
MIN	-2.52	14.67	5	-45.10	14.67	4			
	0.00	14.67	5	0.00	14.67	5	117.14 C	14.67	5
6 MAX	3.69	0.00	4	23.31	0.00	4			
	0.00	0.00	4	0.00	0.00	4	51.93 C	0.00	5
MIN	0.38	14.67	5	-30.78	14.67	4			
	0.00	14.67	5	0.00	14.67	5	51.89 C	14.67	4
7 MAX	1.81	0.00	4	27.66	0.00	4			
	0.00	0.00	4	0.00	0.00	4	109.95 C	0.00	4
MIN	-0.91	15.50	5	-18.15	0.00	5			
	0.00	15.50	5	0.00	15.50	5	105.58 C	15.50	5
8 MAX	1.80	0.00	4	9.61	14.67	5			
	0.00	0.00	4	0.00	0.00	4	69.38 C	0.00	4
MIN	-0.93	14.67	5	-26.66	14.67	4			
	0.00	14.67	5	0.00	14.67	5	65.01 C	14.67	5
9 MAX	3.37	0.00	4	23.19	0.00	4			
	0.00	0.00	4	0.00	0.00	4	22.78 C	0.00	4

	MIN	1.98	14.67	5	-26.26	14.67	4			
		0.00	14.67	5	0.00	14.67	5	21.60 C	14.67	5
12	MAX	13.16	0.00	5	94.96	33.00	4			
		0.00	0.00	4	0.00	0.00	4	2.05 T	0.00	4
	MIN	-14.14	33.00	4	-42.04	13.20	4			
		0.00	33.00	5	0.00	33.00	5	5.80 T	33.00	5
13	MAX	11.64	0.00	5	66.99	0.00	5			
		0.00	0.00	4	0.00	0.00	4	1.58 T	0.00	4
	MIN	-10.26	25.67	4	-25.92	16.26	5			
		0.00	25.67	5	0.00	25.67	5	2.90 T	25.67	5
14	MAX	7.44	0.00	5	49.48	33.00	4			
		0.00	0.00	4	0.00	0.00	4	7.05 C	0.00	4
	MIN	-7.92	33.00	4	-23.29	14.30	4			
		0.00	33.00	5	0.00	33.00	5	2.36 C	33.00	5
15	MAX	6.42	0.00	5	33.82	0.00	5			
		0.00	0.00	4	0.00	0.00	4	3.37 C	0.00	4
	MIN	-5.83	25.67	4	-13.92	14.55	5			
		0.00	25.67	5	0.00	25.67	5	1.98 C	25.67	5

********** END OF FORCE ENVELOPE FROM INTERNAL STORAGE **********

73. PRINT SUPPORT REACTION ALL

MIN	1.98	14.67	5	-26.26	14.67	4			
	0.00	14.67	5	0.00	14.67	5	21.60 C	14.67	5
12 MAX	13.16	0.00	5	94.96	33.00	4			
	0.00	0.00	4	0.00	0.00	4	2.05 T	0.00	4
MIN	-14.14	33.00	4	-42.04	13.20	4			
	0.00	33.00	5	0.00	33.00	5	5.80 T	33.00	5
13 MAX	11.64	0.00	5	66.99	0.00	5			
	0.00	0.00	4	0.00	0.00	4	1.58 T	0.00	4
MIN	-10.26	25.67	4	-25.92	16.26	5			
	0.00	25.67	5	0.00	25.67	5	2.90 T	25.67	5
14 MAX	7.44	0.00	5	49.48	33.00	4			
	0.00	0.00	4	0.00	0.00	4	7.05 C	0.00	4
MIN	-7.92	33.00	4	-23.29	14.30	4			
	0.00	33.00	5	0.00	33.00	5	2.36 C	33.00	5
15 MAX	6.42	0.00	5	33.82	0.00	5			
	0.00	0.00	4	0.00	0.00	4	3.37 C	0.00	4
MIN	-5.83	25.67	4	-13.92	14.55	5			
	0.00	25.67	5	0.00	25.67	5	1.98 C	25.67	5

********** END OF FORCE ENVELOPE FROM INTERNAL STORAGE **********

73. PRINT SUPPORT REACTION ALL

135

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	4	-3.20	153.42	0.00	0.00	0.00	48.84
	5	4.77	157.80	0.00	0.00	0.00	-63.47
5	4	-3.21	170.02	0.00	0.00	0.00	51.99
	5	2.52	170.01	0.00	0.00	0.00	-43.79
9	4	-1.78	109.95	0.00	0.00	0.00	27.66
	5	0.91	105.58	0.00	0.00	0.00	-18.15

************** END OF LATEST ANALYSIS RESULT **************

74. PRINT SECTION MAX DISPL NSECT 30 LIST 1 TO 9 12 TO 15

260

MAX MEMBER SECTION DISPLACEMENTS

UNIT= INCH FOR FPS AND CM FOR METRIC/SI SYSTEM

MEMBER	MAX DISP	LOCATION	LOAD	L/DISPL
1	0.03742	77.50	5	4970
2	0.03228	95.36	5	5453
3	0.01038	51.35	4	16960
4	0.03716	77.50	4	5005
5	0.02675	102.69	4	6581
6	0.00746	124.70	4	23590
7	0.03927	77.50	4	4736
8	0.03463	102.69	4	5083
9	0.01128	51.35	5	15612
12	0.13947	165.00	4	2839
13	0.07726	179.69	5	3987
14	0.12425	181.50	4	3187
15	0.05881	179.69	5	5237

************ END OF SECT DISPL RESULTS ***********

75. PARAMETER
76. CODE LRFD
77. BEAM 1 ALL
78. FYLD 7200 ALL
79. LX 6 MEMB 12 TO 15
80. LY 2 MEMB 12 TO 15
81. LZ 2 MEMB 12 TO 15
82. UNB 6 MEMB 12 TO 15
83. UNT 1 MEMB 12 TO 15
84. CHECK CODE ALL

37

STAAD.Pro CODE CHECKING - (LRF3)
****

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1	ST W18 X76	PASS 157.80 C	LRFD-H1-1A-C 0.00	0.373 -63.47	5 0.00
2	ST W18 X76	PASS 103.80 C	LRFD-H1-1B-C 0.00	0.163 42.69	5 14.67
3	ST W18 X76	PASS 47.04 C	LRFD-H1-1B-C 0.00	0.116 42.40	5 14.67
4	ST W18 X76	PASS 170.02 C	LRFD-H1-1A-C 0.00	0.375 51.99	4 0.00
5	ST W18 X76	PASS 117.15 C	LRFD-H1-1B-C 0.00	0.178 -45.10	4 14.67
6	ST W18 X76	PASS 51.89 C	LRFD-H1-1B-C 0.00	0.099 -30.78	4 14.67
7	ST W14 X61	PASS 109.95 C	LRFD-H1-1A-C 0.00	0.293 27.66	4 0.00
8	ST W14 X61	PASS 69.38 C	LRFD-H1-1B-C 0.00	0.144 -26.66	4 14.67
9	ST W14 X61	PASS 22.78 C	LRFD-H1-1B-C 0.00	0.098 -26.26	4 14.67
12	ST W24 X55	PASS 2.05 T	LRFD-H1-1B-T 0.00	0.200 94.96	4 33.00
13	ST W21 X44	PASS 2.90 T	LRFD-H1-1B-T 0.00	0.203 66.99	5 0.00

STAAD.Pro CODE CHECKING - (LRF3)
****

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1	ST W18 X76	PASS	LRFD-H1-1A-C	0.373	5
		157.80 C	0.00	-63.47	0.00
2	ST W18 X76	PASS	LRFD-H1-1B-C	0.163	5
		103.80 C	0.00	42.69	14.67
3	ST W18 X76	PASS	LRFD-H1-1B-C	0.116	5
		47.04 C	0.00	42.40	14.67
4	ST W18 X76	PASS	LRFD-H1-1A-C	0.375	4
		170.02 C	0.00	51.99	0.00
5	ST W18 X76	PASS	LRFD-H1-1B-C	0.178	4
		117.15 C	0.00	-45.10	14.67
6	ST W18 X76	PASS	LRFD-H1-1B-C	0.099	4
		51.89 C	0.00	-30.78	14.67
7	ST W14 X61	PASS	LRFD-H1-1A-C	0.293	4
		109.95 C	0.00	27.66	0.00
8	ST W14 X61	PASS	LRFD-H1-1B-C	0.144	4
		69.38 C	0.00	-26.66	14.67
9	ST W14 X61	PASS	LRFD-H1-1B-C	0.098	4
		22.78 C	0.00	-26.26	14.67
12	ST W24 X55	PASS	LRFD-H1-1B-T	0.200	4
		2.05 T	0.00	94.96	33.00
13	ST W21 X44	PASS	LRFD-H1-1B-T	0.203	5
		2.90 T	0.00	66.99	0.00

138

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
14 ST	W21 X44	PASS	LRFD-H1-1B-C	0.155	4
		7.05 C	0.00	49.48	33.00
15 ST	W18 X40	PASS	LRFD-H1-1B-C	0.125	5
		1.98 C	0.00	33.82	0.00

************** END OF TABULATED RESULT OF DESIGN **************

85. FINISH

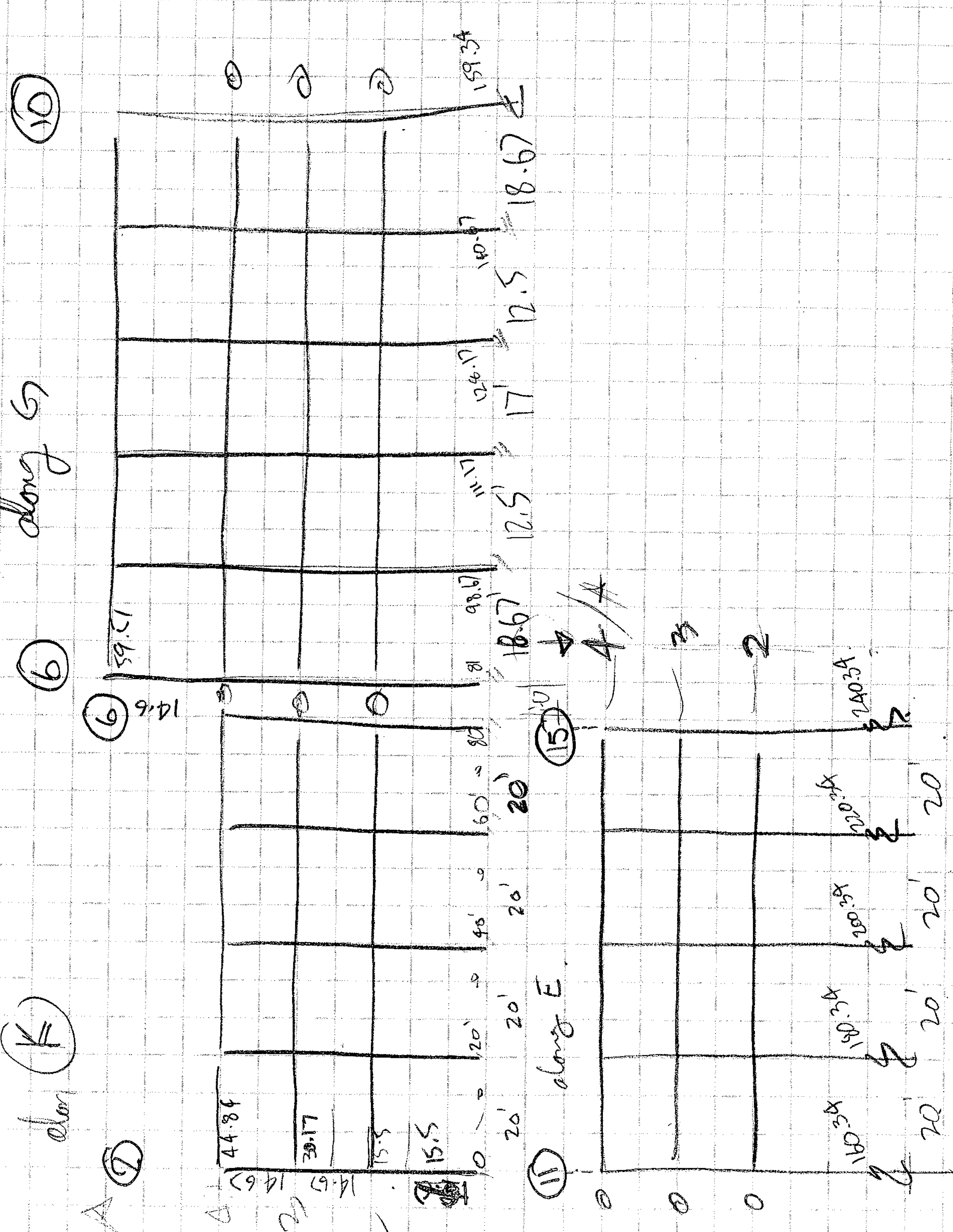
*********** END OF THE STAAD.Pro RUN ***********

**** DATE= MAR 17,2006 TIME= 16:20:34 ****

```
*********************************************************
*      For questions on STAAD.Pro, please contact :     *
*  By Email - North America  : support@reiusa.com       *
*  By Email - International  : support@reiworld.com     *
*  Tel. (USA) : 714-974-2500 ; Fax (USA) : 714-974-4771 *
*********************************************************
```

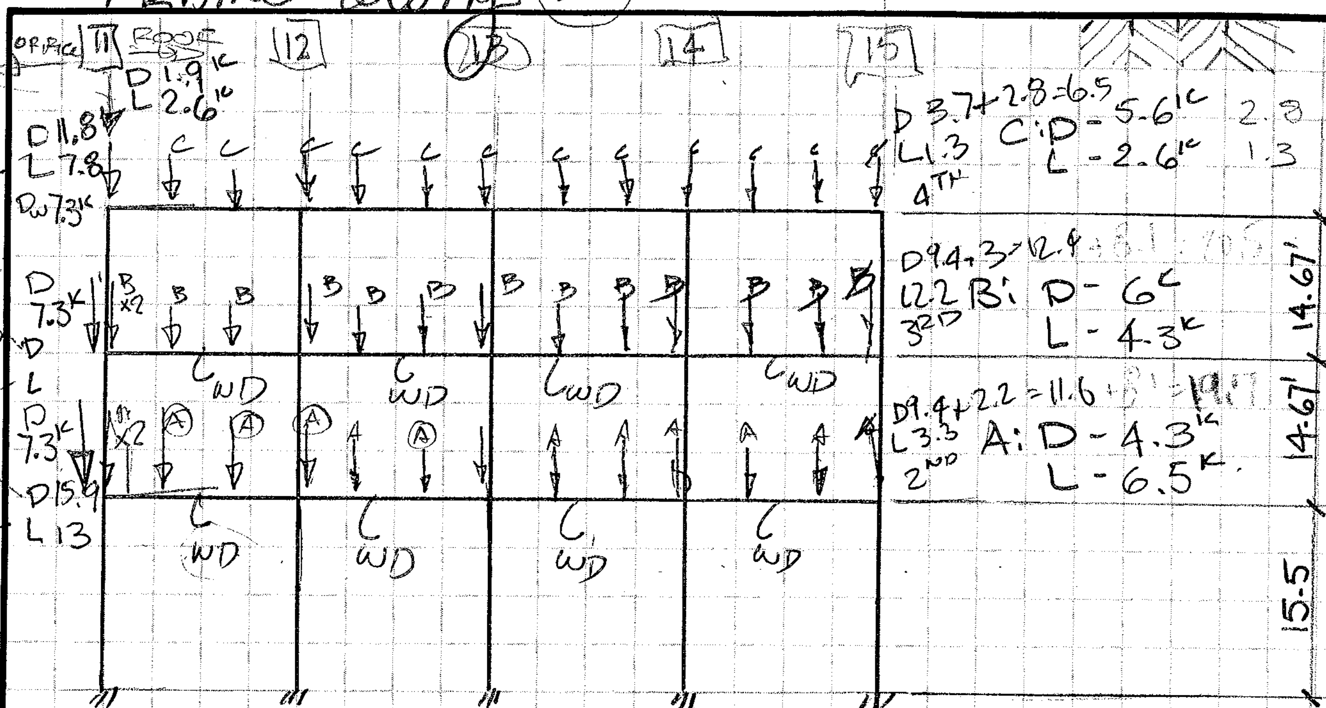
139

Main wind frame EAST WEST



JLS	3-25-06	140

Frame along (E)



2ND LOCKERS

DL	50
LL	75
TL	125

$WD = 0.73^{k/1}$

Area ~ $\frac{25.6}{2} \times 6.67$

= 86□

3RD office

D	70
L	50
T	120

Walls

Cmu - 55

Brick - 40

D 95 #/□

× 14.67 = 1.38 k/1

4TH ATTIC :

D	50
L	10
	60

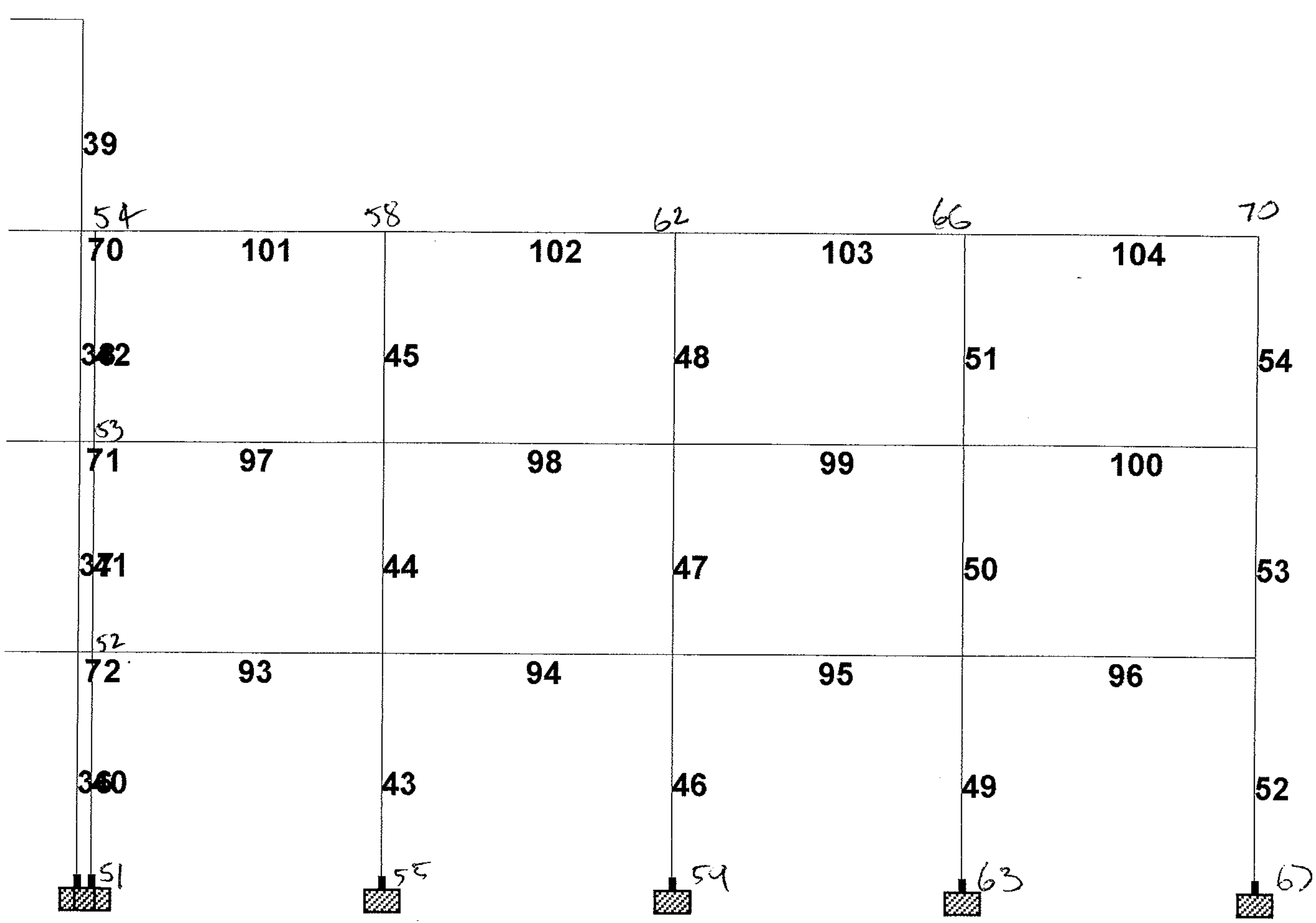
Roof

D	15
L	20
	35

	JLS	3-27-06

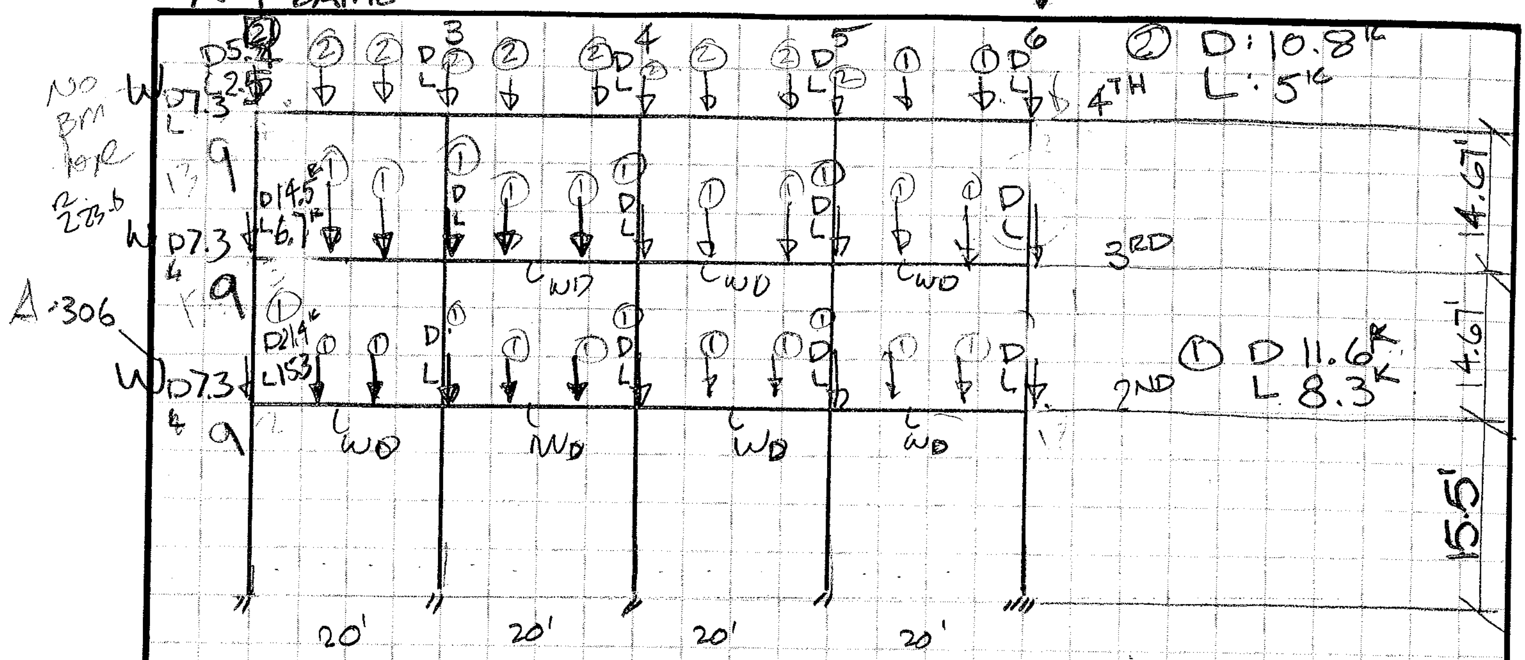
Software licensed to morphy makofsky inc

Job No	Sheet No 1
Rev	
Part	
Job Title	Ref
By	Date 27-Mar-06
Chd	
Client	File FR-E-W.std
Date/Time	29-Mar-2006 13:27



A

K-FRAME



Bay WIDTH = 49.67'

2ND: D 70
L 50
TL 120

EXT WALL
BRICK 40
STOD etc 10
D 50 PSF
× 14.67
W_{DL} = 734 PLF

3RD: D 70
L 50
TL 120

REVISE:

EXT. WALL
BRICK 40
CMU (Reinf) 55
95 PSF
× 14.67
= 1.39 k/'

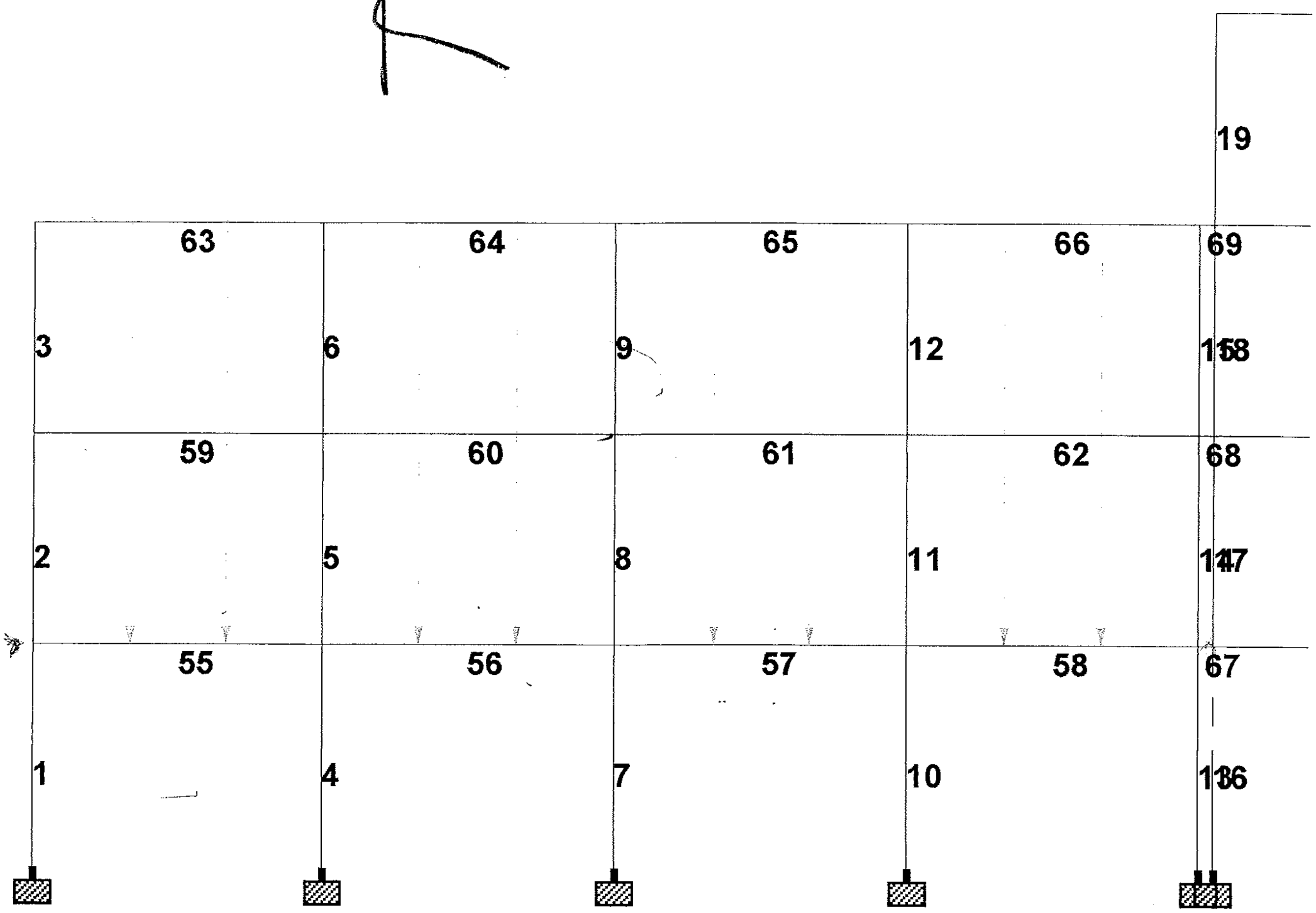
4TH OFFICE:
D 70
L 50
TL 120

ATTIC: D 50
L 10
TL 60

ROOF: D 15
L 20
TL 35

	JLS	3-27-06	143

	Job No	Sheet No 1	Rev
Software licensed to morphy makofsky inc	Part		
Job Title	Ref		
	By	Date 27-Mar-06	Chd
Client	File FR-E-W.std	Date/Time 29-Mar-2006 13:27	



Software licensed to morphy makofsky inc

Job No	Sheet No	Rev
	1	

Part

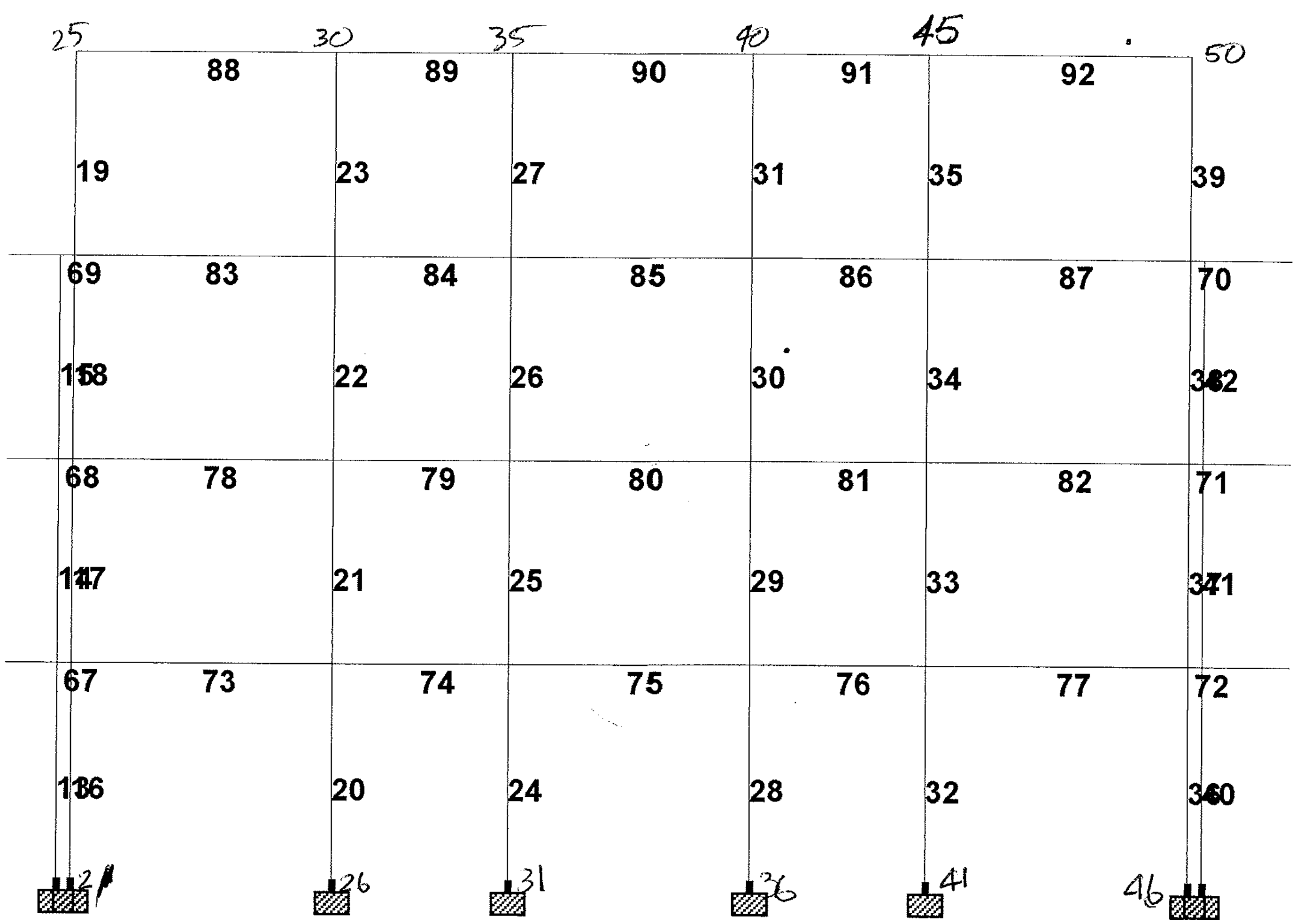
Ref

By — Date 27-Mar-06 — Chd

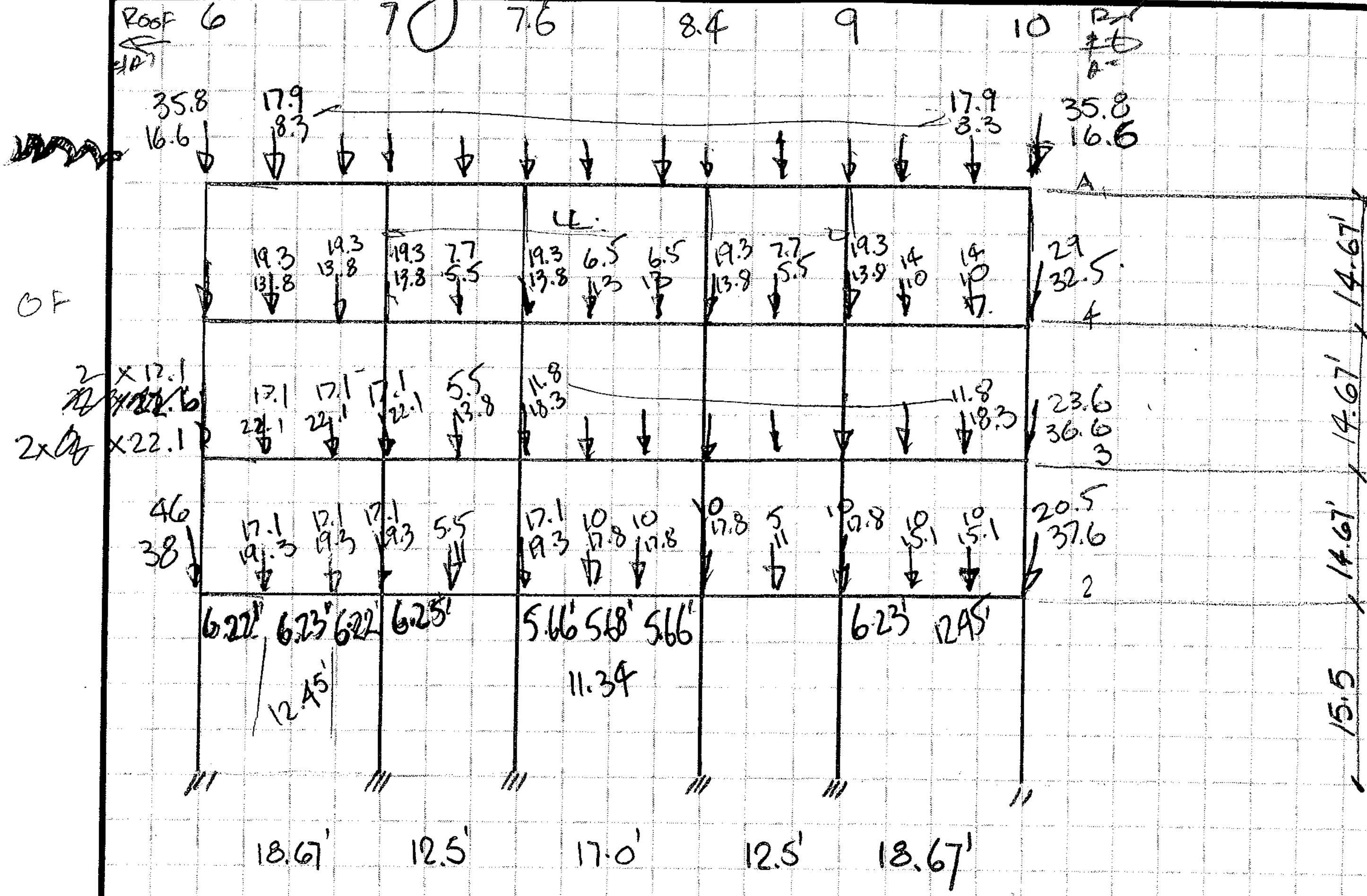
File FR-E-W.std — Date/Time 29-Mar-2006 13:27

Job Title

Client

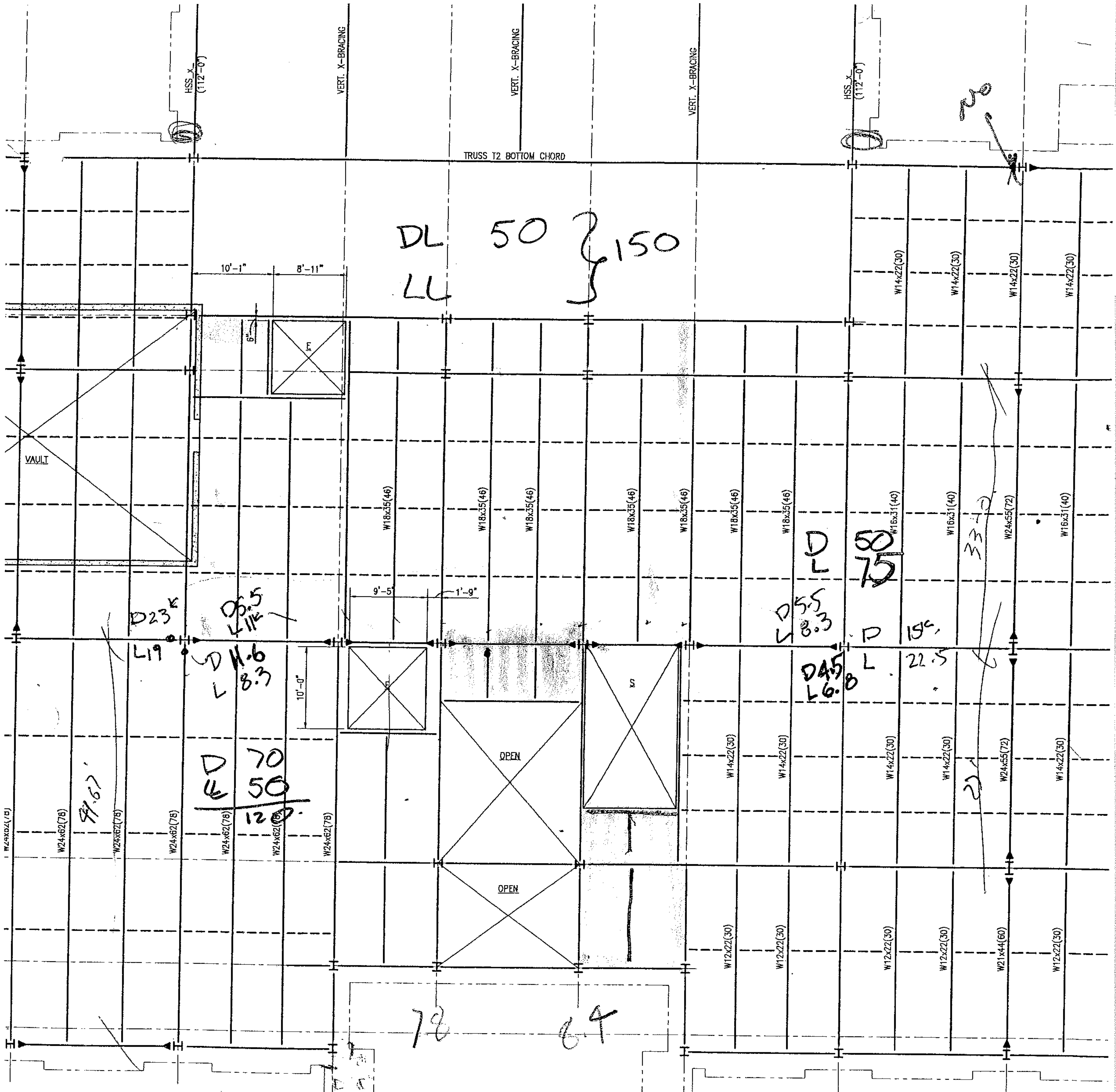


Frame along [illegible]



JLS	3-27-06

MORPHY, MAKOFSKY, INC.



PLAN NOTES: UNLESS NOTED OTHERWISE:

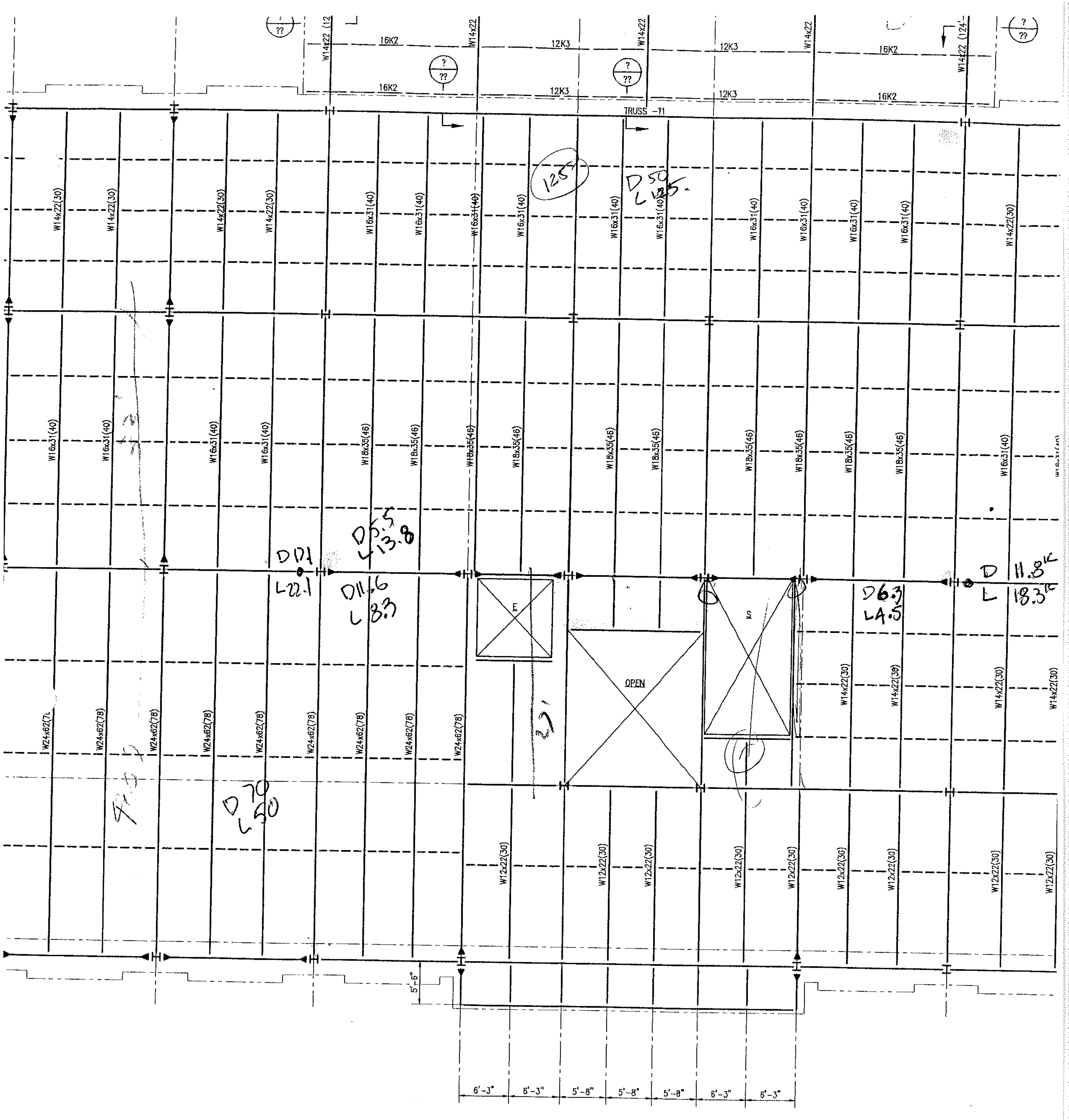
1. TOP OF SLAB EL. 116'-8"
2. TOP OF STRUCTURAL STEEL EL. 115'-3¼"
3. FLOOR SYSTEM CONSISTS OF LT. WT. CONCRETE ON 1½" METAL FLOOR DECK, TOTAL THICKNESS EQUALS 4¾". REINF. W/6x6 – 10/10 W.W.M. PLACE 1" BELOW TOP OF CONCRETE.
4. ⊢H⊣ – INDICATES MOMENT CONNECTION. SEE SHT. S001 FOR DETAILS.

1 / S102 SECOND FLOOR FRAMING PLAN

⅛" = 1'-0"

N

14.7



PLAN NOTES: UNLESS NOTED OTHERWISE:

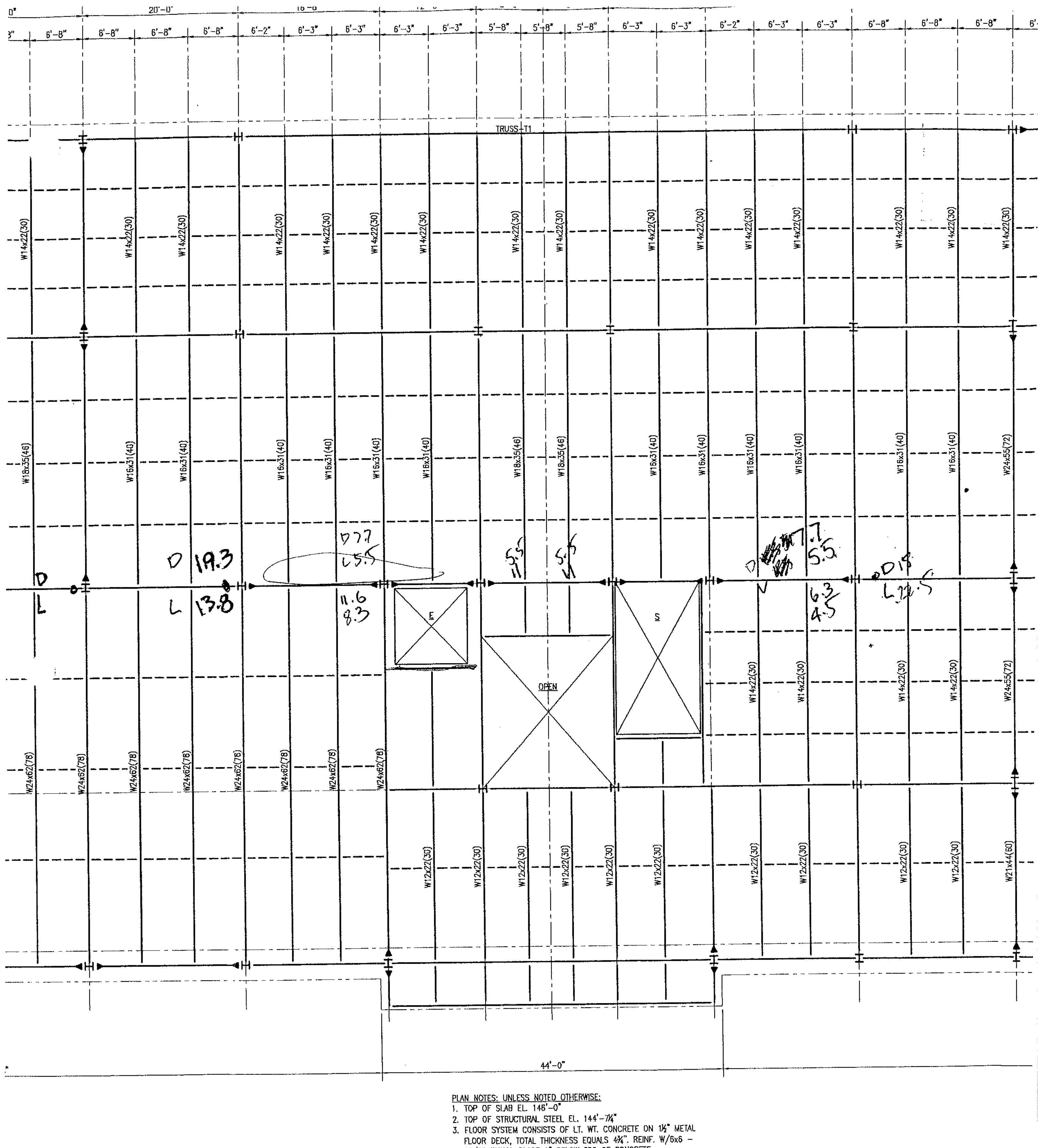
1. TOP OF SLAB EL. 131'-4"
2. TOP OF STEEL EL. 129'-11¼"
3. FLOOR SYSTEM CONSISTS OF LT. WT. CONCRETE ON 1½" METAL FLOOR DECK, TOTAL THICKNESS EQUALS 4¾". REINF. W/6x6 – 10/10 W.W.M, PLACE 1" BELOW TOP OF CONCRETE.
4. ⊣H⊢ – INDICATES MOMENT CONNECTION. SEE SHT. S001 FOR DETAILS.

1 / S103 THIRD FLOOR & ATTIC FRAMING PLAN

⅛" = 1'-0"

N

148



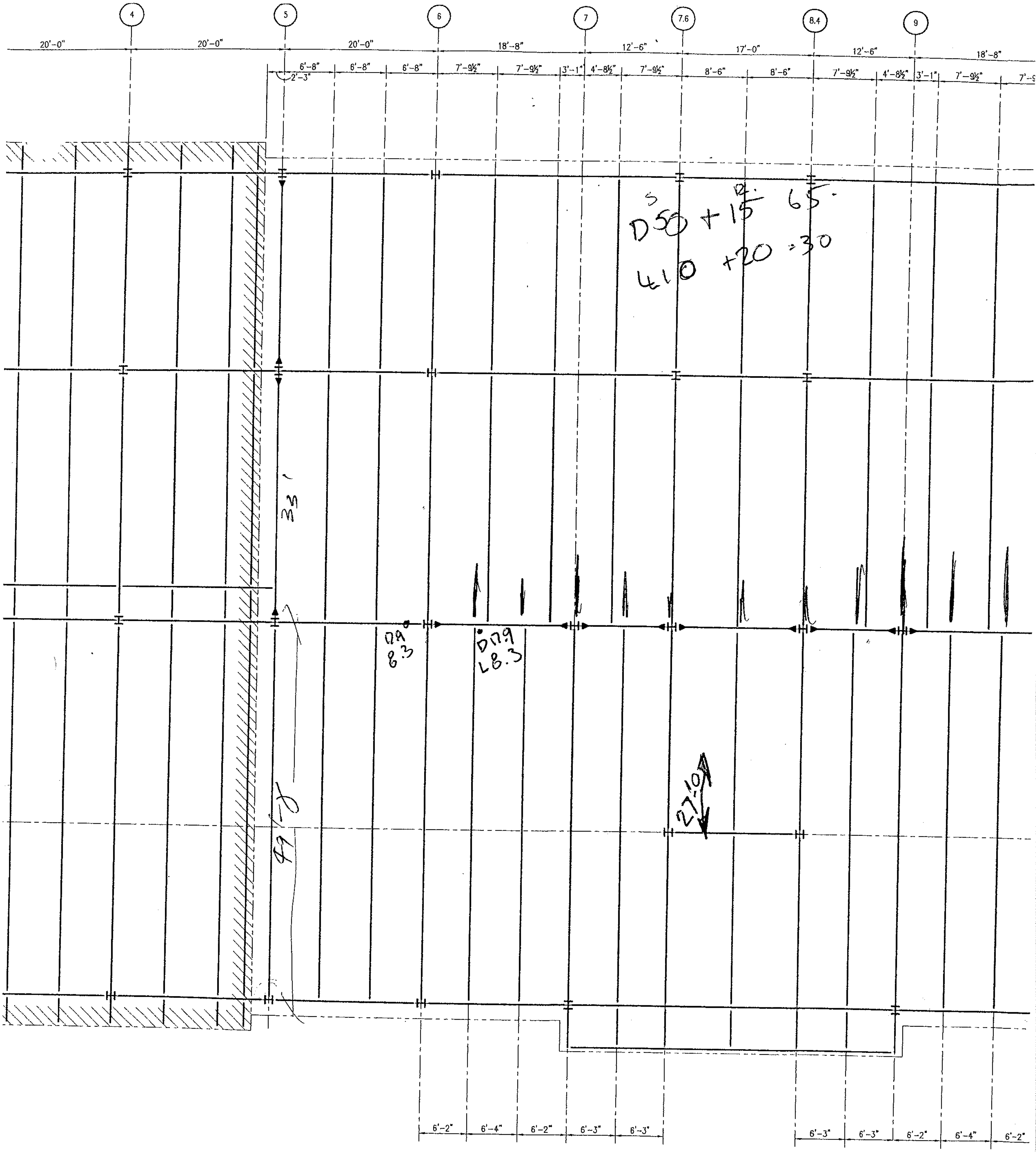
PLAN NOTES: UNLESS NOTED OTHERWISE:

1. TOP OF SLAB EL. 146'-0"
2. TOP OF STRUCTURAL STEEL EL. 144'-7¼"
3. FLOOR SYSTEM CONSISTS OF LT. WT. CONCRETE ON 1½" METAL FLOOR DECK, TOTAL THICKNESS EQUALS 4¾". REINF. W/6x6 – 10/10 W.W.M, PLACE 1" BELOW TOP OF CONCRETE.
4. ⟷ – INDICATES MOMENT CONNECTION. SEE SHT. S001 FOR DETAILS.
5. ▱ – INDICATES AREA OF 1½" METAL ROOF DECK.

1 / S104 — FOURTH FLOOR & ATTIC FRAMING PLAN — ⅛"=1'-0"

N

149

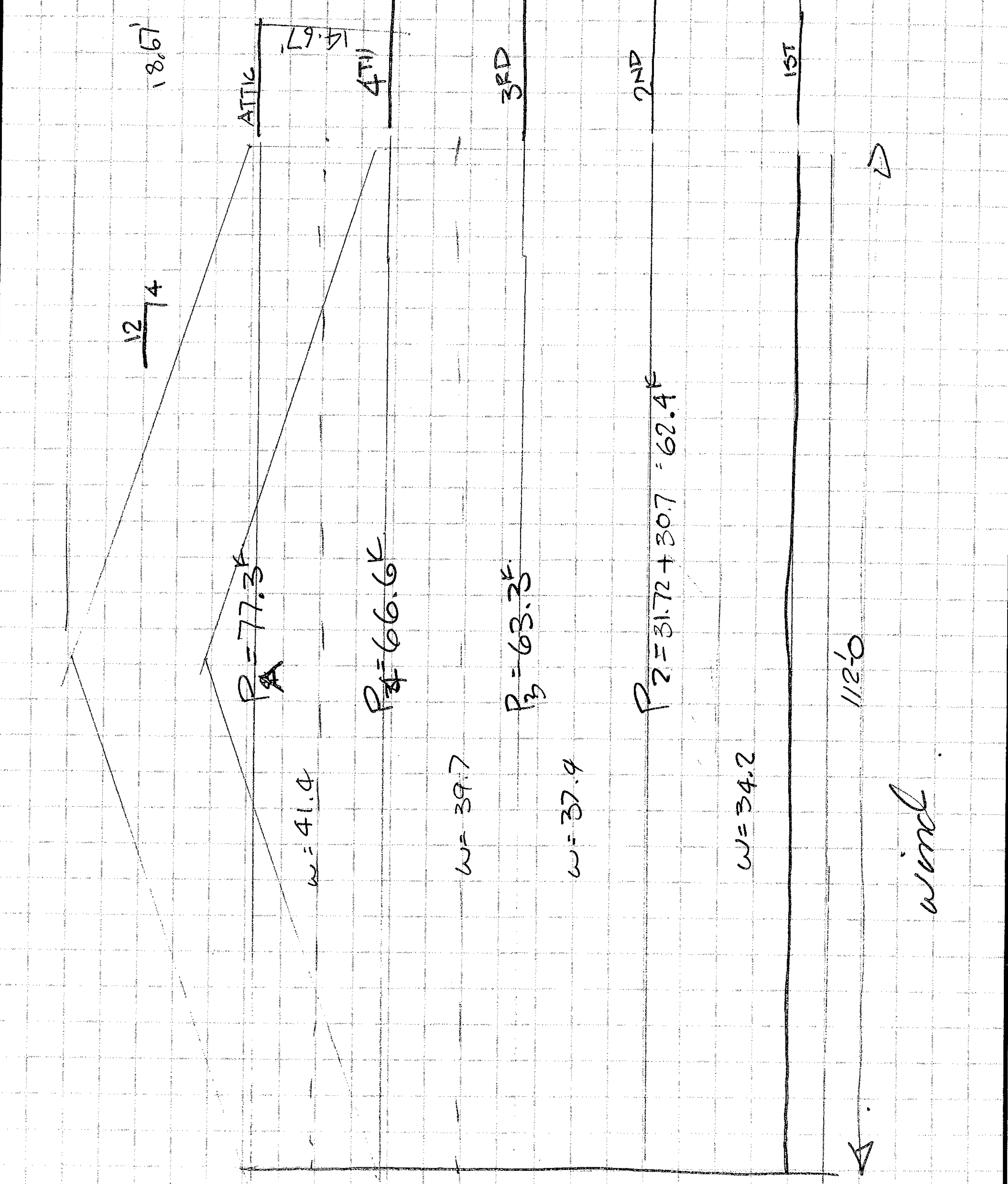


PLAN NOTES: UNLESS NOTED OTHERWISE:

1. TOP OF SLAB EL. 160'-3¼"
2. TOP OF STRUCTURAL STEEL EL. 159'-3¼"
3. FLOOR SYSTEM CONSISTS OF LT. WT. CONCRETE ON 1½" METAL FLOOR DECK, TOTAL THICKNESS EQUALS 4¼". REINF. W/6x6 – 10/10 W.W.M, PLACE 1" BELOW TOP OF CONCRETE.
4. ⟷ – INDICATES MOMENT CONNECTION. SEE SHT. S001 FOR DETAILS.
5. ▨ – INDICATES AREA OF 1½" METAL ROOF DECK.

1 ATTIC FRAMING PLAN AT

wind east-west



	JLS	3.29.06	157

MORPHY, MAKOFSKY, INC.

```
****************************************************
*                                                  *
*           STAAD.Pro                              *
*           Version  2003    Bld 1002.US           *
*           Proprietary Program of                 *
*           Research Engineers,  Intl.             *
*           Date=    APR 17, 2006                  *
*           Time=    16:28:23                      *
*                                                  *
*      USER ID: morphy makofsky inc                *
****************************************************
```

w/CMU

```
 1. STAAD PLANE
 2. START JOB INFORMATION
 3. ENGINEER DATE 27-MAR-06
 4. END JOB INFORMATION
 5. INPUT WIDTH 79
 6. UNIT FEET KIP
 7. JOINT COORDINATES
 8. 1 0 0 0; 2 0 15.5 0; 3 0 30.17 0; 4 0 44.84 0; 5 20 0 0; 6 20 15.5 0
 9. 7 20 30.17 0; 8 20 44.84 0; 9 40 0 0; 10 40 15.5 0; 11 40 30.17 0
10. 12 40 44.84 0; 13 60 0 0; 14 60 15.5 0; 15 60 30.17 0; 16 60 44.84 0
11. 17 80 0 0; 18 80 15.5 0; 19 80 30.17 0; 20 80 44.84 0; 21 81 0 0; 22 81 15.5 0
12. 23 81 30.17 0; 24 81 44.84 0; 25 81 59.5 0; 26 99.67 0 0; 27 99.67 15.5 0
13. 28 99.67 30.17 0; 29 99.67 44.84 0; 30 99.67 59.5 0; 31 112.17 0 0
14. 32 112.17 15.5 0; 33 112.17 30.17 0; 34 112.17 44.84 0; 35 112.17 59.5 0
15. 36 129.17 0 0; 37 129.17 15.5 0; 38 129.17 30.17 0; 39 129.17 44.84 0
16. 40 129.17 59.5 0; 41 141.67 0 0; 42 141.67 15.5 0; 43 141.67 30.17 0
17. 44 141.67 44.84 0; 45 141.67 59.5 0; 46 160.34 0 0; 47 160.34 15.5 0
18. 48 160.34 30.17 0; 49 160.34 44.84 0; 50 160.34 59.5 0; 51 161.34 0 0
19. 52 161.34 15.5 0; 53 161.34 30.17 0; 54 161.34 44.84 0; 55 181.34 0 0
20. 56 181.34 15.5 0; 57 181.34 30.17 0; 58 181.34 44.84 0; 59 201.34 0 0
21. 60 201.34 15.5 0; 61 201.34 30.17 0; 62 201.34 44.84 0; 63 221.34 0 0
22. 64 221.34 15.5 0; 65 221.34 30.17 0; 66 221.34 44.84 0; 67 241.34 0 0
23. 68 241.34 15.5 0; 69 241.34 30.17 0; 70 241.34 44.84 0
24. MEMBER INCIDENCES
25. 1 1 2; 2 2 3; 3 3 4; 4 5 6; 5 6 7; 6 7 8; 7 9 10; 8 10 11; 9 11 12; 10 13 14
26. 11 14 15; 12 15 16; 13 17 18; 14 18 19; 15 19 20; 16 21 22; 17 22 23; 18 23 24
27. 19 24 25; 20 26 27; 21 27 28; 22 28 29; 23 29 30; 24 31 32; 25 32 33; 26 33 34
28. 27 34 35; 28 36 37; 29 37 38; 30 38 39; 31 39 40; 32 41 42; 33 42 43; 34 43 44
29. 35 44 45; 36 46 47; 37 47 48; 38 48 49; 39 49 50; 40 51 52; 41 52 53; 42 53 54
30. 43 55 56; 44 56 57; 45 57 58; 46 59 60; 47 60 61; 48 61 62; 49 63 64; 50 64 65
31. 51 65 66; 52 67 68; 53 68 69; 54 69 70; 55 2 6; 56 6 10; 57 10 14; 58 14 18
32. 59 3 7; 60 7 11; 61 11 15; 62 15 19; 63 4 8; 64 8 12; 65 12 16; 66 16 20
33. 67 18 22; 68 19 23; 69 20 24; 70 49 54; 71 48 53; 72 47 52; 73 22 27; 74 27 32
34. 75 32 37; 76 37 42; 77 42 47; 78 23 28; 79 28 33; 80 33 38; 81 38 43; 82 43 48
35. 83 24 29; 84 29 34; 85 34 39; 86 39 44; 87 44 49; 88 25 30; 89 30 35; 90 35 40
36. 91 40 45; 92 45 50; 93 52 56; 94 56 60; 95 60 64; 96 64 68; 97 53 57; 98 57 61
37. 99 61 65; 100 65 69; 101 54 58; 102 58 62; 103 62 66; 104 66 70
38. DEFINE MATERIAL START
39. ISOTROPIC STEEL
40. E 4.176E+006
41. POISSON 0.3
```

159

```
42. DENSITY 0.489024
43. ALPHA 6.5E-006
44. DAMP 0.03
45. END DEFINE MATERIAL
46. CONSTANTS
47. MATERIAL STEEL MEMB 1 TO 104
48. MEMBER PROPERTY AMERICAN
49. 1 TO 15 TABLE ST W18X86
50. 16 TO 39 TABLE ST W14X74
51. 40 TO 54 TABLE ST W18X86
52. 55 TO 66 TABLE ST W27X114
53. 73 77 78 82 83 87 88 92 TABLE ST W27X114
54. 74 TO 76 79 TO 81 84 TO 86 89 TO 91 TABLE ST W24X68
55. 93 TO 100 TABLE ST W24X68
56. 101 TO 104 TABLE ST W21X57
57. MEMBER PROPERTY AMERICAN
58. 67 TO 72 PRIS YD 0.25 ZD 0.25
59. SUPPORTS
60. 1 5 9 13 17 21 26 31 36 41 46 51 55 59 63 67 FIXED
61. LOAD 1 DEAD
62. * K LINE FRAME
63. MEMBER LOAD
64. 55 TO 62 CON GY -11.6 6.67
65. 55 TO 62 CON GY -11.6 13.33
66. 63 TO 66 CON GY -10.8 6.67
67. 63 TO 66 CON GY -10.8 13.33
68. JOINT LOAD
69. 2 18 19 FY -37.1
70. 3 FY -28.4
71. 4 20 FY -12.7
72. 6 7 10 11 14 15 FY -11.6
73. 8 12 16 FY -10.8
74. MEMBER LOAD
75. 55 TO 62 UNI GY -1.39
76. * E LINE FRAME
77. MEMBER LOAD
78. 93 TO 96 CON GY -4.3 6.67
79. 93 TO 96 CON GY -4.3 13.33
80. 97 TO 100 CON GY -6 6.67
81. 97 TO 100 CON GY -6 13.33
82. 101 TO 104 CON GY -5.6 6.67
83. 101 TO 104 CON GY -5.6 13.33
84. JOINT LOAD
85. 52 FY -22.2
86. 53 FY -25.6
87. 54 FY -27.3
88. 68 FY -17.9
89. 69 FY -18.7
90. 70 FY -6.5
91. 56 60 64 FY -4.3
92. 57 61 65 FY -6
93. 58 62 66 FY -5.6
94. MEMBER LOAD
95. 93 TO 100 UNI GY -1.39
96. * G LINE FRAME
97. MEMBER LOAD
```

157

```
 98. 73 CON GY -17.1 6.22
 99. 73 CON GY -17.1 12.45
100. 74 CON GY -5.5 6.25
101. 75 CON GY -10 5.66
102. 75 CON GY -10 11.34
103. 76 CON GY -5 6.25
104. 77 CON GY -10 6.23
105. 77 CON GY -10 12.45
106. 78 CON GY -17.1 6.22
107. 78 CON GY -17.1 12.45
108. 79 CON GY -5.5 6.25
109. 80 CON GY -11.8 5.66
110. 80 CON GY -11.8 11.34
111. 81 CON GY -11.8 6.25
112. 82 CON GY -11.8 6.23
113. 82 CON GY -11.8 12.45
114. 83 CON GY -19.3 6.22
115. 83 CON GY -19.3 12.45
116. 84 CON GY -7.7 6.25
117. 85 CON GY -6.5 5.66
118. 85 CON GY -6.5 11.34
119. 86 CON GY -7.7 6.25
120. 87 CON GY -14 6.23
121. 87 CON GY -14 12.45
122. 88 CON GY -17.9 6.22
123. 88 CON GY -17.9 12.45
124. 89 CON GY -17.9 6.25
125. 90 CON GY -17.9 5.66
126. 90 CON GY -17.9 11.34
127. 91 CON GY -17.9 6.25
128. 92 CON GY -17.9 6.23
129. 92 CON GY -17.9 12.45
130. JOINT LOAD
131. 22 FY -46
132. 23 FY -34.2
133. 24 FY -38.6
134. 25 FY -35.8
135. 47 FY -20.5
136. 48 FY -23.6
137. 49 FY -29
138. 50 FY -35.8
139. 27 32 FY -17.1
140. 37 42 FY -10
141. 28 FY -17.1
142. 33 38 43 FY -11.8
143. 29 34 39 44 FY -19.3
144. 30 35 40 45 FY -17.9
145. LOAD 2 LIVE
146. * K LINE FRAME
147. MEMBER LOAD
148. 55 TO 62 CON GY -8.3 6.67
149. 55 TO 62 CON GY -8.3 13.33
150. 63 TO 66 CON GY -5 6.67
151. 63 TO 66 CON GY -5 13.33
152. JOINT LOAD
153. 2 18 FY -15.3
```

158

```
154. 3 19 FY -6.7
155. 4 20 FY -2.5
156. 6 7 10 11 14 15 FY -8.3
157. 8 12 16 FY -5
158. * E LINE FRAME
159. MEMBER LOAD
160. 93 TO 96 CON GY -6.5 6.67
161. 93 TO 96 CON GY -6.5 13.33
162. 97 TO 100 CON GY -4.3 6.67
163. 97 TO 100 CON GY -4.3 13.33
164. 101 TO 104 CON GY -2.6 6.67
165. 101 TO 104 CON GY -2.6 13.33
166. JOINT LOAD
167. 52 FY -13
168. 53 FY -8.6
169. 54 FY -10.4
170. 68 FY -3.3
171. 69 FY -2.2
172. 70 FY -1.3
173. 56 60 64 FY -6.5
174. 57 61 65 FY -4.3
175. 58 62 66 FY -2.6
176. * G LINE FRAME
177. MEMBER LOAD
178. 73 CON GY -19.3 6.22
179. 73 CON GY -19.3 12.45
180. 74 CON GY -11 6.25
181. 75 CON GY -17.8 5.66
182. 75 CON GY -17.8 11.34
183. 76 CON GY -11 6.25
184. 77 CON GY -15.1 6.23
185. 77 CON GY -15.1 12.45
186. 78 CON GY -22.1 6.22
187. 78 CON GY -22.1 12.45
188. 79 CON GY -13.8 6.25
189. 80 CON GY -18.3 5.66
190. 80 CON GY -18.3 11.34
191. 81 CON GY -18.3 6.25
192. 82 CON GY -18.3 6.23
193. 82 CON GY -18.3 12.45
194. 83 CON GY -13.8 6.22
195. 83 CON GY -13.8 12.45
196. 84 CON GY -5.5 6.25
197. 85 CON GY -13 5.66
198. 85 CON GY -13 11.34
199. 86 CON GY -5.5 6.25
200. 87 CON GY -10 6.23
201. 87 CON GY -10 12.45
202. 88 CON GY -8.3 6.22
203. 88 CON GY -8.3 12.45
204. 89 CON GY -8.3 6.25
205. 90 CON GY -8.3 5.66
206. 90 CON GY -8.3 11.34
207. 91 CON GY -8.3 6.25
208. 92 CON GY -8.3 6.23
209. 92 CON GY -8.3 12.45
```

```
210. JOINT LOAD
211. 22 FY -38
212. 23 FY -44.2
213. 24 FY -27.2
214. 25 FY -16.6
215. 47 FY -37.6
216. 48 FY -36.6
217. 49 FY -32.5
218. 50 FY -16.6
219. 27 32 FY -19.3
220. 37 42 FY -17.8
221. 28 FY -22.1
222. 33 38 43 FY -18.3
223. 29 34 39 44 FY -13.8
224. 30 35 40 45 FY -8.3
225. LOAD 3 WIND
226. JOINT LOAD
227. 2 FX 62.4
228. 3 FX 63.3
229. 4 FX 66.6
230. 25 FX 77.3
231. LOAD COMB 4 DEAD LIVE
232. 1 1.0 2 1.0
233. LOAD COMB 5 DEAD LIVE WIND
234. 1 1.0 2 0.75 3 0.75
235. LOAD COMB 6 DEAD WIND
236. 3 1.0 1 0.6
237. LOAD COMB 7 DEAD -WIND
238. 1 0.6 3 -1.0
239. PERFORM ANALYSIS
```

P R O B L E M   S T A T I S T I C S

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =    70/   104/    16
ORIGINAL/FINAL BAND-WIDTH=     5/     5/     15 DOF
TOTAL PRIMARY LOAD CASES =     3, TOTAL DEGREES OF FREEDOM =     162
SIZE OF STIFFNESS MATRIX =        3 DOUBLE  KILO-WORDS
REQRD/AVAIL. DISK SPACE  =     12.2/ 24768.2 MB,  EXMEM = 1636.7 MB
```

```
240. PDELTA 2 ANALYSIS
++ Adjusting Displacements                         16:28:23
++ Adjusting Displacements                         16:28:23

241. PRINT JOINT DISPLACEMENTS LIST 2 TO 4 25 42 TO 44 50 68 TO 70
```

160

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
2	1	-0.00229	-0.03404	0.00000	0.00000	0.00000	-0.00033
	2	-0.00146	-0.01122	0.00000	0.00000	0.00000	-0.00013
	3	0.43062	0.01022	0.00000	0.00000	0.00000	-0.00130
	4	-0.00375	-0.04526	0.00000	0.00000	0.00000	-0.00046
	5	0.31958	-0.03479	0.00000	0.00000	0.00000	-0.00140
	6	0.42924	-0.01020	0.00000	0.00000	0.00000	-0.00150
	7	-0.43200	-0.03064	0.00000	0.00000	0.00000	0.00111
3	1	0.00027	-0.05183	0.00000	0.00000	0.00000	-0.00032
	2	0.00025	-0.01638	0.00000	0.00000	0.00000	-0.00013
	3	0.77430	0.01505	0.00000	0.00000	0.00000	-0.00091
	4	0.00052	-0.06820	0.00000	0.00000	0.00000	-0.00046
	5	0.58118	-0.05282	0.00000	0.00000	0.00000	-0.00110
	6	0.77446	-0.01605	0.00000	0.00000	0.00000	-0.00110
	7	-0.77413	-0.04615	0.00000	0.00000	0.00000	0.00071
4	1	0.00393	-0.05719	0.00000	0.00000	0.00000	-0.00024
	2	0.00342	-0.01807	0.00000	0.00000	0.00000	-0.00014
	3	1.00347	0.01654	0.00000	0.00000	0.00000	-0.00050
	4	0.00735	-0.07526	0.00000	0.00000	0.00000	-0.00038
	5	0.75910	-0.05834	0.00000	0.00000	0.00000	-0.00072
	6	1.00583	-0.01777	0.00000	0.00000	0.00000	-0.00064
	7	-1.00111	-0.05085	0.00000	0.00000	0.00000	0.00035
25	1	-0.00184	-0.12445	0.00000	0.00000	0.00000	-0.00044
	2	0.00166	-0.07959	0.00000	0.00000	0.00000	-0.00024
	3	1.35060	0.00812	0.00000	0.00000	0.00000	-0.00055
	4	-0.00018	-0.20403	0.00000	0.00000	0.00000	-0.00068
	5	1.01236	-0.17805	0.00000	0.00000	0.00000	-0.00103
	6	1.34950	-0.06655	0.00000	0.00000	0.00000	-0.00082
	7	-1.35170	-0.08278	0.00000	0.00000	0.00000	0.00029
42	1	0.00010	-0.04024	0.00000	0.00000	0.00000	-0.00016
	2	0.00070	-0.03963	0.00000	0.00000	0.00000	-0.00021
	3	0.35662	0.00165	0.00000	0.00000	0.00000	-0.00041
	4	0.00080	-0.07988	0.00000	0.00000	0.00000	-0.00037
	5	0.26808	-0.06873	0.00000	0.00000	0.00000	-0.00062
	6	0.35667	-0.02249	0.00000	0.00000	0.00000	-0.00050
	7	-0.35656	-0.02580	0.00000	0.00000	0.00000	0.00031
43	1	0.00036	-0.07200	0.00000	0.00000	0.00000	-0.00014
	2	0.00060	-0.06626	0.00000	0.00000	0.00000	-0.00020
	3	0.68864	0.00274	0.00000	0.00000	0.00000	-0.00037
	4	0.00097	-0.13826	0.00000	0.00000	0.00000	-0.00033
	5	0.51730	-0.11964	0.00000	0.00000	0.00000	-0.00056
	6	0.68886	-0.04046	0.00000	0.00000	0.00000	-0.00045
	7	-0.68843	-0.04594	0.00000	0.00000	0.00000	0.00029
44	1	-0.00059	-0.09549	0.00000	0.00000	0.00000	-0.00018
	2	-0.00041	-0.07964	0.00000	0.00000	0.00000	-0.00012
	3	0.94272	0.00348	0.00000	0.00000	0.00000	-0.00040
	4	-0.00100	-0.17512	0.00000	0.00000	0.00000	-0.00030
	5	0.70614	-0.15260	0.00000	0.00000	0.00000	-0.00057
	6	0.94237	-0.05381	0.00000	0.00000	0.00000	-0.00050

157

JOINT DISPLACEMENT (INCH RADIANS)   STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	7	-0.94307	-0.06077	0.00000	0.00000	0.00000	0.00029
50	1	-0.00447	-0.10339	0.00000	0.00000	0.00000	0.00048
	2	-0.00071	-0.07636	0.00000	0.00000	0.00000	0.00023
	3	1.30011	-0.00918	0.00000	0.00000	0.00000	-0.00053
	4	-0.00517	-0.17974	0.00000	0.00000	0.00000	0.00072
	5	0.97009	-0.16754	0.00000	0.00000	0.00000	0.00026
	6	1.29743	-0.07121	0.00000	0.00000	0.00000	-0.00024
	7	-1.30279	-0.05286	0.00000	0.00000	0.00000	0.00082
68	1	0.00288	-0.02137	0.00000	0.00000	0.00000	0.00027
	2	0.00158	-0.00495	0.00000	0.00000	0.00000	0.00013
	3	0.33301	-0.00649	0.00000	0.00000	0.00000	-0.00150
	4	0.00446	-0.02632	0.00000	0.00000	0.00000	0.00041
	5	0.25382	-0.02995	0.00000	0.00000	0.00000	-0.00075
	6	0.33474	-0.01931	0.00000	0.00000	0.00000	-0.00133
	7	-0.33129	-0.00633	0.00000	0.00000	0.00000	0.00166
69	1	-0.00087	-0.03318	0.00000	0.00000	0.00000	0.00031
	2	0.00009	-0.00739	0.00000	0.00000	0.00000	0.00008
	3	0.66541	-0.00971	0.00000	0.00000	0.00000	-0.00113
	4	-0.00077	-0.04056	0.00000	0.00000	0.00000	0.00039
	5	0.49826	-0.04600	0.00000	0.00000	0.00000	-0.00048
	6	0.66489	-0.02961	0.00000	0.00000	0.00000	-0.00094
	7	-0.66593	-0.01020	0.00000	0.00000	0.00000	0.00132
70	1	-0.00637	-0.03600	0.00000	0.00000	0.00000	0.00017
	2	-0.00311	-0.00829	0.00000	0.00000	0.00000	0.00011
	3	0.89505	-0.01068	0.00000	0.00000	0.00000	-0.00080
	4	-0.00949	-0.04429	0.00000	0.00000	0.00000	0.00028
	5	0.66258	-0.05023	0.00000	0.00000	0.00000	-0.00034
	6	0.89123	-0.03228	0.00000	0.00000	0.00000	-0.00069
	7	-0.89887	-0.01092	0.00000	0.00000	0.00000	0.00090

************** END OF LATEST ANALYSIS RESULT **************

242. LOAD LIST 4 TO 7
243. PRINT MAXFORCE ENVELOPE NSECTION 24 LIST 1 TO 104

MEMBER FORCE ENVELOPE

ALL UNITS ARE KIP FEET

MAX AND MIN FORCE VALUES AMONGST ALL SECTION LOCATIONS

MEMB	FY/ FZ	DIST DIST	LD LD	MZ/ MY	DIST DIST	LD LD	FX	DIST	LD
1 MAX	20.73	0.00	6	190.50	0.00	6			
	0.00	0.00	4	0.00	0.00	4	178.53 C	0.00	4
MIN	-23.55	15.50	7	-204.49	0.00	7			
	0.00	15.50	7	0.00	15.50	7	40.24 C	15.50	6
2 MAX	9.66	0.00	6	119.03	14.67	7			
	0.00	0.00	4	0.00	0.00	4	95.62 C	0.00	4
MIN	-15.10	14.67	7	-102.56	0.00	7			
	0.00	14.67	7	0.00	14.67	7	24.37 C	14.67	6
3 MAX	6.46	0.00	6	88.65	14.67	7			
	0.00	0.00	4	0.00	0.00	4	29.41 C	0.00	4
MIN	-11.05	14.67	7	-73.45	0.00	7			
	0.00	14.67	7	0.00	14.67	7	7.20 C	14.67	6
4 MAX	25.52	0.00	6	210.60	0.00	6			
	0.00	0.00	4	0.00	0.00	4	229.80 C	0.00	4
MIN	-25.39	15.50	7	-210.40	0.00	7			
	0.00	15.50	7	0.00	15.50	7	90.07 C	15.50	7
5 MAX	20.02	0.00	6	145.27	14.67	7			
	0.00	0.00	4	0.00	0.00	4	138.70 C	0.00	4
MIN	-19.37	14.67	7	-149.59	14.67	6			
	0.00	14.67	7	0.00	14.67	7	55.82 C	14.67	7
6 MAX	13.74	0.00	6	103.38	14.67	7			
	0.00	0.00	4	0.00	0.00	4	48.69 C	0.00	4
MIN	-13.25	14.67	7	-106.66	14.67	6			
	0.00	14.67	7	0.00	14.67	7	19.16 C	14.67	7
7 MAX	24.16	0.00	6	201.70	0.00	6			
	0.00	0.00	4	0.00	0.00	4	221.03 C	0.00	4
MIN	-24.26	15.50	7	-202.52	0.00	7			
	0.00	15.50	7	0.00	15.50	7	93.50 C	15.50	7
8 MAX	19.06	0.00	6	142.77	14.67	7			
	0.00	0.00	4	0.00	0.00	4	134.39 C	0.00	4
MIN	-18.93	14.67	7	-143.66	14.67	6			
	0.00	14.67	7	0.00	14.67	7	56.57 C	14.67	7
9 MAX	13.71	0.00	6	105.33	14.67	7			
	0.00	0.00	4	0.00	0.00	4	47.27 C	0.00	4

MIN	-13.48	14.67	7	-107.07	14.67	6			
	0.00	14.67	7	0.00	14.67	7	19.29 C	14.67	7
10 MAX	23.83	0.00	6	197.99	0.00	6			
	0.00	0.00	4	0.00	0.00	4	234.61 C	0.00	4
MIN	-24.34	15.50	7	-200.65	0.00	7			
	0.00	15.50	7	0.00	15.50	7	90.36 C	15.50	6
11 MAX	19.34	0.00	6	151.29	14.67	7			
	0.00	0.00	4	0.00	0.00	4	142.33 C	0.00	4
MIN	-20.25	14.67	7	-145.71	0.00	7			
	0.00	14.67	7	0.00	14.67	7	55.03 C	14.67	6
12 MAX	13.96	0.00	6	114.38	14.67	7			
	0.00	0.00	4	0.00	0.00	4	50.10 C	0.00	4
MIN	-14.77	14.67	7	-108.59	14.67	6			
	0.00	14.67	7	0.00	14.67	7	18.63 C	14.67	6
13 MAX	21.08	0.00	6	182.95	0.00	6			
	0.00	0.00	4	0.00	0.00	4	284.26 C	0.00	4
MIN	-18.80	15.50	7	-172.24	0.00	7			
	0.00	15.50	7	0.00	15.50	7	110.10 C	15.50	7
14 MAX	15.48	0.00	6	108.16	0.00	6			
	0.00	0.00	4	0.00	0.00	4	184.25 C	0.00	4
MIN	-10.76	14.67	7	-118.89	14.67	6			
	0.00	14.67	7	0.00	14.67	7	67.71 C	14.67	6
15 MAX	11.93	0.00	6	80.53	0.00	6			
	0.00	0.00	4	0.00	0.00	4	78.28 C	0.00	4
MIN	-8.94	14.67	7	-94.45	14.67	6			
	0.00	14.67	7	0.00	14.67	7	22.88 C	14.67	6
16 MAX	11.33	0.00	6	98.05	0.00	6			
	0.00	0.00	4	0.00	0.00	4	307.20 C	0.00	4
MIN	-12.88	15.50	7	-105.67	0.00	7			
	0.00	15.50	7	0.00	15.50	7	101.55 C	15.50	6
17 MAX	8.13	0.00	6	85.63	14.67	7			
	0.00	0.00	4	0.00	0.00	4	207.15 C	0.00	4
MIN	-11.41	14.67	7	-81.80	0.00	7			
	0.00	14.67	7	0.00	14.67	7	66.97 C	14.67	6
18 MAX	4.19	0.00	6	56.03	14.67	7			
	0.00	0.00	4	0.00	0.00	4	124.31 C	0.00	4
MIN	-7.71	14.67	7	-57.11	0.00	7			
	0.00	14.67	7	0.00	14.67	7	41.95 C	14.67	6
19 MAX	10.36	0.00	6	108.03	14.66	7			
	0.00	0.00	4	0.00	0.00	4	76.74 C	0.00	4
MIN	-14.52	14.66	7	-104.84	0.00	7			
	0.00	14.66	7	0.00	14.66	7	22.79 C	14.66	6
20 MAX	13.78	0.00	6	109.31	0.00	6			
	0.00	0.00	4	0.00	0.00	4	313.38 C	0.00	4

160

MIN	-12.50	15.50	7	-104.35	15.50	6			
	0.00	15.50	7	0.00	15.50	7	92.56 C	15.50	7
21 MAX	13.40	0.00	6	97.78	0.00	6			
	0.00	0.00	4	0.00	0.00	4	229.73 C	0.00	4
MIN	-10.60	14.67	7	-98.82	14.67	6			
	0.00	14.67	7	0.00	14.67	7	71.63 C	14.67	7
22 MAX	10.04	0.00	5	74.50	0.00	5			
	0.00	0.00	4	0.00	0.00	4	140.00 C	0.00	4
MIN	-6.77	14.67	7	-72.81	14.67	5			
	0.00	14.67	7	0.00	14.67	7	50.49 C	14.67	7
23 MAX	15.71	0.00	6	113.43	0.00	6			
	0.00	0.00	4	0.00	0.00	4	65.53 C	0.00	4
MIN	-12.73	14.66	7	-116.92	14.66	6			
	0.00	14.66	7	0.00	14.66	7	25.38 C	14.66	7
24 MAX	11.71	0.00	6	98.41	0.00	6			
	0.00	0.00	4	0.00	0.00	4	269.46 C	0.00	4
MIN	-12.29	15.50	7	-101.27	0.00	7			
	0.00	15.50	7	0.00	15.50	7	70.29 C	15.50	7
25 MAX	9.74	0.00	6	82.04	14.67	7			
	0.00	0.00	4	0.00	0.00	4	197.31 C	0.00	4
MIN	-10.98	14.67	7	-79.01	0.00	7			
	0.00	14.67	7	0.00	14.67	7	55.54 C	14.67	7
26 MAX	6.78	0.00	6	52.95	14.67	7			
	0.00	0.00	4	0.00	0.00	4	127.20 C	0.00	4
MIN	-7.41	14.67	7	-55.69	0.00	7			
	0.00	14.67	7	0.00	14.67	7	41.71 C	14.67	7
27 MAX	12.17	0.00	6	100.31	14.66	7			
	0.00	0.00	4	0.00	0.00	4	67.69 C	0.00	4
MIN	-13.22	14.66	7	-93.55	0.00	7			
	0.00	14.66	7	0.00	14.66	7	26.54 C	14.66	7
28 MAX	12.01	0.00	6	98.91	0.00	6			
	0.00	0.00	4	0.00	0.00	4	264.72 C	0.00	4
MIN	-11.38	15.50	7	-95.84	0.00	7			
	0.00	15.50	7	0.00	15.50	7	68.03 C	15.50	6
29 MAX	10.95	0.00	6	79.13	0.00	6			
	0.00	0.00	4	0.00	0.00	4	200.51 C	0.00	4
MIN	-9.73	14.67	7	-81.46	14.67	6			
	0.00	14.67	7	0.00	14.67	7	57.00 C	14.67	6
30 MAX	7.49	0.00	6	55.97	0.00	6			
	0.00	0.00	4	0.00	0.00	4	124.69 C	0.00	4
MIN	-6.86	14.67	7	-53.98	14.67	6			
	0.00	14.67	7	0.00	14.67	7	41.16 C	14.67	6
31 MAX	13.06	0.00	6	92.22	0.00	6			
	0.00	0.00	4	0.00	0.00	4	65.65 C	0.00	4

161

MIN	-11.97	14.66	7	-99.29	14.66	6				
	0.00	14.66	7	0.00	14.66	7	26.02	C	14.66	6
32 MAX	11.99	0.00	6	98.14	0.00	6				
	0.00	0.00	4	0.00	0.00	4	271.49	C	0.00	4
MIN	-12.67	15.50	7	-101.43	0.00	7				
	0.00	15.50	7	0.00	15.50	7	76.45	C	15.50	6
33 MAX	11.21	0.00	6	92.63	14.67	7				
	0.00	0.00	4	0.00	0.00	4	209.68	C	0.00	4
MIN	-12.59	14.67	7	-92.05	0.00	7				
	0.00	14.67	7	0.00	14.67	7	64.54	C	14.67	6
34 MAX	7.65	0.00	6	67.51	14.67	7				
	0.00	0.00	4	0.00	0.00	4	132.38	C	0.00	4
MIN	-9.21	14.67	7	-67.54	0.00	7				
	0.00	14.67	7	0.00	14.67	7	47.93	C	14.67	6
35 MAX	12.48	0.00	6	111.73	14.66	7				
	0.00	0.00	4	0.00	0.00	4	67.34	C	0.00	4
MIN	-14.92	14.66	7	-107.04	0.00	7				
	0.00	14.66	7	0.00	14.66	7	26.20	C	14.66	6
36 MAX	11.41	0.00	6	94.72	0.00	6				
	0.00	0.00	4	0.00	0.00	4	250.90	C	0.00	4
MIN	-10.48	15.50	7	-90.13	0.00	7				
	0.00	15.50	7	0.00	15.50	7	71.37	C	15.50	7
37 MAX	11.27	0.00	5	80.71	0.00	5				
	0.00	0.00	4	0.00	0.00	4	183.29	C	0.00	4
MIN	-8.58	14.67	7	-84.60	14.67	5				
	0.00	14.67	7	0.00	14.67	7	53.96	C	14.67	7
38 MAX	8.72	0.00	5	65.09	0.00	5				
	0.00	0.00	4	0.00	0.00	4	120.92	C	0.00	4
MIN	-4.96	14.67	7	-62.87	14.67	5				
	0.00	14.67	7	0.00	14.67	7	37.36	C	14.67	7
39 MAX	13.51	0.00	6	96.26	0.00	6				
	0.00	0.00	4	0.00	0.00	4	76.25	C	0.00	4
MIN	-9.94	14.66	7	-101.80	14.66	6				
	0.00	14.66	7	0.00	14.66	7	23.11	C	14.66	7
40 MAX	14.19	0.00	6	142.47	0.00	6				
	0.00	0.00	4	0.00	0.00	4	237.49	C	0.00	4
MIN	-16.15	15.50	7	-151.72	0.00	7				
	0.00	15.50	7	0.00	15.50	7	75.38	C	15.50	7
41 MAX	6.34	0.00	6	85.50	14.67	7				
	0.00	0.00	4	0.00	0.00	4	165.82	C	0.00	4
MIN	-10.64	14.67	7	-70.59	0.00	7				
	0.00	14.67	7	0.00	14.67	7	52.34	C	14.67	7
42 MAX	5.38	0.00	6	60.55	14.67	7				
	0.00	0.00	4	0.00	0.00	4	84.33	C	0.00	4

162

	MIN	-7.76	14.67	7	-53.27	0.00	7			
		0.00	14.67	7	0.00	14.67	7	23.06 C	14.67	7
43	MAX	18.10	0.00	6	159.79	0.00	6			
		0.00	0.00	4	0.00	0.00	4	150.12 C	0.00	4
	MIN	-17.73	15.50	7	-157.80	0.00	7			
		0.00	15.50	7	0.00	15.50	7	59.86 C	15.50	7
44	MAX	14.62	0.00	6	105.74	14.67	7			
		0.00	0.00	4	0.00	0.00	4	87.41 C	0.00	4
	MIN	-13.91	14.67	7	-111.35	14.67	6			
		0.00	14.67	7	0.00	14.67	7	36.69 C	14.67	7
45	MAX	10.35	0.00	6	77.24	14.67	7			
		0.00	0.00	4	0.00	0.00	4	25.86 C	0.00	4
	MIN	-9.74	14.67	7	-81.53	14.67	6			
		0.00	14.67	7	0.00	14.67	7	9.59 C	14.67	7
46	MAX	17.30	0.00	6	154.98	0.00	6			
		0.00	0.00	4	0.00	0.00	4	142.82 C	0.00	4
	MIN	-17.18	15.50	7	-154.06	0.00	7			
		0.00	15.50	7	0.00	15.50	7	61.63 C	15.50	7
47	MAX	13.69	0.00	6	105.77	14.67	7			
		0.00	0.00	4	0.00	0.00	4	82.96 C	0.00	4
	MIN	-13.81	14.67	7	-105.09	14.67	6			
		0.00	14.67	7	0.00	14.67	7	37.38 C	14.67	7
48	MAX	9.16	0.00	6	74.64	14.67	7			
		0.00	0.00	4	0.00	0.00	4	24.50 C	0.00	4
	MIN	-9.39	14.67	7	-72.94	14.67	6			
		0.00	14.67	7	0.00	14.67	7	10.03 C	14.67	7
49	MAX	17.35	0.00	6	154.56	0.00	6			
		0.00	0.00	4	0.00	0.00	4	146.56 C	0.00	4
	MIN	-17.34	15.50	7	-153.99	0.00	7			
		0.00	15.50	7	0.00	15.50	7	60.18 C	15.50	6
50	MAX	14.02	0.00	6	110.21	14.67	7			
		0.00	0.00	4	0.00	0.00	4	84.78 C	0.00	4
	MIN	-14.53	14.67	7	-106.79	14.67	6			
		0.00	14.67	7	0.00	14.67	7	36.98 C	14.67	6
51	MAX	9.05	0.00	6	75.09	14.67	7			
		0.00	0.00	4	0.00	0.00	4	24.94 C	0.00	4
	MIN	-9.47	14.67	7	-72.50	14.67	6			
		0.00	14.67	7	0.00	14.67	7	9.81 C	14.67	6
52	MAX	15.08	0.00	6	143.37	0.00	6			
		0.00	0.00	4	0.00	0.00	4	118.15 C	0.00	5
	MIN	-12.64	15.50	7	-131.02	0.00	7			
		0.00	15.50	7	0.00	15.50	7	24.95 C	15.50	7
53	MAX	11.35	0.00	5	77.56	0.00	5			
		0.00	0.00	4	0.00	0.00	4	66.87 C	0.00	5

163

MIN	-6.01	14.67	7	-88.96	14.67	5			
	0.00	14.67	7	0.00	14.67	7	16.15 C	14.67	7
54 MAX	7.68	0.00	5	53.44	0.00	5			
	0.00	0.00	4	0.00	0.00	4	17.64 C	0.00	5
MIN	-3.14	14.67	7	-59.16	14.67	5			
	0.00	14.67	7	0.00	14.67	7	3.01 C	14.67	7
55 MAX	34.00	0.00	7	268.98	20.00	5			
	0.00	0.00	4	0.00	0.00	4	51.27 C	0.00	6
MIN	-49.96	20.00	5	-193.37	0.00	6			
	0.00	20.00	7	0.00	20.00	7	53.91 T	20.00	7
56 MAX	34.11	0.00	4	240.51	20.00	5			
	0.00	0.00	4	0.00	0.00	4	45.79 C	0.00	6
MIN	-42.86	20.00	5	-96.93	20.00	7			
	0.00	20.00	7	0.00	20.00	7	47.91 T	20.00	7
57 MAX	33.26	0.00	4	243.19	20.00	5			
	0.00	0.00	4	0.00	0.00	4	40.68 C	0.00	6
MIN	-43.45	20.00	5	-95.57	0.00	6			
	0.00	20.00	7	0.00	20.00	7	42.57 T	20.00	7
58 MAX	38.04	0.00	4	246.09	20.00	6			
	0.00	0.00	4	0.00	0.00	4	36.18 C	0.00	6
MIN	-42.21	20.00	5	-181.25	20.00	7			
	0.00	20.00	7	0.00	20.00	7	38.47 T	20.00	7
59 MAX	31.11	0.00	4	225.52	20.00	5			
	0.00	0.00	4	0.00	0.00	4	60.07 C	0.00	6
MIN	-44.70	20.00	5	-128.06	6.67	5			
	0.00	20.00	7	0.00	20.00	7	59.21 T	20.00	7
60 MAX	33.62	0.00	4	216.49	20.00	5			
	0.00	0.00	4	0.00	0.00	4	53.79 C	0.00	6
MIN	-40.70	20.00	5	-83.81	6.67	5			
	0.00	20.00	7	0.00	20.00	7	53.09 T	20.00	7
61 MAX	33.24	0.00	4	220.36	20.00	5			
	0.00	0.00	4	0.00	0.00	4	48.44 C	0.00	6
MIN	-40.97	20.00	5	-83.54	6.67	5			
	0.00	20.00	7	0.00	20.00	7	47.65 T	20.00	7
62 MAX	37.97	0.00	4	200.43	0.00	7			
	0.00	0.00	4	0.00	0.00	4	43.05 C	0.00	6
MIN	-38.93	20.00	5	-128.78	20.00	7			
	0.00	20.00	7	0.00	20.00	7	42.16 T	20.00	7
63 MAX	14.21	0.00	4	103.83	20.00	5			
	0.00	0.00	4	0.00	0.00	4	60.13 C	0.00	6
MIN	-20.68	20.00	5	-74.95	6.67	5			
	0.00	20.00	7	0.00	20.00	7	55.54 T	20.00	7
64 MAX	15.50	0.00	4	107.17	20.00	5			
	0.00	0.00	4	0.00	0.00	4	46.39 C	0.00	6

164

	MIN	-18.83	20.00	5	-46.88	6.67	5			
		0.00	20.00	7	0.00	20.00	7	42.29 T	20.00	7
65	MAX	15.37	0.00	4	110.44	20.00	5			
		0.00	0.00	4	0.00	0.00	4	32.68 C	0.00	6
	MIN	-18.83	19.17	5	-43.60	6.67	5			
		0.00	20.00	7	0.00	20.00	7	28.81 T	20.00	7
66	MAX	18.06	0.00	4	97.76	20.00	5			
		0.00	0.00	4	0.00	0.00	4	18.72 C	0.00	6
	MIN	-17.74	20.00	5	-63.09	20.00	7			
		0.00	20.00	7	0.00	20.00	7	14.04 T	20.00	7
67	MAX	18.86	0.00	7	10.59	0.00	4			
		0.00	0.00	4	0.00	0.00	4	30.59 C	0.00	6
	MIN	-11.58	1.00	6	-8.38	1.00	7			
		0.00	1.00	7	0.00	1.00	7	30.44 T	1.00	7
68	MAX	32.54	0.00	4	17.80	0.00	4			
		0.00	0.00	4	0.00	0.00	4	39.50 C	0.00	6
	MIN	-5.74	1.00	6	-14.74	1.00	4			
		0.00	1.00	7	0.00	1.00	7	40.34 T	1.00	7
69	MAX	49.54	0.00	4	25.89	0.00	4			
		0.00	0.00	4	0.00	0.00	4	6.99 C	0.00	5
	MIN	2.65	1.00	6	-23.66	1.00	4			
		0.00	1.00	7	0.00	1.00	7	5.10 T	1.00	7
70	MAX	0.93	0.00	7	21.84	1.00	5			
		0.00	0.00	4	0.00	0.00	4	40.78 C	0.00	6
	MIN	-42.15	1.00	5	-20.31	0.00	5			
		0.00	1.00	7	0.00	1.00	7	39.48 T	1.00	7
71	MAX	6.89	0.00	7	16.59	1.00	5			
		0.00	0.00	4	0.00	0.00	4	18.64 C	0.00	6
	MIN	-29.96	1.00	5	-13.37	0.00	5			
		0.00	1.00	7	0.00	1.00	7	19.37 T	1.00	7
72	MAX	12.91	0.00	7	12.94	1.00	5			
		0.00	0.00	4	0.00	0.00	4	22.53 C	0.00	6
	MIN	-22.23	1.00	5	-9.29	0.00	5			
		0.00	1.00	7	0.00	1.00	7	22.12 T	1.00	7
73	MAX	34.10	0.00	4	184.77	18.67	5			
		0.00	0.00	4	0.00	0.00	4	27.38 C	0.00	6
	MIN	-44.22	17.89	5	-169.04	6.22	5			
		0.00	18.67	7	0.00	18.67	7	28.97 T	18.67	7
74	MAX	13.95	0.00	7	105.83	12.50	5			
		0.00	0.00	4	0.00	0.00	4	27.01 C	0.00	6
	MIN	-15.59	12.50	5	-71.25	12.50	7			
		0.00	12.50	7	0.00	12.50	7	27.07 T	12.50	7
75	MAX	27.81	0.00	4	132.13	17.00	5			
		0.00	0.00	4	0.00	0.00	4	25.04 C	0.00	6

MIN	-30.21	17.00	5	-77.79	5.67	5			
	0.00	17.00	7	0.00	17.00	7	25.76 T	17.00	7
76 MAX	13.45	0.00	7	91.92	0.00	7			
	0.00	0.00	4	0.00	0.00	4	23.97 C	0.00	6
MIN	-14.93	12.50	5	-69.78	0.00	6			
	0.00	12.50	7	0.00	12.50	7	24.10 T	12.50	7
77 MAX	26.63	0.00	4	152.77	18.67	6			
	0.00	0.00	4	0.00	0.00	4	23.18 C	0.00	6
MIN	-30.18	18.67	5	-128.19	18.67	7			
	0.00	18.67	7	0.00	18.67	7	24.02 T	18.67	7
78 MAX	36.98	0.00	4	172.78	18.67	5			
	0.00	0.00	4	0.00	0.00	4	35.57 C	0.00	6
MIN	-43.78	17.89	5	-162.47	6.22	5			
	0.00	18.67	7	0.00	18.67	7	36.64 T	18.67	7
79 MAX	11.07	0.00	7	101.15	12.50	5			
	0.00	0.00	4	0.00	0.00	4	31.84 C	0.00	6
MIN	-15.85	12.50	5	-50.85	12.50	7			
	0.00	12.50	7	0.00	12.50	7	32.82 T	12.50	7
80 MAX	29.81	0.00	4	135.14	17.00	5			
	0.00	0.00	4	0.00	0.00	4	28.89 C	0.00	6
MIN	-31.45	17.00	5	-76.50	5.67	5			
	0.00	17.00	7	0.00	17.00	7	29.25 T	17.00	7
81 MAX	15.33	0.00	4	96.23	12.50	5			
	0.00	0.00	4	0.00	0.00	4	25.43 C	0.00	6
MIN	-19.79	12.50	5	-48.64	0.00	6			
	0.00	12.50	7	0.00	12.50	7	26.38 T	12.50	7
82 MAX	32.44	0.00	4	136.32	18.67	5			
	0.00	0.00	4	0.00	0.00	4	21.87 C	0.00	6
MIN	-31.88	17.89	5	-113.11	12.45	4			
	0.00	18.67	7	0.00	18.67	7	22.99 T	18.67	7
83 MAX	31.31	0.00	4	164.38	18.67	5			
	0.00	0.00	4	0.00	0.00	4	12.97 C	0.00	6
MIN	-40.43	17.89	5	-154.25	6.22	5			
	0.00	18.67	7	0.00	18.67	7	11.91 T	18.67	7
84 MAX	13.30	0.00	7	89.35	12.50	5			
	0.00	0.00	4	0.00	0.00	4	19.01 C	0.00	6
MIN	-13.89	12.50	5	-60.96	12.50	7			
	0.00	12.50	7	0.00	12.50	7	17.87 T	12.50	7
85 MAX	19.70	0.00	4	106.19	17.00	5			
	0.00	0.00	4	0.00	0.00	4	24.40 C	0.00	6
MIN	-22.29	17.00	5	-56.72	17.00	7			
	0.00	17.00	7	0.00	17.00	7	23.69 T	17.00	7
86 MAX	12.65	0.00	7	80.54	0.00	7			
	0.00	0.00	4	0.00	0.00	4	29.97 C	0.00	6

160

MIN	-13.95	12.50	5	-62.05	0.00	6			
	0.00	12.50	7	0.00	12.50	7	28.80 T	12.50	7
87 MAX	25.37	0.00	4	140.92	18.67	6			
	0.00	0.00	4	0.00	0.00	4	34.80 C	0.00	6
MIN	-29.22	18.67	5	-106.95	18.67	7			
	0.00	18.67	7	0.00	18.67	7	34.51 T	18.67	7
88 MAX	24.34	0.00	4	120.60	18.67	5			
	0.00	0.00	4	0.00	0.00	4	66.92 C	0.00	6
MIN	-32.28	18.67	5	-130.98	6.22	5			
	0.00	18.67	7	0.00	18.67	7	62.76 T	18.67	7
89 MAX	11.50	0.00	7	103.05	12.50	5			
	0.00	0.00	4	0.00	0.00	4	51.21 C	0.00	6
MIN	-18.93	12.50	5	-19.81	6.25	4			
	0.00	12.50	7	0.00	12.50	7	50.03 T	12.50	7
90 MAX	26.56	0.00	4	112.18	17.00	5			
	0.00	0.00	4	0.00	0.00	4	39.04 C	0.00	6
MIN	-28.07	17.00	5	-69.12	5.67	5			
	0.00	17.00	7	0.00	17.00	7	36.81 T	17.00	7
91 MAX	13.61	0.00	4	83.74	12.50	5			
	0.00	0.00	4	0.00	0.00	4	25.98 C	0.00	6
MIN	-16.60	12.50	5	-20.00	6.25	5			
	0.00	12.50	7	0.00	12.50	7	24.84 T	12.50	7
92 MAX	28.55	0.00	4	101.80	18.67	6			
	0.00	0.00	4	0.00	0.00	4	13.49 C	0.00	6
MIN	-27.99	18.67	5	-110.65	12.45	4			
	0.00	18.67	7	0.00	18.67	7	9.92 T	18.67	7
93 MAX	22.62	0.00	7	188.66	20.00	5			
	0.00	0.00	4	0.00	0.00	4	14.69 C	0.00	6
MIN	-34.57	20.00	5	-106.99	0.00	6			
	0.00	20.00	7	0.00	20.00	7	16.62 T	20.00	7
94 MAX	24.92	0.00	4	164.71	20.00	5			
	0.00	0.00	4	0.00	0.00	4	11.21 C	0.00	6
MIN	-30.66	20.00	5	-65.82	19.17	7			
	0.00	20.00	7	0.00	20.00	7	12.80 T	20.00	7
95 MAX	24.57	0.00	4	165.51	20.00	5			
	0.00	0.00	4	0.00	0.00	4	7.60 C	0.00	6
MIN	-30.94	20.00	5	-65.49	0.83	6			
	0.00	20.00	7	0.00	20.00	7	9.43 T	20.00	7
96 MAX	26.15	0.00	4	164.86	20.00	5			
	0.00	0.00	4	0.00	0.00	4	4.27 C	0.00	6
MIN	-30.90	20.00	5	-101.78	20.00	7			
	0.00	20.00	7	0.00	20.00	7	6.61 T	20.00	7
97 MAX	21.70	0.00	4	174.38	20.00	5			
	0.00	0.00	4	0.00	0.00	4	17.68 C	0.00	6

167

	MIN	-32.85	20.00	5	-78.60	6.67	5			
		0.00	20.00	7	0.00	20.00	7	16.50 T	20.00	7
98	MAX	24.55	0.00	4	148.38	20.00	5			
		0.00	0.00	4	0.00	0.00	4	13.41 C	0.00	6
	MIN	-29.08	20.00	5	-54.27	6.67	5			
		0.00	20.00	7	0.00	20.00	7	12.33 T	20.00	7
99	MAX	24.32	0.00	4	148.84	20.00	5			
		0.00	0.00	4	0.00	0.00	4	8.88 C	0.00	6
	MIN	-29.28	20.00	5	-56.55	6.67	5			
		0.00	20.00	7	0.00	20.00	7	7.91 T	20.00	7
100	MAX	25.46	0.00	4	142.40	20.00	5			
		0.00	0.00	4	0.00	0.00	4	3.92 C	0.00	6
	MIN	-28.88	20.00	5	-67.85	17.50	7			
		0.00	20.00	7	0.00	20.00	7	2.85 T	20.00	7
101	MAX	7.60	0.00	7	74.29	20.00	5			
		0.00	0.00	4	0.00	0.00	4	35.41 C	0.00	6
	MIN	-11.90	20.00	5	-37.98	0.00	6			
		0.00	20.00	7	0.00	20.00	7	31.73 T	20.00	7
102	MAX	8.43	0.00	4	60.17	20.00	5			
		0.00	0.00	4	0.00	0.00	4	25.06 C	0.00	6
	MIN	-10.11	20.00	5	-24.36	6.67	5			
		0.00	20.00	7	0.00	20.00	7	21.99 T	20.00	7
103	MAX	8.33	0.00	4	59.47	20.00	5			
		0.00	0.00	4	0.00	0.00	4	15.90 C	0.00	6
	MIN	-10.17	20.00	5	-25.79	6.67	5			
		0.00	20.00	7	0.00	20.00	7	12.60 T	20.00	7
104	MAX	8.67	0.00	4	59.16	20.00	5			
		0.00	0.00	4	0.00	0.00	4	7.67 C	0.00	5
	MIN	-10.17	20.00	5	-31.80	20.00	7			
		0.00	20.00	7	0.00	20.00	7	3.14 T	20.00	7

********** END OF FORCE ENVELOPE FROM INTERNAL STORAGE **********

244. PRINT SUPPORT REACTION ALL

168

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	4	3.31	178.53	0.00	0.00	0.00	-16.58
	5	-13.61	137.22	0.00	0.00	0.00	132.77
	6	-20.83	40.24	0.00	0.00	0.00	190.50
	7	23.64	120.87	0.00	0.00	0.00	-204.49
5	4	-0.09	229.80	0.00	0.00	0.00	-0.25
	5	-19.17	219.16	0.00	0.00	0.00	157.73
	6	-25.50	105.98	0.00	0.00	0.00	210.60
	7	25.37	90.07	0.00	0.00	0.00	-210.40
9	4	0.15	221.03	0.00	0.00	0.00	-1.25
	5	-18.02	205.34	0.00	0.00	0.00	150.47
	6	-24.16	94.54	0.00	0.00	0.00	201.70
	7	24.26	93.50	0.00	0.00	0.00	-202.52
13	4	0.68	234.61	0.00	0.00	0.00	-3.65
	5	-17.46	210.57	0.00	0.00	0.00	146.20
	6	-23.85	90.36	0.00	0.00	0.00	197.99
	7	24.36	108.57	0.00	0.00	0.00	-200.65
17	4	-2.36	284.26	0.00	0.00	0.00	10.97
	5	-17.20	259.67	0.00	0.00	0.00	143.65
	6	-21.07	111.12	0.00	0.00	0.00	182.95
	7	18.80	110.10	0.00	0.00	0.00	-172.24
21	4	2.88	307.20	0.00	0.00	0.00	-14.17
	5	-6.61	270.92	0.00	0.00	0.00	64.18
	6	-11.34	101.55	0.00	0.00	0.00	98.05
	7	12.89	112.33	0.00	0.00	0.00	-105.67
26	4	-2.07	313.38	0.00	0.00	0.00	10.04
	5	-11.67	281.02	0.00	0.00	0.00	88.47
	6	-13.77	105.28	0.00	0.00	0.00	109.31
	7	12.49	92.56	0.00	0.00	0.00	-103.08
31	4	1.38	269.46	0.00	0.00	0.00	-6.78
	5	-7.83	241.63	0.00	0.00	0.00	69.20
	6	-11.69	87.85	0.00	0.00	0.00	98.41
	7	12.27	70.29	0.00	0.00	0.00	-101.27
36	4	-1.45	264.72	0.00	0.00	0.00	7.11
	5	-10.00	224.12	0.00	0.00	0.00	79.01
	6	-12.03	68.03	0.00	0.00	0.00	98.91
	7	11.40	84.63	0.00	0.00	0.00	-95.84
41	4	1.29	271.49	0.00	0.00	0.00	-6.21
	5	-8.15	233.60	0.00	0.00	0.00	69.50
	6	-12.00	76.45	0.00	0.00	0.00	98.14
	7	12.68	87.68	0.00	0.00	0.00	-101.43
46	4	-2.03	250.90	0.00	0.00	0.00	10.04
	5	-9.91	226.32	0.00	0.00	0.00	77.80
	6	-11.40	85.78	0.00	0.00	0.00	94.72
	7	10.46	71.37	0.00	0.00	0.00	-90.13
51	4	2.12	237.49	0.00	0.00	0.00	-9.82
	5	-9.36	221.60	0.00	0.00	0.00	101.03
	6	-14.17	96.07	0.00	0.00	0.00	142.47
	7	16.13	75.38	0.00	0.00	0.00	-151.72

169

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
55	4	-0.57	150.12	0.00	0.00	0.00	3.16
	5	-13.93	142.93	0.00	0.00	0.00	121.88
	6	-18.09	69.11	0.00	0.00	0.00	159.79
	7	17.72	59.86	0.00	0.00	0.00	-157.80
59	4	-0.17	142.82	0.00	0.00	0.00	1.42
	5	-13.08	132.91	0.00	0.00	0.00	117.14
	6	-17.30	61.83	0.00	0.00	0.00	154.98
	7	17.18	61.63	0.00	0.00	0.00	-154.06
63	4	-0.05	146.56	0.00	0.00	0.00	0.98
	5	-13.05	133.90	0.00	0.00	0.00	116.56
	6	-17.36	60.18	0.00	0.00	0.00	154.56
	7	17.35	66.76	0.00	0.00	0.00	-153.99
67	4	-3.04	103.82	0.00	0.00	0.00	15.44
	5	-13.15	118.15	0.00	0.00	0.00	117.05
	6	-15.03	76.19	0.00	0.00	0.00	143.37
	7	12.60	24.95	0.00	0.00	0.00	-131.02

************** END OF LATEST ANALYSIS RESULT **************

245. PRINT SECTION MAX DISPL NSECT 12 LIST 1 TO 104

170

MAX MEMBER SECTION DISPLACEMENTS

UNIT= INCH FOR FPS AND CM FOR METRIC/SI SYSTEM

MEMBER	MAX DISP	LOCATION	LOAD	L/DISPL
1	0.04965	46.50	6	3746
2	0.02098	132.03	7	8391
3	0.01659	132.03	7	10613
4	0.04075	46.50	7	4564
5	0.02136	132.03	6	8240
6	0.01783	132.03	6	9875
7	0.04020	46.50	7	4626
8	0.02136	132.03	6	8242
9	0.01828	132.03	6	9629
10	0.03866	46.50	6	4811
11	0.02164	132.03	7	8135
12	0.01896	132.03	7	9286
13	0.04456	46.50	7	4173
14	0.01908	132.03	6	9224
15	0.01727	132.03	7	10190
16	0.04193	46.50	6	4435
17	0.02397	132.03	7	7344
18	0.01506	44.01	7	11692
19	0.02916	131.94	7	6032
20	0.03766	46.50	7	4939
21	0.02553	132.03	6	6896
22	0.01982	44.01	5	8883
23	0.03159	131.94	6	5569
24	0.03844	46.50	6	4838
25	0.02256	132.03	7	7803
26	0.01575	44.01	7	11179
27	0.02946	131.94	7	5971
28	0.03765	46.50	7	4940
29	0.02197	132.03	6	8011
30	0.01535	44.01	6	11471
31	0.02940	131.94	6	5984
32	0.03488	46.50	6	5332
33	0.02368	132.03	7	7433
34	0.01702	44.01	7	10341
35	0.03103	131.94	7	5668
36	0.03786	46.50	7	4912
37	0.02375	132.03	5	7413
38	0.01778	44.01	5	9899
39	0.02907	131.94	6	6052
40	0.04647	62.00	6	4002
41	0.01608	132.03	7	10950
42	0.01302	117.36	6	13519
43	0.03797	46.50	7	4898
44	0.01728	132.03	6	10184
45	0.01435	132.03	6	12264
46	0.03796	46.50	6	4900
47	0.01682	132.03	6	10465
48	0.01355	132.03	7	12991
49	0.03729	46.50	6	4987

171

50	0.01682	132.03	7	10468
51	0.01353	132.03	7	13015
52	0.04568	62.00	7	4072
53	0.01682	132.03	6	10468
54	0.01071	132.03	6	16434
55	0.05774	100.00	5	4156
56	0.02498	80.00	5	9609
57	0.02751	80.00	5	8725
58	0.04345	160.00	7	5523
59	0.04917	100.00	5	4880
60	0.02570	100.00	5	9338
61	0.02498	100.00	5	9609
62	0.03765	120.00	4	6375
63	0.03056	100.00	5	7852
64	0.01441	120.00	4	16660
65	0.01201	100.00	5	19989
66	0.01887	140.00	4	12719
67	0.00254	3.00	4	4718
68	0.00351	3.00	4	3416
69	0.00434	3.00	4	2765
70	0.00354	9.00	5	3391
71	0.00340	9.00	5	3531
72	0.00304	9.00	5	3945
73	0.06562	93.35	5	3413
74	0.01692	100.00	5	8863
75	0.05408	102.00	4	3772
76	0.01141	37.50	7	13144
77	0.04402	112.02	4	5089
78	0.06837	112.02	4	3277
79	0.01439	100.00	5	10424
80	0.05331	102.00	4	3827
81	0.00813	37.50	7	18444
82	0.04954	112.02	4	4522
83	0.06061	93.35	5	3696
84	0.01211	100.00	5	12387
85	0.03388	102.00	4	6022
86	0.00853	37.50	7	17586
87	0.04169	112.02	4	5374
88	0.05368	93.35	5	4173
89	0.01010	112.50	5	14845
90	0.04803	102.00	4	4247
91	0.00789	37.50	7	19003
92	0.05024	112.02	4	4459
93	0.06713	80.00	5	3575
94	0.03885	80.00	5	6177
95	0.04224	80.00	5	5681
96	0.05321	120.00	4	4510
97	0.05973	80.00	5	4017
98	0.03778	100.00	5	6351
99	0.04048	100.00	5	5928
100	0.05065	120.00	4	4738
101	0.03634	80.00	5	6605
102	0.02371	100.00	5	10123
103	0.02687	100.00	5	8931
104	0.03378	120.00	4	7104

172

```
      ************ END OF SECT DISPL RESULTS ***********

246. PARAMETER
247. CODE AISC
248. BEAM 1 ALL
249. FYLD 7200 ALL
250. LY 7 MEMB 55 TO 66 73 TO 104
251. LZ 7 MEMB 55 TO 66 73 TO 104
252. LX 7 MEMB 55 TO 66 73 TO 104
253. UNT 2 MEMB 55 TO 66 73 TO 104
254. CHECK CODE ALL
```

173

STAAD.Pro CODE CHECKING - (AISC)
****

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1 ST	W18 X86	PASS	AISC- H1-1	0.656	7
		120.87 C	0.00	-204.49	0.00
2 ST	W18 X86	PASS	AISC- H1-3	0.405	7
		64.61 C	0.00	119.03	14.67
3 ST	W18 X86	PASS	AISC- H1-3	0.249	7
		19.63 C	0.00	88.65	14.67
4 ST	W18 X86	PASS	AISC- H1-1	0.750	5
		219.16 C	0.00	157.73	0.00
5 ST	W18 X86	PASS	AISC- H1-1	0.479	5
		130.78 C	0.00	-114.81	14.67
6 ST	W18 X86	PASS	AISC- H1-3	0.295	6
		20.89 C	0.00	-106.66	14.67
7 ST	W18 X86	PASS	AISC- H1-1	0.708	5
		205.34 C	0.00	150.47	0.00
8 ST	W18 X86	PASS	AISC- H1-1	0.455	5
		124.66 C	0.00	-108.71	14.67
9 ST	W18 X86	PASS	AISC- H1-3	0.293	6
		19.57 C	0.00	-107.07	14.67
10 ST	W18 X86	PASS	AISC- H1-1	0.709	5
		210.57 C	0.00	146.20	0.00
11 ST	W18 X86	PASS	AISC- H1-3	0.483	7
		64.77 C	0.00	151.29	14.67
12 ST	W18 X86	PASS	AISC- H1-3	0.316	7
		22.22 C	0.00	114.38	14.67
13 ST	W18 X86	PASS	AISC- H1-1	0.799	5
		259.67 C	0.00	143.65	0.00
14 ST	W18 X86	PASS	AISC- H1-1	0.532	5
		165.24 C	0.00	-109.36	14.67
15 ST	W18 X86	PASS	AISC- H1-3	0.313	5
		66.53 C	0.00	-79.41	14.67
16 ST	W14 X74	PASS	AISC- H1-1	0.833	5
		270.92 C	0.00	64.18	0.00
17 ST	W14 X74	PASS	AISC- H1-1	0.610	4
		207.15 C	0.00	47.43	14.67
18 ST	W14 X74	PASS	AISC- H1-1	0.421	4
		124.31 C	0.00	-46.59	0.00
19 ST	W14 X74	PASS	AISC- H1-3	0.473	7
		39.82 C	0.00	108.03	14.66
20 ST	W14 X74	PASS	AISC- H1-1	0.950	5
		281.02 C	0.00	-92.53	15.50
21 ST	W14 X74	PASS	AISC- H1-1	0.766	5
		207.07 C	0.00	-96.24	14.67

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
22 ST	W14 X74	PASS	AISC- H1-1	0.520	5
		129.62 C	0.00	74.50	0.00
23 ST	W14 X74	PASS	AISC- H1-3	0.504	5
		61.60 C	0.00	-103.46	14.66
24 ST	W14 X74	PASS	AISC- H1-1	0.780	5
		241.63 C	0.00	69.20	0.00
25 ST	W14 X74	PASS	AISC- H1-1	0.524	5
		177.97 C	0.00	-41.09	14.67
26 ST	W14 X74	PASS	AISC- H1-1	0.347	5
		116.99 C	0.00	-28.31	14.67
27 ST	W14 X74	PASS	AISC- H1-3	0.416	7
		26.54 C	0.00	100.31	14.66
28 ST	W14 X74	PASS	AISC- H1-1	0.770	5
		224.12 C	0.00	79.01	0.00
29 ST	W14 X74	PASS	AISC- H1-1	0.616	5
		172.25 C	0.00	-74.10	14.67
30 ST	W14 X74	PASS	AISC- H1-1	0.406	5
		109.54 C	0.00	52.71	0.00
31 ST	W14 X74	PASS	AISC- H1-3	0.435	5
		59.72 C	0.00	-85.14	14.66
32 ST	W14 X74	PASS	AISC- H1-1	0.762	5
		233.60 C	0.00	69.50	0.00
33 ST	W14 X74	PASS	AISC- H1-1	0.559	5
		182.85 C	0.00	-48.69	14.67
34 ST	W14 X74	PASS	AISC- H1-3	0.358	7
		53.26 C	0.00	-67.54	0.00
35 ST	W14 X74	PASS	AISC- H1-3	0.462	7
		28.84 C	0.00	111.73	14.66
36 ST	W14 X74	PASS	AISC- H1-1	0.772	5
		226.32 C	0.00	77.80	0.00
37 ST	W14 X74	PASS	AISC- H1-1	0.643	5
		169.67 C	0.00	-84.60	14.67
38 ST	W14 X74	PASS	AISC- H1-1	0.461	5
		116.69 C	0.00	65.09	0.00
39 ST	W14 X74	PASS	AISC- H1-1	0.477	5
		76.24 C	0.00	-99.87	14.66
40 ST	W18 X86	PASS	AISC- H1-1	0.635	5
		221.60 C	0.00	101.03	0.00
41 ST	W18 X86	PASS	AISC- H1-1	0.374	4
		165.82 C	0.00	-32.85	0.00
42 ST	W18 X86	PASS	AISC- H1-3	0.231	5
		80.44 C	0.00	-34.64	14.67
43 ST	W18 X86	PASS	AISC- H1-1	0.527	5
		142.93 C	0.00	121.88	0.00
44 ST	W18 X86	PASS	AISC- H1-3	0.344	6
		41.56 C	0.00	-111.35	14.67

175

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
45	ST W18 X86	PASS	AISC- H1-3	0.217	6
		11.39 C	0.00	-81.53	14.67
46	ST W18 X86	PASS	AISC- H1-1	0.497	5
		132.91 C	0.00	117.14	0.00
47	ST W18 X86	PASS	AISC- H1-3	0.331	5
		77.86 C	0.00	-78.22	14.67
48	ST W18 X86	PASS	AISC- H1-3	0.198	7
		10.03 C	0.00	74.64	14.67
49	ST W18 X86	PASS	AISC- H1-1	0.498	5
		133.90 C	0.00	116.56	0.00
50	ST W18 X86	PASS	AISC- H1-3	0.338	7
		39.77 C	0.00	110.21	14.67
51	ST W18 X86	PASS	AISC- H1-3	0.200	7
		10.64 C	0.00	75.09	14.67
52	ST W18 X86	PASS	AISC- H1-3	0.490	6
		76.19 C	0.00	143.37	0.00
53	ST W18 X86	PASS	AISC- H1-3	0.337	5
		66.87 C	0.00	-88.96	14.67
54	ST W18 X86	PASS	AISC- H1-3	0.175	5
		17.64 C	0.00	-59.16	14.67
55	ST W27 X114	PASS	AISC- H1-3	0.602	5
		36.63 C	0.00	268.98	20.00
56	ST W27 X114	PASS	AISC- H1-3	0.539	5
		32.89 C	0.00	240.51	20.00
57	ST W27 X114	PASS	AISC- H1-3	0.540	5
		29.30 C	0.00	243.19	20.00
58	ST W27 X114	PASS	AISC- H1-3	0.554	6
		36.18 C	0.00	246.09	20.00
59	ST W27 X114	PASS	AISC- H1-3	0.522	5
		45.51 C	0.00	225.52	20.00
60	ST W27 X114	PASS	AISC- H1-3	0.498	5
		40.71 C	0.00	216.49	20.00
61	ST W27 X114	PASS	AISC- H1-3	0.501	5
		36.82 C	0.00	220.36	20.00
62	ST W27 X114	PASS	AISC- H1-3	0.459	6
		43.05 C	0.00	196.64	20.00
63	ST W27 X114	PASS	AISC- H1-3	0.272	5
		48.48 C	0.00	103.83	20.00
64	ST W27 X114	PASS	AISC- H1-3	0.267	5
		37.85 C	0.00	107.17	20.00
65	ST W27 X114	PASS	AISC- H1-3	0.261	5
		27.31 C	0.00	110.44	20.00
66	ST W27 X114	PASS	AISC- H1-3	0.224	5
		17.51 C	0.00	97.76	20.00

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 67).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

176

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 68).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 69).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 70).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 71).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 72).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

73	ST	W27 X114	PASS	AISC- H1-3	0.373	5
			18.21 C	0.00	184.77	18.67
74	ST	W24 X68	PASS	AISC- H1-3	0.354	5
			19.60 C	0.00	105.83	12.50
75	ST	W24 X68	PASS	AISC- H1-3	0.549	5
			17.16 C	0.00	132.13	17.00
76	ST	W24 X68	PASS	AISC- H1-3	0.292	5
			17.25 C	0.00	86.36	12.50
77	ST	W27 X114	PASS	AISC- H1-3	0.317	6
			23.18 C	0.00	152.77	18.67
78	ST	W27 X114	PASS	AISC- H1-3	0.359	5
			26.02 C	0.00	172.78	18.67
79	ST	W24 X68	PASS	AISC- H1-3	0.347	5
			23.00 C	0.00	101.15	12.50
80	ST	W24 X68	PASS	AISC- H1-3	0.569	5
			21.29 C	0.00	135.14	17.00
81	ST	W24 X68	PASS	AISC- H1-3	0.323	5
			18.22 C	0.00	96.23	12.50
82	ST	W27 X114	PASS	AISC- H1-3	0.277	5
			15.71 C	0.00	136.32	18.67
83	ST	W27 X114	PASS	AISC- H1-3	0.327	5
			12.04 C	0.00	164.38	18.67
84	ST	W24 X68	PASS	AISC- H1-3	0.298	5
			16.01 C	0.00	89.35	12.50
85	ST	W24 X68	PASS	AISC- H1-3	0.454	5
			20.21 C	0.00	106.19	17.00
86	ST	W24 X68	PASS	AISC- H1-3	0.280	5
			24.36 C	0.00	77.84	12.50
87	ST	W27 X114	PASS	AISC- H1-3	0.308	6
			34.80 C	0.00	140.92	18.67
88	ST	W27 X114	PASS	AISC- H1-3	0.291	5
			53.86 C	0.00	120.60	18.67
89	ST	W24 X68	PASS	AISC- H1-3	0.386	5
			39.86 C	0.00	103.05	12.50
90	ST	W24 X68	PASS	AISC- H1-3	0.501	5
			31.98 C	0.00	112.18	17.00
91	ST	W24 X68	PASS	AISC- H1-3	0.291	5
			20.81 C	0.00	83.74	12.50
92	ST	W27 X114	PASS	AISC- H1-3	0.209	6
			13.49 C	0.00	101.80	18.67

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
93 ST	W24 X68	PASS	AISC- H1-3	1.000	5
		9.93 C	0.00	188.66	20.00
94 ST	W24 X68	PASS	AISC- H1-3	0.871	5
		7.57 C	0.00	164.71	20.00
95 ST	W24 X68	PASS	AISC- H1-3	0.869	5
		4.65 C	0.00	165.51	20.00
96 ST	W24 X68	PASS	AISC- H1-3	0.860	5
		1.81 C	0.00	164.86	20.00
97 ST	W24 X68	PASS	AISC- H1-3	0.934	5
		14.10 C	0.00	174.38	20.00
98 ST	W24 X68	PASS	AISC- H1-3	0.792	5
		10.86 C	0.00	148.38	20.00
99 ST	W24 X68	PASS	AISC- H1-3	0.788	5
		7.35 C	0.00	148.84	20.00
100 ST	W24 X68	PASS	AISC- H1-3	0.747	5
		3.66 C	0.00	142.40	20.00
101 ST	W21 X57	PASS	AISC- H1-3	0.871	5
		29.18 C	0.00	74.29	20.00
102 ST	W21 X57	PASS	AISC- H1-3	0.698	5
		20.85 C	0.00	60.17	20.00
103 ST	W21 X57	PASS	AISC- H1-3	0.673	5
		14.20 C	0.00	59.47	20.00
104 ST	W21 X57	PASS	AISC- H1-3	0.652	5
		7.67 C	0.00	59.16	20.00

255. FINISH

*********** END OF THE STAAD.Pro RUN ***********

**** DATE= APR 17,2006 TIME= 16:28:24 ****

178

```
****************************************************
*                                                  *
*            STAAD.Pro                             *
*            Version  2003    Bld 1002.US          *
*            Proprietary Program of                *
*            Research Engineers,  Intl.            *
*            Date=    MAR 30, 2006                 *
*            Time=       7:54: 2                   *
*                                                  *
*      USER ID: morphy makofsky inc                *
****************************************************
```

OLD STADS

```
 1. STAAD PLANE
 2. START JOB INFORMATION
 3. ENGINEER DATE 27-MAR-06
 4. END JOB INFORMATION
 5. INPUT WIDTH 79
 6. UNIT FEET KIP
 7. JOINT COORDINATES
 8. 1 0 0 0; 2 0 15.5 0; 3 0 30.17 0; 4 0 44.84 0; 5 20 0 0; 6 20 15.5 0
 9. 7 20 30.17 0; 8 20 44.84 0; 9 40 0 0; 10 40 15.5 0; 11 40 30.17 0
10. 12 40 44.84 0; 13 60 0 0; 14 60 15.5 0; 15 60 30.17 0; 16 60 44.84 0
11. 17 80 0 0; 18 80 15.5 0; 19 80 30.17 0; 20 80 44.84 0; 21 81 0 0; 22 81 15.5 0
12. 23 81 30.17 0; 24 81 44.84 0; 25 81 59.5 0; 26 99.67 0 0; 27 99.67 15.5 0
13. 28 99.67 30.17 0; 29 99.67 44.84 0; 30 99.67 59.5 0; 31 112.17 0 0
14. 32 112.17 15.5 0; 33 112.17 30.17 0; 34 112.17 44.84 0; 35 112.17 59.5 0
15. 36 129.17 0 0; 37 129.17 15.5 0; 38 129.17 30.17 0; 39 129.17 44.84 0
16. 40 129.17 59.5 0; 41 141.67 0 0; 42 141.67 15.5 0; 43 141.67 30.17 0
17. 44 141.67 44.84 0; 45 141.67 59.5 0; 46 160.34 0 0; 47 160.34 15.5 0
18. 48 160.34 30.17 0; 49 160.34 44.84 0; 50 160.34 59.5 0; 51 161.34 0 0
19. 52 161.34 15.5 0; 53 161.34 30.17 0; 54 161.34 44.84 0; 55 181.34 0 0
20. 56 181.34 15.5 0; 57 181.34 30.17 0; 58 181.34 44.84 0; 59 201.34 0 0
21. 60 201.34 15.5 0; 61 201.34 30.17 0; 62 201.34 44.84 0; 63 221.34 0 0
22. 64 221.34 15.5 0; 65 221.34 30.17 0; 66 221.34 44.84 0; 67 241.34 0 0
23. 68 241.34 15.5 0; 69 241.34 30.17 0; 70 241.34 44.84 0
24. MEMBER INCIDENCES
25. 1 1 2; 2 2 3; 3 3 4; 4 5 6; 5 6 7; 6 7 8; 7 9 10; 8 10 11; 9 11 12; 10 13 14
26. 11 14 15; 12 15 16; 13 17 18; 14 18 19; 15 19 20; 16 21 22; 17 22 23; 18 23 24
27. 19 24 25; 20 26 27; 21 27 28; 22 28 29; 23 29 30; 24 31 32; 25 32 33; 26 33 34
28. 27 34 35; 28 36 37; 29 37 38; 30 38 39; 31 39 40; 32 41 42; 33 42 43; 34 43 44
29. 35 44 45; 36 46 47; 37 47 48; 38 48 49; 39 49 50; 40 51 52; 41 52 53; 42 53 54
30. 43 55 56; 44 56 57; 45 57 58; 46 59 60; 47 60 61; 48 61 62; 49 63 64; 50 64 65
31. 51 65 66; 52 67 68; 53 68 69; 54 69 70; 55 2 6; 56 6 10; 57 10 14; 58 14 18
32. 59 3 7; 60 7 11; 61 11 15; 62 15 19; 63 4 8; 64 8 12; 65 12 16; 66 16 20
33. 67 18 22; 68 19 23; 69 20 24; 70 49 54; 71 48 53; 72 47 52; 73 22 27; 74 27 32
34. 75 32 37; 76 37 42; 77 42 47; 78 23 28; 79 28 33; 80 33 38; 81 38 43; 82 43 48
35. 83 24 29; 84 29 34; 85 34 39; 86 39 44; 87 44 49; 88 25 30; 89 30 35; 90 35 40
36. 91 40 45; 92 45 50; 93 52 56; 94 56 60; 95 60 64; 96 64 68; 97 53 57; 98 57 61
37. 99 61 65; 100 65 69; 101 54 58; 102 58 62; 103 62 66; 104 66 70
38. DEFINE MATERIAL START
39. ISOTROPIC STEEL
40. E 4.176E+006
41. POISSON 0.3
```

179

```
42. DENSITY 0.489024
43. ALPHA 6.5E-006
44. DAMP 0.03
45. END DEFINE MATERIAL
46. CONSTANTS
47. MATERIAL STEEL MEMB 1 TO 104
48. MEMBER PROPERTY AMERICAN
49. 1 TO 15 TABLE ST W18X86
50. 16 TO 39 TABLE ST W14X74
51. 40 TO 54 TABLE ST W18X86
52. 55 TO 66 TABLE ST W27X114
53. 73 77 78 82 83 87 88 92 TABLE ST W27X114
54. 74 TO 76 79 TO 81 84 TO 86 89 TO 91 TABLE ST W24X68
55. 93 TO 100 TABLE ST W24X68
56. 101 TO 104 TABLE ST W21X57
57. MEMBER PROPERTY AMERICAN
58. 67 TO 72 PRIS YD 0.25 ZD 0.25
59. SUPPORTS
60. 1 5 9 13 17 21 26 31 36 41 46 51 55 59 63 67 FIXED
61. LOAD 1 DEAD
62. * K LINE FRAME
63. MEMBER LOAD
64. 55 TO 62 CON GY -11.6 6.67
65. 55 TO 62 CON GY -11.6 13.33
66. 63 TO 66 CON GY -10.8 6.67
67. 63 TO 66 CON GY -10.8 13.33
68. JOINT LOAD
69. 2 18 FY -28.7
70. 3 19 FY -21.8
71. 4 20 FY -12.7
72. 6 7 10 11 14 15 FY -11.6
73. 8 12 16 FY -10.8
74. MEMBER LOAD
75. 55 TO 62 UNI GY -0.734
76. * E LINE FRAME
77. MEMBER LOAD
78. 93 TO 96 CON GY -4.3 6.67
79. 93 TO 96 CON GY -4.3 13.33
80. 97 TO 100 CON GY -6 6.67
81. 97 TO 100 CON GY -6 13.33
82. 101 TO 104 CON GY -5.6 6.67
83. 101 TO 104 CON GY -5.6 13.33
84. JOINT LOAD
85. 52 FY -15.9
86. 53 FY -19.3
87. 54 FY -21
88. 68 FY -11.6
89. 69 FY -12.4
90. 70 FY -6.5
91. 56 60 64 FY -4.3
92. 57 61 65 FY -6
93. 58 62 66 FY -5.6
94. MEMBER LOAD
95. 93 TO 100 UNI GY -0.734
96. * G LINE FRAME
97. MEMBER LOAD
```

Handwritten annotations: COLUMNS (lines 49–51); K LINE (line 52); G LINE (lines 53–54); E LINE (line 55); E LIN (line 56); 180

```
 98. 73 CON GY -17.1 6.22
 99. 73 CON GY -17.1 12.45
100. 74 CON GY -5.5 6.25
101. 75 CON GY -10 5.66
102. 75 CON GY -10 11.34
103. 76 CON GY -5 6.25
104. 77 CON GY -10 6.23
105. 77 CON GY -10 12.45
106. 78 CON GY -17.1 6.22
107. 78 CON GY -17.1 12.45
108. 79 CON GY -5.5 6.25
109. 80 CON GY -11.8 5.66
110. 80 CON GY -11.8 11.34
111. 81 CON GY -11.8 6.25
112. 82 CON GY -11.8 6.23
113. 82 CON GY -11.8 12.45
114. 83 CON GY -19.3 6.22
115. 83 CON GY -19.3 12.45
116. 84 CON GY -7.7 6.25
117. 85 CON GY -6.5 5.66
118. 85 CON GY -6.5 11.34
119. 86 CON GY -7.7 6.25
120. 87 CON GY -14 6.23
121. 87 CON GY -14 12.45
122. 88 CON GY -17.9 6.22
123. 88 CON GY -17.9 12.45
124. 89 CON GY -17.9 6.25
125. 90 CON GY -17.9 5.66
126. 90 CON GY -17.9 11.34
127. 91 CON GY -17.9 6.25
128. 92 CON GY -17.9 6.23
129. 92 CON GY -17.9 12.45
130. JOINT LOAD
131. 22 FY -46
132. 23 FY -34.2
133. 24 FY -38.6
134. 25 FY -35.8
135. 47 FY -20.5
136. 48 FY -23.6
137. 49 FY -29
138. 50 FY -35.8
139. 27 32 FY -17.1
140. 37 42 FY -10
141. 28 FY -17.1
142. 33 38 43 FY -11.8
143. 29 34 39 44 FY -19.3
144. 30 35 40 45 FY -17.9
145. LOAD 2 LIVE
146. * K LINE FRAME
147. MEMBER LOAD
148. 55 TO 62 CON GY -8.3 6.67
149. 55 TO 62 CON GY -8.3 13.33
150. 63 TO 66 CON GY -5 6.67
151. 63 TO 66 CON GY -5 13.33
152. JOINT LOAD
153. 2 18 FY -15.3
```

```
154. 3 19 FY -6.7
155. 4 20 FY -2.5
156. 6 7 10 11 14 15 FY -8.3
157. 8 12 16 FY -5
158. * E LINE FRAME
159. MEMBER LOAD
160. 93 TO 96 CON GY -6.5 6.67
161. 93 TO 96 CON GY -6.5 13.33
162. 97 TO 100 CON GY -4.3 6.67
163. 97 TO 100 CON GY -4.3 13.33
164. 101 TO 104 CON GY -2.6 6.67
165. 101 TO 104 CON GY -2.6 13.33
166. JOINT LOAD
167. 52 FY -13
168. 53 FY -8.6
169. 54 FY -10.4
170. 68 FY -3.3
171. 69 FY -2.2
172. 70 FY -1.3
173. 56 60 64 FY -6.5
174. 57 61 65 FY -4.3
175. 58 62 66 FY -2.6
176. * G LINE FRAME
177. MEMBER LOAD
178. 73 CON GY -19.3 6.22
179. 73 CON GY -19.3 12.45
180. 74 CON GY -11 6.25
181. 75 CON GY -17.8 5.66
182. 75 CON GY -17.8 11.34
183. 76 CON GY -11 6.25
184. 77 CON GY -15.1 6.23
185. 77 CON GY -15.1 12.45
186. 78 CON GY -22.1 6.22
187. 78 CON GY -22.1 12.45
188. 79 CON GY -13.8 6.25
189. 80 CON GY -18.3 5.66
190. 80 CON GY -18.3 11.34
191. 81 CON GY -18.3 6.25
192. 82 CON GY -18.3 6.23
193. 82 CON GY -18.3 12.45
194. 83 CON GY -13.8 6.22
195. 83 CON GY -13.8 12.45
196. 84 CON GY -5.5 6.25
197. 85 CON GY -13 5.66
198. 85 CON GY -13 11.34
199. 86 CON GY -5.5 6.25
200. 87 CON GY -10 6.23
201. 87 CON GY -10 12.45
202. 88 CON GY -8.3 6.22
203. 88 CON GY -8.3 12.45
204. 89 CON GY -8.3 6.25
205. 90 CON GY -8.3 5.66
206. 90 CON GY -8.3 11.34
207. 91 CON GY -8.3 6.25
208. 92 CON GY -8.3 6.23
209. 92 CON GY -8.3 12.45
```

182

```
 210. JOINT LOAD
 211. 22 FY -38
 212. 23 FY -44.2
 213. 24 FY -27.2
 214. 25 FY -16.6
 215. 47 FY -37.6
 216. 48 FY -36.6
 217. 49 FY -32.5
 218. 50 FY -16.6
 219. 27 32 FY -19.3
 220. 37 42 FY -17.8
 221. 28 FY -22.1
 222. 33 38 43 FY -18.3
 223. 29 34 39 44 FY -13.8
 224. 30 35 40 45 FY -8.3
 225. LOAD 3 WIND
 226. JOINT LOAD
 227. 2 FX 62.4
 228. 3 FX 63.3
 229. 4 FX 66.6
 230. 25 FX 77.3
 231. LOAD COMB 4 DEAD LIVE
 232. 1 1.0 2 1.0
 233. LOAD COMB 5 DEAD LIVE WIND
 234. 1 1.0 2 0.75 3 0.75
 235. LOAD COMB 6 DEAD WIND
 236. 3 1.0 1 0.6
 237. LOAD COMB 7 DEAD -WIND
 238. 1 0.6 3 -1.0
 239. PERFORM ANALYSIS


        P R O B L E M   S T A T I S T I C S
        -----------------------------------

   NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =     70/   104/     16
   ORIGINAL/FINAL BAND-WIDTH=      5/      5/      15 DOF
   TOTAL PRIMARY LOAD CASES =     3, TOTAL DEGREES OF FREEDOM =     162
   SIZE OF STIFFNESS MATRIX =        3 DOUBLE  KILO-WORDS
   REQRD/AVAIL. DISK SPACE  =     12.2/ 25060.4 MB,  EXMEM = 1553.1 MB


 240. PDELTA 2 ANALYSIS
++ Adjusting Displacements                           7:54: 3
++ Adjusting Displacements                           7:54: 3

 241. PRINT JOINT DISPLACEMENTS LIST 2 TO 4 25 42 TO 44 50 68 TO 70
```

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
2	1	-0.00201	-0.02720	0.00000	0.00000	0.00000	-0.00026
	2	-0.00146	-0.01122	0.00000	0.00000	0.00000	-0.00013
	3	0.43062	0.01022	0.00000	0.00000	0.00000	-0.00130
	4	-0.00347	-0.03842	0.00000	0.00000	0.00000	-0.00039
	5	0.31986	-0.02795	0.00000	0.00000	0.00000	-0.00133
	6	0.42941	-0.00610	0.00000	0.00000	0.00000	-0.00146
	7	-0.43182	-0.02654	0.00000	0.00000	0.00000	0.00115
3	1	-0.00015	-0.04196	0.00000	0.00000	0.00000	-0.00025
	2	0.00025	-0.01638	0.00000	0.00000	0.00000	-0.00013
	3	0.77430	0.01505	0.00000	0.00000	0.00000	-0.00091
	4	0.00010	-0.05833	0.00000	0.00000	0.00000	-0.00038
	5	0.58076	-0.04295	0.00000	0.00000	0.00000	-0.00103
	6	0.77420	-0.01013	0.00000	0.00000	0.00000	-0.00106
	7	-0.77439	-0.04022	0.00000	0.00000	0.00000	0.00076
4	1	0.00356	-0.04730	0.00000	0.00000	0.00000	-0.00025
	2	0.00342	-0.01807	0.00000	0.00000	0.00000	-0.00014
	3	1.00347	0.01654	0.00000	0.00000	0.00000	-0.00050
	4	0.00698	-0.06537	0.00000	0.00000	0.00000	-0.00039
	5	0.75872	-0.04844	0.00000	0.00000	0.00000	-0.00073
	6	1.00560	-0.01184	0.00000	0.00000	0.00000	-0.00065
	7	-1.00134	-0.04492	0.00000	0.00000	0.00000	0.00035
25	1	-0.00167	-0.11863	0.00000	0.00000	0.00000	-0.00046
	2	0.00166	-0.07959	0.00000	0.00000	0.00000	-0.00024
	3	1.35060	0.00812	0.00000	0.00000	0.00000	-0.00055
	4	-0.00002	-0.19822	0.00000	0.00000	0.00000	-0.00070
	5	1.01252	-0.17223	0.00000	0.00000	0.00000	-0.00105
	6	1.34960	-0.06306	0.00000	0.00000	0.00000	-0.00083
	7	-1.35160	-0.07929	0.00000	0.00000	0.00000	0.00028
42	1	0.00033	-0.04006	0.00000	0.00000	0.00000	-0.00015
	2	0.00070	-0.03963	0.00000	0.00000	0.00000	-0.00021
	3	0.35662	0.00165	0.00000	0.00000	0.00000	-0.00041
	4	0.00103	-0.07970	0.00000	0.00000	0.00000	-0.00036
	5	0.26832	-0.06855	0.00000	0.00000	0.00000	-0.00062
	6	0.35682	-0.02239	0.00000	0.00000	0.00000	-0.00050
	7	-0.35642	-0.02569	0.00000	0.00000	0.00000	0.00032
43	1	0.00033	-0.07168	0.00000	0.00000	0.00000	-0.00013
	2	0.00060	-0.06626	0.00000	0.00000	0.00000	-0.00020
	3	0.68864	0.00274	0.00000	0.00000	0.00000	-0.00037
	4	0.00093	-0.13794	0.00000	0.00000	0.00000	-0.00033
	5	0.51726	-0.11932	0.00000	0.00000	0.00000	-0.00055
	6	0.68884	-0.04027	0.00000	0.00000	0.00000	-0.00044
	7	-0.68845	-0.04575	0.00000	0.00000	0.00000	0.00029
44	1	-0.00066	-0.09505	0.00000	0.00000	0.00000	-0.00017
	2	-0.00041	-0.07964	0.00000	0.00000	0.00000	-0.00012
	3	0.94272	0.00348	0.00000	0.00000	0.00000	-0.00040
	4	-0.00107	-0.17469	0.00000	0.00000	0.00000	-0.00029
	5	0.70607	-0.15217	0.00000	0.00000	0.00000	-0.00056
	6	0.94232	-0.05355	0.00000	0.00000	0.00000	-0.00050

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	7	-0.94312	-0.06051	0.00000	0.00000	0.00000	0.00029
50	1	-0.00461	-0.09788	0.00000	0.00000	0.00000	0.00050
	2	-0.00071	-0.07636	0.00000	0.00000	0.00000	0.00023
	3	1.30011	-0.00918	0.00000	0.00000	0.00000	-0.00053
	4	-0.00531	-0.17423	0.00000	0.00000	0.00000	0.00073
	5	0.96995	-0.16203	0.00000	0.00000	0.00000	0.00028
	6	1.29735	-0.06790	0.00000	0.00000	0.00000	-0.00023
	7	-1.30288	-0.04955	0.00000	0.00000	0.00000	0.00083
68	1	0.00238	-0.01503	0.00000	0.00000	0.00000	0.00018
	2	0.00158	-0.00495	0.00000	0.00000	0.00000	0.00013
	3	0.33301	-0.00649	0.00000	0.00000	0.00000	-0.00150
	4	0.00396	-0.01998	0.00000	0.00000	0.00000	0.00032
	5	0.25333	-0.02362	0.00000	0.00000	0.00000	-0.00084
	6	0.33444	-0.01551	0.00000	0.00000	0.00000	-0.00139
	7	-0.33159	-0.00253	0.00000	0.00000	0.00000	0.00161
69	1	0.00009	-0.02384	0.00000	0.00000	0.00000	0.00022
	2	0.00009	-0.00739	0.00000	0.00000	0.00000	0.00008
	3	0.66541	-0.00971	0.00000	0.00000	0.00000	-0.00113
	4	0.00019	-0.03122	0.00000	0.00000	0.00000	0.00029
	5	0.49922	-0.03666	0.00000	0.00000	0.00000	-0.00057
	6	0.66546	-0.02401	0.00000	0.00000	0.00000	-0.00100
	7	-0.66535	-0.00460	0.00000	0.00000	0.00000	0.00126
70	1	-0.00546	-0.02664	0.00000	0.00000	0.00000	0.00020
	2	-0.00311	-0.00829	0.00000	0.00000	0.00000	0.00011
	3	0.89505	-0.01068	0.00000	0.00000	0.00000	-0.00080
	4	-0.00857	-0.03493	0.00000	0.00000	0.00000	0.00031
	5	0.66350	-0.04087	0.00000	0.00000	0.00000	-0.00031
	6	0.89178	-0.02667	0.00000	0.00000	0.00000	-0.00068
	7	-0.89832	-0.00531	0.00000	0.00000	0.00000	0.00092

************** END OF LATEST ANALYSIS RESULT **************

242. LOAD LIST 4 TO 7
243. PRINT MAXFORCE ENVELOPE NSECTION 24 LIST 1 TO 104

185

MEMBER FORCE ENVELOPE

ALL UNITS ARE KIP FEET

MAX AND MIN FORCE VALUES AMONGST ALL SECTION LOCATIONS

MEMB		FY/ FZ	DIST DIST	LD LD	MZ/ MY	DIST DIST	LD LD	FX	DIST	LD
1	MAX	21.02	0.00	6	191.92	0.00	6			
		0.00	0.00	4	0.00	0.00	4	151.57 C	0.00	4
	MIN	-23.26	15.50	7	-203.07	0.00	7			
		0.00	15.50	7	0.00	15.50	7	24.06 C	15.50	6
2	MAX	10.25	0.00	6	114.73	14.67	7			
		0.00	0.00	4	0.00	0.00	4	82.98 C	0.00	4
	MIN	-14.52	14.67	7	-98.30	0.00	7			
		0.00	14.67	7	0.00	14.67	7	16.78 C	14.67	6
3	MAX	6.73	0.00	6	87.68	14.67	7			
		0.00	0.00	4	0.00	0.00	4	29.30 C	0.00	4
	MIN	-10.78	14.67	7	-70.43	0.00	7			
		0.00	14.67	7	0.00	14.67	7	7.13 C	14.67	6
4	MAX	25.49	0.00	6	210.47	0.00	6			
		0.00	0.00	4	0.00	0.00	4	202.33 C	0.00	4
	MIN	-25.42	15.50	7	-210.53	0.00	7			
		0.00	15.50	7	0.00	15.50	7	73.59 C	15.50	7
5	MAX	19.92	0.00	6	146.07	14.67	7			
		0.00	0.00	4	0.00	0.00	4	125.06 C	0.00	4
	MIN	-19.48	14.67	7	-148.79	14.67	6			
		0.00	14.67	7	0.00	14.67	7	47.64 C	14.67	7
6	MAX	13.71	0.00	6	103.45	14.67	7			
		0.00	0.00	4	0.00	0.00	4	48.86 C	0.00	4
	MIN	-13.28	14.67	7	-106.59	14.67	6			
		0.00	14.67	7	0.00	14.67	7	19.26 C	14.67	7
7	MAX	24.16	0.00	6	201.73	0.00	6			
		0.00	0.00	4	0.00	0.00	4	194.94 C	0.00	4
	MIN	-24.26	15.50	7	-202.49	0.00	7			
		0.00	15.50	7	0.00	15.50	7	77.84 C	15.50	7
8	MAX	19.04	0.00	6	142.85	14.67	7			
		0.00	0.00	4	0.00	0.00	4	121.27 C	0.00	4
	MIN	-18.94	14.67	7	-143.58	14.67	6			
		0.00	14.67	7	0.00	14.67	7	48.70 C	14.67	7
9	MAX	13.71	0.00	6	105.30	14.67	7			
		0.00	0.00	4	0.00	0.00	4	47.13 C	0.00	4

160

	MIN	-13.48	14.67	7	-107.09	14.67	6			
		0.00	14.67	7	0.00	14.67	7	19.21 C	14.67	7
10	MAX	23.87	0.00	6	198.18	0.00	6			
		0.00	0.00	4	0.00	0.00	4	207.08 C	0.00	4
	MIN	-24.30	15.50	7	-200.46	0.00	7			
		0.00	15.50	7	0.00	15.50	7	73.84 C	15.50	6
11	MAX	19.42	0.00	6	150.65	14.67	7			
		0.00	0.00	4	0.00	0.00	4	128.63 C	0.00	4
	MIN	-20.16	14.67	7	-145.17	14.67	6			
		0.00	14.67	7	0.00	14.67	7	46.82 C	14.67	6
12	MAX	13.99	0.00	6	114.30	14.67	7			
		0.00	0.00	4	0.00	0.00	4	50.25 C	0.00	4
	MIN	-14.73	14.67	7	-108.67	14.67	6			
		0.00	14.67	7	0.00	14.67	7	18.72 C	14.67	6
13	MAX	20.77	0.00	6	181.49	0.00	6			
		0.00	0.00	4	0.00	0.00	4	259.43 C	0.00	4
	MIN	-19.11	15.50	7	-173.70	0.00	7			
		0.00	15.50	7	0.00	15.50	7	95.20 C	15.50	7
14	MAX	14.82	0.00	6	103.34	0.00	6			
		0.00	0.00	4	0.00	0.00	4	170.63 C	0.00	4
	MIN	-11.42	14.67	7	-114.02	14.67	6			
		0.00	14.67	7	0.00	14.67	7	59.54 C	14.67	6
15	MAX	11.59	0.00	6	78.16	14.67	7			
		0.00	0.00	4	0.00	0.00	4	81.40 C	0.00	4
	MIN	-9.28	14.67	7	-92.92	14.67	6			
		0.00	14.67	7	0.00	14.67	7	24.75 C	14.67	6
16	MAX	11.29	0.00	6	97.86	0.00	6			
		0.00	0.00	4	0.00	0.00	4	296.89 C	0.00	4
	MIN	-12.92	15.50	7	-105.86	0.00	7			
		0.00	15.50	7	0.00	15.50	7	95.37 C	15.50	6
17	MAX	8.04	0.00	6	86.37	14.67	7			
		0.00	0.00	4	0.00	0.00	4	199.89 C	0.00	4
	MIN	-11.51	14.67	7	-82.42	0.00	7			
		0.00	14.67	7	0.00	14.67	7	62.62 C	14.67	6
18	MAX	4.08	0.00	6	56.84	14.67	7			
		0.00	0.00	4	0.00	0.00	4	121.42 C	0.00	4
	MIN	-7.82	14.67	7	-57.93	0.00	7			
		0.00	14.67	7	0.00	14.67	7	40.21 C	14.67	6
19	MAX	10.26	0.00	6	108.74	14.66	7			
		0.00	0.00	4	0.00	0.00	4	76.89 C	0.00	4
	MIN	-14.62	14.66	7	-105.59	0.00	7			
		0.00	14.66	7	0.00	14.66	7	22.88 C	14.66	6
20	MAX	13.77	0.00	6	109.24	0.00	6			
		0.00	0.00	4	0.00	0.00	4	312.74 C	0.00	4

(18)

MIN	-12.51	15.50	7	-104.21	15.50	6			
	0.00	15.50	7	0.00	15.50	7	92.18 C	15.50	7
21 MAX	13.37	0.00	6	97.55	0.00	6			
	0.00	0.00	4	0.00	0.00	4	229.16 C	0.00	4
MIN	-10.63	14.67	7	-98.54	14.67	6			
	0.00	14.67	7	0.00	14.67	7	71.29 C	14.67	7
22 MAX	9.96	0.00	5	73.91	0.00	5			
	0.00	0.00	4	0.00	0.00	4	139.57 C	0.00	4
MIN	-6.82	14.67	7	-72.17	14.67	5			
	0.00	14.67	7	0.00	14.67	7	50.23 C	14.67	7
23 MAX	15.65	0.00	6	113.00	0.00	6			
	0.00	0.00	4	0.00	0.00	4	65.31 C	0.00	4
MIN	-12.79	14.66	7	-116.46	14.66	6			
	0.00	14.66	7	0.00	14.66	7	25.25 C	14.66	7
24 MAX	11.71	0.00	6	98.41	0.00	6			
	0.00	0.00	4	0.00	0.00	4	269.64 C	0.00	4
MIN	-12.29	15.50	7	-101.26	0.00	7			
	0.00	15.50	7	0.00	15.50	7	70.40 C	15.50	7
25 MAX	9.74	0.00	6	82.05	14.67	7			
	0.00	0.00	4	0.00	0.00	4	197.46 C	0.00	4
MIN	-10.98	14.67	7	-79.02	0.00	7			
	0.00	14.67	7	0.00	14.67	7	55.64 C	14.67	7
26 MAX	6.78	0.00	6	52.96	14.67	7			
	0.00	0.00	4	0.00	0.00	4	127.32 C	0.00	4
MIN	-7.41	14.67	7	-55.70	0.00	7			
	0.00	14.67	7	0.00	14.67	7	41.77 C	14.67	7
27 MAX	12.17	0.00	6	100.31	14.66	7			
	0.00	0.00	4	0.00	0.00	4	67.76 C	0.00	4
MIN	-13.22	14.66	7	-93.55	0.00	7			
	0.00	14.66	7	0.00	14.66	7	26.58 C	14.66	7
28 MAX	12.01	0.00	6	98.94	0.00	6			
	0.00	0.00	4	0.00	0.00	4	264.90 C	0.00	4
MIN	-11.38	15.50	7	-95.81	0.00	7			
	0.00	15.50	7	0.00	15.50	7	68.14 C	15.50	6
29 MAX	10.94	0.00	6	79.10	0.00	6			
	0.00	0.00	4	0.00	0.00	4	200.66 C	0.00	4
MIN	-9.73	14.67	7	-81.44	14.67	6			
	0.00	14.67	7	0.00	14.67	7	57.09 C	14.67	6
30 MAX	7.50	0.00	6	55.98	0.00	6			
	0.00	0.00	4	0.00	0.00	4	124.80 C	0.00	4
MIN	-6.86	14.67	7	-53.98	14.67	6			
	0.00	14.67	7	0.00	14.67	7	41.22 C	14.67	6
31 MAX	13.07	0.00	6	92.24	0.00	6			
	0.00	0.00	4	0.00	0.00	4	65.72 C	0.00	4

	MIN	-11.97	14.66	7	-99.30	14.66	6			
		0.00	14.66	7	0.00	14.66	7	26.06 C	14.66	6
32	MAX	12.01	0.00	6	98.24	0.00	6			
		0.00	0.00	4	0.00	0.00	4	270.89 C	0.00	4
	MIN	-12.65	15.50	7	-101.33	0.00	7			
		0.00	15.50	7	0.00	15.50	7	76.09 C	15.50	6
33	MAX	11.23	0.00	6	92.41	14.67	7			
		0.00	0.00	4	0.00	0.00	4	209.15 C	0.00	4
	MIN	-12.56	14.67	7	-91.89	0.00	7			
		0.00	14.67	7	0.00	14.67	7	64.22 C	14.67	6
34	MAX	7.70	0.00	6	67.15	14.67	7			
		0.00	0.00	4	0.00	0.00	4	131.98 C	0.00	4
	MIN	-9.16	14.67	7	-67.21	0.00	7			
		0.00	14.67	7	0.00	14.67	7	47.70 C	14.67	6
35	MAX	12.54	0.00	6	111.28	14.66	7			
		0.00	0.00	4	0.00	0.00	4	67.13 C	0.00	4
	MIN	-14.86	14.66	7	-106.63	0.00	7			
		0.00	14.66	7	0.00	14.66	7	26.07 C	14.66	6
36	MAX	11.45	0.00	6	94.92	0.00	6			
		0.00	0.00	4	0.00	0.00	4	241.72 C	0.00	4
	MIN	-10.44	15.50	7	-89.93	0.00	7			
		0.00	15.50	7	0.00	15.50	7	65.86 C	15.50	7
37	MAX	11.39	0.00	5	81.51	0.00	5			
		0.00	0.00	4	0.00	0.00	4	176.52 C	0.00	4
	MIN	-8.51	14.67	7	-85.56	14.67	5			
		0.00	14.67	7	0.00	14.67	7	49.89 C	14.67	7
38	MAX	8.90	0.00	5	66.34	0.00	5			
		0.00	0.00	4	0.00	0.00	4	117.46 C	0.00	4
	MIN	-4.86	14.67	7	-64.17	14.67	5			
		0.00	14.67	7	0.00	14.67	7	35.28 C	14.67	7
39	MAX	13.61	0.00	6	97.02	0.00	6			
		0.00	0.00	4	0.00	0.00	4	76.40 C	0.00	4
	MIN	-9.84	14.66	7	-102.50	14.66	6			
		0.00	14.66	7	0.00	14.66	7	23.20 C	14.66	7
40	MAX	14.59	0.00	6	144.40	0.00	6			
		0.00	0.00	4	0.00	0.00	4	215.80 C	0.00	4
	MIN	-15.75	15.50	7	-149.79	0.00	7			
		0.00	15.50	7	0.00	15.50	7	62.36 C	15.50	7
41	MAX	7.19	0.00	6	79.25	14.67	7			
		0.00	0.00	4	0.00	0.00	4	154.16 C	0.00	4
	MIN	-9.80	14.67	7	-64.47	0.00	7			
		0.00	14.67	7	0.00	14.67	7	45.35 C	14.67	7
42	MAX	5.78	0.00	6	59.02	14.67	7			
		0.00	0.00	4	0.00	0.00	4	81.74 C	0.00	4

MIN	-7.36	14.67	7	-50.59	14.67	6			
	0.00	14.67	7	0.00	14.67	7	21.50 C	14.67	7
43 MAX	18.07	0.00	6	159.67	0.00	6			
	0.00	0.00	4	0.00	0.00	4	123.11 C	0.00	4
MIN	-17.76	15.50	7	-157.92	0.00	7			
	0.00	15.50	7	0.00	15.50	7	43.65 C	15.50	7
44 MAX	14.55	0.00	6	106.26	14.67	7			
	0.00	0.00	4	0.00	0.00	4	73.94 C	0.00	4
MIN	-13.98	14.67	7	-110.83	14.67	6			
	0.00	14.67	7	0.00	14.67	7	28.61 C	14.67	7
45 MAX	10.33	0.00	6	77.23	14.67	7			
	0.00	0.00	4	0.00	0.00	4	25.93 C	0.00	4
MIN	-9.76	14.67	7	-81.54	14.67	6			
	0.00	14.67	7	0.00	14.67	7	9.63 C	14.67	7
46 MAX	17.29	0.00	6	154.95	0.00	6			
	0.00	0.00	4	0.00	0.00	4	116.65 C	0.00	4
MIN	-17.19	15.50	7	-154.09	0.00	7			
	0.00	15.50	7	0.00	15.50	7	45.93 C	15.50	7
47 MAX	13.71	0.00	6	105.65	14.67	7			
	0.00	0.00	4	0.00	0.00	4	69.85 C	0.00	4
MIN	-13.79	14.67	7	-105.21	14.67	6			
	0.00	14.67	7	0.00	14.67	7	29.51 C	14.67	7
48 MAX	9.16	0.00	6	74.64	14.67	7			
	0.00	0.00	4	0.00	0.00	4	24.45 C	0.00	4
MIN	-9.39	14.67	7	-72.94	14.67	6			
	0.00	14.67	7	0.00	14.67	7	10.00 C	14.67	7
49 MAX	17.37	0.00	6	154.62	0.00	6			
	0.00	0.00	4	0.00	0.00	4	119.56 C	0.00	4
MIN	-17.32	15.50	7	-153.93	0.00	7			
	0.00	15.50	7	0.00	15.50	7	43.98 C	15.50	6
50 MAX	14.13	0.00	6	109.37	14.67	7			
	0.00	0.00	4	0.00	0.00	4	71.34 C	0.00	4
MIN	-14.42	14.67	7	-107.63	14.67	6			
	0.00	14.67	7	0.00	14.67	7	28.91 C	14.67	6
51 MAX	9.06	0.00	6	75.19	14.67	7			
	0.00	0.00	4	0.00	0.00	4	25.05 C	0.00	4
MIN	-9.46	14.67	7	-72.40	14.67	6			
	0.00	14.67	7	0.00	14.67	7	9.88 C	14.67	6
52 MAX	14.69	0.00	6	141.46	0.00	6			
	0.00	0.00	4	0.00	0.00	4	93.16 C	0.00	5
MIN	-13.03	15.50	7	-132.94	0.00	7			
	0.00	15.50	7	0.00	15.50	7	9.96 C	15.50	7
53 MAX	10.09	0.00	5	68.41	0.00	5			
	0.00	0.00	4	0.00	0.00	4	54.34 C	0.00	5

190

MIN	-6.77	14.67	7	-81.73	14.67	6			
	0.00	14.67	7	0.00	14.67	7	8.63 C	14.67	7
54 MAX	7.15	0.00	5	47.03	0.00	5			
	0.00	0.00	4	0.00	0.00	4	17.55 C	0.00	5
MIN	-3.45	14.67	7	-57.92	14.67	5			
	0.00	14.67	7	0.00	14.67	7	2.95 C	14.67	7
55 MAX	30.45	0.00	7	255.70	0.00	7			
	0.00	0.00	4	0.00	0.00	4	51.57 C	0.00	6
MIN	-42.77	20.00	5	-200.71	0.00	6			
	0.00	20.00	7	0.00	20.00	7	53.61 T	20.00	7
56 MAX	27.48	0.00	4	218.94	20.00	5			
	0.00	0.00	4	0.00	0.00	4	46.00 C	0.00	6
MIN	-36.37	20.00	5	-109.87	20.00	7			
	0.00	20.00	7	0.00	20.00	7	47.69 T	20.00	7
57 MAX	26.77	0.00	4	220.15	20.00	5			
	0.00	0.00	4	0.00	0.00	4	40.88 C	0.00	6
MIN	-36.82	20.00	5	-108.46	0.00	6			
	0.00	20.00	7	0.00	20.00	7	42.37 T	20.00	7
58 MAX	31.97	0.00	7	238.91	20.00	6			
	0.00	0.00	4	0.00	0.00	4	36.42 C	0.00	6
MIN	-36.29	20.00	5	-188.43	20.00	7			
	0.00	20.00	7	0.00	20.00	7	38.22 T	20.00	7
59 MAX	25.18	0.00	4	200.67	20.00	5			
	0.00	0.00	4	0.00	0.00	4	59.76 C	0.00	6
MIN	-37.50	20.00	5	-124.38	0.00	6			
	0.00	20.00	7	0.00	20.00	7	59.53 T	20.00	7
60 MAX	27.00	0.00	4	194.82	20.00	5			
	0.00	0.00	4	0.00	0.00	4	53.55 C	0.00	6
MIN	-34.20	20.00	5	-77.14	6.67	5			
	0.00	20.00	7	0.00	20.00	7	53.33 T	20.00	7
61 MAX	26.75	0.00	4	197.33	20.00	5			
	0.00	0.00	4	0.00	0.00	4	48.22 C	0.00	6
MIN	-34.34	20.00	5	-76.44	6.67	5			
	0.00	20.00	7	0.00	20.00	7	47.87 T	20.00	7
62 MAX	30.75	0.00	4	189.61	20.00	6			
	0.00	0.00	4	0.00	0.00	4	42.78 C	0.00	6
MIN	-33.02	20.00	5	-135.81	20.00	7			
	0.00	20.00	7	0.00	20.00	7	42.44 T	20.00	7
63 MAX	14.10	0.00	4	104.42	20.00	5			
	0.00	0.00	4	0.00	0.00	4	59.86 C	0.00	6
MIN	-20.79	19.17	5	-75.83	6.67	5			
	0.00	20.00	7	0.00	20.00	7	55.81 T	20.00	7
64 MAX	15.56	0.00	4	106.63	20.00	5			
	0.00	0.00	4	0.00	0.00	4	46.15 C	0.00	6

MIN	-18.77	19.17	5	-46.58	6.67	5			
	0.00	20.00	7	0.00	20.00	7	42.53 T	20.00	7
65 MAX	15.29	0.00	4	111.31	20.00	5			
	0.00	0.00	4	0.00	0.00	4	32.44 C	0.00	6
MIN	-18.90	19.17	5	-43.70	6.67	5			
	0.00	20.00	7	0.00	20.00	7	29.05 T	20.00	7
66 MAX	18.15	0.00	4	96.84	20.00	5			
	0.00	0.00	4	0.00	0.00	4	18.45 C	0.00	6
MIN	-17.66	20.00	5	-63.64	20.00	7			
	0.00	20.00	7	0.00	20.00	7	14.32 T	20.00	7
67 MAX	21.16	0.00	4	12.07	0.00	4			
	0.00	0.00	4	0.00	0.00	4	30.48 C	0.00	6
MIN	-9.72	1.00	6	-9.36	1.00	7			
	0.00	1.00	7	0.00	1.00	7	30.54 T	1.00	7
68 MAX	37.00	0.00	4	19.96	0.00	4			
	0.00	0.00	4	0.00	0.00	4	39.55 C	0.00	6
MIN	-3.07	1.00	6	-17.04	1.00	4			
	0.00	1.00	7	0.00	1.00	7	40.29 T	1.00	7
69 MAX	52.75	0.00	4	27.52	0.00	4			
	0.00	0.00	4	0.00	0.00	4	7.09 C	0.00	5
MIN	4.57	1.00	6	-25.23	1.00	4			
	0.00	1.00	7	0.00	1.00	7	5.04 T	1.00	7
70 MAX	-1.33	0.00	7	23.76	1.00	5			
	0.00	0.00	4	0.00	0.00	4	40.85 C	0.00	6
MIN	-45.90	1.00	5	-22.14	0.00	5			
	0.00	1.00	7	0.00	1.00	7	39.41 T	1.00	7
71 MAX	4.84	0.00	7	18.18	1.00	5			
	0.00	0.00	4	0.00	0.00	4	18.71 C	0.00	6
MIN	-33.36	1.00	5	-15.18	0.00	5			
	0.00	1.00	7	0.00	1.00	7	19.30 T	1.00	7
72 MAX	11.44	0.00	7	14.05	1.00	5			
	0.00	0.00	4	0.00	0.00	4	22.38 C	0.00	6
MIN	-24.68	1.00	5	-10.63	0.00	5			
	0.00	1.00	7	0.00	1.00	7	22.27 T	1.00	7
73 MAX	34.16	0.00	4	183.85	18.67	5			
	0.00	0.00	4	0.00	0.00	4	27.22 C	0.00	6
MIN	-44.17	17.89	5	-169.32	6.22	5			
	0.00	18.67	7	0.00	18.67	7	29.13 T	18.67	7
74 MAX	13.94	0.00	7	105.83	12.50	5			
	0.00	0.00	4	0.00	0.00	4	26.82 C	0.00	6
MIN	-15.62	12.50	5	-71.25	12.50	7			
	0.00	12.50	7	0.00	12.50	7	27.25 T	12.50	7
75 MAX	27.81	0.00	4	132.12	17.00	5			
	0.00	0.00	4	0.00	0.00	4	24.85 C	0.00	6

192

MIN	-30.21	17.00	5	-77.79	5.67	5			
	0.00	17.00	7	0.00	17.00	7	25.95 T	17.00	7
76 MAX	13.47	0.00	7	91.92	0.00	7			
	0.00	0.00	4	0.00	0.00	4	23.78 C	0.00	6
MIN	-14.91	12.50	5	-69.78	0.00	6			
	0.00	12.50	7	0.00	12.50	7	24.30 T	12.50	7
77 MAX	26.59	0.00	4	152.81	18.67	6			
	0.00	0.00	4	0.00	0.00	4	23.00 C	0.00	6
MIN	-30.23	18.67	5	-128.14	18.67	7			
	0.00	18.67	7	0.00	18.67	7	24.21 T	18.67	7
78 MAX	37.08	0.00	4	171.19	18.67	5			
	0.00	0.00	4	0.00	0.00	4	35.60 C	0.00	6
MIN	-43.68	18.67	5	-162.81	6.22	5			
	0.00	18.67	7	0.00	18.67	7	36.61 T	18.67	7
79 MAX	11.05	0.00	7	101.13	12.50	5			
	0.00	0.00	4	0.00	0.00	4	31.86 C	0.00	6
MIN	-15.90	12.50	5	-50.87	12.50	7			
	0.00	12.50	7	0.00	12.50	7	32.81 T	12.50	7
80 MAX	29.81	0.00	4	135.12	17.00	5			
	0.00	0.00	4	0.00	0.00	4	28.91 C	0.00	6
MIN	-31.45	17.00	5	-76.51	5.67	5			
	0.00	17.00	7	0.00	17.00	7	29.24 T	17.00	7
81 MAX	15.38	0.00	4	95.71	12.50	5			
	0.00	0.00	4	0.00	0.00	4	25.45 C	0.00	6
MIN	-19.75	12.50	5	-48.63	0.00	6			
	0.00	12.50	7	0.00	12.50	7	26.36 T	12.50	7
82 MAX	32.34	0.00	4	136.72	18.67	5			
	0.00	0.00	4	0.00	0.00	4	21.91 C	0.00	6
MIN	-31.98	18.67	5	-113.33	12.45	4			
	0.00	18.67	7	0.00	18.67	7	22.95 T	18.67	7
83 MAX	31.47	0.00	4	162.38	18.67	5			
	0.00	0.00	4	0.00	0.00	4	13.04 C	0.00	6
MIN	-40.27	17.89	5	-154.23	6.22	5			
	0.00	18.67	7	0.00	18.67	7	11.84 T	18.67	7
84 MAX	13.28	0.00	7	89.31	12.50	5			
	0.00	0.00	4	0.00	0.00	4	19.07 C	0.00	6
MIN	-13.94	12.50	5	-60.98	12.50	7			
	0.00	12.50	7	0.00	12.50	7	17.81 T	12.50	7
85 MAX	19.70	0.00	4	106.18	17.00	5			
	0.00	0.00	4	0.00	0.00	4	24.47 C	0.00	6
MIN	-22.29	17.00	5	-56.73	17.00	7			
	0.00	17.00	7	0.00	17.00	7	23.63 T	17.00	7
86 MAX	12.67	0.00	7	80.51	0.00	7			
	0.00	0.00	4	0.00	0.00	4	30.03 C	0.00	6

	MIN	-13.90	12.50	5	-62.07	0.00	6			
		0.00	12.50	7	0.00	12.50	7	28.73 T	12.50	7
87	MAX	25.23	0.00	4	141.37	18.67	6			
		0.00	0.00	4	0.00	0.00	4	34.87 C	0.00	6
	MIN	-29.35	18.67	5	-106.51	18.67	7			
		0.00	18.67	7	0.00	18.67	7	34.44 T	18.67	7
88	MAX	24.49	0.00	4	118.97	18.67	5			
		0.00	0.00	4	0.00	0.00	4	67.02 C	0.00	6
	MIN	-32.13	18.67	5	-130.74	6.22	5			
		0.00	18.67	7	0.00	18.67	7	62.66 T	18.67	7
89	MAX	11.46	0.00	7	103.04	12.50	5			
		0.00	0.00	4	0.00	0.00	4	51.37 C	0.00	6
	MIN	-19.00	11.98	5	-20.24	6.25	4			
		0.00	12.50	7	0.00	12.50	7	49.87 T	12.50	7
90	MAX	26.55	0.00	4	112.19	17.00	5			
		0.00	0.00	4	0.00	0.00	4	39.20 C	0.00	6
	MIN	-28.08	17.00	5	-69.13	5.67	5			
		0.00	17.00	7	0.00	17.00	7	36.65 T	17.00	7
91	MAX	13.67	0.00	4	82.92	12.50	5			
		0.00	0.00	4	0.00	0.00	4	26.13 C	0.00	6
	MIN	-16.53	12.50	5	-20.41	6.25	5			
		0.00	12.50	7	0.00	12.50	7	24.69 T	12.50	7
92	MAX	28.40	0.00	4	102.50	18.67	6			
		0.00	0.00	4	0.00	0.00	4	13.59 C	0.00	6
	MIN	-28.13	18.67	5	-110.40	12.45	4			
		0.00	18.67	7	0.00	18.67	7	9.82 T	18.67	7
93	MAX	18.92	0.00	7	164.89	20.00	5			
		0.00	0.00	4	0.00	0.00	4	14.98 C	0.00	6
	MIN	-27.63	20.00	5	-116.66	0.00	6			
		0.00	20.00	7	0.00	20.00	7	16.32 T	20.00	7
94	MAX	18.32	0.00	4	143.07	20.00	5			
		0.00	0.00	4	0.00	0.00	4	11.46 C	0.00	6
	MIN	-24.14	20.00	5	-78.70	20.00	7			
		0.00	20.00	7	0.00	20.00	7	12.55 T	20.00	7
95	MAX	18.04	0.00	4	143.23	20.00	5			
		0.00	0.00	4	0.00	0.00	4	7.88 C	0.00	6
	MIN	-24.36	20.00	5	-78.40	0.00	6			
		0.00	20.00	7	0.00	20.00	7	9.15 T	20.00	7
96	MAX	19.60	0.00	7	151.67	20.00	6			
		0.00	0.00	4	0.00	0.00	4	4.64 C	0.00	6
	MIN	-24.74	20.00	5	-111.38	20.00	7			
		0.00	20.00	7	0.00	20.00	7	6.24 T	20.00	7
97	MAX	17.11	0.00	7	150.65	20.00	5			
		0.00	0.00	4	0.00	0.00	4	17.30 C	0.00	6

MIN	-25.91	20.00	5	-84.10	0.00	6			
	0.00	20.00	7	0.00	20.00	7	16.87 T	20.00	7
98 MAX	17.96	0.00	4	126.72	20.00	5			
	0.00	0.00	4	0.00	0.00	4	13.09 C	0.00	6
MIN	-22.55	20.00	5	-53.93	20.00	7			
	0.00	20.00	7	0.00	20.00	7	12.66 T	20.00	7
99 MAX	17.78	0.00	4	126.57	20.00	5			
	0.00	0.00	4	0.00	0.00	4	8.54 C	0.00	6
MIN	-22.70	20.00	5	-52.75	20.00	7			
	0.00	20.00	7	0.00	20.00	7	8.26 T	20.00	7
100 MAX	18.49	0.00	4	126.63	20.00	5			
	0.00	0.00	4	0.00	0.00	4	3.47 C	0.00	6
MIN	-22.74	20.00	5	-75.10	20.00	7			
	0.00	20.00	7	0.00	20.00	7	3.30 T	20.00	7
101 MAX	7.57	0.00	7	74.60	20.00	5			
	0.00	0.00	4	0.00	0.00	4	35.09 C	0.00	6
MIN	-11.95	20.00	5	-38.36	0.00	6			
	0.00	20.00	7	0.00	20.00	7	32.06 T	20.00	7
102 MAX	8.45	0.00	4	59.98	20.00	5			
	0.00	0.00	4	0.00	0.00	4	24.76 C	0.00	6
MIN	-10.09	20.00	5	-24.23	6.67	5			
	0.00	20.00	7	0.00	20.00	7	22.30 T	20.00	7
103 MAX	8.30	0.00	4	59.79	20.00	5			
	0.00	0.00	4	0.00	0.00	4	15.60 C	0.00	6
MIN	-10.19	20.00	5	-25.80	6.67	5			
	0.00	20.00	7	0.00	20.00	7	12.91 T	20.00	7
104 MAX	8.75	0.00	4	57.92	20.00	5			
	0.00	0.00	4	0.00	0.00	4	7.15 C	0.00	5
MIN	-10.08	20.00	5	-32.54	20.00	7			
	0.00	20.00	7	0.00	20.00	7	3.45 T	20.00	7

********** END OF FORCE ENVELOPE FROM INTERNAL STORAGE **********

244. PRINT SUPPORT REACTION ALL

195

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	4	2.83	151.57	0.00	0.00	0.00	-14.21
	5	-14.09	110.26	0.00	0.00	0.00	135.14
	6	-21.12	24.06	0.00	0.00	0.00	191.92
	7	23.35	104.70	0.00	0.00	0.00	-203.07
5	4	-0.03	202.33	0.00	0.00	0.00	-0.47
	5	-19.12	191.69	0.00	0.00	0.00	157.51
	6	-25.47	89.50	0.00	0.00	0.00	210.47
	7	25.40	73.59	0.00	0.00	0.00	-210.53
9	4	0.15	194.94	0.00	0.00	0.00	-1.20
	5	-18.03	179.25	0.00	0.00	0.00	150.52
	6	-24.16	78.89	0.00	0.00	0.00	201.73
	7	24.26	77.84	0.00	0.00	0.00	-202.49
13	4	0.61	207.08	0.00	0.00	0.00	-3.34
	5	-17.53	183.04	0.00	0.00	0.00	146.51
	6	-23.89	73.84	0.00	0.00	0.00	198.18
	7	24.32	92.05	0.00	0.00	0.00	-200.46
17	4	-1.86	259.43	0.00	0.00	0.00	8.53
	5	-16.69	234.83	0.00	0.00	0.00	141.22
	6	-20.77	96.22	0.00	0.00	0.00	181.49
	7	19.11	95.20	0.00	0.00	0.00	-173.70
21	4	2.94	296.89	0.00	0.00	0.00	-14.48
	5	-6.55	260.61	0.00	0.00	0.00	63.87
	6	-11.31	95.37	0.00	0.00	0.00	97.86
	7	12.93	106.15	0.00	0.00	0.00	-105.86
26	4	-2.05	312.74	0.00	0.00	0.00	9.93
	5	-11.65	280.38	0.00	0.00	0.00	88.36
	6	-13.76	104.89	0.00	0.00	0.00	109.24
	7	12.50	92.18	0.00	0.00	0.00	-103.14
31	4	1.38	269.64	0.00	0.00	0.00	-6.77
	5	-7.83	241.81	0.00	0.00	0.00	69.21
	6	-11.69	87.96	0.00	0.00	0.00	98.41
	7	12.27	70.40	0.00	0.00	0.00	-101.26
36	4	-1.45	264.90	0.00	0.00	0.00	7.16
	5	-10.01	224.30	0.00	0.00	0.00	79.05
	6	-12.03	68.14	0.00	0.00	0.00	98.94
	7	11.39	84.73	0.00	0.00	0.00	-95.81
41	4	1.26	270.89	0.00	0.00	0.00	-6.05
	5	-8.17	233.00	0.00	0.00	0.00	69.66
	6	-12.02	76.09	0.00	0.00	0.00	98.24
	7	12.66	87.32	0.00	0.00	0.00	-101.33
46	4	-2.09	241.72	0.00	0.00	0.00	10.37
	5	-9.97	217.15	0.00	0.00	0.00	78.13
	6	-11.44	80.28	0.00	0.00	0.00	94.92
	7	10.43	65.86	0.00	0.00	0.00	-89.93
51	4	1.46	215.80	0.00	0.00	0.00	-6.60
	5	-10.02	199.91	0.00	0.00	0.00	104.25
	6	-14.57	83.06	0.00	0.00	0.00	144.40
	7	15.73	62.36	0.00	0.00	0.00	-149.79

297K

196

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
55	4	-0.52	123.11	0.00	0.00	0.00	2.95
	5	-13.88	115.92	0.00	0.00	0.00	121.68
	6	-18.06	52.90	0.00	0.00	0.00	159.67
	7	17.75	43.65	0.00	0.00	0.00	-157.92
59	4	-0.16	116.65	0.00	0.00	0.00	1.36
	5	-13.07	106.74	0.00	0.00	0.00	117.09
	6	-17.29	46.13	0.00	0.00	0.00	154.95
	7	17.19	45.93	0.00	0.00	0.00	-154.09
63	4	-0.08	119.56	0.00	0.00	0.00	1.09
	5	-13.08	106.90	0.00	0.00	0.00	116.67
	6	-17.38	43.98	0.00	0.00	0.00	154.62
	7	17.33	50.56	0.00	0.00	0.00	-153.93
67	4	-2.39	78.83	0.00	0.00	0.00	12.24
	5	-12.50	93.16	0.00	0.00	0.00	113.85
	6	-14.64	61.19	0.00	0.00	0.00	141.46
	7	12.99	9.96	0.00	0.00	0.00	-132.94

************** END OF LATEST ANALYSIS RESULT **************

245. PRINT SECTION MAX DISPL NSECT 12 LIST 1 TO 104

197

MAX MEMBER SECTION DISPLACEMENTS

UNIT= INCH FOR FPS AND CM FOR METRIC/SI SYSTEM

MEMBER	MAX DISP	LOCATION	LOAD	L/DISPL
1	0.04925	46.50	6	3776
2	0.02040	132.03	7	8628
3	0.01713	132.03	7	10275
4	0.04068	46.50	7	4572
5	0.02126	132.03	6	8280
6	0.01792	132.03	6	9825
7	0.04020	46.50	7	4627
8	0.02135	132.03	6	8247
9	0.01828	132.03	6	9627
10	0.03860	46.50	6	4818
11	0.02155	132.03	7	8169
12	0.01906	132.03	7	9235
13	0.04412	46.50	7	4215
14	0.01843	132.03	6	9552
15	0.01735	132.03	6	10145
16	0.04202	46.50	6	4426
17	0.02422	132.03	7	7266
18	0.01527	44.01	7	11526
19	0.02932	131.94	7	6001
20	0.03763	46.50	7	4943
21	0.02542	132.03	6	6924
22	0.01970	44.01	5	8935
23	0.03145	131.94	6	5594
24	0.03844	46.50	6	4838
25	0.02256	132.03	7	7802
26	0.01575	44.01	7	11180
27	0.02946	131.94	7	5971
28	0.03764	46.50	7	4941
29	0.02197	132.03	6	8013
30	0.01535	44.01	6	11470
31	0.02940	131.94	6	5984
32	0.03486	46.50	6	5335
33	0.02359	132.03	7	7461
34	0.01695	44.01	7	10383
35	0.03089	131.94	7	5694
36	0.03792	46.50	7	4904
37	0.02409	132.03	5	7307
38	0.01806	44.01	5	9747
39	0.02920	131.94	6	6023
40	0.04564	62.00	6	4075
41	0.01522	132.03	7	11566
42	0.01203	117.36	6	14629
43	0.03792	46.50	7	4905
44	0.01722	132.03	6	10225
45	0.01446	132.03	6	12172
46	0.03796	46.50	6	4900
47	0.01683	132.03	6	10457
48	0.01354	132.03	7	13000
49	0.03723	46.50	6	4995

98

50	0.01671	132.03	6	10537
51	0.01365	132.03	7	12893
52	0.04488	62.00	7	4143
53	0.01604	132.03	6	10975
54	0.01163	132.03	6	15135
55	0.05200	80.00	5	4615
56	0.02225	80.00	5	10786
57	0.02466	80.00	5	9732
58	0.03999	160.00	7	6002
59	0.04290	100.00	5	5594
60	0.02236	100.00	5	10734
61	0.02161	80.00	5	11104
62	0.03205	160.00	7	7488
63	0.03097	100.00	5	7750
64	0.01434	120.00	4	16736
65	0.01194	100.00	5	20108
66	0.01897	140.00	4	12652
67	0.00269	3.00	4	4459
68	0.00376	3.00	4	3191
69	0.00459	3.00	4	2617
70	0.00383	9.00	5	3130
71	0.00354	9.00	5	3387
72	0.00312	9.00	5	3849
73	0.06588	93.35	5	3400
74	0.01684	100.00	5	8906
75	0.05408	102.00	4	3772
76	0.01138	37.50	7	13184
77	0.04425	112.02	4	5062
78	0.06878	112.02	4	3257
79	0.01425	100.00	5	10527
80	0.05332	102.00	4	3826
81	0.00807	37.50	7	18583
82	0.04987	112.02	4	4492
83	0.06086	93.35	5	3681
84	0.01194	100.00	5	12566
85	0.03389	102.00	4	6018
86	0.00845	37.50	7	17744
87	0.04204	112.02	4	5329
88	0.05377	93.35	5	4166
89	0.00993	112.50	5	15103
90	0.04804	102.00	4	4246
91	0.00779	37.50	7	19245
92	0.05037	112.02	4	4448
93	0.05692	80.00	5	4216
94	0.03230	80.00	5	7429
95	0.03561	80.00	5	6739
96	0.04571	180.00	7	5250
97	0.04939	80.00	5	4859
98	0.03011	80.00	5	7971
99	0.03268	80.00	5	7343
100	0.03885	120.00	4	6178
101	0.03682	80.00	5	6517
102	0.02355	100.00	5	10189
103	0.02673	100.00	5	8980
104	0.03474	120.00	4	6908

199

```
      ************ END OF SECT DISPL RESULTS ***********

 246. PARAMETER
 247. CODE AISC
 248. BEAM 1 ALL
 249. FYLD 7200 ALL
 250. LY 7 MEMB 55 TO 66 73 TO 104
 251. LZ 7 MEMB 55 TO 66 73 TO 104
 252. LX 7 MEMB 55 TO 66 73 TO 104
 253. UNT 2 MEMB 55 TO 66 73 TO 104
 254. CHECK CODE ALL
```

200

STAAD.Pro CODE CHECKING - (AISC)
****

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1 ST	W18 X86	PASS	AISC- H1-2	0.627	7
		104.70 C	0.00	-203.07	0.00
2 ST	W18 X86	PASS	AISC- H1-3	0.381	7
		57.03 C	0.00	114.73	14.67
3 ST	W18 X86	PASS	AISC- H1-3	0.247	7
		19.56 C	0.00	87.68	14.67
4 ST	W18 X86	PASS	AISC- H1-1	0.696	5
		191.69 C	0.00	157.51	0.00
5 ST	W18 X86	PASS	AISC- H1-3	0.456	6
		53.64 C	0.00	-148.79	14.67
6 ST	W18 X86	PASS	AISC- H1-3	0.295	6
		21.00 C	0.00	-106.59	14.67
7 ST	W18 X86	PASS	AISC- H1-1	0.657	5
		179.25 C	0.00	150.52	0.00
8 ST	W18 X86	PASS	AISC- H1-3	0.436	6
		49.20 C	0.00	-143.58	14.67
9 ST	W18 X86	PASS	AISC- H1-3	0.293	6
		19.49 C	0.00	-107.09	14.67
10 ST	W18 X86	PASS	AISC- H1-1	0.656	5
		183.04 C	0.00	146.51	0.00
11 ST	W18 X86	PASS	AISC- H1-3	0.466	7
		56.56 C	0.00	150.65	14.67
12 ST	W18 X86	PASS	AISC- H1-3	0.316	7
		22.31 C	0.00	114.30	14.67
13 ST	W18 X86	PASS	AISC- H1-1	0.746	5
		234.83 C	0.00	141.22	0.00
14 ST	W18 X86	PASS	AISC- H1-1	0.490	5
		151.62 C	0.00	-101.24	14.67
15 ST	W18 X86	PASS	AISC- H1-3	0.313	5
		69.66 C	0.00	-76.86	14.67
16 ST	W14 X74	PASS	AISC- H1-1	0.807	5
		260.61 C	0.00	63.87	0.00
17 ST	W14 X74	PASS	AISC- H1-1	0.597	4
		199.89 C	0.00	48.65	14.67
18 ST	W14 X74	PASS	AISC- H1-1	0.418	4
		121.42 C	0.00	-47.96	0.00
19 ST	W14 X74	PASS	AISC- H1-3	0.475	7
		39.91 C	0.00	108.74	14.66
20 ST	W14 X74	PASS	AISC- H1-1	0.948	5
		280.38 C	0.00	-92.30	15.50
21 ST	W14 X74	PASS	AISC- H1-1	0.763	5
		206.50 C	0.00	-95.77	14.67

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
22 ST	W14 X74	PASS	AISC- H1-1	0.517	5
		129.19 C	0.00	73.91	0.00
23 ST	W14 X74	PASS	AISC- H1-3	0.501	5
		61.38 C	0.00	-102.68	14.66
24 ST	W14 X74	PASS	AISC- H1-1	0.780	5
		241.81 C	0.00	69.21	0.00
25 ST	W14 X74	PASS	AISC- H1-1	0.524	5
		178.12 C	0.00	-41.07	14.67
26 ST	W14 X74	PASS	AISC- H1-1	0.347	5
		117.10 C	0.00	-28.29	14.67
27 ST	W14 X74	PASS	AISC- H1-3	0.416	7
		26.58 C	0.00	100.31	14.66
28 ST	W14 X74	PASS	AISC- H1-1	0.771	5
		224.30 C	0.00	79.05	0.00
29 ST	W14 X74	PASS	AISC- H1-1	0.616	5
		172.40 C	0.00	-74.05	14.67
30 ST	W14 X74	PASS	AISC- H1-1	0.407	5
		109.65 C	0.00	52.72	0.00
31 ST	W14 X74	PASS	AISC- H1-3	0.435	5
		59.79 C	0.00	-85.15	14.66
32 ST	W14 X74	PASS	AISC- H1-1	0.761	5
		233.00 C	0.00	69.66	0.00
33 ST	W14 X74	PASS	AISC- H1-1	0.559	5
		182.32 C	0.00	-49.06	14.67
34 ST	W14 X74	PASS	AISC- H1-3	0.357	7
		53.03 C	0.00	-67.21	0.00
35 ST	W14 X74	PASS	AISC- H1-3	0.460	7
		28.72 C	0.00	111.28	14.66
36 ST	W14 X74	PASS	AISC- H1-1	0.751	5
		217.15 C	0.00	78.13	0.00
37 ST	W14 X74	PASS	AISC- H1-1	0.631	5
		162.89 C	0.00	-85.56	14.67
38 ST	W14 X74	PASS	AISC- H1-1	0.457	5
		113.22 C	0.00	66.34	0.00
39 ST	W14 X74	PASS	AISC- H1-1	0.481	5
		76.38 C	0.00	-101.03	14.66
40 ST	W18 X86	PASS	AISC- H1-1	0.600	5
		199.91 C	0.00	104.25	0.00
41 ST	W18 X86	PASS	AISC- H1-1	0.337	5
		144.18 C	0.00	-34.39	14.67
42 ST	W18 X86	PASS	AISC- H1-3	0.233	5
		77.84 C	0.00	-37.20	14.67
43 ST	W18 X86	PASS	AISC- H1-3	0.485	6
		52.90 C	0.00	159.67	0.00
44 ST	W18 X86	PASS	AISC- H1-3	0.339	5
		70.22 C	0.00	-87.38	14.67

202

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
45 ST	W18 X86	PASS	AISC- H1-3	0.217	6
		11.44 C	0.00	-81.54	14.67
46 ST	W18 X86	PASS	AISC- H1-3	0.461	6
		46.13 C	0.00	154.95	0.00
47 ST	W18 X86	PASS	AISC- H1-3	0.308	7
		29.51 C	0.00	105.65	14.67
48 ST	W18 X86	PASS	AISC- H1-3	0.198	7
		10.00 C	0.00	74.64	14.67
49 ST	W18 X86	PASS	AISC- H1-3	0.467	7
		50.56 C	0.00	-153.93	0.00
50 ST	W18 X86	PASS	AISC- H1-3	0.321	7
		31.70 C	0.00	109.37	14.67
51 ST	W18 X86	PASS	AISC- H1-3	0.200	7
		10.70 C	0.00	75.19	14.67
52 ST	W18 X86	PASS	AISC- H1-3	0.457	6
		61.19 C	0.00	141.46	0.00
53 ST	W18 X86	PASS	AISC- H1-3	0.291	5
		54.34 C	0.00	-79.60	14.67
54 ST	W18 X86	PASS	AISC- H1-3	0.172	5
		17.55 C	0.00	-57.92	14.67
55 ST	W27 X114	PASS	AISC- H1-3	0.551	5
		37.12 C	0.00	244.03	20.00
56 ST	W27 X114	PASS	AISC- H1-3	0.494	5
		33.25 C	0.00	218.94	20.00
57 ST	W27 X114	PASS	AISC- H1-3	0.493	5
		29.64 C	0.00	220.15	20.00
58 ST	W27 X114	PASS	AISC- H1-3	0.539	6
		36.42 C	0.00	238.91	20.00
59 ST	W27 X114	PASS	AISC- H1-3	0.470	5
		44.99 C	0.00	200.67	20.00
60 ST	W27 X114	PASS	AISC- H1-3	0.452	5
		40.32 C	0.00	194.82	20.00
61 ST	W27 X114	PASS	AISC- H1-3	0.453	5
		36.45 C	0.00	197.33	20.00
62 ST	W27 X114	PASS	AISC- H1-3	0.444	6
		42.78 C	0.00	189.61	20.00
63 ST	W27 X114	PASS	AISC- H1-3	0.273	5
		48.03 C	0.00	104.42	20.00
64 ST	W27 X114	PASS	AISC- H1-3	0.265	5
		37.45 C	0.00	106.63	20.00
65 ST	W27 X114	PASS	AISC- H1-3	0.263	5
		26.90 C	0.00	111.31	20.00
66 ST	W27 X114	PASS	AISC- H1-3	0.221	5
		17.05 C	0.00	96.84	20.00

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 67).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

209

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 68).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 69).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 70).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 71).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

THIS VERSION DOES NOT DESIGN PRISMATIC SECTIONS (MEMBER 72).
PLEASE DEFINE THE PROPERTIES THROUGH A USER TABLE GENERAL SECTION.

73	ST	W27 X114	PASS	AISC- H1-3	0.370	5
			17.94 C	0.00	183.85	18.67
74	ST	W24 X68	PASS	AISC- H1-3	0.354	5
			19.29 C	0.00	105.83	12.50
75	ST	W24 X68	PASS	AISC- H1-3	0.549	5
			16.84 C	0.00	132.12	17.00
76	ST	W24 X68	PASS	AISC- H1-3	0.290	5
			16.92 C	0.00	86.07	12.50
77	ST	W27 X114	PASS	AISC- H1-3	0.317	6
			23.00 C	0.00	152.81	18.67
78	ST	W27 X114	PASS	AISC- H1-3	0.356	5
			26.07 C	0.00	171.19	18.67
79	ST	W24 X68	PASS	AISC- H1-3	0.347	5
			23.02 C	0.00	101.13	12.50
80	ST	W24 X68	PASS	AISC- H1-3	0.569	5
			21.32 C	0.00	135.12	17.00
81	ST	W24 X68	PASS	AISC- H1-3	0.321	5
			18.26 C	0.00	95.71	12.50
82	ST	W27 X114	PASS	AISC- H1-3	0.278	5
			15.78 C	0.00	136.72	18.67
83	ST	W27 X114	PASS	AISC- H1-3	0.323	5
			12.16 C	0.00	162.38	18.67
84	ST	W24 X68	PASS	AISC- H1-3	0.298	5
			16.11 C	0.00	89.31	12.50
85	ST	W24 X68	PASS	AISC- H1-3	0.454	5
			20.32 C	0.00	106.18	17.00
86	ST	W24 X68	PASS	AISC- H1-3	0.279	5
			24.47 C	0.00	77.26	12.50
87	ST	W27 X114	PASS	AISC- H1-3	0.309	6
			34.87 C	0.00	141.37	18.67
88	ST	W27 X114	PASS	AISC- H1-3	0.288	5
			54.03 C	0.00	118.97	18.67
89	ST	W24 X68	PASS	AISC- H1-3	0.387	5
			40.12 C	0.00	103.04	12.50
90	ST	W24 X68	PASS	AISC- H1-3	0.501	5
			32.24 C	0.00	112.19	17.00
91	ST	W24 X68	PASS	AISC- H1-3	0.289	5
			21.07 C	0.00	82.92	12.50
92	ST	W27 X114	PASS	AISC- H1-3	0.211	6
			13.59 C	0.00	102.50	18.67

204

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
93 ST	W24 X68	PASS	AISC- H1-3	0.877	5
		10.43 C	0.00	164.89	20.00
94 ST	W24 X68	PASS	AISC- H1-3	0.759	5
		7.99 C	0.00	143.07	20.00
95 ST	W24 X68	PASS	AISC- H1-3	0.754	5
		5.11 C	0.00	143.23	20.00
96 ST	W24 X68	PASS	AISC- H1-3	0.797	6
		4.64 C	0.00	151.67	20.00
97 ST	W24 X68	PASS	AISC- H1-3	0.809	5
		13.47 C	0.00	150.65	20.00
98 ST	W24 X68	PASS	AISC- H1-3	0.679	5
		10.32 C	0.00	126.72	20.00
99 ST	W24 X68	PASS	AISC- H1-3	0.671	5
		6.78 C	0.00	126.57	20.00
100 ST	W24 X68	PASS	AISC- H1-3	0.664	5
		2.92 C	0.00	126.63	20.00
101 ST	W21 X57	PASS	AISC- H1-3	0.873	5
		28.64 C	0.00	74.60	20.00
102 ST	W21 X57	PASS	AISC- H1-3	0.695	5
		20.34 C	0.00	59.98	20.00
103 ST	W21 X57	PASS	AISC- H1-3	0.675	5
		13.70 C	0.00	59.79	20.00
104 ST	W21 X57	PASS	AISC- H1-3	0.638	5
		7.15 C	0.00	57.92	20.00

255. FINISH

*********** END OF THE STAAD.Pro RUN ***********

**** DATE= MAR 30,2006 TIME= 7:54: 4 ****

205

B-3.1.2.2 **Glazing Frame Bite.** The glazing shall have a minimum frame bite of 9.5-mm (3/8-in) for structurally glazed systems and 25-mm (1-in) for window systems that are not structurally glazed.

B-3.1.2.3 **Connection Design.** Equivalent static design loads for connections of the window, skylight, or doorframe to the surrounding walls or roof, hardware and associated connections, and glazing stop connections shall be 75 kilopascals (10.8 lbs per square inch) for glazing panels with a vision area less than or equal to 1.0 square meters (10.8 square feet) and 30 kilopascals (4.4 lbs per square inch) for glazing panels with a vision area greater than 1.0 square meters (10.8 square feet) but less than or equal to 3.0 square meters (32 square feet). Loads shall be applied to the surface of the glazing and frame. Connections and hardware may be designed based on ultimate strength for steel and 0.2% offset yield strength for aluminum.

B-3.1.2.4 **Supporting Structural Elements.** Design supporting wall and roof elements and their connections based on their ultimate capacities. In addition, because the resulting dynamic loads are likely to be dissipated through multiple mechanisms, it is not necessary to account for reactions from the supporting wall or roof elements in the design of the remainder of the structure.

B-3.1.3 **Mitigation.** Where the minimum standoff distances cannot be met, provide glazing and frames that will provide an equivalent level of protection to that provided by the glazing and frames as described above and in Tables 2-1 and 2-2 for the applicable explosive weight in Table B-1.

B-3.1.4 **Window, Skylight, and Glazed Door Replacement Projects.** Whenever window, skylight, or door glazing is being replaced in existing inhabited buildings as part of a planned window or glazing replacement project, whether or not the building meets the triggers in paragraph 1-6.2, install glazing and frames that meet all of the requirements above.

B-3.2 **Standard 11. Building Entrance Layout.** The areas outside of installations are commonly not under the direct control of the installations. Where the main entrances to buildings face installation perimeters, people entering and exiting the buildings are vulnerable to being fired upon from vantage points outside the installations. To mitigate those vulnerabilities apply the following measures:

B-3.2.1 **New Buildings.** For new inhabited buildings, ensure that the main entrance to the building does not face an installation perimeter or other uncontrolled vantage points with direct lines of sight to the entrance or provide means to block the lines of sight.

B-3.2.2 **Existing Buildings.** For existing inhabited buildings where the main entrance faces an installation perimeter, either use a different entrance as the main entrance or screen that entrance to limit the ability of potential aggressors to target people entering and leaving the building.

B-3.3 **Standard 12. Exterior Doors.** For all new and existing buildings covered by these standards, ensure that all exterior doors into inhabited areas open outwards.

Tie force design

Horiz forces @ Columns

0.01 A (1.2 D + 1.6 L) or ≤ 56.5^K ⟸ LRFD
x 4 x

3^RD

D 70 x1.2 84

L 50 x1.6 80

164 PSF

Tiebeams
3^RD FLR.

INTERNAL TIES

P = 0.5 x 0.164 x 49.67 x 20 = 81.5^K

W24x62 L = 20.5" n = 7 @ 3/4" ϕ

L 4 x 3 1/2 x 5/16

weld 1/4" to bm

tensile per bolt 81.5 / 7 = 11.6^K/bolt

< 29.8^K

bearing ϕ rn = ϕ 2.4 db Fu = 0.75 x 2.4 x 3/4 x 7/16 x 58 OK
= 34^K > bolt tension ✓
OK

	JLS	3-31-06	207

MORPHY, MAKOFSKY, INC.

Block Shear of bm.

$\phi R_n = 304^k$ Table 10-2 ✓ ok.

$S_{net} = 44.1$ Table 9-2

$\phi R_n = 0.75 \times \frac{50 \times 44.1}{4.5} = 378^k$ ✓ ok

$\phi F_v = \phi\ 0.6 \times \frac{F_y A_{gv}}{t} / t$

Table 9-3b

→ $439^k/in$

$439 \times 7/16 = 192^k$ ok ✓

Col. is continuous $P = 0.164 \times 20 \times 49.67 \times .5 = 81.5$

$f_a = \frac{81.}{22.3}$ 18x76

$= 8.2^{ksi}$ / ok ✓

JLS | 3/31/06 | 208

members 10 & 11

P = 146.3 k   m = 28 k'   W18x86

$f_a = \frac{146.3}{25.3} = 5.78$ ksi $f_b = \frac{28 \times 12}{166} = 2.0$ ksi

$\Rightarrow \frac{5.78}{7.84} + \frac{0.85 \times 2}{\left(1 - \frac{2.86}{688}\right) 15.8} =$

0.737   0.12   = 0.86 < 1

✓ OK

member 20 & 21

P = 236.4   m = 18.6 k'

W14x74

$f_a = \frac{236.4}{21.8} = 10.84$ ks $\frac{Kl}{r} = \frac{30.17 \times 12}{2.48}$

$f_b = 18.6 \times 12/112 = 2.0$ = 146

NO good ⇒ $F_a = 7.01$

comb

10.84

$F_b = \frac{12 \times 10^3}{30.17 \times 36} = 24.3$ $\frac{l_b}{r_b} = \frac{30.17 \times 12}{6.04}$

= 59.9

$\frac{Kl}{r} = \frac{30.17 \times 12}{3.7} = 97.8$ $F_{ex} = 41.6$

W14x90 $F_a = 15.17$ $f_a = \frac{236.4}{26.5} = 8.9$ ksi $\frac{Kl_b}{r_b} = 58.9$

⇒ $F_{ex} = 43$

$\frac{8.9}{15.17} + \frac{0.85 \times 2}{\left(1 - \frac{8.9}{43}\right) 24.3} =$

.59   0.08   = 0.67 OK

JLS	3/31/06	209

MORPHY, MAKOFSKY, INC.

Col 1

$l = 15.5 + 14.67 = 30.17$

$P = 128.4^k$ W18x86.

$f_a = \frac{128.4}{25.3}$

$= 5.06^{ksi}$

$\frac{Kl}{r} = \frac{1.0 \times 30.17 \times 12}{2.63}$

$= 138$

$\Rightarrow F_a = 7.84^{ksi}$

$\frac{Kl_b}{r_b} = \frac{30.17 \times 12}{7.77} = 46.6$

$M = 83.7^{k'}$

$f_b = \frac{83.7 \times 12}{166}$

$= 6.05^{ksi}$

$F_b = \frac{1 \times 10^3}{30.17 \times 2.15} = 15.8$

$F_e' = \frac{12\pi^2 E}{23 \times 46.6^2} = 68.8$

com.

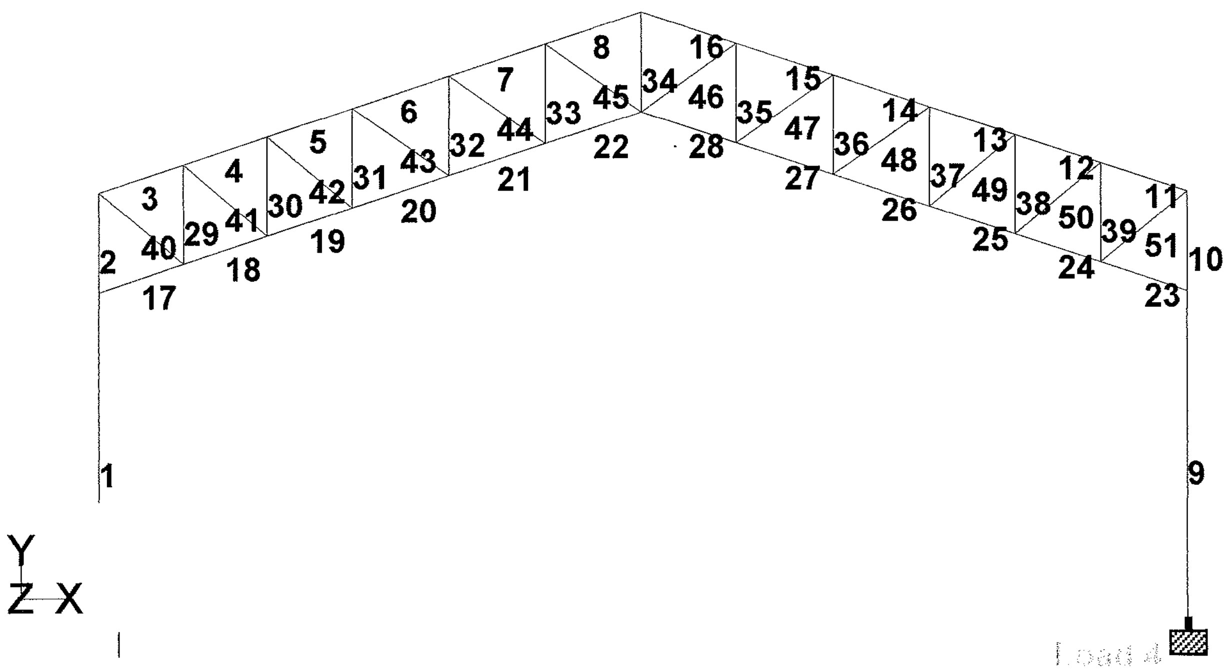
$\frac{5.06}{7.84} + \frac{0.85 \times 6.05}{\left(1 - \frac{5.06}{68.8}\right) 15.8}$

$= 0.645 + 0.351 = 0.996 < 1$ ✓ OK

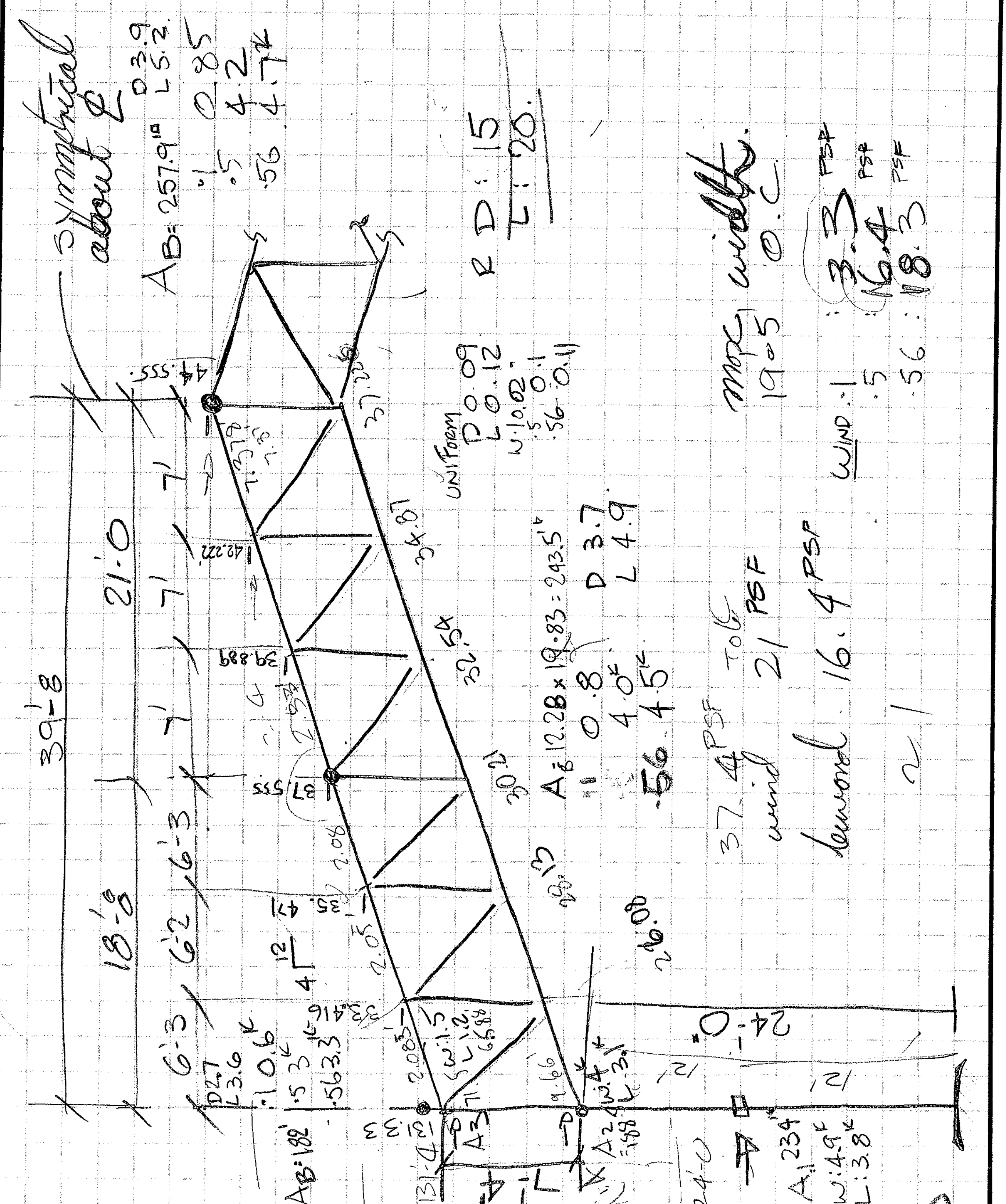
	JCS	3/31/06	210

MORPHY, MAKOFSKY, INC.

Software licensed to morphy makofsky inc	Job No	Sheet No 1		Rev
	Part			
Job Title	Ref			
	By	Date 24-Mar-06		Chd
Client	File ASSHFR.std		Date/Time 25-Mar-2006 11:00	



ASSEMBLY HALL



JLS | 3/24/06 | 2/2

MORPHY, MAKOFSKY, INC.

```
****************************************************
*                                                  *
*           STAAD.Pro                              *
*           Version  2003    Bld 1002.US           *
*           Proprietary Program of                 *
*           Research Engineers,  Intl.             *
*           Date=    MAR 25, 2006                  *
*           Time=    11: 0: 5                      *
*                                                  *
*      USER ID: morphy makofsky inc                *
****************************************************
```

```
 1. STAAD PLANE
 2. START JOB INFORMATION
 3. ENGINEER DATE 24-MAR-06
 4. END JOB INFORMATION
 5. INPUT WIDTH 79
 6. UNIT FEET KIP
 7. JOINT COORDINATES
 8. 1 0 0 0; 2 0 24 0; 3 0 31.33 0; 4 6.25 33.416 0; 5 12.42 35.471 0
 9. 6 18.67 37.555 0; 7 25.67 39.889 0; 8 32.67 42.222 0; 9 39.67 44.555 0
10. 10 79.34 0 0; 11 79.34 24 0; 12 79.34 31.33 0; 13 73.09 33.416 0
11. 14 66.92 35.471 0; 15 60.67 37.555 0; 16 53.67 39.889 0; 17 46.67 42.222 0
12. 18 6.25 26.086 0; 19 12.42 28.141 0; 20 18.67 30.225 0; 21 25.67 32.559 0
13. 22 32.67 34.892 0; 23 39.67 37.225 0; 24 73.09 26.086 0; 25 66.92 28.141 0
14. 26 60.67 30.225 0; 27 53.67 32.559 0; 28 46.67 34.892 0
15. MEMBER INCIDENCES
16. 1 1 2; 2 2 3; 3 3 4; 4 4 5; 5 5 6; 6 6 7; 7 7 8; 8 8 9; 9 10 11; 10 11 12
17. 11 12 13; 12 13 14; 13 14 15; 14 15 16; 15 16 17; 16 17 9; 17 2 18; 18 18 19
18. 19 19 20; 20 20 21; 21 21 22; 22 22 23; 23 11 24; 24 24 25; 25 25 26; 26 26 27
19. 27 27 28; 28 28 23; 29 4 18; 30 5 19; 31 6 20; 32 7 21; 33 8 22; 34 9 23
20. 35 17 28; 36 16 27; 37 15 26; 38 14 25; 39 13 24; 40 3 18; 41 4 19; 42 5 20
21. 43 6 21; 44 7 22; 45 8 23; 46 17 23; 47 16 28; 48 15 27; 49 14 26; 50 13 25
22. 51 12 24
23. DEFINE MATERIAL START
24. ISOTROPIC STEEL
25. E 4.176E+006
26. POISSON 0.3
27. DENSITY 0.489024
28. ALPHA 6.5E-006
29. DAMP 0.03
30. END DEFINE MATERIAL
31. CONSTANTS
32. MATERIAL STEEL MEMB 1 TO 51
33. MEMBER PROPERTY AMERICAN
34. 1 2 9 10 TABLE ST W21X73
35. 3 TO 7 11 TO 16 TABLE T W10X33
36. 17 TO 28 TABLE T W8X24
37. 29 TO 51 TABLE LD L40405
38. 8 TABLE T W10X33
39. SUPPORTS
40. 1 10 FIXED
41. LOAD 1 DEAD
```

```
42. JOINT LOAD
43. 3 12 FY -2.7
44. 6 15 FY -3.7
45. 9 FY -3.9
46. MEMBER LOAD
47. 3 TO 8 11 TO 16 UNI GY -0.09
48. SELFWEIGHT Y -1
49. LOAD 2 LIVE
50. JOINT LOAD
51. 3 12 FY -3.6
52. 6 15 FY -4.9
53. 9 FY -5.2
54. MEMBER LOAD
55. 3 TO 8 11 TO 16 UNI GY -0.12
56. LOAD 3 WIND 1
57. JOINT LOAD
58. 3 FX 1.5
59. 12 FX 1.2
60. 2 FX 4
61. 11 FX 3.1
62. MEMBER LOAD
63. 1 CON GX 4.9 12
64. 9 CON GX 3.8 12
65. 3 CON Y 0.6 0.01
66. 6 CON Y 0.8 0.01
67. 8 CON Y 0.43 7.37
68. 16 CON Y 2.35 7.37
69. 14 CON Y 4.5 0.01
70. 11 CON Y 3.3 0.01
71. 3 TO 8 UNI Y 0.02
72. 11 TO 16 UNI Y 0.11
73. LOAD 4 WIND 2
74. JOINT LOAD
75. 3 FX 1.5
76. 12 FX 1.2
77. 2 FX 4
78. 11 FX 3.1
79. MEMBER LOAD
80. 1 CON GX 4.9 12
81. 9 CON GX 3.8 12
82. 3 CON Y 3 0.01
83. 6 CON Y 4 0.01
84. 8 CON Y 2.1 7.37
85. 16 CON Y 2.35 7.37
86. 14 CON Y 4.5 0.01
87. 11 CON Y 3.3 0.01
88. 3 TO 8 UNI Y 0.1
89. 11 TO 16 UNI Y 0.11
90. LOAD COMB 5 DEAD LIVE
91. 1 1.0 2 1.0
92. LOAD COMB 6 DEAD LIVE WIND 1
93. 1 1.0 2 0.75 3 0.75
94. LOAD COMB 7 DEAD WIND 1
95. 1 0.6 3 1.0
96. LOAD COMB 8 DEAD LIVE WIND2
97. 1 1.0 2 0.75 4 0.75
```

2\8

```
 98. LOAD COMB 9 DEAD WIND 2
 99. 4 1.0 1 0.6
100. PERFORM ANALYSIS


        P R O B L E M   S T A T I S T I C S
        -----------------------------------

  NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =    28/    51/      2
  ORIGINAL/FINAL BAND-WIDTH=    16/      3/      12 DOF
  TOTAL PRIMARY LOAD CASES =    4, TOTAL DEGREES OF FREEDOM =      78
  SIZE OF STIFFNESS MATRIX =       1 DOUBLE  KILO-WORDS
  REQRD/AVAIL. DISK SPACE  =    12.1/ 25109.4 MB,  EXMEM = 1560.9 MB



101. PDELTA 2 ANALYSIS
++ Adjusting Displacements                             11: 0: 6
++ Adjusting Displacements                             11: 0: 6


102. LOAD LIST 5 TO 9
103. PRINT SUPPORT REACTION ALL
```

215

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	5	9.72	33.19	0.00	0.00	0.00	-106.34
	6	-2.16	23.17	0.00	0.00	0.00	34.72
	7	-11.34	2.26	0.00	0.00	0.00	138.88
	8	-2.02	18.06	0.00	0.00	0.00	27.92
	9	-11.16	-4.56	0.00	0.00	0.00	129.81
10	5	-9.72	33.19	0.00	0.00	0.00	106.34
	6	-14.58	22.76	0.00	0.00	0.00	173.12
	7	-10.98	1.71	0.00	0.00	0.00	138.24
	8	-12.20	20.32	0.00	0.00	0.00	142.15
	9	-7.81	-1.54	0.00	0.00	0.00	96.95

************** END OF LATEST ANALYSIS RESULT **************

104. PRINT MAXFORCE ENVELOPE NSECTION 12 LIST 1 TO 51

MEMBER FORCE ENVELOPE

ALL UNITS ARE KIP FEET

MAX AND MIN FORCE VALUES AMONGST ALL SECTION LOCATIONS

MEMB		FY/ FZ	DIST DIST	LD LD	MZ/ MY	DIST DIST	LD LD	FX	DIST	LD
1	MAX	11.32	0.00	7	138.88	0.00	7			
		0.00	0.00	5	0.00	0.00	5	33.19 C	0.00	5
	MIN	-9.73	24.00	5	-106.34	0.00	5			
		0.00	24.00	9	0.00	24.00	9	5.61 T	24.00	9
2	MAX	17.11	0.00	5	126.59	0.00	5			
		0.00	0.00	5	0.00	0.00	5	22.33 C	0.00	5
	MIN	-10.63	7.33	9	-77.99	0.00	9			
		0.00	7.33	9	0.00	7.33	9	1.56 T	7.33	9
3	MAX	0.79	0.00	5	1.11	0.00	5			
		0.00	0.00	5	0.00	0.00	5	12.10 C	0.00	7
	MIN	-3.13	0.00	9	-0.34	3.84	5			
		0.00	6.59	9	0.00	6.59	9	0.01 C	6.59	5
4	MAX	0.76	0.00	5	0.92	0.00	5			
		0.00	0.00	5	0.00	0.00	5	19.88 C	0.00	6
	MIN	-0.64	6.50	5	-0.40	3.25	5			
		0.00	6.50	9	0.00	6.50	9	4.25 C	6.50	9
5	MAX	0.76	0.00	5	0.85	0.00	5			
		0.00	0.00	5	0.00	0.00	5	32.28 C	0.00	5
	MIN	-0.66	6.59	5	-0.47	3.29	5			
		0.00	6.59	9	0.00	6.59	9	0.52 C	6.59	9
6	MAX	0.79	0.00	5	0.85	7.38	5			
		0.00	0.00	5	0.00	0.00	5	38.77 C	0.00	5
	MIN	-4.15	0.00	9	-0.64	3.69	5			
		0.00	7.38	9	0.00	7.38	9	2.90 T	7.38	9
7	MAX	0.81	0.00	5	0.89	0.00	5			
		0.00	0.00	5	0.00	0.00	5	43.14 C	0.00	5
	MIN	-0.78	7.38	5	-0.63	3.69	5			
		0.00	7.38	9	0.00	7.38	9	4.89 T	7.38	9
8	MAX	2.25	7.38	9	1.02	7.38	5			
		0.00	0.00	5	0.00	0.00	5	45.47 C	0.00	5
	MIN	-0.84	7.38	5	-0.62	3.69	5			
		0.00	7.38	9	0.00	7.38	9	6.78 T	7.38	9
9	MAX	14.58	0.00	6	173.12	0.00	6			
		0.00	0.00	5	0.00	0.00	5	33.19 C	0.00	5

MIN	4.00	22.00	9	-142.65	24.00	6			
	0.00	24.00	9	0.00	24.00	9	2.59 T	24.00	9
10 MAX	-6.10	0.00	9	0.28	7.33	9			
	0.00	0.00	5	0.00	0.00	5	22.33 C	0.00	5
MIN	-19.29	7.33	6	-141.95	0.00	6			
	0.00	7.33	9	0.00	7.33	9	5.29 T	7.33	9
11 MAX	0.79	0.00	5	1.11	0.00	5			
	0.00	0.00	5	0.00	0.00	5	0.49 C	0.00	5
MIN	-3.49	0.00	9	-0.34	3.84	5			
	0.00	6.59	9	0.00	6.59	9	12.77 T	6.59	7
12 MAX	0.76	0.00	5	0.92	0.00	5			
	0.00	0.00	5	0.00	0.00	5	17.09 C	0.00	5
MIN	-0.64	6.50	5	-0.40	3.25	5			
	0.00	6.50	9	0.00	6.50	9	11.67 T	6.50	7
13 MAX	0.76	0.00	5	0.85	0.00	5			
	0.00	0.00	5	0.00	0.00	5	32.28 C	0.00	5
MIN	-0.66	6.59	5	-0.47	3.29	5			
	0.00	6.59	9	0.00	6.59	9	11.31 T	6.59	9
14 MAX	0.79	0.00	5	0.85	7.38	5			
	0.00	0.00	5	0.00	0.00	5	38.77 C	0.00	5
MIN	-4.68	0.00	9	-0.64	3.69	5			
	0.00	7.38	9	0.00	7.38	9	10.95 T	7.38	9
15 MAX	0.81	0.00	5	0.89	0.00	5			
	0.00	0.00	5	0.00	0.00	5	43.14 C	0.00	5
MIN	-0.78	7.38	5	-0.63	3.69	5			
	0.00	7.38	9	0.00	7.38	9	8.91 T	7.38	9
16 MAX	2.53	7.38	9	1.02	7.38	5			
	0.00	0.00	5	0.00	0.00	5	45.47 C	0.00	5
MIN	-0.84	7.38	5	-0.62	3.69	5			
	0.00	7.38	9	0.00	7.38	9	6.69 T	7.38	9
17 MAX	0.18	0.00	5	0.69	0.00	5			
	0.00	0.00	5	0.00	0.00	5	28.31 C	0.00	5
MIN	-0.09	6.59	9	-0.30	0.00	9			
	0.00	6.59	9	0.00	6.59	9	13.63 T	6.59	9
18 MAX	0.09	0.00	5	0.19	0.00	5			
	0.00	0.00	5	0.00	0.00	5	9.93 C	0.00	5
MIN	-0.03	6.50	9	-0.13	6.50	5			
	0.00	6.50	9	0.00	6.50	9	13.26 T	6.50	7
19 MAX	0.09	0.00	5	0.18	0.00	5			
	0.00	0.00	5	0.00	0.00	5	6.44 T	0.00	9
MIN	-0.03	6.59	9	-0.16	6.59	5			
	0.00	6.59	9	0.00	6.59	9	13.99 T	6.59	6
20 MAX	0.07	0.00	5	0.08	0.00	5			
	0.00	0.00	5	0.00	0.00	5	2.93 T	0.00	9

228

MIN	-0.03	7.38	8	-0.11	5.53	5			
	0.00	7.38	9	0.00	7.38	9	23.30 T	7.38	6
21 MAX	0.05	0.00	5	0.04	0.00	8			
	0.00	0.00	5	0.00	0.00	5	1.08 T	0.00	9
MIN	-0.04	7.38	6	-0.09	4.92	5			
	0.00	7.38	9	0.00	7.38	9	28.30 T	7.38	5
22 MAX	0.06	0.00	5	0.06	7.38	7			
	0.00	0.00	5	0.00	0.00	5	0.66 C	0.00	9
MIN	-0.04	7.38	6	-0.12	5.53	5			
	0.00	7.38	9	0.00	7.38	9	32.65 T	7.38	5
23 MAX	0.18	0.00	5	0.70	0.00	6			
	0.00	0.00	5	0.00	0.00	5	30.27 C	0.00	6
MIN	0.01	6.59	9	-0.26	6.59	5			
	0.00	6.59	9	0.00	6.59	9	7.37 C	6.59	9
24 MAX	0.09	0.00	5	0.19	0.00	5			
	0.00	0.00	5	0.00	0.00	5	17.37 C	0.00	6
MIN	-0.02	6.50	9	-0.13	6.50	5			
	0.00	6.50	9	0.00	6.50	9	8.10 C	6.50	9
25 MAX	0.09	0.00	5	0.18	0.00	5			
	0.00	0.00	5	0.00	0.00	5	13.17 C	0.00	7
MIN	-0.02	6.59	9	-0.16	6.59	5			
	0.00	6.59	9	0.00	6.59	9	6.69 T	6.59	5
26 MAX	0.07	0.00	5	0.11	0.00	6			
	0.00	0.00	5	0.00	0.00	5	11.70 C	0.00	7
MIN	-0.02	7.38	8	-0.11	5.53	5			
	0.00	7.38	9	0.00	7.38	9	21.86 T	7.38	5
27 MAX	0.06	0.00	6	0.09	0.00	7			
	0.00	0.00	5	0.00	0.00	5	7.37 C	0.00	7
MIN	-0.03	7.38	5	-0.09	4.92	5			
	0.00	7.38	9	0.00	7.38	9	28.30 T	7.38	5
28 MAX	0.06	0.00	6	0.08	0.00	7			
	0.00	0.00	5	0.00	0.00	5	4.80 C	0.00	9
MIN	-0.03	7.38	8	-0.12	5.53	5			
	0.00	7.38	9	0.00	7.38	9	32.65 T	7.38	5
29 MAX	0.02	0.00	9	0.28	7.33	5			
	0.00	0.00	5	0.00	0.00	5	20.28 C	7.33	5
MIN	-0.08	7.33	5	-0.31	0.00	5			
	0.00	7.33	9	0.00	7.33	9	4.22 T	0.00	9
30 MAX	0.02	0.00	9	0.20	7.33	5			
	0.00	0.00	5	0.00	0.00	5	18.48 C	7.33	5
MIN	-0.06	7.33	5	-0.23	0.00	5			
	0.00	7.33	9	0.00	7.33	9	4.11 T	0.00	9
31 MAX	0.01	0.00	9	0.17	7.33	5			
	0.00	0.00	5	0.00	0.00	5	16.70 C	7.33	5

219

MIN	-0.05	7.33	5	-0.17	0.00	5			
	0.00	7.33	9	0.00	7.33	9	4.05 T	0.00	9
32 MAX	0.01	0.00	7	0.07	7.33	5			
	0.00	0.00	5	0.00	0.00	5	6.21 C	7.33	5
MIN	-0.01	7.33	5	-0.05	7.33	7			
	0.00	7.33	9	0.00	7.33	9	2.98 T	0.00	7
33 MAX	0.01	0.00	7	0.06	7.33	5			
	0.00	0.00	5	0.00	0.00	5	4.16 C	7.33	5
MIN	0.00	7.33	5	-0.05	7.33	7			
	0.00	7.33	9	0.00	7.33	9	3.49 T	0.00	7
34 MAX	0.04	0.00	7	0.19	0.00	7			
	0.00	0.00	5	0.00	0.00	5	2.14 C	7.33	9
MIN	0.00	7.33	5	-0.10	7.33	7			
	0.00	7.33	9	0.00	7.33	9	17.72 T	0.00	5
35 MAX	0.01	0.00	6	0.04	0.00	7			
	0.00	0.00	5	0.00	0.00	5	6.02 C	7.33	6
MIN	0.00	7.33	9	-0.06	7.33	5			
	0.00	7.33	9	0.00	7.33	9	2.13 C	0.00	9
36 MAX	0.02	0.00	6	0.08	0.00	7			
	0.00	0.00	5	0.00	0.00	5	7.20 C	7.33	6
MIN	0.01	7.33	9	-0.07	7.33	6			
	0.00	7.33	9	0.00	7.33	9	1.95 C	0.00	9
37 MAX	0.05	0.00	5	0.17	0.00	5			
	0.00	0.00	5	0.00	0.00	5	16.70 C	7.33	5
MIN	0.00	7.33	9	-0.17	7.33	5			
	0.00	7.33	9	0.00	7.33	9	0.71 T	0.00	9
38 MAX	0.06	0.00	5	0.23	0.00	5			
	0.00	0.00	5	0.00	0.00	5	18.48 C	7.33	5
MIN	0.00	7.33	9	-0.20	7.33	5			
	0.00	7.33	9	0.00	7.33	9	0.85 T	0.00	9
39 MAX	0.08	0.00	5	0.31	0.00	5			
	0.00	0.00	5	0.00	0.00	5	20.28 C	7.33	5
MIN	0.00	7.33	9	-0.28	7.33	5			
	0.00	7.33	9	0.00	7.33	9	0.96 T	0.00	9
40 MAX	0.06	0.00	8	0.17	8.16	5			
	0.00	0.00	5	0.00	0.00	5	4.47 C	8.16	9
MIN	-0.07	8.16	5	-0.06	6.80	9			
	0.00	8.16	9	0.00	8.16	9	22.64 T	0.00	5
41 MAX	0.04	0.00	8	0.11	8.12	5			
	0.00	0.00	5	0.00	0.00	5	4.40 C	8.12	9
MIN	-0.07	8.12	5	-0.09	2.71	6			
	0.00	8.12	9	0.00	8.12	9	20.67 T	0.00	5
42 MAX	0.04	0.00	8	0.07	8.16	5			
	0.00	0.00	5	0.00	0.00	5	4.35 C	8.16	9

220

MIN	-0.07	8.16	5	-0.11	2.72	5			
	0.00	8.16	9	0.00	8.16	9	18.75 T	0.00	5
43 MAX	0.05	0.00	8	0.07	0.00	9			
	0.00	0.00	5	0.00	0.00	5	3.32 C	8.60	7
MIN	-0.08	8.60	5	-0.15	2.87	5			
	0.00	8.60	9	0.00	8.60	9	7.51 T	0.00	5
44 MAX	0.06	0.00	6	0.05	0.00	9			
	0.00	0.00	5	0.00	0.00	5	3.93 C	8.60	7
MIN	-0.06	8.60	5	-0.12	3.58	5			
	0.00	8.60	9	0.00	8.60	9	5.11 T	0.00	5
45 MAX	0.08	0.00	5	0.09	8.60	9			
	0.00	0.00	5	0.00	0.00	5	4.59 C	8.60	7
MIN	-0.05	8.60	6	-0.17	5.73	5			
	0.00	8.60	9	0.00	8.60	9	2.78 T	0.00	5
46 MAX	0.08	0.00	5	0.09	8.60	9			
	0.00	0.00	5	0.00	0.00	5	2.70 T	8.60	5
MIN	-0.05	8.60	8	-0.17	5.73	5			
	0.00	8.60	9	0.00	8.60	9	5.98 T	0.00	6
47 MAX	0.05	0.00	8	0.06	8.60	7			
	0.00	0.00	5	0.00	0.00	5	2.66 T	8.60	9
MIN	-0.06	8.60	6	-0.12	3.58	5			
	0.00	8.60	9	0.00	8.60	9	7.28 T	0.00	6
48 MAX	0.05	0.00	6	0.09	0.00	9			
	0.00	0.00	5	0.00	0.00	5	2.45 T	8.60	9
MIN	-0.08	8.60	5	-0.15	2.87	5			
	0.00	8.60	9	0.00	8.60	9	8.65 T	0.00	6
49 MAX	0.04	0.00	8	0.08	8.16	6			
	0.00	0.00	5	0.00	0.00	5	0.64 C	8.16	9
MIN	-0.07	8.16	5	-0.11	2.72	5			
	0.00	8.16	9	0.00	8.16	9	18.75 T	0.00	5
50 MAX	0.04	0.00	6	0.11	8.12	5			
	0.00	0.00	5	0.00	0.00	5	0.79 C	8.12	9
MIN	-0.07	8.12	5	-0.08	2.71	5			
	0.00	8.12	9	0.00	8.12	9	20.67 T	0.00	5
51 MAX	0.03	0.00	5	0.19	8.16	6			
	0.00	0.00	5	0.00	0.00	5	0.96 C	8.16	9
MIN	-0.08	8.16	6	-0.03	2.04	7			
	0.00	8.16	9	0.00	8.16	9	22.64 T	0.00	5

********** END OF FORCE ENVELOPE FROM INTERNAL STORAGE **********

```
105. PARAMETER
106. CODE AISC
107. FYLD 7200 MEMB 1 TO 28
108. UNB 1 MEMB 3 TO 8 11 TO 16
```

109. BEAM 1 ALL
110. CHECK CODE ALL

222

STAAD.Pro CODE CHECKING - (AISC)
****

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1 ST	W21 X73	PASS	AISC- H1-1	0.971	5
		31.44 C	0.00	127.28	24.00
2 ST	W21 X73	PASS	AISC- H1-3	0.348	5
		22.33 C	0.00	126.59	0.00
3 T	W10 X33	PASS	AISC- H1-3	0.253	6
		9.38 C	0.00	0.88	0.00
4 T	W10 X33	PASS	AISC- H1-1	0.320	5
		17.09 C	0.00	0.92	0.00
5 T	W10 X33	PASS	AISC- H1-1	0.465	5
		32.28 C	0.00	0.85	0.00
6 T	W10 X33	PASS	AISC- H1-1	0.562	5
		38.24 C	0.00	0.85	7.38
7 T	W10 X33	PASS	AISC- H1-1	0.629	5
		43.14 C	0.00	0.89	0.00
8 T	W10 X33	PASS	AISC- H1-1	0.679	5
		44.94 C	0.00	1.02	7.38
* 9 ST	W21 X73	FAIL	AISC- H1-2	1.180	6
		22.76 C	0.00	173.12	0.00
10 ST	W21 X73	PASS	AISC- H1-3	0.364	6
		11.27 C	0.00	-141.95	0.00
11 T	W10 X33	PASS	AISC- H1-3	0.214	5
		0.49 C	0.00	1.11	0.00
12 T	W10 X33	PASS	AISC- H1-1	0.320	5
		17.09 C	0.00	0.92	0.00
13 T	W10 X33	PASS	AISC- H1-1	0.465	5
		32.28 C	0.00	0.85	0.00
14 T	W10 X33	PASS	AISC- H1-1	0.562	5
		38.24 C	0.00	0.85	7.38
15 T	W10 X33	PASS	AISC- H1-1	0.629	5
		43.14 C	0.00	0.89	0.00
16 T	W10 X33	PASS	AISC- H1-1	0.679	5
		44.94 C	0.00	1.02	7.38
17 T	W8X 24	PASS	AISC- H1-1	0.746	5
		28.31 C	0.00	0.69	0.00
18 T	W8X 24	PASS	AISC- H1-3	0.214	5
		9.93 C	0.00	0.19	0.00
19 T	W8X 24	PASS	AISC- H2-1	0.171	6
		13.99 T	0.00	-0.10	6.04
20 T	W8X 24	PASS	AISC- H2-1	0.251	6
		23.29 T	0.00	-0.08	4.92
21 T	W8X 24	PASS	AISC- H2-1	0.299	5
		28.29 T	0.00	-0.09	4.92

223

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER		TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
22	T	W8X 24	PASS	AISC- H2-1	0.353	5
			32.64 T	0.00	-0.12	5.53
23	T	W8X 24	PASS	AISC- H1-1	0.791	6
			30.27 C	0.00	0.70	0.00
24	T	W8X 24	PASS	AISC- H1-1	0.316	6
			17.37 C	0.00	0.16	0.00
25	T	W8X 24	PASS	AISC- H1-1	0.221	7
			13.17 C	0.00	0.07	0.00
26	T	W8X 24	PASS	AISC- H2-1	0.245	5
			21.86 T	0.00	-0.11	5.53
27	T	W8X 24	PASS	AISC- H2-1	0.299	5
			28.29 T	0.00	-0.09	4.92
28	T	W8X 24	PASS	AISC- H2-1	0.353	5
			32.64 T	0.00	-0.12	5.53
29	LD	L40 405	PASS	AISC- H1-1	0.324	5
			20.16 C	0.00	-0.31	0.00
30	LD	L40 405	PASS	AISC- H1-1	0.283	5
			18.37 C	0.00	-0.23	0.00
31	LD	L40 405	PASS	AISC- H1-1	0.248	5
			16.70 C	0.00	0.17	7.33
32	LD	L40 405	PASS	AISC- H1-3	0.095	5
			6.21 C	0.00	0.07	7.33
33	LD	L40 405	PASS	AISC- H1-3	0.066	5
			4.16 C	0.00	0.06	7.33
34	LD	L40 405	PASS	AISC- H2-1	0.170	5
			17.72 T	0.00	0.00	0.00
35	LD	L40 405	PASS	AISC- H1-3	0.089	6
			6.02 C	0.00	-0.06	7.33
36	LD	L40 405	PASS	AISC- H1-3	0.107	6
			7.20 C	0.00	-0.07	7.33
37	LD	L40 405	PASS	AISC- H1-1	0.248	5
			16.70 C	0.00	-0.17	7.33
38	LD	L40 405	PASS	AISC- H1-1	0.283	5
			18.37 C	0.00	0.23	0.00
39	LD	L40 405	PASS	AISC- H1-1	0.324	5
			20.16 C	0.00	0.31	0.00
40	LD	L40 405	PASS	AISC- H2-1	0.253	5
			22.55 T	0.00	0.17	8.16
41	LD	L40 405	PASS	AISC- H2-1	0.222	5
			20.58 T	0.00	0.11	8.12
42	LD	L40 405	PASS	AISC- H2-1	0.204	5
			18.73 T	0.00	-0.11	2.72
43	LD	L40 405	PASS	AISC- H2-1	0.105	5
			7.48 T	0.00	-0.15	2.87
44	LD	L40 405	PASS	AISC- H2-1	0.075	5
			5.07 T	0.00	-0.12	3.58

224

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
45 LD	L40 405	PASS	AISC- H1-3	0.079	7
		4.59 C	0.00	0.07	8.60
46 LD	L40 405	PASS	AISC- H2-1	0.083	6
		5.92 T	0.00	-0.12	5.73
47 LD	L40 405	PASS	AISC- H2-1	0.090	6
		7.25 T	0.00	-0.09	3.58
48 LD	L40 405	PASS	AISC- H2-1	0.105	5
		7.48 T	0.00	-0.15	2.87
49 LD	L40 405	PASS	AISC- H2-1	0.204	5
		18.73 T	0.00	-0.11	2.72
50 LD	L40 405	PASS	AISC- H2-1	0.222	5
		20.58 T	0.00	0.11	8.12
51 LD	L40 405	PASS	AISC- H2-1	0.253	5
		22.55 T	0.00	0.17	8.16

111. PRINT JOINT DISPLACEMENTS LIST 2 3 6 9 11 12 15 23

225

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
2	5	-0.33133	-0.01493	0.00000	0.00000	0.00000	-0.00078
	6	0.22948	-0.01030	0.00000	0.00000	0.00000	-0.00150
	7	0.59450	-0.00080	0.00000	0.00000	0.00000	-0.00132
	8	0.16897	-0.00794	0.00000	0.00000	0.00000	-0.00113
	9	0.51381	0.00235	0.00000	0.00000	0.00000	-0.00082
3	5	-0.16397	-0.01804	0.00000	0.00000	0.00000	-0.00223
	6	0.38290	-0.01289	0.00000	0.00000	0.00000	-0.00182
	7	0.65336	-0.00154	0.00000	0.00000	0.00000	-0.00049
	8	0.28706	-0.00982	0.00000	0.00000	0.00000	-0.00141
	9	0.52558	0.00255	0.00000	0.00000	0.00000	0.00006
6	5	-0.00441	-0.58346	0.00000	0.00000	0.00000	-0.00203
	6	0.49070	-0.43836	0.00000	0.00000	0.00000	-0.00134
	7	0.65812	-0.07642	0.00000	0.00000	0.00000	-0.00002
	8	0.37449	-0.34593	0.00000	0.00000	0.00000	-0.00110
	9	0.50317	0.04682	0.00000	0.00000	0.00000	0.00029
9	5	0.00000	-0.84841	0.00000	0.00000	0.00000	0.00000
	6	0.47270	-0.56645	0.00000	0.00000	0.00000	0.00039
	7	0.63027	-0.01640	0.00000	0.00000	0.00000	0.00052
	8	0.36793	-0.46929	0.00000	0.00000	0.00000	0.00014
	9	0.49057	0.11315	0.00000	0.00000	0.00000	0.00019
11	5	0.33133	-0.01493	0.00000	0.00000	0.00000	0.00078
	6	0.67131	-0.01011	0.00000	0.00000	0.00000	-0.00050
	7	0.60656	-0.00055	0.00000	0.00000	0.00000	-0.00134
	8	0.53677	-0.00898	0.00000	0.00000	0.00000	-0.00032
	9	0.42718	0.00095	0.00000	0.00000	0.00000	-0.00110
12	5	0.16397	-0.01804	0.00000	0.00000	0.00000	0.00223
	6	0.60449	-0.01166	0.00000	0.00000	0.00000	0.00112
	7	0.66316	0.00010	0.00000	0.00000	0.00000	-0.00045
	8	0.47415	-0.01047	0.00000	0.00000	0.00000	0.00101
	9	0.48938	0.00168	0.00000	0.00000	0.00000	-0.00060
15	5	0.00441	-0.58346	0.00000	0.00000	0.00000	0.00203
	6	0.49929	-0.33791	0.00000	0.00000	0.00000	0.00137
	7	0.66187	0.05752	0.00000	0.00000	0.00000	0.00007
	8	0.38451	-0.29437	0.00000	0.00000	0.00000	0.00114
	9	0.50883	0.11557	0.00000	0.00000	0.00000	-0.00024
23	5	0.00000	-0.85954	0.00000	0.00000	0.00000	0.00000
	6	0.49210	-0.57394	0.00000	0.00000	0.00000	0.00023
	7	0.65613	-0.01676	0.00000	0.00000	0.00000	0.00031
	8	0.37785	-0.47551	0.00000	0.00000	0.00000	0.00012
	9	0.50380	0.11447	0.00000	0.00000	0.00000	0.00017

************** END OF LATEST ANALYSIS RESULT **************

226

```
112. FINISH

          *********** END OF THE STAAD.Pro RUN ***********

            **** DATE= MAR 25,2006   TIME= 11: 0: 6 ****

     *********************************************************
     *     For questions on STAAD.Pro, please contact :      *
     *  By Email - North America  : support@reiusa.com       *
     *  By Email - International  : support@reiworld.com     *
     *  Tel. (USA) : 714-974-2500 ; Fax (USA) : 714-974-4771 *
     *********************************************************
```

227

1ST Floor slab — NOT assembly Hall

case 1 storage light 125
5" SLAB

DL	63	x 1.2	= 76
LL	125	x 1.6	= 200
			276

Typical span 10'-0 ℄ TO ℄ Bm.

∴ clear span = 8-0'

Positive

END span
inte

$m = \frac{1}{11} w l^2$

$= \frac{1}{11} \times 0.28 \times 8^2 = 1.63^{K'}$

$\Rightarrow As_{req} = \frac{1.63}{4 \times 3.75} = 0.11''^{\square}$

$As.min = 0.0018 \times 5 \times 12 = 0.11''^{\square}$ end

interior moment less ∴ ~~positive~~ gov.S

Negative

END span

$m = \frac{1}{9} w l^2 = 1.99^{K'}$

$As_{-} = \frac{1.99}{4 \times 4} = 0.1.24''^{\square}$

int $m = \frac{1}{11} w l^2 \Rightarrow$ as above

#4@12" ⇒ 0.2"□/'
#3@12" ⇒ 0.11"□/' ⟵
#4@15" ⇒ 0.16"□/'

Note min steel govs.
∴ OK

JLS	4/4/06.	2/8

MORPHY, MAKOFSKY, INC.

if $f_s = \frac{2}{3} f_y = 40^{ksi}$

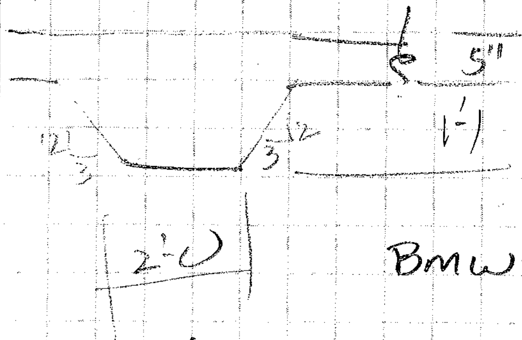
$S = 15 \times \frac{40{,}000}{40{,}000} - 2.5\ c_c$ for $c_c = 1''$

$= 15 - 2.5 = 12.5''$ or $12 \times \frac{40}{40}$

$= \underline{\underline{12''}}$

	JLS	4-4-06	229

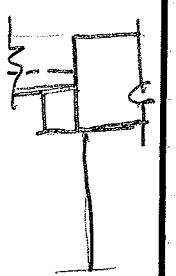
Bm design @ storage & office



$BmWT = 2.25 \times 1.09 \times 0.15 = 0.378$

$\times 1.2 = 0.44^{K/\prime}$

slab



$DL = 10 \times 0.076 = 0.76 + 0.44 = 1.2$

$LL = 10 \times 0.2 = 2$

TL . $3.2^{K/\prime}$

BTWN Columns

$+M_{end} = \frac{1}{11}\, 3.2 \times 19^2 = 105^{K\prime}$

$A_{sr} = \frac{105}{F \times 19.5} = 1.34$

$A_{sm} = 1.58 \quad 4\text{-}\#6$

$V_u = \frac{1.15}{2} \times 3.2 \times 19 = 34.96^K$

$\phi V_c = 0.75 \times 2 \times \sqrt{4000} \times 19 \times 24 = 43.3^K$

$\frac{\phi V_c}{2} < V_u \Rightarrow$ min. Asv. req'd. 21.6

$= 0.083 \times 24 \times 10 = 0.2''^{\square}$

$\Rightarrow \#3 @ 10''$

Negative M $\frac{1}{9} \times 3.2 \times 19^2 = 128.4^{K\prime}$

$\Rightarrow A_s = 1.53''^{\square}$

2-#6 CONT

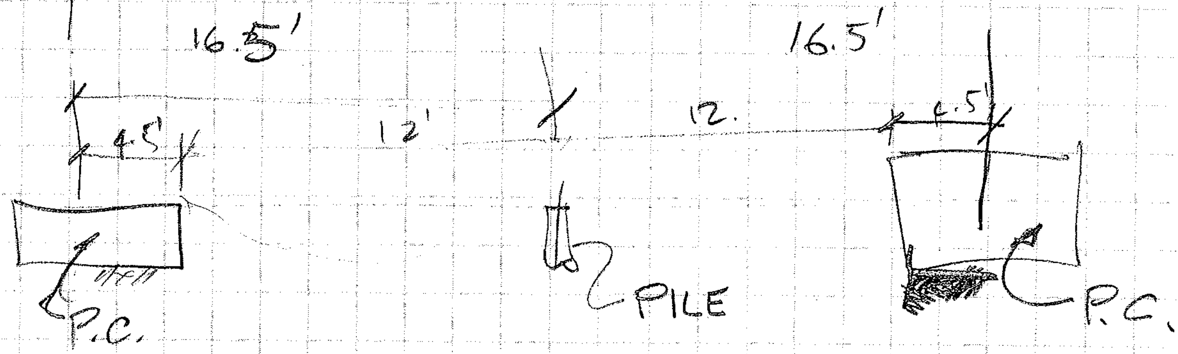
1-#8 x 12'-6 centered on pile.

	JLS	4/4/06	230

MORPHY, MAKOFSKY, INC.

BM @ COL

worst case.



$-m = \frac{1}{8} w l^2 = \frac{1}{8} \times 3.2 \times 12^2 = 57.6^{k'}$

$A_{s\,req} = 0.8''^{\square}$

$A_{s.min} : 1.5''$

TOP 2 - #8

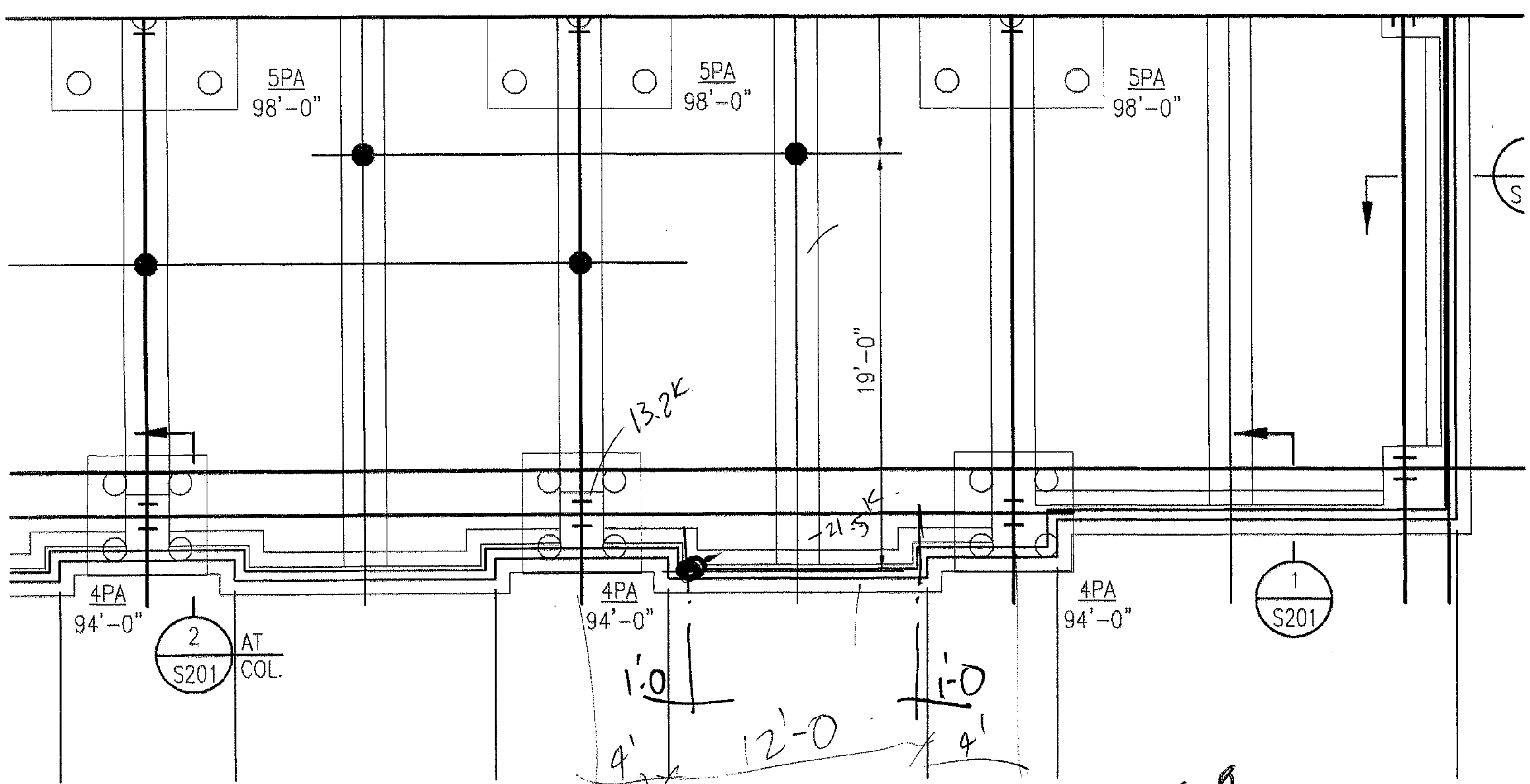
bot 4 - #6

$V_U = \frac{1.15}{2} \times 3.2 \times 12 = 22^K$

see prev

	JLS	4.4.06	239

MORPHY, MAKOFSKY, INC.



2+1.16
=.91
12.42

21.8
+10.75 ✓

BRICK - 0.64
CMU - 0.88
C.B - 0.6
G.W - 0.3

2.42 k/'

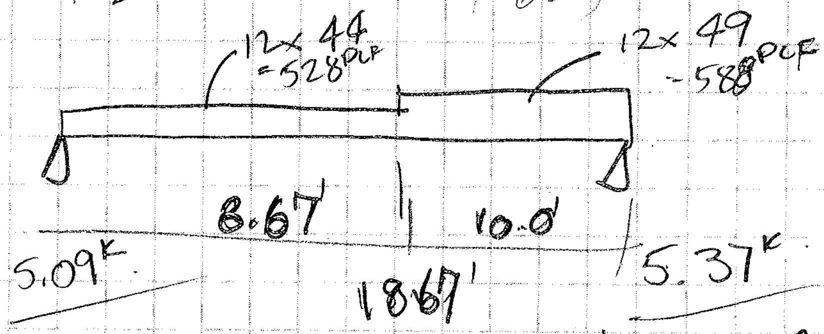
232

Horizontal wall suppt @ Assembly hall

Corner. S = 18.67'

w = 12x

(60)



x = 9.13' ⇒ M = 24.52 k'

l/600 ⇒ 5/384 ... 18.67 x 12 / 600 = 5 x 0.588 x 18.67^4 x 12^4 x 1728 / 384 x 29 x 10^3 x I

I = 125.33 in^4

TS 10 x 8 x 0.3125

$f_b = \frac{25.62 \times 12}{30.8} = 10$ ksi

Δ ≈ 0.36" ≈ l/619 ✓ OK

< l/600

interior S = 21.2 w = 0.528 k/'

M = 29.58 k' ✓

Δ = 0.53" ⇒ l/482 (NO)

Not TS 12 x 8 x 1/4 wt = 33 I = 196 ; 10 x 8 x 5/16 wt = 36

use

	JLS	4/4/06	233

MORPHY, MAKOFSKY, INC.

_e Number for this job

Note # suffix in Gen Note list

Filenames for these notes are prefixed "GN"

06018

Jack. Bar. 141st R.C.
Blitch/Broadmoor

MJ 4/5/06
TO JLS

C4. ~~MODIFIED CLASS 5 TREATED TIMBER POLES:~~
THIS NOTE VOID

C5. PILES:
WOOD-CONCRETE COMPOSITE PILES (
A. SYMBOL ON PLAN:
B. SYMBOL IN DETAILS:
C. TIP ~~PENETRATION BELOW FIRST FLOOR~~ ELEVATION: (-) 60.0 FEET (ASSUMES EXIST. GD. = 0.00 FEET)
D. LOWER TIMBER SECTION:
1. TYPE: UNTREATED TIMBER PILE, A.S.T.M. D25
2. MINIMUM TIP DIAMETER: 7"
3. MINIMUM DIAMETER 3'-0" FROM BUTT: 12"
4. LENGTH: 48 FEET
E. CONCRETE UPPER SECTION:
1. TYPE: CAST-IN-PLACE CONCRETE
2. STRENGTH: ~~3,000~~ 4,000 P.S.I. AT 28 DAYS
3. CASING: SEE SPECIFICATIONS
4. CONNECTOR: SEE SPECIFICATIONS
5. LENGTH: AS REQUIRED TO EXTEND FROM BUTT OF TIMBER LOWER SECTION TO CUT-OFF ELEVATIONS.
6. REINFORCING: REFER TO DRAWINGS
F. PREDRILL: To ELEVATION (-) 10.0 feet with a 6" diameter bit.
G. HAMMER: VULCAN NO. 1 (15,000 ft.-lbs. per blow)
H. EXPLORATORY PILES: 15 TOTAL - LAST 3 TO BE LOCATED AFTER FIRST 12 ARE DRIVEN
I. LOAD TEST: TWO - REFER TO SPECIFICATIONS
J. DESIGN LOAD: 25 TONS

~~C6. PILES:~~
~~WOOD-CONCRETE COMPOSITE PILES~~
~~A. TIP PENETRATION BELOW EXISTING GROUND SURFACE: 80'-0~~
~~B. LOWER TIMBER SECTION:~~
~~1. TYPE: UNTREATED TIMBER PILE, A.S.T.M. D25~~
~~2. MINIMUM TIP DIAMETER: 7"~~
~~3. MINIMUM DIAMETER 3'-0" FROM BUTT: 13"~~
~~4. LENGTH: 66 FEET~~
~~C. CONCRETE UPPER SECTION:~~
~~1. TYPE: CAST-IN-PLACE CONCRETE~~
~~2. STRENGTH: 3,000 P.S.I. AT 28 DAYS~~
~~3. CASING: SEE SPECIFICATIONS~~
~~4. CONNECTOR: SEE SPECIFICATIONS~~
~~5. LENGTH: AS REQUIRED TO EXTEND FROM TOP OF TIMBER LOWER SECTION TO CUT-OFF ELEVATIONS.~~
~~D. PREDRILL: 50 FEET WITH 8" DIA. 4 BLADE FISH TAIL BIT~~
~~E. HAMMER: VULCAN NO. 1~~
~~F. EXPLORATORY PILES: NONE REQUIRED~~
~~G. LOAD TEST: NONE REQUIRED~~
~~H. DESIGN LOAD: $\frac{(7+13)\pi \times 66 \times 150}{2 \times 12}$ = 26,000 LBS = 13 TONS~~

ABOVE ALSO APPLIES TO 06020 BILLETING

MJ 4/5/06

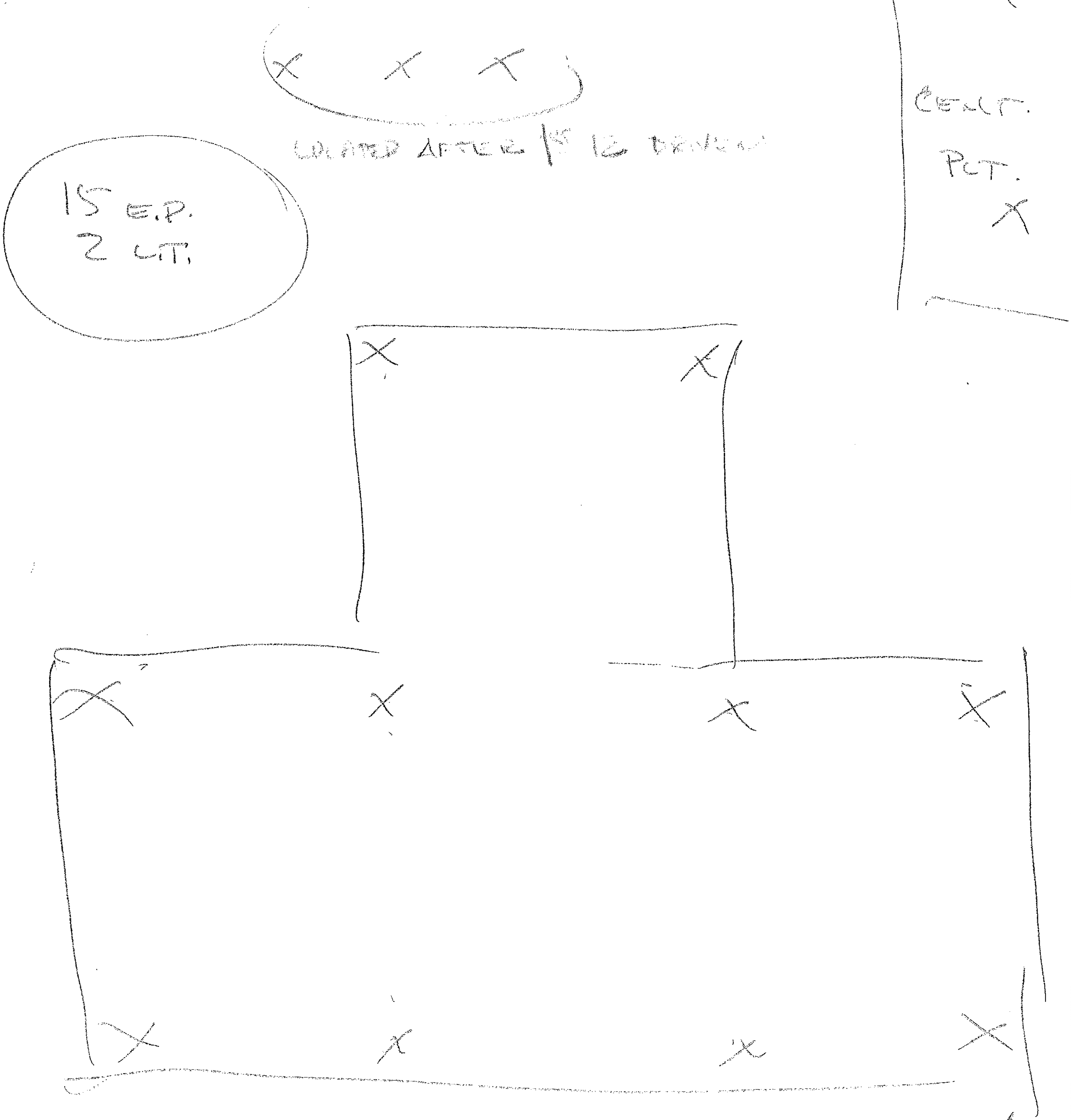
224

MORPHY, MAKOFSKY INCORPORATED Consulting Engineers

Reprinted 17 Dec 99

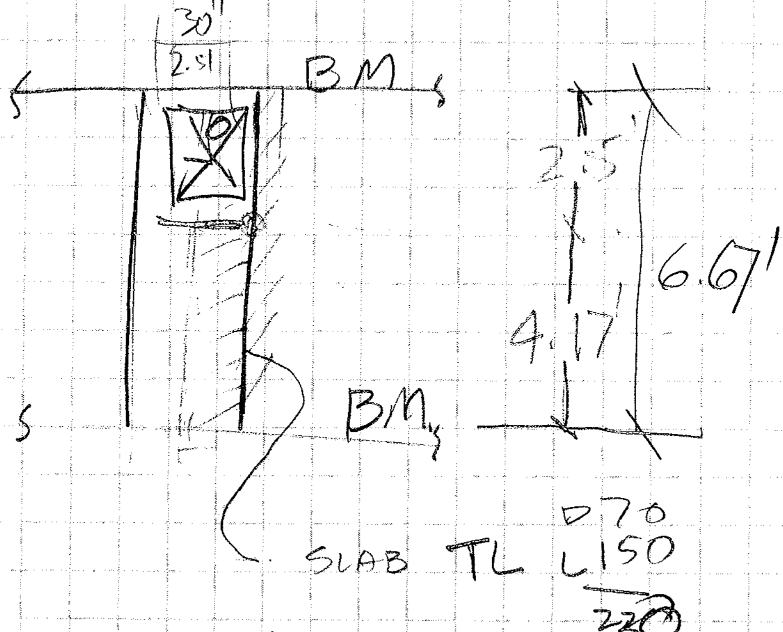
14L3T

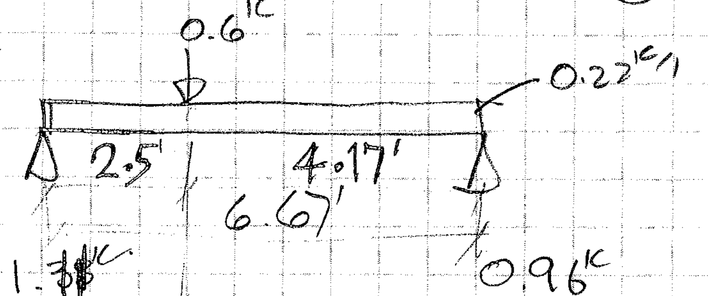
3/30/06



235

Framing @ SLAB OP'NG





M = 2.1 k'   C8x11.5 OK

L 4x4x3/8 $f_b = \frac{2.1 \times 12}{1.52} = 16.5$ ksi ✓

$\Delta = 0.18''$ 1/4.. / ok

	JLS	4-10-06	23/0

MORPHY, MAKOFSKY, INC.

Seismic

$S_{ms} = F_a S_s$ 0.325 S_s = 13 % g F_a = 2.5

$S_{m1} = F_v S_1$ ~~0.134~~ 0.193 S_1 = ~~0.0~~5.5 % g. Fv = 3.5

site class E

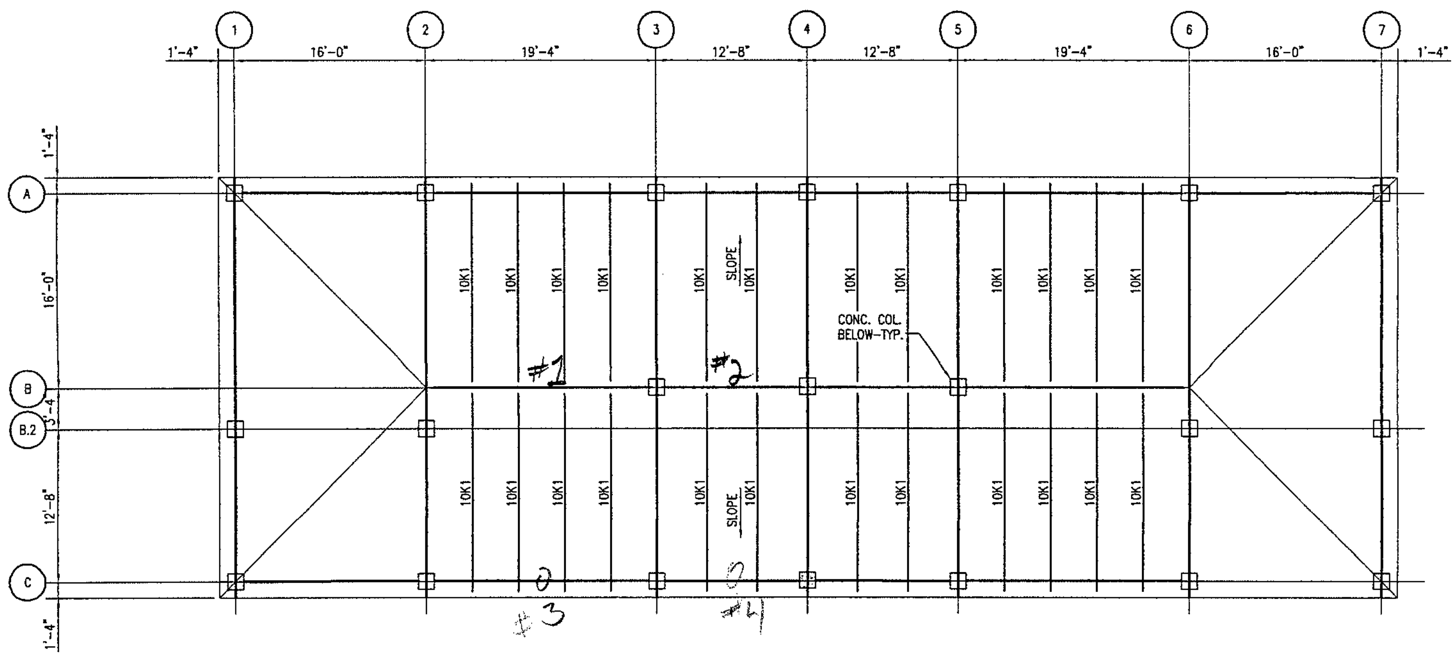
$S_{DS} = \frac{2}{3} \times$ 0.325 = 0.

$S_{D1} = \frac{2}{3} \times$ 0.193 = 0.117

	JLS	4-20-06	227

MORPHY, MAKOFSKY, INC.

CENTRAL PLANT.


1
2
3
4
5
6
7
A
B
B.2
C
1'-4"
16'-0"
19'-4"
12'-8"
12'-8"
19'-4"
16'-0"
1'-4"
3'-4"
10K1
SLOPE
CONC. COL. BELOW-TYP.
#1
#2
#3
#4

238

Loads

DL

STL	5 psf
MD	2 psf
INSUL	1 psf
METAL	2 psf
MISC	5 psf

$DL = 15 psf$

$D_{Lf} = 15 \times 1.05 = 15.8$ psf

$LL_p = 20 \times 1.05 = 21.1$ psf

Wind

+18.5
-38

$D + L = 36.9$ psf

$D + .75(21.1 + 18.5) = 45.5$ psf

$.6D + w = 27.98$

$(45.5 psf)(4.5 ft) = 205$ plf

uplift

$.6D - W = .6(15.8) - (38) = -28.5$ psf

$(28.5 psf)(4.5 ft) = 128.25$ use 130 plf

29

MORPHY, MAKOFSKY, INC.

16 ft span

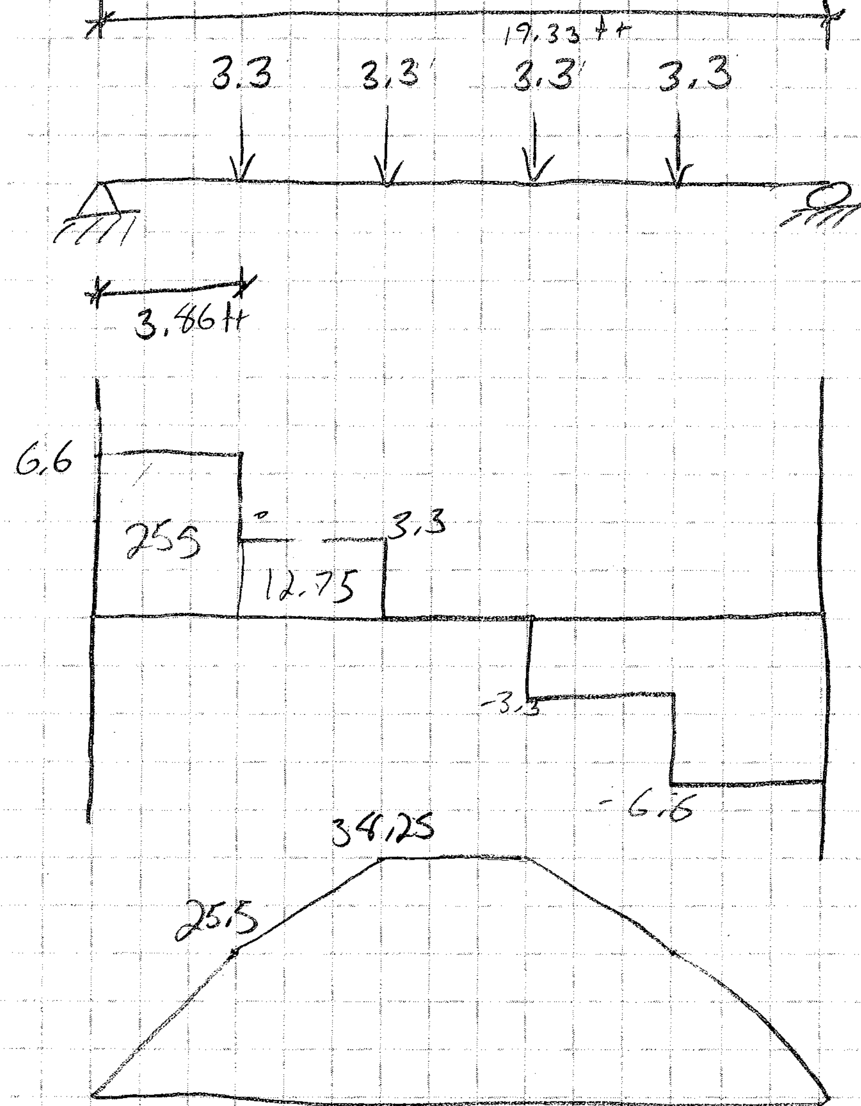
TL = 205 plf

LL =

Use 10K1

240

Beam #1



$$S_x = \frac{(38.25)(12)}{33} = 13.9 \qquad 14 \text{ in}^3$$

Try W12x22 $\qquad S_x = 25.4 \qquad \frac{l}{240} = .96 \text{ in}$

deflection

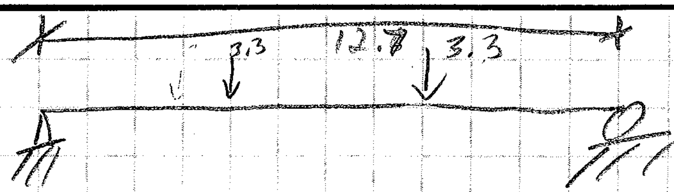
$$f_b = \frac{(38.25)(12)}{25.4} = 18.2 \text{ Ksi} \qquad \Delta = \frac{(18.2)(19.33)^2}{12 \times 10^3} = .566 \text{ in}$$

ok

Use W12x22

201

#2 + #4



14.85 ft-kip

$$S_x = \frac{(15)(12)}{33} = 5.45$$

W12 x 14 $S_x = 14.9\ in^3$

$$\frac{(15)(12)}{14.9} = 12\ ksi$$

$$\Delta = \frac{(12)(12.7)^2}{12 \times 10^3} = .16$$

$$\frac{l}{240} = .63$$

W12x14

242

MORPHY, MAKOFSKY, INC.

#3

19.3 ft-kip

$$S_x = \frac{(19.3)(12)}{33} = 7.2$$

Try W12x14 $S_x = 14.9$

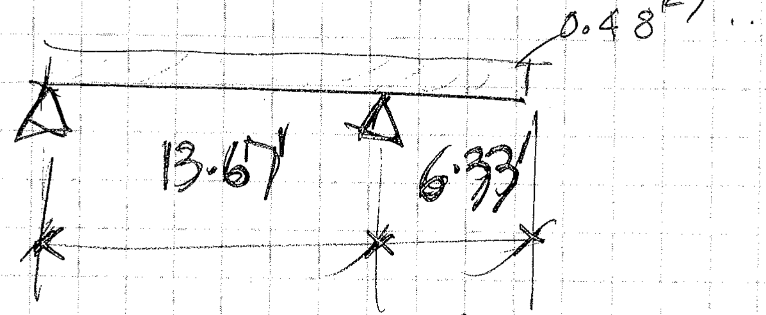
$$f_b = \frac{(19.3)(12)}{14.9} = 15.6$$

$$\Delta = \frac{(15.6)(19.33)^2}{12 \times 10^3} = .49$$

Use W12x14

2 of 3

Cooling tower suppt framing plan.



2.58 / 7.02K /

$M_1 = 6.94^{K'}$ $M_0 = 9.62^{K'}$

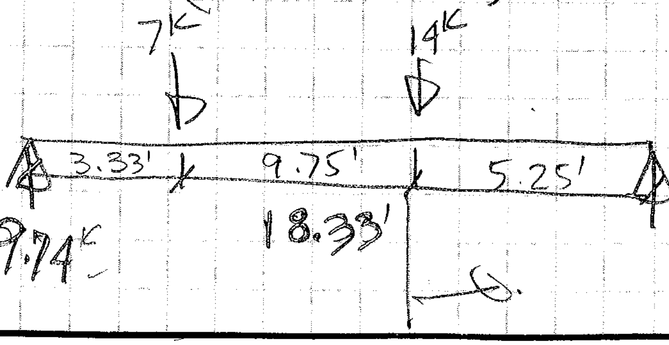
W12x40 $f_b = \frac{9.62 \times 12}{51.9}$

$= 2.23^{ksi}$ 4.5

$F_b = \frac{12 \times 10^3}{6.33 \times 2.9} = 54.5$

W12x30 $f_b = 3^{ksi}$ $F_b = 36$ OK ⇒ 30^{ksi} governs

(if doubled) OK ✓ OK.



14x43 $f_b = 11.3^{ksi}$
$F_b = 16.9^{ksi}$

$M = 59.1^{K'}$

W14x34 $f_b = 14.6^{K}$
(18.33' ⇒ $F_b = 11.96^{ksi}$)

	JLS	4-20-06	

MORPHY, MAKOFSKY, INC.

P=25°

H=10'-0 P6 STD

OK

265

MORPHY, MAKOFSKY, INC.

2ND FLR SLAB

6" con	75	
clg	5	
DL	80	x1.2 = 96
LL	150	x1.6 = 240
		336

$\frac{1}{8} \times 0.34 \times 10.67^2 = 4.84^{K'}$

$As_{req} = \frac{4.84}{4 \times 4.75} = 0.25^{"}$

#4@10" = 0.24

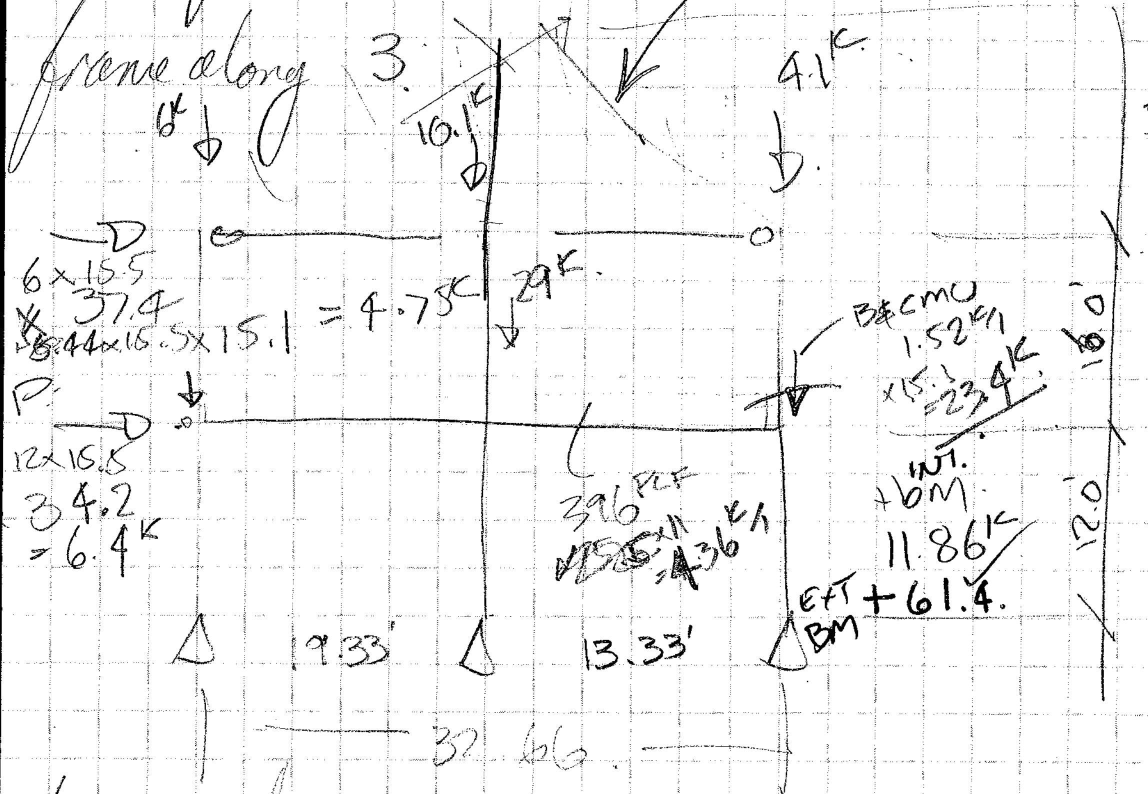
→ #4@9"

246

Central plant

D 20 ×1.2 24
L 20 ×1.6 32

frame along 3.



bay width = (18.33 + 12.67) / 2 = 15.5'

6" SLAB	75		
BM's	50		
CLG	5		
DL	130	×1.2	156
LL	150	×1.6	240
	280		396

Do not reduce live load in wind ag's for mech units.

JLS | 4-21-06 | 247

Column.

$P_u = 126^k$ $M = 66^{k'}$

24" x 24" col

~~8~~ 8-#8 OK.

Bm's

$M_u = 178^{k'}$ $V_u = 49^k$

$A_{s\,req} = \frac{178}{4 \times 21} = 2.2^{\square"}$ => 3-#8 T&B

$A_{s\,w} = 1.67"$

$\phi V_c = 0.75 \times 2 \sqrt{4000} \times 21 \times 24 = 47.8^{k}$

=> #4 bar will work

2b2

MORPHY, MAKOFSKY, INC.

```
****************************************************
*                                                  *
*          STAAD.Pro                               *
*          Version  2003    Bld 1002.US            *
*          Proprietary Program of                  *
*          Research Engineers,  Intl.              *
*          Date=    APR 21, 2006                   *
*          Time=     8:23:33                       *
*                                                  *
*      USER ID: morphy makofsky inc                *
****************************************************
```

```
 1. STAAD PLANE
 2. START JOB INFORMATION
 3. JOB NAME JACKSON 141ST
 4. JOB CLIENT BROAD/BLITCH
 5. JOB NO 06018
 6. ENGINEER NAME JLS
 7. ENGINEER DATE 21-APR-06
 8. END JOB INFORMATION
 9. INPUT WIDTH 79
10. UNIT FEET KIP
11. JOINT COORDINATES
12. 1 0 0 0; 2 0 12 0; 3 0 28 0; 4 19.33 0 0; 5 19.33 12 0; 6 19.33 28 0
13. 7 32.66 0 0; 8 32.66 12 0; 9 32.66 28 0
14. MEMBER INCIDENCES
15. 1 1 2; 2 2 3; 3 4 5; 4 5 6; 5 7 8; 6 8 9; 7 2 5; 8 5 8; 9 3 6; 10 6 9
16. DEFINE MATERIAL START
17. ISOTROPIC CONCRETE
18. E 453600
19. POISSON 0.17
20. DENSITY 0.14999
21. ALPHA 5.5E-006
22. DAMP 0.05
23. ISOTROPIC STEEL
24. E 4.176E+006
25. POISSON 0.3
26. DENSITY 0.489024
27. ALPHA 6.5E-006
28. DAMP 0.03
29. END DEFINE MATERIAL
30. CONSTANTS
31. MATERIAL CONCRETE MEMB 1 TO 8
32. MATERIAL STEEL MEMB 9 10
33. MEMBER PROPERTY AMERICAN
34. 1 TO 8 PRIS YD 2 ZD 2
35. MEMBER PROPERTY AMERICAN
36. 9 10 TABLE ST W12X35
37. SUPPORTS
38. 1 4 7 PINNED
39. LOAD 1 DEAD LIVE
40. JOINT LOAD
41. 2 FY -40.6
```

299

```
42. 5 FY -29
43. 8 FY -96.7
44. 3 FY -6
45. 6 FY -10.1
46. 9 FY -4.1
47. MEMBER LOAD
48. 7 8 UNI GY -4.36
49. LOAD 2 DEAD LIVE WIND
50. JOINT LOAD
51. 2 FY -40.6
52. 5 FY -29
53. 8 FY -35.3
54. 3 FY -6
55. 6 FY -10.1
56. 9 FY -4.1
57. 2 FX 6.4
58. 3 FX 4.8
59. MEMBER LOAD
60. 7 8 UNI GY -4.36
61. PERFORM ANALYSIS
```

P R O B L E M   S T A T I S T I C S

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =      9/    10/     3
ORIGINAL/FINAL BAND-WIDTH=      3/      3/     10 DOF
TOTAL PRIMARY LOAD CASES =    2, TOTAL DEGREES OF FREEDOM =     21
SIZE OF STIFFNESS MATRIX =       1 DOUBLE  KILO-WORDS
REQRD/AVAIL. DISK SPACE  =    12.0/ 24676.7 MB,  EXMEM = 1585.5 MB
```

```
62. PRINT SUPPORT REACTION ALL
```

```
42. 5 FY -29
43. 8 FY -96.7
44. 3 FY -6
45. 6 FY -10.1
46. 9 FY -4.1
47. MEMBER LOAD
48. 7 8 UNI GY -4.36
49. LOAD 2 DEAD LIVE WIND
50. JOINT LOAD
51. 2 FY -40.6
52. 5 FY -29
53. 8 FY -35.3
54. 3 FY -6
55. 6 FY -10.1
56. 9 FY -4.1
57. 2 FX 6.4
58. 3 FX 4.8
59. MEMBER LOAD
60. 7 8 UNI GY -4.36
61. PERFORM ANALYSIS
```

P R O B L E M   S T A T I S T I C S

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =      9/    10/      3
ORIGINAL/FINAL BAND-WIDTH=      3/      3/     10 DOF
TOTAL PRIMARY LOAD CASES =     2, TOTAL DEGREES OF FREEDOM =      21
SIZE OF STIFFNESS MATRIX =        1 DOUBLE  KILO-WORDS
REQRD/AVAIL. DISK SPACE  =    12.0/ 24676.7 MB,  EXMEM = 1585.5 MB
```

```
62. PRINT SUPPORT REACTION ALL
```

250

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	4.33	86.13	0.00	0.00	0.00	0.00
	2	1.40	81.54	0.00	0.00	0.00	0.00
4	1	-2.42	116.70	0.00	0.00	0.00	0.00
	2	-7.11	112.10	0.00	0.00	0.00	0.00
7	1	-1.91	126.07	0.00	0.00	0.00	0.00
	2	-5.49	73.86	0.00	0.00	0.00	0.00

************** END OF LATEST ANALYSIS RESULT **************

63. PRINT MAXFORCE ENVELOPE NSECTION 24 LIST 1 TO 10

251

MEMBER FORCE ENVELOPE

ALL UNITS ARE KIP FEET

MAX AND MIN FORCE VALUES AMONGST ALL SECTION LOCATIONS

MEMB		FY/ FZ	DIST DIST	LD LD	MZ/ MY	DIST DIST	LD LD	FX	DIST	LD
1	MAX	-1.40	0.00	2	51.95	12.00	1			
		0.00	0.00	1	0.00	0.00	1	86.13 C	0.00	1
	MIN	-4.33	12.00	1	0.00	0.00	1			
		0.00	12.00	2	0.00	12.00	2	81.54 C	12.00	2
2	MAX	-1.77	0.00	2	0.85	16.00	1			
		0.00	0.00	1	0.00	0.00	1	6.02 C	0.00	1
	MIN	-2.63	16.00	1	-41.24	0.00	1			
		0.00	16.00	2	0.00	16.00	2	5.45 C	16.00	2
3	MAX	7.11	0.00	2	0.00	0.00	1			
		0.00	0.00	1	0.00	0.00	1	116.70 C	0.00	1
	MIN	2.42	12.00	1	-85.32	12.00	2			
		0.00	12.00	2	0.00	12.00	2	112.10 C	12.00	2
4	MAX	4.04	0.00	2	48.16	0.00	2			
		0.00	0.00	1	0.00	0.00	1	9.72 C	0.00	1
	MIN	1.50	16.00	1	-16.54	16.00	2			
		0.00	16.00	2	0.00	16.00	2	9.08 C	16.00	2
5	MAX	5.49	0.00	2	0.00	0.00	2			
		0.00	0.00	1	0.00	0.00	1	126.07 C	0.00	1
	MIN	1.91	12.00	1	-65.91	12.00	2			
		0.00	12.00	2	0.00	12.00	2	73.86 C	12.00	2
6	MAX	2.52	0.00	2	30.04	0.00	2			
		0.00	0.00	1	0.00	0.00	1	5.67 C	0.00	2
	MIN	1.13	16.00	1	-10.32	16.00	2			
		0.00	16.00	2	0.00	16.00	2	4.47 C	16.00	1
7	MAX	39.51	0.00	1	178.35	19.33	2			
		0.00	0.00	1	0.00	0.00	1	6.04 C	0.00	2
	MIN	-48.79	19.33	2	-94.65	8.05	2			
		0.00	19.33	2	0.00	19.33	2	1.70 C	19.33	1
8	MAX	33.21	0.00	1	95.95	13.33	2			
		0.00	0.00	1	0.00	0.00	1	2.97 C	0.00	2
	MIN	-32.89	13.33	2	-32.36	7.78	1			
		0.00	13.33	2	0.00	13.33	2	0.78 C	13.33	1
9	MAX	0.02	0.00	1	5.98	19.33	2			
		0.00	0.00	1	0.00	0.00	1	6.57 C	0.00	2

```
   MIN    -0.55  19.33    2      -4.66   0.00    2
           0.00  19.33    2       0.00  19.33    2      2.63 C  19.33    1

10 MAX    -0.37   0.00    1      10.32  13.33    2
           0.00   0.00    1       0.00   0.00    1      2.52 C   0.00    2
   MIN    -1.57  13.33    2     -10.56   0.00    2
           0.00  13.33    2       0.00  13.33    2      1.13 C  13.33    1
```

********** END OF FORCE ENVELOPE FROM INTERNAL STORAGE **********

64. PRINT JOINT DISPLACEMENTS ALL

259

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
1	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00009
	2	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00054
2	1	0.01058	-0.00684	0.00000	0.00000	0.00000	-0.00042
	2	0.08591	-0.00647	0.00000	0.00000	0.00000	-0.00071
3	1	0.02203	-0.00747	0.00000	0.00000	0.00000	0.00011
	2	0.16206	-0.00705	0.00000	0.00000	0.00000	-0.00021
4	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00016
	2	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00086
5	1	0.01036	-0.00926	0.00000	0.00000	0.00000	0.00012
	2	0.08514	-0.00890	0.00000	0.00000	0.00000	-0.00002
6	1	0.01999	-0.01029	0.00000	0.00000	0.00000	-0.00011
	2	0.15696	-0.00986	0.00000	0.00000	0.00000	-0.00043
7	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00014
	2	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00080
8	1	0.01029	-0.01001	0.00000	0.00000	0.00000	0.00008
	2	0.08488	-0.00586	0.00000	0.00000	0.00000	-0.00015
9	1	0.01938	-0.01048	0.00000	0.00000	0.00000	-0.00009
	2	0.15561	-0.00646	0.00000	0.00000	0.00000	-0.00041

************** END OF LATEST ANALYSIS RESULT **************

65. PRINT SECTION MAX DISPL NSECT 12 LIST 1 TO 10

264

MAX MEMBER SECTION DISPLACEMENTS

UNIT= INCH FOR FPS AND CM FOR METRIC/SI SYSTEM

MEMBER	MAX DISP	LOCATION	LOAD	L/DISPL
1	0.00952	84.00	1	15124
2	0.01319	80.00	1	14557
3	0.01564	84.00	2	9209
4	0.01095	64.00	2	17530
5	0.01208	84.00	2	11921
6	0.00683	64.00	2	28106
7	0.05166	96.65	2	4490
8	0.00640	93.31	1	24987
9	0.01131	173.97	2	20517
10	0.00649	39.99	2	24665

************ END OF SECT DISPL RESULTS ***********

66. FINISH

*********** END OF THE STAAD.Pro RUN ***********

**** DATE= APR 21,2006 TIME= 8:23:34 ****

```
*********************************************************
*     For questions on STAAD.Pro, please contact :      *
*  By Email - North America  : support@reiusa.com       *
*  By Email - International  : support@reiworld.com     *
*  Tel. (USA) : 714-974-2500 ; Fax (USA) : 714-974-4771 *
*********************************************************
```

255

Chiller/Mech Central Plant

2ND

6" SLAB	75
BM'S	30
CLG	5
DL	110
LL	150
TL	260 PSF

(use to approx pile cap).

ROOF

STRUCT. DECK	2
INS. & ARCH. deck	3
JST.	5
STL	5
DL	15
LL	20
	35

EXT. WALL BRICK 40
BLOCK 55

95 PSF

1-2 12'
2-Roof 12' > 24' w = 2.28 k/'

JLS	4/5/06	256

MORPHY, MAKOFSKY, INC.

Col ~~4~~-B

$A = 12.67 \times 16 = 203^{\square'}$

$P_{2\#R} = 203(35 + 260) = 59.9^K$

$+ 15^K$

3-B

$A = 16 \times (9.67 + 6.33) = 256^{\square'}$

$P_{2\#R} = 76^K$ ✓

$3PA = 46 \times 3 = 138^K$ ok

Col 24" x 24" ok

	JLS	4/5/06	257

MORPHY, MAKOFSKY, INC.

3-A

$A_t = 9 \times 16 = 144^{\square'}$

$P = 0.345 \times 144 + 16 \times 2.28 = 86^k$

1ST FLOOR

$144 \times 0.213 = 31^k$

117^k

3PA

$\approx 138^k$

JLS	4/5/06	258

MORPHY, MAKOFSKY, INC.

1ST FLOOR

5" SLAB	63
BM	25
DL	88
LL	125 PSF Light STORAGE
	213 PSF

PLAZA.

5" SLAB	63		
Bm	25		
DL	88	x1.2	106
LL	100	x1.6	160
TL	188		266

Bms @ 10.5'

w. 2'-1

=> Pile @ 25'-0 O.C. max.

JL3 4/10/06 260

MORPHY, MAKOFSKY, INC.

Generator

– 38000#

tank = 10000#

fuel diesel 12500 gal × 6.7 = 83750#

131,750#

132K

JLS 4/21/06 261

MORPHY, MAKOFSKY, INC.