CORPS OF ENGINEERS, U.S. ARMY
MOBILE DISTRICT
Design Analysis
20 and 15 Meter Water Towers
Afghanistan
17 December 09

1. Design References:

a. ACI 318 (2005), Building Code Requirements for Reinforced Concrete

b. AISC (2005), American Institute of Steel Construction, Allowable Stress Design

c. ASCE 7-05, Minimum Design Loads for Buildings and Other Structures

d. AWWA D100 2005, Seismic Design of the American Water Works Association

2. General Description and Requirements:

Mobile District was requested by AED to design a 20 meter and 15 meter tower to support a modular water tank for use at various locations in Afghanistan. Requirements for the design were as follows:

1. Use section 13, Seismic Design of the American Water Works Association manual, AWWA D100 2005.

2. Modular water tanks; 7000 gallon, 9000 gallon, and 4600 gallon having 1.08 meter modular cells and an overall 3.24 meter footprint.

3. Weight and contents shall be used in calculating the equivalent lateral force for seismic design.

4. Compression diagonal bracing is not allowed per AWWA.

5. P-delta effects from lateral deflection shall be three times the elastic deflection. Apply the calculated deflection as a load.

6. Connection shall be designed to show that a stress equal to 4/3 times the minimum yield can be developed in the bracing without failure of the connections, wing plates, struts, or anchor bolts.

7. Foundation shall be checked using a lateral seismic force sufficient to yield the diagonal bracing.

8. Anchor bolt connections to the foundations shall be designed for the combined vertical and lateral forces for shear and overturning in accordance with ACI 318 Appendix D and ASCE 7-05.

9. Maximum weight of any member shall be 200 lbs.

10. Use local structural steel member sizes in the plans.

10. Welding will not be allowed.

3. Tower Design:

At the request of AED, four single angles were to be used for the columns of the tower. These can be bolted together and spacer and gusset plates can easily be inserted where required. Since the modular tank foot print is 3.24 meters square, a 5.0 meter square column spacing was used for the square four column structure. This will give approximately a 0.880 meter walkway around the tank. Initially the 20 meter tower had 5 levels, 4 meters for each level, and the 15 meter tower had 4 levels, 3.75 meters for each level. For the sake of simplicity, AED requested both towers be designed to 5 meter level heights so one level could be removed from the 20 meter tower to construct the 15 meter tower using the same structural members.

Using angles instead of rods for diagonal bracing made it difficult to meet the maximum slenderness ratio, kl/r, of 300 for tension members. This is not a requirement in AWWA since rods are used in welded water tanks. Since a single angle gives a stress ratio of 0.28, rather than use a double angle for bracing that would require much more structural steel, the kl/r requirement was waived by AED.

A 5.50 meter (18') square base dimension was initially used. This caused the platform girders to greatly exceed the requested weight limit. The footprint was reduced to 5.0 meters square (16.4'), which reduced the weight somewhat. But when trying to use the available member sizes, the girder weight increased to approximately 340 pounds. AED suggested extending the columns above the tower platform by 1.5 meters to support a beam for attaching a pulley for hoisting the heavier members. This was implemented into the plans.

An analysis of P-delta effects using a lateral deflection of three times the elastic deflection was performed. This was done by applying a lateral load at the top of the tower that would give the required deflection. No members in the structure model failed after this load was applied.

AWWA requires the connection design show that a stress equal to 4/3 times the minimum yield can be developed in the bracing without failure. This design would require as many as 15 bolts in the 100x100x10 angle. ASCE 7 required the connection to be two times the load in the member being attached. This analysis was used and resulted in three 1" diameter bolts in single shear.

An access ladder and 900mm wide platform is located along one side of the water tower. On the 20 meter water tower, the platform is at the 10 meter height (2nd level). The ladder is enclosed in a cage from approximately 2200 mm above the tower foundation to the landing and from approximately 2200 mm above the landing to the tower platform. On the 15 meter water tower, the platform is at the 5 meter height (1st level). The ladder is enclosed in a cage form 2200 mm above the landing to the tower platform only.

An 8mm thick steel checker plate was used on the platform beams to support the water tank as well as the ladder landing.

4. Foundation:

AWWA's requirement in designing the foundation using a lateral seismic force sufficient to yield the diagonal bracing resulted in an extremely large matt foundation. Since angles are used for diagonals and not rods, the larger cross sectional area of the angle called for a much larger load to be applied to the top of the tower to fail the diagonal. AED agreed that this was not practical and directed MDO to use the actual calculated lateral seismic force and use an overturning factor of safety of 3.0. This resulted in a 7600 mm square by 680 mm thick reinforced concrete foundation. The top of the foundation was placed 535 mm below grade and 650 mm high concrete pedestals 1000 mm square were centered under the columns to allow the tower embedded structural steel foundation plates to be above grade to help prevent corrosion.

5. Design Loads:

a. Platform Floor Live Load:	195 kg/m2 (40 psf)
b. Water Tank Dead Load	7000 gal (20 meter tower) 9000 gal (15 meter tower)
c. Wind Velocity	135 km/hr (84 mph)
Exposure	D
Importance Factor	1.0 (per user)
d. Seismic	IBC 2006
Occupancy Category	II
Importance Factor	1.0 (per user)
Site Classification	D
Ss	1.28 g
S1	0.51 g

6. Materials:

a. Concrete:	28 MPa @ 28 days (f'c = 4.0 ksi)

b. Reinforcing Steel	420 MPa (Fy = 60 ksi)
c. Structural Steel	250 MPa (Fy = 36 ksi)
d. Bolts	ASTM A307

STRUCTURAL DESIGN CALCULATIONS

CORPS OF ENGINEERS, U.S. ARMY
MOBILE DISTRICT

Subject: WATER TANK AFGHANISTAN
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Computed by: MDT
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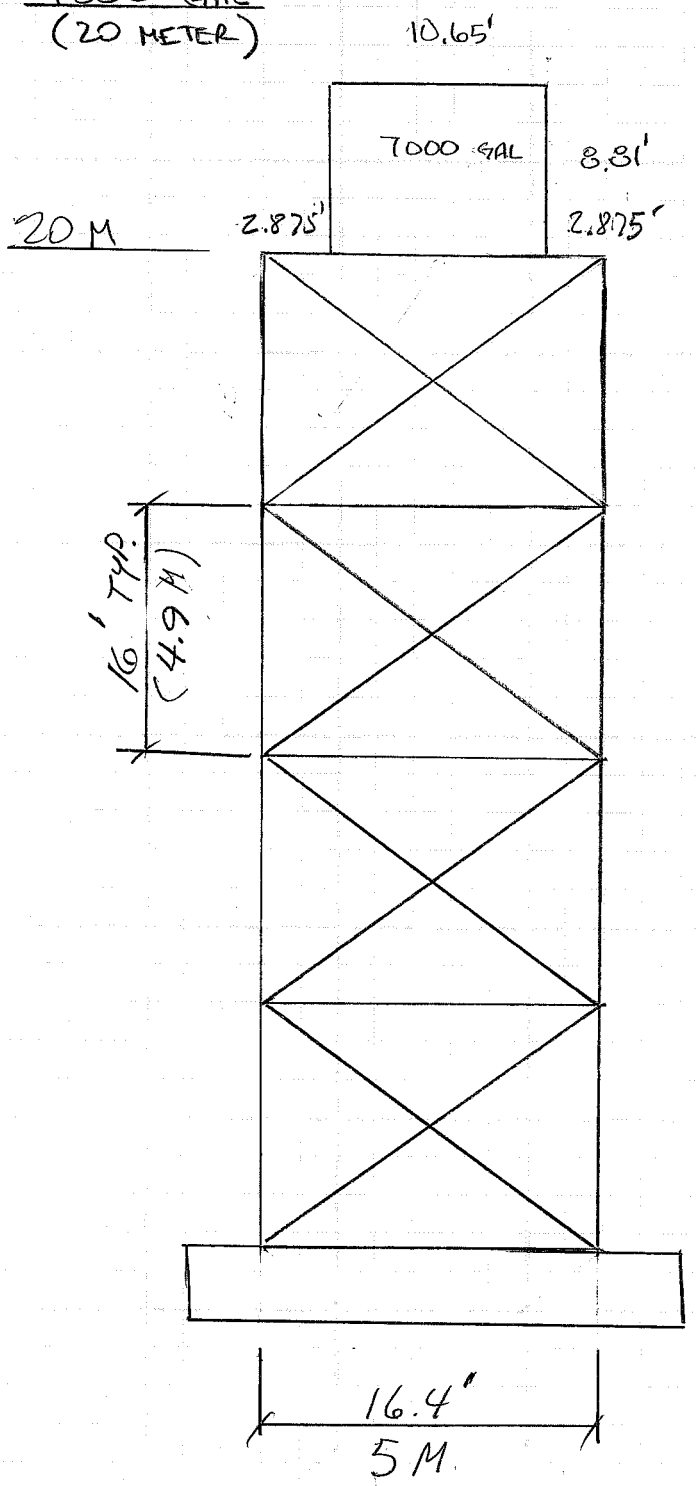
Symbol

7000 GAL
(20 METER)



CORPS OF ENGINEERS, U.S. ARMY
MOBILE DISTRICT

Subject WATER TANK TOWERS AFGHANISTAN File No. Pages, Page Date 11-6-09
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EARTHQUAKE ANALYSIS AWWA D100-05 CHAPTER 13.

$S_S = 1.28g$
$S_1 = 0.51g$ } UFC 3-310-01 TABLE D-2

ASSUME SITE CLASS D

$F_a = 1.0$ (PER TABLE 26)

$F_v = 1.5$ (PER TABLE 27)

$I_E = 1.0$ (PER CUSTOMER)

RESPONCE MODIFICATION FACTOR (TABLE 28)

CROSS-BRACED COLUMN-SUPPORTED ELEVATED TANK $R_i = 3.0$

$$S_{MS} = F_a S_S = (1.0)(1.28g) = 1.28g \quad \text{Eq 13-5}$$

$$S_{M1} = F_v S_1 = (1.5)(0.51g) = 0.765g \quad \text{Eq. 13-6}$$

DESIGN RESPONSE ACCELERATION

$$S_{DS} = U S_{MS} = (2/3)(1.28g) = 0.853g$$

$$S_{D1} = U S_{M1} = (2/3)(0.765g) = 0.510g$$

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$T_i = T_a = C_t h_n^x$ (ASCE 7-05, 12.8.7)

$C_t = 0.02$ $h_n = (20\,m)(3.28') = 65.6'$

$X = 0.75$

$T_i = T_a = 0.02\,(65.6)^{0.75} = 0.46$

$T_s = S_{D1}/S_{DS} = 0.51/0.853 = 0.60$

$0 \le T_i \le T_s \quad \therefore \quad S_{ai} = S_{DS}$ (Eq. 13-9)

$= 0.853g$

DESIGN ACCELERATION, A_i

$$A_i = \frac{S_{ai}\, I_E}{1.4 R_i} \ge \frac{0.36\, S_1\, I_E}{R_i} \quad \text{(Eq. 13-16)}$$

$$A_i = \frac{(0.853g)(1.0)}{1.4(3.0)} \ge \frac{(0.36)(0.51g)(1.0)}{3.0}$$

$A_i = 0.126g \ge 0.06g$

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EARTHQUAKE ANALYSIS ASCE 7-05 CHAPTER 15.

$S_s = 1.28g$
$S_1 = 0.51g$

SITE CLASS D
$F_a = 1.0$ (TABLE 11.4-1)
$F_v = 1.5$ (TABLE 11.4-2)

$S_{MS} = F_a S_s = (1.0)(1.28g) = 1.28g$
$S_{M1} = F_v S_1 = (1.5)(0.51g) = 0.765g$

$S_{DS} = 2/3\, S_{MS} = (2/3)(1.28g) = 0.853g$
$S_{D1} = 2/3\, S_{M1} = (2/3)(0.51g) = 0.34g$

IMPORTANCE FACTOR, $I = 1.0$ (PER USER)
OCCUPANCY CATEGORY II

$S_{DS} = 0.853g \geq 0.50$ ∴ SEISMIC DESIGN CAT. = D (TABLE 11.6.1)

$S_{D1} = 0.34g \geq 0.20$ ∴ SEISMIC DESIGN CAT. = D (TABLE 11.6.2)

USE "D"

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

CORPS OF ENGINEERS, U.S. ARMY
MOBILE DISTRICT

File No.
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EQUIVALENT LATERAL FORCE METHOD

$$V = C_s W$$

$$C_s = \frac{S_{DS}}{\frac{R}{I}} = \frac{0.853g}{\frac{3}{1}} = 0.284g$$

$R = 3$ (PER TABLE 15.4-2)

$\Omega_0 = 2$

$C_d = 2.5$

$$T_a = C_t h_n^x$$

$$h_n = (20M)(3.28'/M) = 65.6'$$

$$\left.\begin{aligned} x &= 0.75 \\ C_t &= 0.02 \end{aligned}\right\} \text{TABLE } 12.8.2$$

$$T_a = (0.02)(65.6)^{0.75} = 0.46$$

$$C_u = 1.4$$

$$T \leq C_u T_a \leq (1.4)(0.46) \leq 0.645$$

$$C_s = \frac{S_{D1}}{T_a\left(\frac{R}{I}\right)} = \frac{0.34g}{(0.46)(3)} = 0.246$$

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Subject Seismic Calculations File No. _____ Pages, Page _____
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Earthquake Load Analysis

$S_s = 1.28$ $S_1 = 0.51$

Site Class D

$F_a = 1.0$ $F_v = 1.5$

$S_{MS} = F_a S_s = (1.0)(1.28) = 1.28\ g$

$S_{M1} = F_v S_1 = (1.5)(0.51) = 0.765\ g$

$S_{DS} = 2/3\ S_{MS} = 2/3\ (1.28) = 0.853$

$S_{D1} = 2/3\ S_{M1} = 2/3\ (0.765) = 0.51$

$S_{DS} = 0.853\ g$ "D"

$S_{D1} = 0.51\ g$ "D"

Seismic Design Category "D"

$$C_s = \frac{S_{DS}}{\left(\frac{R}{I}\right)} = \frac{0.853}{\left(\frac{3.0}{1.0}\right)} = 0.284$$

$R = 3$

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

CORPS OF ENGINEERS, U.S. ARMY
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TOWER LOADS FOR STAAD

$$7000 \text{ gal} \Rightarrow \frac{7000}{7.5}(62.5) = 58{,}333^{\#}$$

TANK LOAD TO PLATFORM BEAMS SUPPORTING TANK

$$W = \frac{58333}{16.4(4)} = 890^{\#/'}$$

SEISMIC VERT LOAD TO PLATFORM BEAMS

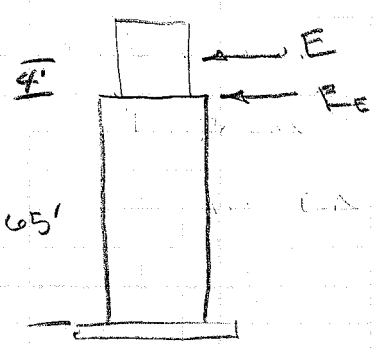
$$E_V = (S_{DS})(D)$$

$$= (.853)(890) = 760^{\#/'}$$

EST. TANK WT: (3 x 3 x 3 - 1080 MM³ CELLS)

$$W = 6{,}300^{\#} \qquad w = \frac{6300}{16.4(4)} = 96^{\#/'}$$

EQUIVALENT TANK & WATER SEISMIC LOAD TO PLATFORM



$$E = .284(58{,}333 + 6300) = 18{,}356^{\#}$$

$$E_E = \frac{18{,}356(69)}{65} = 19485^{\#}$$

1/4 TO EA PLATFORM CORNER

$$\frac{19{,}485}{4} = 4871^{\#}$$

ACCEL. STRUCT WT

20 JTS 18K TOTAL WT

$$P_E = \frac{18{,}000}{16}(.284) = 320^{\#}$$

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

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SNOW LOAD = 15 PSF

$w_1 = 15(4.5') = 67.5\#/1$

$w_2 = 15(2.25') = 33.8\#/1$ (EDGE BM)

LIVE LOAD (40 PSF)

PLATFORM = 3.67' WIDE

$w = \frac{3.67}{2}(40) = 73$ PLF

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

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WIND LOAD

$P_W = q_z G C_f \geq 30\ C_f$ (AWWA Eq 3.1)

$q_z = 0.00256\ K_z\ I\ V^2$ (AWWA Eq 3.2)

$V = 135\ Km/HR = 84\ mph$

$I = 1.15$

$K_z = 1.33$ Exp D @ $z = 69'$

$G = 1.0$

$C_f = 1.0$

$q_z = .00256\ (1.33)(1.0)(84)^2 = 24\ psf$

$P_W = 24\ (1.0)(1.0) = 24\ psf$

TANK SURFACE (VERT) $= (10.65)^2 = 113.4\ SF$

$F = 113.4\ (24) = 2722\#\ << E = 17{,}860\#$

SEISMIC CONTROLS

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

CORPS OF ENGINEERS, U.S. ARMY
MOBILE DISTRICT

Subject WATER TANK AF GHANISTAN File No. Pages, Page Date 11/09
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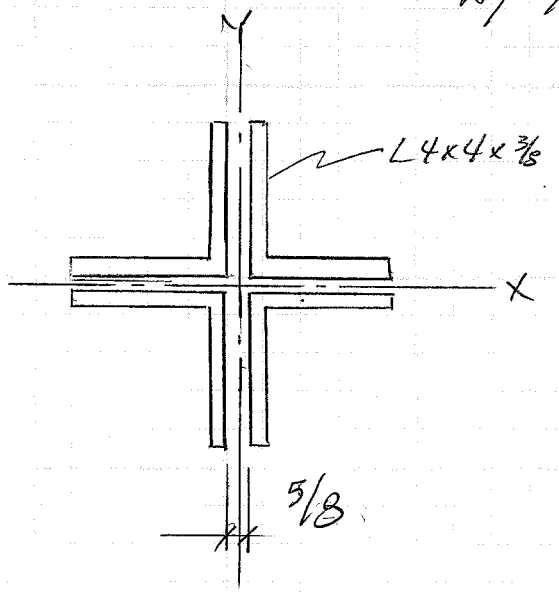
— PROPERTIES FOR 4 - L 4x4x 3/8 TOWER LEGS w/ 1/2" PL



$A = 2.86 \text{ in}^2$

$I_o = 4.36 \text{ in}^4$

$x = y = 1.14''$

$I = I_o + Ad^2$ $A_{TOT} = 4(2.86) = 11.44 \text{ in}^2$

$I_x = I_y = 4(4.36) + 4(2.86)(1.14 + .3125)^2$

$= 41.58 \text{ in}^4$

— PROPERTIES FOR 4 - L 4x4x 5/16 w/ 1/2" PL

$A = 2.40 \text{ in}^2$ $x = y = 1.12''$

$I_o = 3.71 \text{ in}^4$ $A_{TOT} = 4(2.4) = 9.6 \text{ in}^2$

$I_x = I_y = 4(3.71) + 4(2.4)(1.12 + .3125)^2$

$= 34.68 \text{ in}^4$

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

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$9000 \text{ gal} \Rightarrow \frac{9000}{7.5}(62.5) = 75{,}000^{\#}$

LOAD TO PLATFORM BEAMS SUPPORTING TANK

$W = \frac{75000}{16.4(4)} = 1143^{\#/'}$

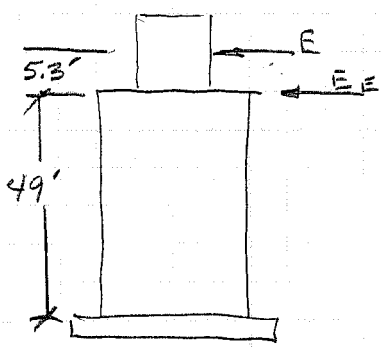
SEISMIC VERT LOAD TO PLATFORM BEAMS

$E_V = S_{DS} D = .853(1143) = 975^{\#/'}$

EST. TANK WT

$W = 6300^{\#} \quad w = 96^{\#/'}$

EQUIVALENT TANK & WATER SEISMIC LOAD TO PLATFORM



$E = .284(75000 + 6300) = 23{,}089$

$E_E = \frac{23{,}089^{\#}(54.3')}{49} = 25{,}587^{\#}$

1/4 TO EA PLATFORM CORNER

$\frac{25{,}587}{4} = 6397^{\#}$

ACCELERATED STRUCTURE WT

12 JTS 15^{K} TOTAL WT

$P_E = \frac{15^{K}}{12}(.284) = .355^{K}$

```
**************************************************
*                                                *
*           STAAD.Pro                            *
*           Version  2007    Build 03            *
*           Proprietary Program of               *
*           Research Engineers,  Intl.           *
*           Date=    NOV 20, 2009                *
*           Time=     9:29:56                    *
*                                                *
*      USER ID: USACE                            *
**************************************************
```

```
     1. STAAD SPACE - 65' HIGH X 16.4'X16.4' (20M HIGH X 5MX5M) 7000 GAL WATER TANK
INPUT FILE: Structure10.STD
     2. START JOB INFORMATION
     3. ENGINEER DATE 08-MAY-06
     4. END JOB INFORMATION
     5. UNIT FEET KIP
     6. JOINT COORDINATES
     7. 1 0 0 0; 2 0 16 0; 3 0 32 0; 4 0 48 0; 5 0 64 0; 6 16.4 0 0
     8. 7 16.4 16 0; 8 16.4 32 0; 9 16.4 48 0; 10 16.4 64 0; 11 0 0 16.4
     9. 12 0 16 16.4; 13 0 32 16.4; 14 0 48 16.4; 15 0 64 16.4; 16 16.4 0 16.4
    10. 17 16.4 16 16.4; 18 16.4 32 16.4; 19 16.4 48 16.4; 20 16.4 64 16.4
    11. 21 2.87 64 0; 22 5.54 64 0; 23 8.2 64 0; 24 10.87 64 0; 25 13.53 64 0
    12. 26 2.87 64 16.4; 27 5.54 64 16.4; 28 8.2 64 16.4; 29 10.87 64 16.4
    13. 30 13.53 64 16.4
    14. MEMBER INCIDENCES
    15. 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 2 7; 10 3 8
    16. 11 4 9; 12 5 21; 13 21 22; 14 22 23; 15 23 24; 16 24 25; 17 25 10
    17. 18 1 7; 19 2 8; 20 3 9; 21 4 10; 22 11 12; 23 12 13; 24 13 14; 25 14 15
    18. 26 16 17; 27 17 18; 28 18 19; 29 19 20; 30 12 17; 31 13 18; 32 14 19
    19. 33 15 26; 34 26 27; 35 27 28; 36 28 29; 37 29 30; 38 30 20; 39 2 12
    20. 40 3 13; 41 4 14; 42 5 15; 43 1 12; 44 2 13; 45 3 14; 46 4 15; 47 17 7
    21. 48 18 8; 49 19 9; 50 20 10; 51 6 17; 52 7 18; 53 8 19; 54 9 20
    22. 55 11 17; 56 12 18; 57 13 19; 58 14 20; 59 21 26; 60 22 27; 61 23 28
    23. 62 24 29; 63 25 30
    24. ELEMENT INCIDENCES SHELL
    25. 70 5 10 20 15
    26. START USER TABLE
    27. TABLE 1
    28. UNIT INCHES KIP
    29. GENERAL
    30. 4ANGLES
    31. *L4X4X3/8 W/ 5/8" SPACER PLATE
    32. 11.44 8.625 0.625 8.625 0.625 41.58 41.58 1 11.44 9.64 0 9.64 0 0 0 0
    33. END
    34. UNIT INCHES KIP
    35. MEMBER PROPERTY AMERICAN
    36. 1 TO 8 22 TO 29 UPTABLE 1 4ANGLES
    37. 18 TO 21 43 TO 46 51 TO 58 TABLE ST L40406
    38. 9 TO 11 30 TO 32 39 TO 41 47 TO 49 TABLE LD L40406 SP 0.625
    39. 12 TO 17 33 TO 38 TABLE ST W16X40
    40. 42 50 59 TO 63 TABLE ST W12X19
```

```
41. ELEMENT PROPERTY
42. 70 THICKNESS 0.25
43. UNIT FEET KIP
44. DEFINE MATERIAL START
45. ISOTROPIC STEEL
46. E 4.176E+006
47. POISSON 0.3
48. DENSITY 0.489024
49. ALPHA 6.5E-006
50. END DEFINE MATERIAL
51. MEMBER RELEASE
52. 2 TO 4 6 TO 12 18 TO 21 23 TO 25 27 TO 33 39 TO 63 START MY MZ
53. 1 TO 3 5 TO 7 9 TO 11 17 TO 28 30 TO 32 38 TO 54 58 TO 63 END MY MZ
54. CONSTANTS
55. MATERIAL STEEL ALL
56. SUPPORTS
57. 1 6 11 16 PINNED
58. ************************************
59. LOAD 1 DEAD LOAD
60. *SELFWEIGHT Y -1
61. MEMBER LOAD
62. *BEAM WT
63. 12 TO 17 33 TO 37 UNI Y -0.045
64. 59 TO 63 UNI Y -0.019
65. 42 50 UNI Y -0.019
66. *TANK DL
67. 60 TO 62 UNI Y -0.096
68. 59 63 UNI Y -0.048
69. *WATER
70. 60 TO 62 UNI Y -0.89
71. 59 63 UNI Y -0.445
72. ************************************
73. LOAD 2 LIVE LOAD
74. *PLATFORM LL
75. MEMBER LOAD
76. 12 TO 17 33 TO 38 UNI Y -0.82
77. 42 50 59 63 UNI Y -0.41
78. ************************************
79. LOAD 3 SEISMIC
80. JOINT LOAD
81. *ACCELERATED HORIZ WATER LOAD _TANK
82. 5 10 15 20 FZ 4.871
83. 5 10 15 20 FX 1.461
84. *ACCELERATED TOWER WT SIESMIC LOAD
85. JOINT LOAD
86. 2 TO 5 7 TO 10 12 TO 15 20 FZ 0.32
87. 2 TO 5 7 TO 10 12 TO 15 20 FX 0.11
88. ************************************
89. *LOAD 4 SEISMIC (VERTICAL SIESMIC WATER LOAD (SDS X W)
90. *MEMBER LOAD
91. *60 TO 62 UNI Y -0.76
92. *59 63 UNI Y -0.38
93. ************************************
94. LOAD 4 SNOW
95. MEMBER LOAD
96. 59 TO 63 UNI Y -0.031
```

```
 97. 42 50 UNI Y -0.016
 98. ****************************************
 99. LOAD COMB 5 DL + LL
100. 1 1.0 2 1.0
101. ****************************************
102. LOAD COMB 6 DL + SEISMIC
103. 1 1.12 3 0.7
104. ****************************************
105. LOAD COMB 7 DL + SEISMIC + LL + SNOW
106. 1 1.08 2 0.75 3 0.525 4 0.75
107. ****************************************
108. LOAD COMB 8 DL + SEISMIC
109. 1 0.48 3 0.7
110. ****************************************
111. UNIT INCHES KIP
112. PDELTA ANALYSIS
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P R O B L E M S T A T I S T I C S

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =    30/    64/     4

      SOLVER USED IS THE OUT-OF-CORE BASIC SOLVER

ORIGINAL/FINAL BAND-WIDTH=    16/     6/     42 DOF
TOTAL PRIMARY LOAD CASES =    4, TOTAL DEGREES OF FREEDOM =    168
SIZE OF STIFFNESS MATRIX =        8 DOUBLE  KILO-WORDS
REQRD/AVAIL. DISK SPACE  =     12.2/ 106844.8 MB

++ Adjusting Displacements                          9:29:56

113. LOAD LIST 1 5 TO 8
114. PRINT SUPPORT REACTION
```

SUPPORT REACTIONS -UNIT KIP INCH STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	0.00	17.10	0.00	0.00	0.00	0.00
	5	0.00	30.54	0.00	0.00	0.00	0.00
	6	-2.86	-22.83	-8.83	0.00	0.00	0.00
	7	-2.15	-2.36	-6.62	0.00	0.00	0.00
	8	-2.86	-33.77	-8.83	0.00	0.00	0.00
6	1	0.00	17.06	0.00	0.00	0.00	0.00
	5	0.00	30.51	-0.01	0.00	0.00	0.00
	6	0.00	0.43	-7.76	0.00	0.00	0.00
	7	0.00	15.08	-5.82	0.00	0.00	0.00
	8	0.00	-10.49	-7.76	0.00	0.00	0.00
11	1	0.00	17.04	0.00	0.00	0.00	0.00
	5	-0.01	30.49	0.00	0.00	0.00	0.00
	6	-2.24	42.54	0.01	0.00	0.00	0.00
	7	-1.68	46.65	0.01	0.00	0.00	0.00
	8	-2.23	31.63	0.01	0.00	0.00	0.00
16	1	0.00	17.01	0.00	0.00	0.00	0.00
	5	0.00	30.47	0.00	0.00	0.00	0.00
	6	0.01	56.25	0.02	0.00	0.00	0.00
	7	0.01	56.94	0.02	0.00	0.00	0.00
	8	0.01	45.36	0.02	0.00	0.00	0.00

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

115. PRINT MEMBER FORCES

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1	1	17.09	0.00	0.00	0.00	0.00	0.00
		2	-17.09	0.00	0.00	0.00	0.00	0.00
	5	1	30.53	0.00	0.00	0.00	0.00	0.00
		2	-30.53	0.00	0.00	0.00	0.00	0.00
	6	1	-11.45	0.00	0.00	0.00	0.00	0.00
		2	11.45	0.00	0.00	0.00	0.00	0.00
	7	1	6.17	0.00	0.00	0.00	0.00	0.00
		2	-6.17	0.00	0.00	0.00	0.00	0.00
	8	1	-22.39	0.00	0.00	0.00	0.00	0.00
		2	22.39	0.00	0.00	0.00	0.00	0.00
2	1	2	17.09	0.00	0.00	0.00	0.00	0.00
		3	-17.09	0.00	0.00	0.00	0.00	0.00
	5	2	30.53	0.00	0.00	0.00	0.00	0.00
		3	-30.53	0.00	0.00	0.00	0.00	0.00
	6	2	-0.67	0.00	0.00	0.00	0.00	0.00
		3	0.67	0.00	0.00	0.00	0.00	0.00
	7	2	14.26	0.00	0.00	0.00	0.00	0.00
		3	-14.26	0.00	0.00	0.00	0.00	0.00
	8	2	-11.61	0.00	0.00	0.00	0.00	0.00
		3	11.61	0.00	0.00	0.00	0.00	0.00
3	1	3	17.08	0.00	0.00	0.00	0.00	0.00
		4	-17.08	0.00	0.00	0.00	0.00	0.00
	5	3	30.53	0.00	0.00	0.00	0.00	0.00
		4	-30.53	0.00	0.00	0.00	0.00	0.00
	6	3	9.52	0.00	0.00	0.00	0.00	0.00
		4	-9.52	0.00	0.00	0.00	0.00	0.00
	7	3	21.90	0.00	0.00	0.00	0.00	0.00
		4	-21.90	0.00	0.00	0.00	0.00	0.00
	8	3	-1.41	0.00	0.00	0.00	0.00	0.00
		4	1.41	0.00	0.00	0.00	0.00	0.00
4	1	4	17.08	0.00	0.00	0.00	0.00	0.00
		5	-17.08	0.00	0.00	0.00	0.01	0.01
	5	4	30.53	0.00	0.00	0.00	0.00	0.00
		5	-30.53	0.00	0.00	0.00	0.02	0.02
	6	4	19.13	0.00	0.00	0.00	0.00	0.00
		5	-19.13	0.00	0.00	0.00	0.06	0.05
	7	4	29.10	0.00	0.00	0.00	0.00	0.00
		5	-29.10	0.00	0.00	0.00	0.05	0.04
	8	4	8.20	0.00	0.00	0.00	0.00	0.00
		5	-8.20	0.00	0.00	0.00	0.05	0.04
5	1	6	17.07	0.00	0.00	0.00	0.00	0.00
		7	-17.07	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	6	30.51	0.00	0.00	0.00	0.00	0.00
		7	-30.51	0.00	0.00	0.00	0.00	0.00
	6	6	7.99	0.00	0.00	0.00	0.00	0.00
		7	-7.99	0.00	0.00	0.00	0.00	0.00
	7	6	20.75	0.00	0.00	0.00	0.00	0.00
		7	-20.75	0.00	0.00	0.00	0.00	0.00
	8	6	-2.94	0.00	0.00	0.00	0.00	0.00
		7	2.94	0.00	0.00	0.00	0.00	0.00
6	1	7	17.07	0.00	0.00	0.00	0.00	0.00
		8	-17.07	0.00	0.00	0.00	0.00	0.00
	5	7	30.52	0.00	0.00	0.00	0.00	0.00
		8	-30.52	0.00	0.00	0.00	0.00	0.00
	6	7	12.54	0.00	0.00	0.00	0.00	0.00
		8	-12.54	0.00	0.00	0.00	0.00	0.00
	7	7	24.17	0.00	0.00	0.00	0.00	0.00
		8	-24.17	0.00	0.00	0.00	0.00	0.00
	8	7	1.62	0.00	0.00	0.00	0.00	0.00
		8	-1.62	0.00	0.00	0.00	0.00	0.00
7	1	8	17.08	0.00	0.00	0.00	0.00	0.00
		9	-17.08	0.00	0.00	0.00	0.00	0.00
	5	8	30.53	0.00	0.00	0.00	0.00	0.00
		9	-30.53	0.00	0.00	0.00	0.00	0.00
	6	8	17.04	0.00	0.00	0.00	0.00	0.00
		9	-17.04	0.00	0.00	0.00	0.00	0.00
	7	8	27.54	0.00	0.00	0.00	0.00	0.00
		9	-27.54	0.00	0.00	0.00	0.00	0.00
	8	8	6.11	0.00	0.00	0.00	0.00	0.00
		9	-6.11	0.00	0.00	0.00	0.00	0.00
8	1	9	17.09	0.00	0.00	0.00	0.00	0.00
		10	-17.09	0.00	0.00	0.00	0.00	0.00
	5	9	30.54	0.00	0.00	0.00	0.00	0.00
		10	-30.54	0.00	0.00	0.00	0.01	0.01
	6	9	21.47	0.00	0.00	0.00	0.00	0.00
		10	-21.47	0.00	0.00	0.00	0.03	0.01
	7	9	30.86	0.00	0.00	0.00	0.00	0.00
		10	-30.86	0.00	0.00	0.00	0.03	0.01
	8	9	10.53	0.00	0.00	0.00	0.00	0.00
		10	-10.53	0.00	0.00	0.00	0.03	0.00
9	1	2	0.00	0.00	0.00	0.00	0.00	0.00
		7	0.00	0.00	0.00	0.00	0.00	0.00
	5	2	0.00	0.00	0.00	0.00	0.00	0.00
		7	0.00	0.00	0.00	0.00	0.00	0.00
	6	2	2.78	0.00	0.00	0.00	0.00	0.00
		7	-2.78	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	2	2.08	0.00	0.00	0.00	0.00	0.00
		7	-2.08	0.00	0.00	0.00	0.00	0.00
	8	2	2.78	0.00	0.00	0.00	0.00	0.00
		7	-2.78	0.00	0.00	0.00	0.00	0.00
10	1	3	0.00	0.00	0.00	0.00	0.00	0.00
		8	0.00	0.00	0.00	0.00	0.00	0.00
	5	3	0.00	0.00	0.00	0.00	0.00	0.00
		8	0.00	0.00	0.00	0.00	0.00	0.00
	6	3	2.62	0.00	0.00	0.00	0.00	0.00
		8	-2.62	0.00	0.00	0.00	0.00	0.00
	7	3	1.97	0.00	0.00	0.00	0.00	0.00
		8	-1.97	0.00	0.00	0.00	0.00	0.00
	8	3	2.62	0.00	0.00	0.00	0.00	0.00
		8	-2.62	0.00	0.00	0.00	0.00	0.00
11	1	4	0.00	0.00	0.00	0.00	0.00	0.00
		9	0.00	0.00	0.00	0.00	0.00	0.00
	5	4	0.00	0.00	0.00	0.00	0.00	0.00
		9	0.00	0.00	0.00	0.00	0.00	0.00
	6	4	2.47	0.00	0.00	0.00	0.00	0.00
		9	-2.47	0.00	0.00	0.00	0.00	0.00
	7	4	1.85	0.00	0.00	0.00	0.00	0.00
		9	-1.85	0.00	0.00	0.00	0.00	0.00
	8	4	2.47	0.00	0.00	0.00	0.00	0.00
		9	-2.47	0.00	0.00	0.00	0.00	0.00
12	1	5	0.00	16.92	0.00	0.00	0.00	0.00
		21	0.00	-16.79	0.00	0.00	0.00	580.63
	5	5	0.00	27.01	0.00	0.00	0.00	0.00
		21	0.00	-24.53	0.00	0.00	0.00	887.47
	6	5	-1.15	18.95	0.02	0.00	0.00	0.00
		21	1.15	-18.81	-0.02	0.00	-0.79	650.31
	7	5	-0.87	26.32	0.02	0.00	0.00	0.00
		21	0.87	-24.41	-0.02	0.00	-0.59	873.62
	8	5	-1.15	8.12	0.02	0.00	0.00	0.00
		21	1.15	-8.06	-0.02	0.00	-0.79	278.70
13	1	21	0.00	12.60	0.00	0.00	0.00	-580.63
		22	0.00	-12.48	0.00	0.00	0.00	982.30
	5	21	0.00	16.97	0.00	0.00	0.00	-887.47
		22	0.00	-14.66	0.00	0.00	0.00	1394.09
	6	21	-1.15	14.11	-0.03	0.00	0.79	-650.31
		22	1.15	-13.97	0.03	0.00	0.09	1100.17
	7	21	-0.87	17.17	-0.02	0.00	0.59	-873.62
		22	0.87	-15.40	0.02	0.00	0.07	1395.30
	8	21	-1.15	6.05	-0.03	0.00	0.79	-278.70
		22	1.15	-5.99	0.03	0.00	0.09	471.50

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
14	1	22	0.00	4.24	0.00	0.00	0.00	-982.30
		23	0.00	-4.12	0.00	0.00	0.00	1115.57
	5	22	0.00	6.42	0.00	0.00	0.00	-1394.09
		23	0.00	-4.12	0.00	0.00	0.00	1562.18
	6	22	-1.15	4.74	0.00	0.00	-0.09	-1100.17
		23	1.15	-4.61	0.00	0.00	0.01	1249.44
	7	22	-0.87	6.31	0.00	0.00	-0.07	-1395.30
		23	0.87	-4.54	0.00	0.00	0.01	1568.38
	8	22	-1.15	2.03	0.00	0.00	-0.09	-471.50
		23	1.15	-1.98	0.00	0.00	0.01	535.47
15	1	23	0.00	-4.13	0.00	0.00	0.00	-1115.57
		24	0.00	4.25	0.00	0.00	0.00	981.47
	5	23	0.00	-4.13	0.00	0.00	0.00	-1562.18
		24	0.00	6.44	0.00	0.00	0.00	1393.00
	6	23	-1.15	-4.62	0.00	0.00	-0.01	-1249.44
		24	1.15	4.76	0.00	0.00	0.08	1099.24
	7	23	-0.87	-4.55	0.00	0.00	-0.01	-1568.38
		24	0.87	6.32	0.00	0.00	0.06	1394.18
	8	23	-1.15	-1.98	0.00	0.00	-0.01	-535.47
		24	1.15	2.04	0.00	0.00	0.08	471.10
16	1	24	0.00	-12.49	0.00	0.00	0.00	-981.47
		25	0.00	12.61	0.00	0.00	0.00	580.98
	5	24	0.00	-14.68	0.00	0.00	0.00	-1393.00
		25	0.00	16.98	0.00	0.00	0.00	887.82
	6	24	-1.15	-13.99	0.03	0.00	-0.08	-1099.24
		25	1.15	14.12	-0.03	0.00	-0.75	650.70
	7	24	-0.87	-15.41	0.02	0.00	-0.06	-1394.18
		25	0.87	17.18	-0.02	0.00	-0.56	874.00
	8	24	-1.15	-5.99	0.03	0.00	-0.08	-471.10
		25	1.15	6.05	-0.03	0.00	-0.75	278.87
17	1	25	0.00	-16.80	0.00	0.00	0.00	-580.98
		10	0.00	16.93	0.00	0.00	0.00	0.00
	5	25	0.00	-24.54	0.00	0.00	0.00	-887.82
		10	0.00	27.02	0.00	0.00	0.00	0.00
	6	25	-1.15	-18.82	-0.02	0.00	0.75	-650.70
		10	1.15	18.97	0.02	0.00	0.00	0.00
	7	25	-0.87	-24.43	-0.02	0.00	0.56	-874.00
		10	0.87	26.33	0.02	0.00	0.00	0.00
	8	25	-1.15	-8.07	-0.02	0.00	0.75	-278.87
		10	1.15	8.13	0.02	0.00	0.00	0.00
18	1	1	0.00	0.00	0.00	0.00	0.00	0.00
		7	0.00	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	1	0.00	0.00	0.00	0.00	0.00	0.00
		7	0.00	0.00	0.00	0.00	0.00	0.00
	6	1	-3.99	0.00	0.00	0.00	0.00	0.00
		7	3.99	0.00	0.00	0.00	0.00	0.00
	7	1	-2.99	0.00	0.00	0.00	0.00	0.00
		7	2.99	0.00	0.00	0.00	0.00	0.00
	8	1	-3.99	0.00	0.00	0.00	0.00	0.00
		7	3.99	0.00	0.00	0.00	0.00	0.00
19	1	2	0.00	0.00	0.00	0.00	0.00	0.00
		8	0.00	0.00	0.00	0.00	0.00	0.00
	5	2	0.00	0.00	0.00	0.00	0.00	0.00
		8	0.00	0.00	0.00	0.00	0.00	0.00
	6	2	-3.77	0.00	0.00	0.00	0.00	0.00
		8	3.77	0.00	0.00	0.00	0.00	0.00
	7	2	-2.83	0.00	0.00	0.00	0.00	0.00
		8	2.83	0.00	0.00	0.00	0.00	0.00
	8	2	-3.77	0.00	0.00	0.00	0.00	0.00
		8	3.77	0.00	0.00	0.00	0.00	0.00
20	1	3	0.00	0.00	0.00	0.00	0.00	0.00
		9	0.00	0.00	0.00	0.00	0.00	0.00
	5	3	0.00	0.00	0.00	0.00	0.00	0.00
		9	0.00	0.00	0.00	0.00	0.00	0.00
	6	3	-3.55	0.00	0.00	0.00	0.00	0.00
		9	3.55	0.00	0.00	0.00	0.00	0.00
	7	3	-2.66	0.00	0.00	0.00	0.00	0.00
		9	2.66	0.00	0.00	0.00	0.00	0.00
	8	3	-3.55	0.00	0.00	0.00	0.00	0.00
		9	3.55	0.00	0.00	0.00	0.00	0.00
21	1	4	0.00	0.00	0.00	0.00	0.00	0.00
		10	0.00	0.00	0.00	0.00	0.00	0.00
	5	4	0.00	0.00	0.00	0.00	0.00	0.00
		10	0.00	0.00	0.00	0.00	0.00	0.00
	6	4	-3.34	0.00	0.00	0.00	0.00	0.00
		10	3.34	0.00	0.00	0.00	0.00	0.00
	7	4	-2.50	0.00	0.00	0.00	0.00	0.00
		10	2.50	0.00	0.00	0.00	0.00	0.00
	8	4	-3.34	0.00	0.00	0.00	0.00	0.00
		10	3.34	0.00	0.00	0.00	0.00	0.00
22	1	11	17.04	0.00	0.00	0.00	0.00	0.00
		12	-17.04	0.00	0.00	0.00	0.00	0.00
	5	11	30.49	0.00	0.00	0.00	0.00	0.00
		12	-30.49	0.00	0.00	0.00	0.00	0.00
	6	11	44.73	0.00	0.00	0.00	0.00	0.00
		12	-44.73	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	11	48.30	0.00	0.00	0.00	0.00	0.00
		12	-48.30	0.00	0.00	0.00	0.00	0.00
	8	11	33.82	0.00	0.00	0.00	0.00	0.00
		12	-33.82	0.00	0.00	0.00	0.00	0.00
23	1	12	17.05	0.00	0.00	0.00	0.00	0.00
		13	-17.05	0.00	0.00	0.00	0.00	0.00
	5	12	30.50	0.00	0.00	0.00	0.00	0.00
		13	-30.50	0.00	0.00	0.00	0.00	0.00
	6	12	38.25	0.00	0.00	0.00	0.00	0.00
		13	-38.25	0.00	0.00	0.00	0.00	0.00
	7	12	43.44	0.00	0.00	0.00	0.00	0.00
		13	-43.44	0.00	0.00	0.00	0.00	0.00
	8	12	27.34	0.00	0.00	0.00	0.00	0.00
		13	-27.34	0.00	0.00	0.00	0.00	0.00
24	1	13	17.06	0.00	0.00	0.00	0.00	0.00
		14	-17.06	0.00	0.00	0.00	0.00	0.00
	5	13	30.51	0.00	0.00	0.00	0.00	0.00
		14	-30.51	0.00	0.00	0.00	0.00	0.00
	6	13	32.14	0.00	0.00	0.00	0.00	0.00
		14	-32.14	0.00	0.00	0.00	0.00	0.00
	7	13	38.86	0.00	0.00	0.00	0.00	0.00
		14	-38.86	0.00	0.00	0.00	0.00	0.00
	8	13	21.22	0.00	0.00	0.00	0.00	0.00
		14	-21.22	0.00	0.00	0.00	0.00	0.00
25	1	14	17.07	0.00	0.00	0.00	0.00	0.00
		15	-17.07	0.00	0.00	0.00	0.00	0.00
	5	14	30.52	0.00	0.00	0.00	0.00	0.00
		15	-30.52	0.00	0.00	0.00	0.00	0.00
	6	14	26.39	0.00	0.00	0.00	0.00	0.00
		15	-26.39	0.00	0.00	0.00	0.00	0.00
	7	14	34.55	0.00	0.00	0.00	0.00	0.00
		15	-34.55	0.00	0.00	0.00	0.00	0.00
	8	14	15.47	0.00	0.00	0.00	0.00	0.00
		15	-15.47	0.00	0.00	0.00	0.00	0.00
26	1	16	17.01	0.00	0.00	0.00	0.00	0.00
		17	-17.01	0.00	0.00	0.00	0.00	0.00
	5	16	30.47	0.00	0.00	0.00	0.00	0.00
		17	-30.47	0.00	0.00	0.00	0.00	0.00
	6	16	56.25	0.00	0.00	0.00	0.00	0.00
		17	-56.25	0.00	0.00	0.00	0.00	0.00
	7	16	56.94	0.00	0.00	0.00	0.00	0.00
		17	-56.94	0.00	0.00	0.00	0.00	0.00
	8	16	45.36	0.00	0.00	0.00	0.00	0.00
		17	-45.36	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
27	1	17	17.00	0.00	0.00	0.00	0.00	0.00
		18	-17.00	0.00	0.00	0.00	0.00	0.00
	5	17	30.46	0.00	0.00	0.00	0.00	0.00
		18	-30.46	0.00	0.00	0.00	0.00	0.00
	6	17	46.50	0.00	0.00	0.00	0.00	0.00
		18	-46.50	0.00	0.00	0.00	0.00	0.00
	7	17	49.62	0.00	0.00	0.00	0.00	0.00
		18	-49.62	0.00	0.00	0.00	0.00	0.00
	8	17	35.62	0.00	0.00	0.00	0.00	0.00
		18	-35.62	0.00	0.00	0.00	0.00	0.00
28	1	18	16.99	0.00	0.00	0.00	0.00	0.00
		19	-16.99	0.00	0.00	0.00	0.00	0.00
	5	18	30.45	0.00	0.00	0.00	0.00	0.00
		19	-30.45	0.00	0.00	0.00	0.00	0.00
	6	18	37.04	0.00	0.00	0.00	0.00	0.00
		19	-37.04	0.00	0.00	0.00	0.00	0.00
	7	18	42.53	0.00	0.00	0.00	0.00	0.00
		19	-42.53	0.00	0.00	0.00	0.00	0.00
	8	18	26.17	0.00	0.00	0.00	0.00	0.00
		19	-26.17	0.00	0.00	0.00	0.00	0.00
29	1	19	16.98	0.00	0.00	0.00	0.00	0.00
		20	-16.98	0.00	0.00	0.00	0.01	0.01
	5	19	30.43	0.00	0.00	0.00	0.00	0.00
		20	-30.43	0.00	0.00	0.00	0.02	0.02
	6	19	27.88	0.00	0.00	0.00	0.00	0.00
		20	-27.88	0.00	0.00	0.00	0.07	0.05
	7	19	35.65	0.00	0.00	0.00	0.00	0.00
		20	-35.65	0.00	0.00	0.00	0.07	0.04
	8	19	17.01	0.00	0.00	0.00	0.00	0.00
		20	-17.01	0.00	0.00	0.00	0.06	0.04
30	1	12	0.01	0.00	0.00	0.00	0.00	0.00
		17	-0.01	0.00	0.00	0.00	0.00	0.00
	5	12	0.01	0.00	0.00	0.00	0.00	0.00
		17	-0.01	0.00	0.00	0.00	0.00	0.00
	6	12	2.24	0.00	0.00	0.00	0.00	0.00
		17	-2.24	0.00	0.00	0.00	0.00	0.00
	7	12	1.69	0.00	0.00	0.00	0.00	0.00
		17	-1.69	0.00	0.00	0.00	0.00	0.00
	8	12	2.24	0.00	0.00	0.00	0.00	0.00
		17	-2.24	0.00	0.00	0.00	0.00	0.00
31	1	13	0.01	0.00	0.00	0.00	0.00	0.00
		18	-0.01	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	13	0.01	0.00	0.00	0.00	0.00	0.00
		18	-0.01	0.00	0.00	0.00	0.00	0.00
	6	13	2.17	0.00	0.00	0.00	0.00	0.00
		18	-2.17	0.00	0.00	0.00	0.00	0.00
	7	13	1.63	0.00	0.00	0.00	0.00	0.00
		18	-1.63	0.00	0.00	0.00	0.00	0.00
	8	13	2.16	0.00	0.00	0.00	0.00	0.00
		18	-2.16	0.00	0.00	0.00	0.00	0.00
32	1	14	0.01	0.00	0.00	0.00	0.00	0.00
		19	-0.01	0.00	0.00	0.00	0.00	0.00
	5	14	0.01	0.00	0.00	0.00	0.00	0.00
		19	-0.01	0.00	0.00	0.00	0.00	0.00
	6	14	2.09	0.00	0.00	0.00	0.00	0.00
		19	-2.09	0.00	0.00	0.00	0.00	0.00
	7	14	1.57	0.00	0.00	0.00	0.00	0.00
		19	-1.57	0.00	0.00	0.00	0.00	0.00
	8	14	2.08	0.00	0.00	0.00	0.00	0.00
		19	-2.08	0.00	0.00	0.00	0.00	0.00
33	1	15	0.00	16.91	0.00	0.00	0.00	0.00
		26	0.00	-16.78	0.00	0.00	0.00	580.25
	5	15	0.00	27.00	0.00	-0.01	0.00	0.00
		26	0.00	-24.52	0.00	0.01	0.00	887.08
	6	15	-1.27	18.94	-0.02	-0.02	0.00	0.00
		26	1.27	-18.80	0.02	0.02	0.79	649.87
	7	15	-0.95	26.31	-0.02	-0.02	0.00	0.00
		26	0.95	-24.40	0.02	0.02	0.59	873.20
	8	15	-1.27	8.12	-0.02	-0.02	0.00	0.00
		26	1.27	-8.06	0.02	0.02	0.79	278.52
34	1	26	0.00	12.59	0.00	0.00	0.00	-580.25
		27	0.00	-12.46	0.00	0.00	0.00	981.54
	5	26	0.00	16.96	0.00	-0.01	0.00	-887.08
		27	0.00	-14.65	0.00	0.01	0.00	1393.34
	6	26	-1.27	14.10	0.03	-0.02	-0.79	-649.88
		27	1.27	-13.96	-0.03	0.02	-0.09	1099.33
	7	26	-0.95	17.16	0.02	-0.02	-0.59	-873.20
		27	0.95	-15.38	-0.02	0.02	-0.07	1394.49
	8	26	-1.27	6.04	0.03	-0.02	-0.79	-278.52
		27	1.27	-5.98	-0.03	0.02	-0.09	471.14
35	1	27	0.00	4.22	0.00	0.00	0.00	-981.54
		28	0.00	-4.10	0.00	0.00	0.00	1114.46
	5	27	0.00	6.41	0.00	-0.01	0.00	-1393.34
		28	0.00	-4.10	0.00	0.01	0.00	1561.07
	6	27	-1.27	4.73	0.00	-0.02	0.09	-1099.33
		28	1.27	-4.60	0.00	0.02	-0.01	1248.20

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	27	-0.95	6.29	0.00	-0.02	0.07	-1394.49
		28	0.95	-4.53	0.00	0.02	-0.01	1567.18
	8	27	-1.27	2.03	0.00	-0.02	0.09	-471.14
		28	1.27	-1.97	0.00	0.02	-0.01	534.94
36	1	28	0.00	-4.14	0.00	0.00	0.00	-1114.46
		29	0.00	4.26	0.00	0.00	0.00	979.99
	5	28	0.00	-4.14	0.00	-0.01	0.00	-1561.07
		29	0.00	6.45	0.00	0.01	0.00	1391.53
	6	28	-1.27	-4.63	0.00	-0.02	0.01	-1248.20
		29	1.27	4.77	0.00	0.02	-0.08	1097.59
	7	28	-0.95	-4.56	0.00	-0.02	0.01	-1567.18
		29	0.95	6.34	0.00	0.02	-0.06	1392.59
	8	28	-1.27	-1.99	0.00	-0.02	0.01	-534.94
		29	1.27	2.04	0.00	0.02	-0.08	470.40
37	1	29	0.00	-12.50	0.00	0.00	0.00	-979.99
		30	0.00	12.62	0.00	0.00	0.00	579.15
	5	29	0.00	-14.69	0.00	-0.01	0.00	-1391.53
		30	0.00	16.99	0.00	0.01	0.00	885.98
	6	29	-1.27	-14.00	-0.03	-0.02	0.08	-1097.59
		30	1.27	14.13	0.03	0.02	0.75	648.64
	7	29	-0.95	-15.43	-0.02	-0.02	0.06	-1392.59
		30	0.95	17.19	0.02	0.02	0.56	872.02
	8	29	-1.27	-6.00	-0.03	-0.02	0.08	-470.40
		30	1.27	6.06	0.03	0.02	0.75	277.99
38	1	30	0.00	-16.82	0.00	0.00	0.00	-579.15
		20	0.00	16.82	0.00	0.00	0.00	0.00
	5	30	0.00	-24.55	0.00	-0.01	0.00	-885.98
		20	0.00	26.90	0.00	0.01	0.00	0.00
	6	30	-1.27	-18.83	0.02	-0.02	-0.75	-648.64
		20	1.27	18.83	-0.02	0.02	0.00	0.00
	7	30	-0.95	-24.44	0.02	-0.02	-0.56	-872.02
		20	0.95	26.20	-0.02	0.02	0.00	0.00
	8	30	-1.27	-8.07	0.02	-0.02	-0.75	-277.99
		20	1.27	8.07	-0.02	0.02	0.00	0.00
39	1	2	0.00	0.00	0.00	0.00	0.00	0.00
		12	0.00	0.00	0.00	0.00	0.00	0.00
	5	2	0.00	0.00	0.00	0.00	0.00	0.00
		12	0.00	0.00	0.00	0.00	0.00	0.00
	6	2	8.58	0.00	0.00	0.00	0.00	0.00
		12	-8.58	0.00	0.00	0.00	0.00	0.00
	7	2	6.44	0.00	0.00	0.00	0.00	0.00
		12	-6.44	0.00	0.00	0.00	0.00	0.00
	8	2	8.58	0.00	0.00	0.00	0.00	0.00
		12	-8.58	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
40	1	3	0.00	0.00	0.00	0.00	0.00	0.00
		13	0.00	0.00	0.00	0.00	0.00	0.00
	5	3	0.00	0.00	0.00	0.00	0.00	0.00
		13	0.00	0.00	0.00	0.00	0.00	0.00
	6	3	8.13	0.00	0.00	0.00	0.00	0.00
		13	-8.13	0.00	0.00	0.00	0.00	0.00
	7	3	6.10	0.00	0.00	0.00	0.00	0.00
		13	-6.10	0.00	0.00	0.00	0.00	0.00
	8	3	8.13	0.00	0.00	0.00	0.00	0.00
		13	-8.13	0.00	0.00	0.00	0.00	0.00
41	1	4	0.00	0.00	0.00	0.00	0.00	0.00
		14	0.00	0.00	0.00	0.00	0.00	0.00
	5	4	0.00	0.00	0.00	0.00	0.00	0.00
		14	0.00	0.00	0.00	0.00	0.00	0.00
	6	4	7.68	0.00	0.00	0.00	0.00	0.00
		14	-7.68	0.00	0.00	0.00	0.00	0.00
	7	4	5.76	0.00	0.00	0.00	0.00	0.00
		14	-5.76	0.00	0.00	0.00	0.00	0.00
	8	4	7.68	0.00	0.00	0.00	0.00	0.00
		14	-7.68	0.00	0.00	0.00	0.00	0.00
42	1	5	0.00	0.16	0.00	0.00	0.00	0.00
		15	0.00	0.16	0.00	0.00	0.00	0.00
	5	5	0.00	3.52	0.00	0.00	0.00	0.00
		15	0.00	3.52	0.00	0.00	0.00	0.00
	6	5	1.34	0.17	0.00	0.00	0.00	0.00
		15	-1.34	0.17	0.00	0.00	0.00	0.00
	7	5	1.01	2.79	0.00	0.00	0.00	0.00
		15	-1.01	2.79	0.00	0.00	0.00	0.00
	8	5	1.34	0.07	0.00	0.00	0.00	0.00
		15	-1.34	0.07	0.00	0.00	0.00	0.00
43	1	1	0.00	0.00	0.00	0.00	0.00	0.00
		12	0.00	0.00	0.00	0.00	0.00	0.00
	5	1	0.00	0.00	0.00	0.00	0.00	0.00
		12	0.00	0.00	0.00	0.00	0.00	0.00
	6	1	-12.30	0.00	0.00	0.00	0.00	0.00
		12	12.30	0.00	0.00	0.00	0.00	0.00
	7	1	-9.23	0.00	0.00	0.00	0.00	0.00
		12	9.23	0.00	0.00	0.00	0.00	0.00
	8	1	-12.30	0.00	0.00	0.00	0.00	0.00
		12	12.30	0.00	0.00	0.00	0.00	0.00
44	1	2	0.00	0.00	0.00	0.00	0.00	0.00
		13	0.00	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	2	0.00	0.00	0.00	0.00	0.00	0.00
		13	0.00	0.00	0.00	0.00	0.00	0.00
	6	2	-11.67	0.00	0.00	0.00	0.00	0.00
		13	11.67	0.00	0.00	0.00	0.00	0.00
	7	2	-8.76	0.00	0.00	0.00	0.00	0.00
		13	8.76	0.00	0.00	0.00	0.00	0.00
	8	2	-11.68	0.00	0.00	0.00	0.00	0.00
		13	11.68	0.00	0.00	0.00	0.00	0.00
45	1	3	0.00	0.00	0.00	0.00	0.00	0.00
		14	0.00	0.00	0.00	0.00	0.00	0.00
	5	3	0.00	0.00	0.00	0.00	0.00	0.00
		14	0.00	0.00	0.00	0.00	0.00	0.00
	6	3	-11.05	0.00	0.00	0.00	0.00	0.00
		14	11.05	0.00	0.00	0.00	0.00	0.00
	7	3	-8.28	0.00	0.00	0.00	0.00	0.00
		14	8.28	0.00	0.00	0.00	0.00	0.00
	8	3	-11.05	0.00	0.00	0.00	0.00	0.00
		14	11.05	0.00	0.00	0.00	0.00	0.00
46	1	4	0.00	0.00	0.00	0.00	0.00	0.00
		15	0.00	0.00	0.00	0.00	0.00	0.00
	5	4	0.00	0.00	0.00	0.00	0.00	0.00
		15	0.00	0.00	0.00	0.00	0.00	0.00
	6	4	-10.42	0.00	0.00	0.00	0.00	0.00
		15	10.42	0.00	0.00	0.00	0.00	0.00
	7	4	-7.82	0.00	0.00	0.00	0.00	0.00
		15	7.82	0.00	0.00	0.00	0.00	0.00
	8	4	-10.42	0.00	0.00	0.00	0.00	0.00
		15	10.42	0.00	0.00	0.00	0.00	0.00
47	1	17	0.01	0.00	0.00	0.00	0.00	0.00
		7	-0.01	0.00	0.00	0.00	0.00	0.00
	5	17	0.01	0.00	0.00	0.00	0.00	0.00
		7	-0.01	0.00	0.00	0.00	0.00	0.00
	6	17	7.76	0.00	0.00	0.00	0.00	0.00
		7	-7.76	0.00	0.00	0.00	0.00	0.00
	7	17	5.82	0.00	0.00	0.00	0.00	0.00
		7	-5.82	0.00	0.00	0.00	0.00	0.00
	8	17	7.75	0.00	0.00	0.00	0.00	0.00
		7	-7.75	0.00	0.00	0.00	0.00	0.00
48	1	18	0.01	0.00	0.00	0.00	0.00	0.00
		8	-0.01	0.00	0.00	0.00	0.00	0.00
	5	18	0.01	0.00	0.00	0.00	0.00	0.00
		8	-0.01	0.00	0.00	0.00	0.00	0.00
	6	18	7.53	0.00	0.00	0.00	0.00	0.00
		8	-7.53	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	18	5.65	0.00	0.00	0.00	0.00	0.00
		8	-5.65	0.00	0.00	0.00	0.00	0.00
	8	18	7.53	0.00	0.00	0.00	0.00	0.00
		8	-7.53	0.00	0.00	0.00	0.00	0.00
49	1	19	0.01	0.00	0.00	0.00	0.00	0.00
		9	-0.01	0.00	0.00	0.00	0.00	0.00
	5	19	0.01	0.00	0.00	0.00	0.00	0.00
		9	-0.01	0.00	0.00	0.00	0.00	0.00
	6	19	7.31	0.00	0.00	0.00	0.00	0.00
		9	-7.31	0.00	0.00	0.00	0.00	0.00
	7	19	5.48	0.00	0.00	0.00	0.00	0.00
		9	-5.48	0.00	0.00	0.00	0.00	0.00
	8	19	7.30	0.00	0.00	0.00	0.00	0.00
		9	-7.30	0.00	0.00	0.00	0.00	0.00
50	1	20	0.00	0.16	0.00	0.00	0.00	0.00
		10	0.00	0.16	0.00	0.00	0.00	0.00
	5	20	0.00	3.52	0.00	0.00	0.00	0.00
		10	0.00	3.52	0.00	0.00	0.00	0.00
	6	20	1.27	0.17	0.00	0.00	0.00	0.00
		10	-1.27	0.17	0.00	0.00	0.00	0.00
	7	20	0.95	2.79	0.00	0.00	0.00	0.00
		10	-0.95	2.79	0.00	0.00	0.00	0.00
	8	20	1.26	0.07	0.00	0.00	0.00	0.00
		10	-1.26	0.07	0.00	0.00	0.00	0.00
51	1	6	-0.01	0.00	0.00	0.00	0.00	0.00
		17	0.01	0.00	0.00	0.00	0.00	0.00
	5	6	-0.01	0.00	0.00	0.00	0.00	0.00
		17	0.01	0.00	0.00	0.00	0.00	0.00
	6	6	-10.83	0.00	0.00	0.00	0.00	0.00
		17	10.83	0.00	0.00	0.00	0.00	0.00
	7	6	-8.12	0.00	0.00	0.00	0.00	0.00
		17	8.12	0.00	0.00	0.00	0.00	0.00
	8	6	-10.82	0.00	0.00	0.00	0.00	0.00
		17	10.82	0.00	0.00	0.00	0.00	0.00
52	1	7	-0.01	0.00	0.00	0.00	0.00	0.00
		18	0.01	0.00	0.00	0.00	0.00	0.00
	5	7	-0.01	0.00	0.00	0.00	0.00	0.00
		18	0.01	0.00	0.00	0.00	0.00	0.00
	6	7	-10.52	0.00	0.00	0.00	0.00	0.00
		18	10.52	0.00	0.00	0.00	0.00	0.00
	7	7	-7.89	0.00	0.00	0.00	0.00	0.00
		18	7.89	0.00	0.00	0.00	0.00	0.00
	8	7	-10.52	0.00	0.00	0.00	0.00	0.00
		18	10.52	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
53	1	8	-0.01	0.00	0.00	0.00	0.00	0.00
		19	0.01	0.00	0.00	0.00	0.00	0.00
	5	8	-0.01	0.00	0.00	0.00	0.00	0.00
		19	0.01	0.00	0.00	0.00	0.00	0.00
	6	8	-10.21	0.00	0.00	0.00	0.00	0.00
		19	10.21	0.00	0.00	0.00	0.00	0.00
	7	8	-7.66	0.00	0.00	0.00	0.00	0.00
		19	7.66	0.00	0.00	0.00	0.00	0.00
	8	8	-10.20	0.00	0.00	0.00	0.00	0.00
		19	10.20	0.00	0.00	0.00	0.00	0.00
54	1	9	-0.01	0.00	0.00	0.00	0.00	0.00
		20	0.01	0.00	0.00	0.00	0.00	0.00
	5	9	-0.01	0.00	0.00	0.00	0.00	0.00
		20	0.01	0.00	0.00	0.00	0.00	0.00
	6	9	-9.90	0.00	0.00	0.00	0.00	0.00
		20	9.90	0.00	0.00	0.00	0.00	0.00
	7	9	-7.43	0.00	0.00	0.00	0.00	0.00
		20	7.43	0.00	0.00	0.00	0.00	0.00
	8	9	-9.89	0.00	0.00	0.00	0.00	0.00
		20	9.89	0.00	0.00	0.00	0.00	0.00
55	1	11	-0.01	0.00	0.00	0.00	0.00	0.00
		17	0.01	0.00	0.00	0.00	0.00	0.00
	5	11	-0.01	0.00	0.00	0.00	0.00	0.00
		17	0.01	0.00	0.00	0.00	0.00	0.00
	6	11	-3.14	0.00	0.00	0.00	0.00	0.00
		17	3.14	0.00	0.00	0.00	0.00	0.00
	7	11	-2.36	0.00	0.00	0.00	0.00	0.00
		17	2.36	0.00	0.00	0.00	0.00	0.00
	8	11	-3.13	0.00	0.00	0.00	0.00	0.00
		17	3.13	0.00	0.00	0.00	0.00	0.00
56	1	12	-0.01	0.00	0.00	0.00	0.00	0.00
		18	0.01	0.00	0.00	0.00	0.00	0.00
	5	12	-0.01	0.00	0.00	0.00	0.00	0.00
		18	0.01	0.00	0.00	0.00	0.00	0.00
	6	12	-3.03	0.00	0.00	0.00	0.00	0.00
		18	3.03	0.00	0.00	0.00	0.00	0.00
	7	12	-2.27	0.00	0.00	0.00	0.00	0.00
		18	2.27	0.00	0.00	0.00	0.00	0.00
	8	12	-3.02	0.00	0.00	0.00	0.00	0.00
		18	3.02	0.00	0.00	0.00	0.00	0.00
57	1	13	-0.01	0.00	0.00	0.00	0.00	0.00
		19	0.01	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	13	-0.01	0.00	0.00	0.00	0.00	0.00
		19	0.01	0.00	0.00	0.00	0.00	0.00
	6	13	-2.92	0.00	0.00	0.00	0.00	0.00
		19	2.92	0.00	0.00	0.00	0.00	0.00
	7	13	-2.19	0.00	0.00	0.00	0.00	0.00
		19	2.19	0.00	0.00	0.00	0.00	0.00
	8	13	-2.91	0.00	0.00	0.00	0.00	0.00
		19	2.91	0.00	0.00	0.00	0.00	0.00
58	1	14	-0.01	0.00	0.00	0.00	0.00	0.00
		20	0.01	0.00	0.00	0.00	0.00	0.00
	5	14	-0.01	0.00	0.00	0.00	0.00	0.00
		20	0.01	0.00	0.00	0.00	0.00	0.00
	6	14	-2.81	0.00	0.00	0.00	0.00	0.00
		20	2.81	0.00	0.00	0.00	0.00	0.00
	7	14	-2.11	0.00	0.00	0.00	0.00	0.00
		20	2.11	0.00	0.00	0.00	0.00	0.00
	8	14	-2.80	0.00	0.00	0.00	0.00	0.00
		20	2.80	0.00	0.00	0.00	0.00	0.00
59	1	21	0.00	4.20	0.00	0.00	0.00	0.00
		26	0.00	4.20	0.00	0.00	0.00	0.00
	5	21	0.00	7.56	0.00	0.00	0.00	0.00
		26	0.00	7.56	0.00	0.00	0.00	0.00
	6	21	0.05	4.70	0.00	0.00	0.00	0.00
		26	-0.05	4.70	0.00	0.00	0.00	0.00
	7	21	0.04	7.25	0.00	0.00	0.00	0.00
		26	-0.04	7.25	0.00	0.00	0.00	0.00
	8	21	0.05	2.02	0.00	0.00	0.00	0.00
		26	-0.05	2.02	0.00	0.00	0.00	0.00
60	1	22	0.00	8.24	0.00	0.00	0.00	0.00
		27	0.00	8.24	0.00	0.00	0.00	0.00
	5	22	0.00	8.24	0.00	0.00	0.00	0.00
		27	0.00	8.24	0.00	0.00	0.00	0.00
	6	22	-0.03	9.23	0.00	0.00	0.00	0.00
		27	0.03	9.23	0.00	0.00	0.00	0.00
	7	22	-0.02	9.09	0.00	0.00	0.00	0.00
		27	0.02	9.09	0.00	0.00	0.00	0.00
	8	22	-0.03	3.96	0.00	0.00	0.00	0.00
		27	0.03	3.96	0.00	0.00	0.00	0.00
61	1	23	0.00	8.24	0.00	0.00	0.00	0.00
		28	0.00	8.24	0.00	0.00	0.00	0.00
	5	23	0.00	8.24	0.00	0.00	0.00	0.00
		28	0.00	8.24	0.00	0.00	0.00	0.00
	6	23	0.00	9.23	0.00	0.00	0.00	0.00
		28	0.00	9.23	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP INCH (LOCAL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	23	0.00	9.09	0.00	0.00	0.00	0.00
		28	0.00	9.09	0.00	0.00	0.00	0.00
	8	23	0.00	3.96	0.00	0.00	0.00	0.00
		28	0.00	3.96	0.00	0.00	0.00	0.00
62	1	24	0.00	8.24	0.00	0.00	0.00	0.00
		29	0.00	8.24	0.00	0.00	0.00	0.00
	5	24	0.00	8.24	0.00	0.00	0.00	0.00
		29	0.00	8.24	0.00	0.00	0.00	0.00
	6	24	-0.03	9.23	0.00	0.00	0.00	0.00
		29	0.03	9.23	0.00	0.00	0.00	0.00
	7	24	-0.02	9.09	0.00	0.00	0.00	0.00
		29	0.02	9.09	0.00	0.00	0.00	0.00
	8	24	-0.03	3.96	0.00	0.00	0.00	0.00
		29	0.03	3.96	0.00	0.00	0.00	0.00
63	1	25	0.00	4.20	0.00	0.00	0.00	0.00
		30	0.00	4.20	0.00	0.00	0.00	0.00
	5	25	0.00	7.56	0.00	0.00	0.00	0.00
		30	0.00	7.56	0.00	0.00	0.00	0.00
	6	25	0.05	4.70	0.00	0.00	0.00	0.00
		30	-0.05	4.70	0.00	0.00	0.00	0.00
	7	25	0.04	7.25	0.00	0.00	0.00	0.00
		30	-0.04	7.25	0.00	0.00	0.00	0.00
	8	25	0.05	2.02	0.00	0.00	0.00	0.00
		30	-0.05	2.02	0.00	0.00	0.00	0.00

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

116. PRINT JOINT DISPLACEMENTS

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
1	1	0.00000	0.00000	0.00000	0.00005	0.00000	-0.00005
	5	0.00000	0.00000	0.00000	0.00009	0.00001	-0.00009
	6	0.00000	0.00000	0.00000	0.00048	0.00005	-0.00014
	7	0.00000	0.00000	0.00000	0.00040	0.00004	-0.00015
	8	0.00000	0.00000	0.00000	0.00045	0.00005	-0.00010
2	1	0.00962	-0.00989	0.00961	0.00005	0.00000	-0.00003
	5	0.01722	-0.01767	0.01721	0.00009	0.00001	-0.00005
	6	0.02630	0.00663	0.09242	0.00052	0.00005	-0.00011
	7	0.02806	-0.00357	0.07765	0.00043	0.00004	-0.00011
	8	0.02015	0.01296	0.08628	0.00049	0.00005	-0.00010
3	1	0.01923	-0.01978	0.01919	0.00005	0.00000	0.00000
	5	0.03444	-0.03534	0.03440	0.00009	0.00000	0.00000
	6	0.06493	0.00702	0.20947	0.00056	0.00005	-0.00008
	7	0.06537	-0.01182	0.17377	0.00046	0.00004	-0.00006
	8	0.05263	0.01968	0.19719	0.00052	0.00005	-0.00008
4	1	0.02883	-0.02967	0.02876	0.00005	0.00000	0.00002
	5	0.05165	-0.05301	0.05158	0.00009	0.00000	0.00004
	6	0.11237	0.00150	0.34161	0.00059	0.00005	-0.00005
	7	0.10929	-0.02450	0.28120	0.00049	0.00004	-0.00002
	8	0.09392	0.02049	0.32320	0.00056	0.00005	-0.00006
5	1	0.03844	-0.03955	0.03832	0.00005	0.00000	-0.00005
	5	0.06887	-0.07068	0.06875	0.00009	0.00000	-0.00009
	6	0.16197	-0.00956	0.47288	0.00068	0.00004	-0.00026
	7	0.15482	-0.04134	0.38798	0.00055	0.00003	-0.00023
	8	0.13737	0.01575	0.44836	0.00065	0.00005	-0.00022
6	1	0.00000	0.00000	0.00000	0.00005	0.00000	-0.00005
	5	0.00000	0.00000	0.00000	0.00009	0.00000	-0.00009
	6	0.00000	0.00000	0.00000	0.00047	0.00000	-0.00012
	7	0.00000	0.00000	0.00000	0.00040	0.00000	-0.00013
	8	0.00000	0.00000	0.00000	0.00044	0.00001	-0.00009
7	1	0.00962	-0.00988	0.00965	0.00005	0.00000	-0.00005
	5	0.01722	-0.01766	0.01725	0.00009	0.00000	-0.00009
	6	0.02301	-0.00462	0.09113	0.00052	0.00001	-0.00020
	7	0.02559	-0.01201	0.07669	0.00043	0.00001	-0.00019
	8	0.01685	0.00170	0.08496	0.00049	0.00001	-0.00017
8	1	0.01923	-0.01976	0.01926	0.00005	0.00000	-0.00005
	5	0.03444	-0.03532	0.03448	0.00009	0.00000	-0.00009
	6	0.06182	-0.01188	0.20232	0.00056	0.00001	-0.00020
	7	0.06304	-0.02599	0.16843	0.00046	0.00001	-0.00019
	8	0.04952	0.00076	0.19000	0.00052	0.00001	-0.00017
9	1	0.02883	-0.02964	0.02883	0.00005	0.00000	-0.00005
	5	0.05165	-0.05299	0.05166	0.00009	0.00000	-0.00009
	6	0.10944	-0.02174	0.32564	0.00059	0.00001	-0.00020
	7	0.10709	-0.04193	0.26924	0.00049	0.00001	-0.00019
	8	0.09099	-0.00277	0.30719	0.00056	0.00001	-0.00017
10	1	0.03844	-0.03953	0.03834	0.00005	0.00000	-0.00005
	5	0.06887	-0.07066	0.06877	0.00009	0.00000	-0.00009
	6	0.16263	-0.03417	0.44649	0.00063	0.00001	-0.00028

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	7	0.15532	-0.05979	0.36819	0.00051	0.00001	-0.00025
	8	0.13803	-0.00887	0.42195	0.00060	0.00001	-0.00024
11	1	0.00000	0.00000	0.00000	0.00005	0.00000	-0.00005
	5	0.00000	0.00000	0.00000	0.00009	-0.00001	-0.00009
	6	0.00000	0.00000	0.00000	0.00043	0.00004	-0.00026
	7	0.00000	0.00000	0.00000	0.00036	0.00002	-0.00023
	8	0.00000	0.00000	0.00000	0.00040	0.00004	-0.00022
12	1	0.00965	-0.00986	0.00961	0.00005	0.00000	-0.00003
	5	0.01725	-0.01765	0.01721	0.00009	-0.00001	-0.00005
	6	0.04896	-0.02589	0.08224	0.00049	0.00003	-0.00012
	7	0.04506	-0.02795	0.07001	0.00041	0.00002	-0.00011
	8	0.04278	-0.01957	0.07609	0.00045	0.00004	-0.00010
13	1	0.01928	-0.01973	0.01919	0.00005	0.00000	0.00000
	5	0.03449	-0.03530	0.03440	0.00009	-0.00001	-0.00001
	6	0.09832	-0.04803	0.19982	0.00062	0.00003	-0.00009
	7	0.09042	-0.05310	0.16653	0.00051	0.00002	-0.00007
	8	0.08598	-0.03540	0.18754	0.00059	0.00003	-0.00008
14	1	0.02887	-0.02960	0.02876	0.00005	0.00000	0.00002
	5	0.05169	-0.05296	0.05158	0.00009	0.00000	0.00003
	6	0.14639	-0.06663	0.33249	0.00065	0.00002	-0.00005
	7	0.13481	-0.07559	0.27436	0.00053	0.00001	-0.00002
	8	0.12791	-0.04768	0.31409	0.00062	0.00002	-0.00006
15	1	0.03841	-0.03948	0.03832	-0.00002	0.00000	0.00004
	5	0.06884	-0.07062	0.06875	-0.00003	0.00000	0.00006
	6	0.18835	-0.08190	0.47125	0.00025	0.00001	0.00000
	7	0.17460	-0.09558	0.38675	0.00017	0.00001	0.00003
	8	0.16376	-0.05663	0.44673	0.00026	0.00001	-0.00003
16	1	0.00000	0.00000	0.00000	0.00005	0.00000	-0.00005
	5	0.00000	0.00000	0.00000	0.00009	0.00000	-0.00009
	6	0.00000	0.00000	0.00000	0.00043	0.00004	-0.00024
	7	0.00000	0.00000	0.00000	0.00036	0.00003	-0.00022
	8	0.00000	0.00000	0.00000	0.00039	0.00004	-0.00021
17	1	0.00964	-0.00985	0.00964	0.00005	0.00000	-0.00005
	5	0.01725	-0.01763	0.01725	0.00009	0.00000	-0.00009
	6	0.04630	-0.03256	0.08193	0.00046	0.00004	-0.00020
	7	0.04306	-0.03295	0.06979	0.00039	0.00003	-0.00019
	8	0.04012	-0.02625	0.07576	0.00043	0.00004	-0.00017
18	1	0.01927	-0.01969	0.01926	0.00005	0.00000	-0.00005
	5	0.03448	-0.03526	0.03447	0.00009	0.00000	-0.00009
	6	0.09575	-0.05947	0.19339	0.00061	0.00003	-0.00021
	7	0.08849	-0.06167	0.16172	0.00050	0.00002	-0.00020
	8	0.08341	-0.04687	0.18106	0.00058	0.00003	-0.00017
19	1	0.02886	-0.02952	0.02883	0.00005	0.00000	-0.00005
	5	0.05168	-0.05288	0.05165	0.00009	0.00000	-0.00009
	6	0.14391	-0.08091	0.31697	0.00065	0.00004	-0.00020
	7	0.13295	-0.08628	0.26273	0.00053	0.00003	-0.00019
	8	0.12544	-0.06201	0.29852	0.00062	0.00004	-0.00017
20	1	0.03841	-0.03935	0.03834	0.00005	0.00000	-0.00005

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	5	0.06884	-0.07049	0.06877	0.00009	0.00000	-0.00009
	6	0.18908	-0.09704	0.44495	0.00066	0.00004	-0.00023
	7	0.17515	-0.10691	0.36704	0.00054	0.00003	-0.00022
	8	0.16449	-0.07186	0.42041	0.00063	0.00004	-0.00020
21	1	0.03844	-0.19973	0.03832	0.00005	0.00000	-0.00390
	5	0.06887	-0.30348	0.06875	0.00009	0.00000	-0.00560
	6	0.16208	-0.19327	0.46749	0.00067	0.00015	-0.00449
	7	0.15491	-0.27629	0.38393	0.00055	0.00011	-0.00568
	8	0.13748	-0.06544	0.44296	0.00064	0.00015	-0.00200
22	1	0.03844	-0.30754	0.03833	0.00005	0.00000	-0.00223
	5	0.06887	-0.45591	0.06876	0.00009	0.00000	-0.00315
	6	0.16219	-0.31803	0.46315	0.00066	0.00013	-0.00262
	7	0.15499	-0.43198	0.38068	0.00054	0.00010	-0.00325
	8	0.13759	-0.12120	0.43862	0.00063	0.00013	-0.00120
23	1	0.03844	-0.34632	0.03833	0.00005	0.00000	0.00000
	5	0.06887	-0.51029	0.06876	0.00009	0.00000	0.00000
	6	0.16230	-0.36546	0.45890	0.00065	0.00013	-0.00013
	7	0.15507	-0.48955	0.37749	0.00053	0.00010	-0.00009
	8	0.13770	-0.14381	0.43437	0.00062	0.00013	-0.00013
24	1	0.03844	-0.30726	0.03833	0.00005	0.00000	0.00224
	5	0.06887	-0.45553	0.06876	0.00009	0.00000	0.00316
	6	0.16241	-0.32572	0.45459	0.00065	0.00014	0.00238
	7	0.15515	-0.43760	0.37426	0.00053	0.00010	0.00308
	8	0.13781	-0.12907	0.43005	0.00061	0.00014	0.00095
25	1	0.03844	-0.19974	0.03834	0.00005	0.00000	0.00390
	5	0.06887	-0.30350	0.06877	0.00009	0.00000	0.00560
	6	0.16251	-0.20929	0.45036	0.00064	0.00012	0.00424
	7	0.15523	-0.28832	0.37109	0.00052	0.00009	0.00550
	8	0.13791	-0.08146	0.42582	0.00061	0.00012	0.00175
26	1	0.03841	-0.19947	0.03832	-0.00001	0.00000	-0.00389
	5	0.06884	-0.30324	0.06875	-0.00001	0.00000	-0.00560
	6	0.18848	-0.26376	0.46743	0.00032	0.00012	-0.00444
	7	0.17470	-0.32911	0.38389	0.00024	0.00009	-0.00564
	8	0.16389	-0.13610	0.44290	0.00033	0.00012	-0.00195
27	1	0.03841	-0.30713	0.03833	0.00000	0.00000	-0.00223
	5	0.06884	-0.45552	0.06876	0.00001	0.00000	-0.00315
	6	0.18859	-0.38683	0.46319	0.00039	0.00014	-0.00257
	7	0.17479	-0.48350	0.38071	0.00030	0.00010	-0.00321
	8	0.16401	-0.19027	0.43866	0.00039	0.00014	-0.00115
28	1	0.03841	-0.34583	0.03833	0.00001	0.00000	0.00000
	5	0.06884	-0.50980	0.06876	0.00003	0.00000	0.00000
	6	0.18871	-0.43265	0.45889	0.00046	0.00013	-0.00008
	7	0.17488	-0.53983	0.37749	0.00036	0.00010	-0.00006
	8	0.16413	-0.21132	0.43436	0.00045	0.00013	-0.00008
29	1	0.03841	-0.30675	0.03833	0.00003	0.00000	0.00224
	5	0.06884	-0.45502	0.06876	0.00005	0.00000	0.00316
	6	0.18883	-0.39137	0.45462	0.00052	0.00013	0.00243
	7	0.17496	-0.48672	0.37429	0.00042	0.00010	0.00311

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	8	0.16425	-0.19505	0.43009	0.00051	0.00013	0.00100
30	1	0.03841	-0.19930	0.03834	0.00004	0.00000	0.00389
	5	0.06884	-0.30308	0.06877	0.00007	0.00000	0.00560
	6	0.18895	-0.27351	0.45030	0.00059	0.00014	0.00428
	7	0.17505	-0.33639	0.37105	0.00048	0.00011	0.00553
	8	0.16436	-0.14596	0.42577	0.00057	0.00014	0.00179

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

117. PRINT MEMBER PROPERTIES

EMBER PROPERTIES. UNIT - INCH

MEMB	PROFILE	AX/ AY	IZ/ AZ	IY/ SZ	IX/ SY
1	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
2	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
3	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
4	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
5	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
6	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
7	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
8	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
9	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
10	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
11	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
12	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
13	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
14	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
15	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
16	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
17	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
18	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
19	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
20	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
21	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
22	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
23	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
24	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64

EMBER PROPERTIES. UNIT - INCH

MEMB	PROFILE	AX/ AY	IZ/ AZ	IY/ SZ	IX/ SY
25	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
26	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
27	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
28	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
29	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
30	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
31	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
32	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
33	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
34	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
35	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
36	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
37	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
38	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
39	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
40	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
41	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
42	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
43	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
44	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
45	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
46	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
47	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
48	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81

EMBER PROPERTIES. UNIT - INCH

MEMB	PROFILE	AX/ AY	IZ/ AZ	IY/ SZ	IX/ SY
49	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
50	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
51	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
52	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
53	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
54	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
55	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
56	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
57	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
58	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
59	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
60	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
61	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
62	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
63	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90

********** END OF DATA FROM INTERNAL STORAGE **********

```
118. SECTION 0 0.25 0.5 0.75 1 ALL
119. PARAMETER 1
120. CODE AISC
121. LY 75 MEMB 18 TO 21 43 TO 46 51 TO 58
122. LZ 75 MEMB 18 TO 21 43 TO 46 51 TO 58
123. LY 42 MEMB 42 50 59 TO 63
124. UNL 42 MEMB 42 50 59 TO 63
125. FYLD 36 ALL
126. TRACK 1 ALL
127. CHECK CODE MEMB 1 TO 4 9 TO 14 18 TO 25 39 TO 46 59 TO 61
```

STAAD.Pro CODE CHECKING - (AISC 9TH EDITION)
****

ALL UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1	ST 4ANGLES		(UPT)		
		PASS	AISC- H1-1	0.207	5
		30.53 C	0.00	0.00	0.00

```
 ----------------------------------------------------------------------
| MEM=     1, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
2	ST 4ANGLES		(UPT)		
		PASS	AISC- H1-1	0.207	5
		30.53 C	0.00	0.00	0.00

```
 ----------------------------------------------------------------------
| MEM=     2, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
3	ST 4ANGLES		(UPT)		
		PASS	AISC- H1-1	0.207	5
		30.53 C	0.00	0.00	0.00

```
 ----------------------------------------------------------------------
| MEM=     3, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
4	ST 4ANGLES		(UPT)		
		PASS	AISC- H1-1	0.207	5
		30.53 C	-0.02	-0.02	192.00

```
 ----------------------------------------------------------------------
| MEM=     4, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
9	LD L40406		(AISC SECTIONS)		
		PASS	AISC- H1-3	0.083	8
		2.78 C	0.00	0.00	0.00

L UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION

```
 ----------------------------------------------------------------------
| MEM=     9, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   10  LD   L40406                    (AISC SECTIONS)
                         PASS     AISC- H1-3          0.078          8
                      2.62 C          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    10, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   11  LD   L40406                    (AISC SECTIONS)
                         PASS     AISC- H1-3          0.073          8
                      2.47 C          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    11, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   12  ST   W16X40                    (AISC SECTIONS)
                         PASS     AISC- H2-1          0.577          5
                      0.00 T          0.00         -887.47       34.44

 ----------------------------------------------------------------------
| MEM=    12, UNIT KIP-INCH, L=  34.4 AX=  11.80 SZ=    64.7 SY=     8.3|
| KL/R-Y=  22.0  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 19.63  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   13  ST   W16X40                    (AISC SECTIONS)
                         PASS     AISC- H2-1          0.911          7
                      0.87 T         -0.07        -1395.30       32.04

 ----------------------------------------------------------------------
| MEM=    13, UNIT KIP-INCH, L=  32.0 AX=  11.80 SZ=    64.7 SY=     8.3|
| KL/R-Y=  20.5  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 19.71  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

GLOBAL UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
* 14	ST W16X40		(AISC SECTIONS)		
		FAIL	AISC- H2-1	1.024	7
		0.87 T	-0.01	-1568.38	31.92

```
 ----------------------------------------------------------------------
| MEM=    14, UNIT KIP-INCH, L=  31.9 AX=  11.80 SZ=    64.7 SY=     8.3|
| KL/R-Y=  20.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 19.71  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

18	ST L40406		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.065	8
		3.99 T	0.00	0.00	0.00

```
 ----------------------------------------------------------------------
| MEM=    18, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

19	ST L40406		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.061	8
		3.77 T	0.00	0.00	0.00

```
 ----------------------------------------------------------------------
| MEM=    19, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

20	ST L40406		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.058	8
		3.55 T	0.00	0.00	0.00

```
 ----------------------------------------------------------------------
| MEM=    20, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

21	ST L40406		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.054	8
		3.34 T	0.00	0.00	0.00

UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION

```
 ----------------------------------------------------------------------
| MEM=    21, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   22  ST   4ANGLES                    (UPT)
                          PASS     AISC- H1-1          0.328          7
                      48.30 C          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    22, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   23  ST   4ANGLES                    (UPT)
                          PASS     AISC- H1-1          0.295          7
                      43.44 C          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    23, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   24  ST   4ANGLES                    (UPT)
                          PASS     AISC- H1-1          0.264          7
                      38.86 C          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    24, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   25  ST   4ANGLES                    (UPT)
                          PASS     AISC- H1-1          0.234          7
                      34.55 C          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    25, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
39 LD	L40406		(AISC SECTIONS)		
		PASS	AISC- H1-1	0.255	8
		8.58 C	0.00	0.00	0.00

```
-----------------------------------------------------------------------
| MEM=    39, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
-----------------------------------------------------------------------
```

40 LD	L40406		(AISC SECTIONS)		
		PASS	AISC- H1-1	0.242	8
		8.13 C	0.00	0.00	0.00

```
-----------------------------------------------------------------------
| MEM=    40, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
-----------------------------------------------------------------------
```

41 LD	L40406		(AISC SECTIONS)		
		PASS	AISC- H1-1	0.229	8
		7.68 C	0.00	0.00	0.00

```
-----------------------------------------------------------------------
| MEM=    41, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
-----------------------------------------------------------------------
```

42 ST	W12X19		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.341	5
		0.00 T	0.00	-173.08	98.40

```
-----------------------------------------------------------------------
| MEM=    42, UNIT KIP-INCH, L= 196.8 AX=   5.57 SZ=    21.4 SY=     1.9|
| KL/R-Y=  50.8  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 17.79  FT= 21.60  FV= 14.40   |
-----------------------------------------------------------------------
```

43 ST	L40406		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.199	8
		12.30 T	0.00	0.00	0.00

L UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION

```
 ----------------------------------------------------------------------
| MEM=    43, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   44  ST   L40406                    (AISC SECTIONS)
                        PASS     AISC- H2-1          0.189          8
                    11.68 T          0.00            0.00        0.00

 ----------------------------------------------------------------------
| MEM=    44, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   45  ST   L40406                    (AISC SECTIONS)
                        PASS     AISC- H2-1          0.179          8
                    11.05 T          0.00            0.00        0.00

 ----------------------------------------------------------------------
| MEM=    45, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   46  ST   L40406                    (AISC SECTIONS)
                        PASS     AISC- H2-1          0.169          8
                    10.42 T          0.00            0.00        0.00

 ----------------------------------------------------------------------
| MEM=    46, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   59  ST   W12X19                    (AISC SECTIONS)
                        PASS     AISC- H1-3          0.732          5
                     0.00 T          0.00         -371.97       98.40

 ----------------------------------------------------------------------
| MEM=    59, UNIT KIP-INCH, L= 196.8 AX=   5.57 SZ=    21.4 SY=     1.9|
| KL/R-Y=  50.8  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 17.79  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
60	ST W12X19		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.894	6
		0.03 T	0.00	-454.11	98.40

```
-----------------------------------------------------------------------
| MEM=    60, UNIT KIP-INCH, L= 196.8 AX=   5.57 SZ=    21.4 SY=     1.9|
| KL/R-Y=  50.8  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 17.79  FT= 21.60  FV= 14.40   |
-----------------------------------------------------------------------
```

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
61	ST W12X19		(AISC SECTIONS)		
		PASS	AISC- H1-3	0.894	6
		0.00 C	0.00	-454.11	98.40

```
-----------------------------------------------------------------------
| MEM=    61, UNIT KIP-INCH, L= 196.8 AX=   5.57 SZ=    21.4 SY=     1.9|
| KL/R-Y=  50.8  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 17.79  FT= 21.60  FV= 14.40   |
-----------------------------------------------------------------------
```

.28. STEEL TAKE OFF ALL

'TEEL TAKE-OFF

PROFILE	LENGTH(INCH)	WEIGHT(KIP)
ST 4ANGLES	3072.00	9.946
LD L40406	2361.60	3.822
ST W16X40	393.60	1.314
ST L40406	4399.10	3.559
ST W12X19	1377.60	2.172
	TOTAL =	20.812

********** END OF DATA FROM INTERNAL STORAGE **********

129. FINISH

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

  **** DATE= NOV 20,2009   TIME=  9:29:57 ****

************************************************************
*         For questions on STAAD.Pro, please contact       *
*   Research Engineers Offices at the following locations  *
*                                                          *
*               Telephone                Email             *
*  USA:       +1 (714)974-2500       support@bentley.com    *
*  CANADA     +1 (905)632-4771       detech@odandetech.com  *
*  UK         +44(1454)207-000       support@bentley.com    *
*  NORWAY     +47 67 57 21 30        staad@edr.no           *
*  SINGAPORE  +65 6225-6158          support@bentley.com    *
*  INDIA      +91(033)4006-2021      support@bentley.com    *
*  JAPAN      +81(03)5952-6500       eng-eye@crc.co.jp      *
*  CHINA      +86(411)8479-1166      support@bentley.com    *
*  THAILAND   +66(0)2645-1018/19     support@bentley.com    *
*                                                          *
*  North America                   support@bentley.com      *
*  Europe                          support@bentley.com      *
*  Asia                            support@bentley.com      *
************************************************************
```

LATERAL LOAD UNDER LOAD 3, SEISMIC WAS INCREASED TO GET A DEFLECTION OF 3 TIMES THE ELASTIC DEFLECTION ALLOWABLE STRESS RATIO IS INCREASED TO 1.33,

```
**************************************************
*                                                *
*           STAAD.Pro                            *
*           Version  2007    Build 03            *
*           Proprietary Program of               *
*           Research Engineers,  Intl.           *
*           Date=    DEC 15, 2009                *
*           Time=    12: 7:38                    *
*                                                *
*      USER ID: USACE                            *
**************************************************
```

```
     1. STAAD SPACE - 65' HIGH X 16.4'X16.4' (20M HIGH X 5MX5M) 7000 GAL WATER TANK
INPUT FILE: Structure10_3delta.STD
     2. START JOB INFORMATION
     3. ENGINEER DATE 08-MAY-06
     4. END JOB INFORMATION
     5. UNIT FEET KIP
     6. JOINT COORDINATES
     7. 1 0 0 0; 2 0 16 0; 3 0 32 0; 4 0 48 0; 5 0 64 0; 6 16.4 0 0
     8. 7 16.4 16 0; 8 16.4 32 0; 9 16.4 48 0; 10 16.4 64 0; 11 0 0 16.4
     9. 12 0 16 16.4; 13 0 32 16.4; 14 0 48 16.4; 15 0 64 16.4; 16 16.4 0 16.4
    10. 17 16.4 16 16.4; 18 16.4 32 16.4; 19 16.4 48 16.4; 20 16.4 64 16.4
    11. 21 2.87 64 0; 22 5.54 64 0; 23 8.2 64 0; 24 10.87 64 0; 25 13.53 64 0
    12. 26 2.87 64 16.4; 27 5.54 64 16.4; 28 8.2 64 16.4; 29 10.87 64 16.4
    13. 30 13.53 64 16.4
    14. MEMBER INCIDENCES
    15. 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 2 7; 10 3 8
    16. 11 4 9; 12 5 21; 13 21 22; 14 22 23; 15 23 24; 16 24 25; 17 25 10
    17. 18 1 7; 19 2 8; 20 3 9; 21 4 10; 22 11 12; 23 12 13; 24 13 14; 25 14 15
    18. 26 16 17; 27 17 18; 28 18 19; 29 19 20; 30 12 17; 31 13 18; 32 14 19
    19. 33 15 26; 34 26 27; 35 27 28; 36 28 29; 37 29 30; 38 30 20; 39 2 12
    20. 40 3 13; 41 4 14; 42 5 15; 43 1 12; 44 2 13; 45 3 14; 46 4 15; 47 17 7
    21. 48 18 8; 49 19 9; 50 20 10; 51 6 17; 52 7 18; 53 8 19; 54 9 20
    22. 55 11 17; 56 12 18; 57 13 19; 58 14 20; 59 21 26; 60 22 27; 61 23 28
    23. 62 24 29; 63 25 30
    24. ELEMENT INCIDENCES SHELL
    25. 70 5 10 20 15
    26. START USER TABLE
    27. TABLE 1
    28. UNIT INCHES KIP
    29. GENERAL
    30. 4ANGLES
    31. *L4X4X3/8 W/ 5/8" SPACER PLATE
    32. 11.44 8.625 0.625 8.625 0.625 41.58 41.58 1 11.44 9.64 0 9.64 0 0 0 0
    33. END
    34. UNIT INCHES KIP
    35. MEMBER PROPERTY AMERICAN
    36. 1 TO 8 22 TO 29 UPTABLE 1 4ANGLES
    37. 18 TO 21 43 TO 46 51 TO 58 TABLE ST L40406
    38. 9 TO 11 30 TO 32 39 TO 41 47 TO 49 TABLE LD L40406 SP 0.625
    39. 12 TO 17 33 TO 38 TABLE ST W16X40
    40. 42 50 59 TO 63 TABLE ST W12X19
```

```
41. ELEMENT PROPERTY
42. 70 THICKNESS 0.25
43. UNIT FEET KIP
44. DEFINE MATERIAL START
45. ISOTROPIC STEEL
46. E 4.176E+006
47. POISSON 0.3
48. DENSITY 0.489024
49. ALPHA 6.5E-006
50. END DEFINE MATERIAL
51. MEMBER RELEASE
52. 2 TO 4 6 TO 12 18 TO 21 23 TO 25 27 TO 33 39 TO 63 START MY MZ
53. 1 TO 3 5 TO 7 9 TO 11 17 TO 28 30 TO 32 38 TO 54 58 TO 63 END MY MZ
54. CONSTANTS
55. MATERIAL STEEL ALL
56. SUPPORTS
57. 1 6 11 16 PINNED
58. ****************************************
59. LOAD 1 DEAD LOAD
60. *SELFWEIGHT Y -1
61. MEMBER LOAD
62. *BEAM WT
63. 12 TO 17 33 TO 37 UNI Y -0.045
64. 59 TO 63 UNI Y -0.019
65. 42 50 UNI Y -0.019
66. *TANK DL
67. 60 TO 62 UNI Y -0.096
68. 59 63 UNI Y -0.048
69. *WATER
70. 60 TO 62 UNI Y -0.89
71. 59 63 UNI Y -0.445
72. ****************************************
73. LOAD 2 LIVE LOAD
74. *PLATFORM LL
75. MEMBER LOAD
76. 12 TO 17 33 TO 38 UNI Y -0.82
77. 42 50 59 63 UNI Y -0.41
78. ****************************************
79. LOAD 3 SEISMIC
80. JOINT LOAD
81. *ACCELERATED HORIZ WATER LOAD _TANK
82. *5 10 15 20 FZ 4.871
83. *5 10 15 20 FX 1.461
84. 5 10 15 20 FZ 23
85. 5 10 15 20 FX 6.9
86. *ACCELERATED TOWER WT SIESMIC LOAD
87. JOINT LOAD
88. 2 TO 5 7 TO 10 12 TO 15 20 FZ 0.32
89. 2 TO 5 7 TO 10 12 TO 15 20 FX 0.11
90. ****************************************
91. *LOAD 4 SEISMIC (VERTICAL SIESMIC WATER LOAD (SDS X W)
92. *MEMBER LOAD
93. *60 TO 62 UNI Y -0.76
94. *59 63 UNI Y -0.38
95. ****************************************
96. LOAD 4 SNOW
```

```
 97. MEMBER LOAD
 98. 59 TO 63 UNI Y -0.031
 99. 42 50 UNI Y -0.016
100. ***************************************
101. LOAD COMB 5 DL + LL
102. 1 1.0 2 1.0
103. ***************************************
104. LOAD COMB 6 DL + SEISMIC
105. 1 1.12 3 0.7
106. ***************************************
107. LOAD COMB 7 DL + SEISMIC + LL + SNOW
108. 1 1.08 2 0.75 3 0.525 4 0.75
109. ***************************************
110. LOAD COMB 8 DL + SEISMIC
111. 1 0.48 3 0.7
112. ***************************************
113. UNIT INCHES KIP
114. PDELTA ANALYSIS
```

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

  NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =    30/    64/     4

        SOLVER USED IS THE OUT-OF-CORE BASIC SOLVER

  ORIGINAL/FINAL BAND-WIDTH=    16/     6/     42 DOF
  TOTAL PRIMARY LOAD CASES =    4, TOTAL DEGREES OF FREEDOM =    168
  SIZE OF STIFFNESS MATRIX =        8 DOUBLE  KILO-WORDS
  REQRD/AVAIL. DISK SPACE  =     12.2/ 106179.3 MB

++ Adjusting Displacements                          12: 7:38

115. LOAD LIST 8
116. PRINT SUPPORT REACTION
```

SUPPORT REACTIONS -UNIT KIP INCH STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	8	-11.63	-169.93	-35.57	0.00	0.00	0.00
6	8	-0.05	-72.40	-32.31	0.00	0.00	0.00
11	8	-8.82	108.37	0.22	0.00	0.00	0.00
16	8	0.17	166.70	0.35	0.00	0.00	0.00

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

117. *PRINT MEMBER FORCES
118. PRINT JOINT DISPLACEMENTS

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
1	8	0.00000	0.00000	0.00000	0.00175	0.00015	-0.00034
2	8	0.06496	0.07200	0.33528	0.00196	0.00015	-0.00036
3	8	0.18624	0.11807	0.78878	0.00216	0.00015	-0.00034
4	8	0.35035	0.13858	1.32092	0.00235	0.00015	-0.00028
5	8	0.52814	0.13386	1.86047	0.00280	0.00015	-0.00092
6	8	0.00000	0.00000	0.00000	0.00177	-0.00003	-0.00027
7	8	0.05142	0.02378	0.34044	0.00195	-0.00002	-0.00062
8	8	0.17299	0.03602	0.77438	0.00215	-0.00001	-0.00064
9	8	0.33730	0.03669	1.26770	0.00235	-0.00001	-0.00065
10	8	0.53109	0.02580	1.75613	0.00254	0.00000	-0.00101
11	8	0.00000	0.00000	0.00000	0.00153	0.00014	-0.00085
12	8	0.16255	-0.06776	0.29374	0.00179	0.00013	-0.00035
13	8	0.32967	-0.12065	0.74787	0.00243	0.00009	-0.00033
14	8	0.49345	-0.15887	1.28058	0.00265	0.00005	-0.00027
15	8	0.63241	-0.18265	1.85305	0.00117	-0.00001	-0.00016
16	8	0.00000	0.00000	0.00000	0.00157	0.00011	-0.00079
17	8	0.15196	-0.09647	0.30218	0.00169	0.00011	-0.00064
18	8	0.31921	-0.16977	0.73639	0.00240	0.00009	-0.00066
19	8	0.48310	-0.22002	1.22999	0.00263	0.00011	-0.00065
20	8	0.63575	-0.24741	1.74926	0.00269	0.00015	-0.00079
21	8	0.52866	0.03807	1.83868	0.00275	0.00058	-0.00242
22	8	0.52914	-0.03128	1.82151	0.00271	0.00052	-0.00162
23	8	0.52962	-0.06742	1.80473	0.00267	0.00053	-0.00055
24	8	0.53010	-0.06627	1.78770	0.00263	0.00054	0.00052
25	8	0.53058	-0.03219	1.77103	0.00258	0.00048	0.00132
26	8	0.63300	-0.27079	1.83840	0.00144	0.00048	-0.00220
27	8	0.63354	-0.33302	1.82168	0.00168	0.00054	-0.00140
28	8	0.63408	-0.36211	1.80471	0.00193	0.00053	-0.00033
29	8	0.63462	-0.35390	1.78785	0.00218	0.00052	0.00074
30	8	0.63517	-0.31285	1.77077	0.00242	0.00058	0.00154

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

119. PRINT MEMBER PROPERTIES

EMBER PROPERTIES. UNIT - INCH

MEMB	PROFILE	AX/ AY	IZ/ AZ	IY/ SZ	IX/ SY
1	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
2	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
3	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
4	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
5	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
6	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
7	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
8	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
9	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
10	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
11	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
12	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
13	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
14	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
15	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
16	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
17	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
18	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
19	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
20	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
21	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
22	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
23	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
24	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64

EMBER PROPERTIES. UNIT - INCH

MEMB	PROFILE	AX/ AY	IZ/ AZ	IY/ SZ	IX/ SY
25	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
26	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
27	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
28	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
29	ST 4ANGLES	11.44	41.58	41.58	1.00
		0.00	9.64	11.44	9.64
30	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
31	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
32	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
33	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
34	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
35	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
36	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
37	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
38	ST W16X40	11.80	518.00	28.90	0.79
		4.88	4.71	64.71	8.26
39	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
40	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
41	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
42	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
43	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
44	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
45	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
46	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
47	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
48	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81

EMBER PROPERTIES. UNIT - INCH

MEMB	PROFILE	AX/ AY	IZ/ AZ	IY/ SZ	IX/ SY
49	LD L40406	5.72	8.72	20.76	0.27
		2.00	2.00	3.05	4.81
50	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
51	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
52	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
53	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
54	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
55	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
56	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
57	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
58	ST L40406	2.86	1.78	6.94	0.13
		1.00	1.00	1.10	2.45
59	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
60	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
61	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
62	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90
63	ST W12X19	5.57	130.00	3.80	0.18
		2.86	1.87	21.38	1.90

********** END OF DATA FROM INTERNAL STORAGE **********

```
120. SECTION 0 0.25 0.5 0.75 1 ALL
121. PARAMETER 1
122. CODE AISC
123. LY 75 MEMB 18 TO 21 43 TO 46 51 TO 58
124. LZ 75 MEMB 18 TO 21 43 TO 46 51 TO 58
125. LY 42 MEMB 42 50 59 TO 63
126. UNL 42 MEMB 42 50 59 TO 63
127. FYLD 36 ALL
128. TRACK 1 ALL
129. CHECK CODE MEMB 1 TO 4 9 TO 14 18 TO 25 39 TO 46 59 TO 61
```

STAAD.Pro CODE CHECKING - (AISC 9TH EDITION)
****

ALL UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1	ST 4ANGLES		(UPT)		
		PASS	AISC- H2-1	0.503	8
		124.41 T	0.00	0.00	0.00

```
 ----------------------------------------------------------------------
| MEM=     1, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
2	ST 4ANGLES		(UPT)		
		PASS	AISC- H2-1	0.322	8
		79.61 T	0.00	0.00	0.00

```
 ----------------------------------------------------------------------
| MEM=     2, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
3	ST 4ANGLES		(UPT)		
		PASS	AISC- H2-1	0.143	8
		35.44 T	0.00	0.00	0.00

```
 ----------------------------------------------------------------------
| MEM=     3, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
4	ST 4ANGLES		(UPT)		
		PASS	AISC- H1-3	0.057	8
		8.16 C	-0.20	-0.16	192.00

```
 ----------------------------------------------------------------------
| MEM=     4, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
9	LD L40406		(AISC SECTIONS)		
		PASS	AISC- H1-1	0.339	8
		11.41 C	0.00	0.00	0.00

ALL UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

```
MEMBER     TABLE        RESULT/   CRITICAL COND/     RATIO/     LOADING/
                          FX            MY              MZ       LOCATION
=====================================================================

 ---------------------------------------------------------------------
| MEM=     9, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
 ---------------------------------------------------------------------

   10  LD   L40406                    (AISC SECTIONS)
                          PASS     AISC- H1-1          0.332         8
                      11.17 C          0.00            0.00        0.00

 ---------------------------------------------------------------------
| MEM=    10, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
 ---------------------------------------------------------------------

   11  LD   L40406                    (AISC SECTIONS)
                          PASS     AISC- H1-1          0.327         8
                      11.00 C          0.00            0.00        0.00

 ---------------------------------------------------------------------
| MEM=    11, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
 ---------------------------------------------------------------------

   12  ST   W16X40                    (AISC SECTIONS)
                          PASS     AISC- H2-1          0.217         8
                       5.13 T          3.59         -278.70       34.44

 ---------------------------------------------------------------------
| MEM=    12, UNIT KIP-INCH, L=  34.4 AX=  11.80 SZ=    64.7 SY=     8.3|
| KL/R-Y=  22.0  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 19.63  FT= 21.60  FV= 14.40   |
 ---------------------------------------------------------------------

   13  ST   W16X40                    (AISC SECTIONS)
                          PASS     AISC- H2-1          0.329         8
                       5.13 T         -0.39         -471.50       32.04

 ---------------------------------------------------------------------
| MEM=    13, UNIT KIP-INCH, L=  32.0 AX=  11.80 SZ=    64.7 SY=     8.3|
| KL/R-Y=  20.5  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 19.71  FT= 21.60  FV= 14.40   |
 ---------------------------------------------------------------------
```

ALL UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
14	ST W16X40		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.369	8
		5.13 T	-0.05	-535.48	31.92

```
| MEM=    14, UNIT KIP-INCH, L=  31.9 AX=  11.80 SZ=    64.7 SY=     8.3|
| KL/R-Y=  20.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 19.71  FT= 21.60  FV= 14.40   |
```

18	ST L40406		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.261	8
		16.11 T	0.00	0.00	0.00

```
| MEM=    18, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
```

19	ST L40406		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.255	8
		15.74 T	0.00	0.00	0.00

```
| MEM=    19, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
```

20	ST L40406		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.250	8
		15.47 T	0.00	0.00	0.00

```
| MEM=    20, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
```

21	ST L40406		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.247	8
		15.26 T	0.00	0.00	0.00

ALL UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION

```
 ----------------------------------------------------------------------
| MEM=    21, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   22  ST   4ANGLES                    (UPT)
                         PASS     AISC- H1-1          0.794          8
                    117.08 C          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    22, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   23  ST   4ANGLES                    (UPT)
                         PASS     AISC- H1-1          0.620          8
                     91.39 C          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    23, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   24  ST   4ANGLES                    (UPT)
                         PASS     AISC- H1-1          0.448          8
                     66.05 C          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    24, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   25  ST   4ANGLES                    (UPT)
                         PASS     AISC- H1-1          0.279          8
                     41.09 C          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    25, UNIT KIP-INCH, L= 192.0 AX=  11.44 SZ=    11.4 SY=     9.6|
| KL/R-Y= 100.7  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 27.00  FTY= 27.00  FC= 12.89  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

ALL UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

```
MEMBER     TABLE        RESULT/   CRITICAL COND/     RATIO/     LOADING/
                          FX            MY             MZ       LOCATION
=====================================================================


  **WARNING- THE AXIAL COMPRESSIVE STRESS EXCEEDS THE EULER STRESS FOR MEMBER      39
             EQN. AISC H1-1 CANNOT BE CHECKED PROPERLY.
*   39  LD   L40406                    (AISC SECTIONS)
                          FAIL     AISC- H1-1          1.042          8
                       35.01 C          0.00            0.00        0.00

 ----------------------------------------------------------------------
| MEM=    39, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------


  **WARNING- THE AXIAL COMPRESSIVE STRESS EXCEEDS THE EULER STRESS FOR MEMBER      40
             EQN. AISC H1-1 CANNOT BE CHECKED PROPERLY.
*   40  LD   L40406                    (AISC SECTIONS)
                          FAIL     AISC- H1-1          1.026          8
                       34.47 C          0.00            0.00        0.00

 ----------------------------------------------------------------------
| MEM=    40, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------


  **WARNING- THE AXIAL COMPRESSIVE STRESS EXCEEDS THE EULER STRESS FOR MEMBER      41
             EQN. AISC H1-1 CANNOT BE CHECKED PROPERLY.
*   41  LD   L40406                    (AISC SECTIONS)
                          FAIL     AISC- H1-1          1.011          8
                       33.99 C          0.00            0.00        0.00

 ----------------------------------------------------------------------
| MEM=    41, UNIT KIP-INCH, L= 196.8 AX=   5.72 SZ=     3.0 SY=     4.8|
| KL/R-Z= 159.4  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 21.60 |
| FTZ= 21.60  FCY= 21.60  FTY= 21.60  FC=  5.88  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

    42  ST   W12X19                    (AISC SECTIONS)
                          PASS     AISC- H1-3          0.069          8
                        6.09 C          0.00           -3.68      98.40
```

ALL UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

```
MEMBER     TABLE        RESULT/   CRITICAL COND/     RATIO/     LOADING/
                          FX            MY              MZ       LOCATION
=======================================================================


 ----------------------------------------------------------------------
| MEM=    42, UNIT KIP-INCH, L= 196.8 AX=   5.57 SZ=    21.4 SY=     1.9|
| KL/R-Y=  50.8  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 17.79  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   43  ST   L40406                    (AISC SECTIONS)
                          PASS     AISC- H2-1          0.796          8
                      49.13 T          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    43, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   44  ST   L40406                    (AISC SECTIONS)
                          PASS     AISC- H2-1          0.785          8
                      48.49 T          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    44, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   45  ST   L40406                    (AISC SECTIONS)
                          PASS     AISC- H2-1          0.775          8
                      47.84 T          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    45, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------

   46  ST   L40406                    (AISC SECTIONS)
                          PASS     AISC- H2-1          0.765          8
                      47.21 T          0.00            0.00         0.00

 ----------------------------------------------------------------------
| MEM=    46, UNIT KIP-INCH, L= 274.9 AX=   2.86 SZ=     1.1 SY=     2.5|
| KL/R- =  95.2  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 16.80  FTY= 23.76  FC= 13.58  FT= 21.60  FV= 14.40   |
 ----------------------------------------------------------------------
```

ALL UNITS ARE - KIP INCH (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
59	ST W12X19		(AISC SECTIONS)		
		PASS	AISC- H1-3	0.197	8
		0.23 C	0.00	-99.15	98.40

```
-----------------------------------------------------------------------
| MEM=    59, UNIT KIP-INCH, L= 196.8 AX=   5.57 SZ=    21.4 SY=     1.9|
| KL/R-Y=  50.8  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 17.79  FT= 21.60  FV= 14.40   |
-----------------------------------------------------------------------
```

60	ST W12X19		(AISC SECTIONS)		
		PASS	AISC- H2-1	0.384	8
		0.14 T	0.00	-194.62	98.40

```
-----------------------------------------------------------------------
| MEM=    60, UNIT KIP-INCH, L= 196.8 AX=   5.57 SZ=    21.4 SY=     1.9|
| KL/R-Y=  50.8  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 17.79  FT= 21.60  FV= 14.40   |
-----------------------------------------------------------------------
```

61	ST W12X19		(AISC SECTIONS)		
		PASS	AISC- H1-3	0.383	8
		0.02 C	0.00	-194.62	98.40

```
-----------------------------------------------------------------------
| MEM=    61, UNIT KIP-INCH, L= 196.8 AX=   5.57 SZ=    21.4 SY=     1.9|
| KL/R-Y=  50.8  CB=  1.00  YLD= 36.00  ALLOWABLE STRESSES:  FCZ= 23.76 |
| FTZ= 23.76  FCY= 27.00  FTY= 27.00  FC= 17.79  FT= 21.60  FV= 14.40   |
-----------------------------------------------------------------------
```

130. STEEL TAKE OFF ALL

TEEL TAKE-OFF

	PROFILE	LENGTH(INCH)	WEIGHT(KIP)
ST	4ANGLES	3072.00	9.946
LD	L40406	2361.60	3.822
ST	W16X40	393.60	1.314
ST	L40406	4399.10	3.559
ST	W12X19	1377.60	2.172
		TOTAL =	20.812

********** END OF DATA FROM INTERNAL STORAGE **********

131. FINISH

CORPS OF ENGINEERS, U.S. ARMY
MOBILE DISTRICT

File No. _____

Subject WATER TANK AFGHANISTAN — Pages, Page _____

Date 11/09

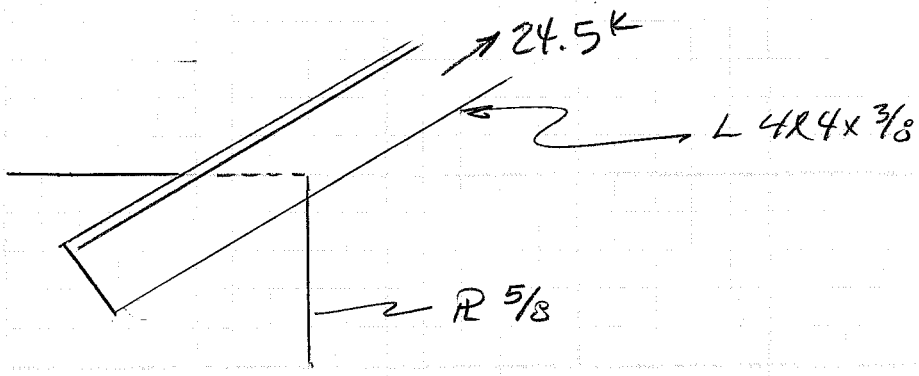
Computed by MDT Checked by ASP Approved by _____ Symbol _____

DIAGONAL CONNECTION:

USE MAXIMUM DIAGONAL LOAD OF 12.25^K T
MEMBER 43 OF STAAD

CONNECTION = $\Omega \times T$
= 2 x 12.25 = 24.5^K T

ASCE7
15.7.3a



A307 BOLTS, 1" ϕ SINGLE SHEAR = 7.9^K

No BOLTS = $\frac{24.5}{7.9}$ = 3.1

USE 2 - 1" ϕ BOLTS

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

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LOCATION OF SPACER PL'S IN COLUMNS

COL => 4 - L 4 x 4 x 3/8

$Kl/r = .788$

$Kl/r_{MAX} = 200$

$l = 16.4' = 197''$

FULL HT $Kl/r = \frac{197}{.288} = 250 > 250$ N.G.

ADD SPACER PLATES AT MID HT OF COL BETWEEN LEVELS

$\frac{197/2}{.788} = 125 > 200$ OK

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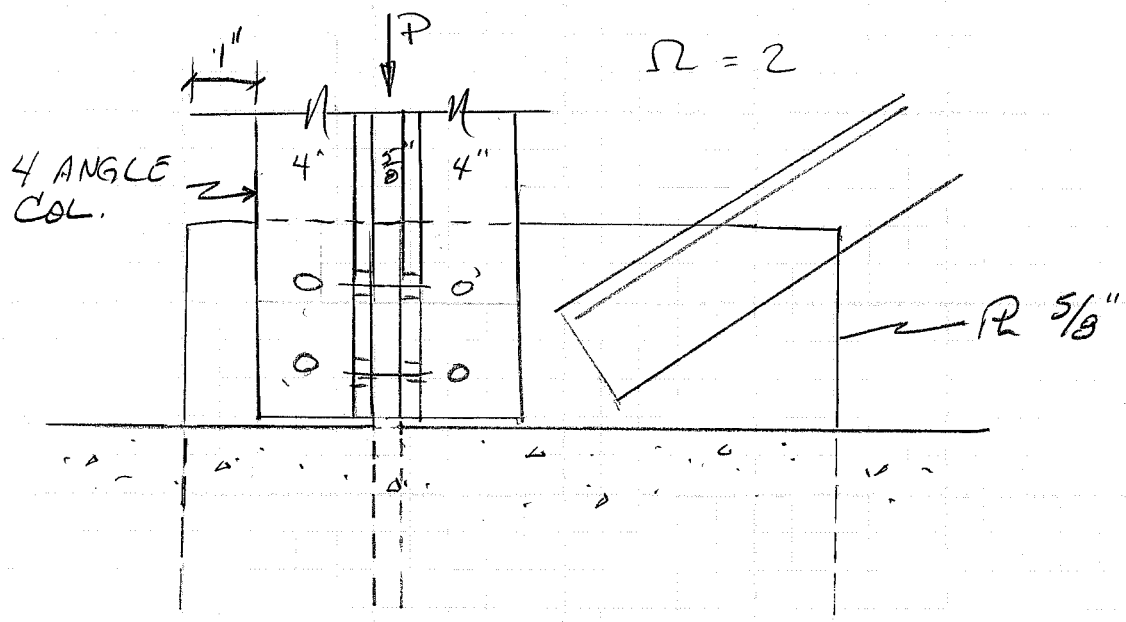
4 ANGLE COLUMN TO EMBEDDED PLATE CONNECTION

P = 53.61^K C MEMBER 22 STAAD



$\Omega = 2$

A307 BOLTS DOUBLE SHEAR

$3/4''\phi = 8.8^K$

$1''\phi = 15.4^K$

FOR CONNECTIONS $P_u = P\Omega = 2(53.61) = 107.22^K$

$$\text{NO BOLTS} = \frac{107.22^K}{15.4^{K/BOLT}} = 6.96$$

USE 8 BOLTS

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CHECK BEARING ON 5/8" PL @ FDTN

ASSUME EFFECTIVE WIDTH IS 1" WIDER THAN COL

WIDTH = 4+4+5/8 + 1(2) = 10 5/8"

CHECK BRG WITH ONLY 1 PLATE

$A = 10\,5/8\,(5/8) = 6.64\ IN^2$

$\sigma_{BRG} = P/A = \frac{107.22}{6.61} = 16.22\ KSI < 21.6\ KSI$

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HORIZONTAL COMPRESSION STRUT.

FROM STAAD MEMBER

$C = 8.59^k$ $\Omega = 2$ ASCE7 15.7.3.d

$P_c = C\Omega = 8.59(2) = 17.18^k$

$$\frac{f_a}{F_a} = \frac{17.18/5.72}{5.88} = .51 < 1.0 \quad OK$$

Subject: Water Tower - Afghanistan — File No.
Moment splice (IPE 450) — Pages, Page 1
Date
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Factored Loads

$M = 1244$ kip-in $\quad V = 10.7$ kips

W410 x 60 (W16 x 40)

$d = 16.0$ $\quad I_x = 518$ in^4
$b = 7.0$ $\quad S_x = 64.7$ in^3
$t_w = 0.305$ $\quad F_b = 0.6 F_y = 0.6(36) = 21.6$ ksi
$t_f = 0.505$ $\quad F_v = 0.40 F_y = 14.4$ ksi
$K = 1\,13/16$ $\quad Z_x = 73$ in^3

Allowable load for 3/4" A307 bolts ($F_u = 60$)
(STD) $F_v = 10$ ksi (p. 4-5 ASD)

Single Shear = 4.4 kips / bolt
Double Shear = 8.8 kips/bolt
Bearing = ($F_u = 58$ ksi)
At 3" spc. + 1½" edge distance =

Table X1 (ASD) (p. 4-62)
$b = 3$ in $\quad I = 2$
$n = 3$
$C = 2.23$

$P = C \times r_v = 2.23 \times 8.8 = 19.62$ kips > 10.7 kips
O.K

If use two rows of 4 bolts

$P = 6.62 \times 8.8 = 58.2^k >> 10.7$ kips O.K

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Subject: Water Tower - Afghanistan File No. ____ Pages, Page 2
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Splice Plate Design:

$M = 10.7^k \times 1\frac{3}{4} = 18.725$ kip·in

$S_{req'd} = M/F_b = 18.73$ kip·in $/ 21.6 = 0.867$

Try 3/8" x 12" plate $S = 6.8\ (2) = 13.6\ in^3$

$S = 13.6\ in^3 > 0.867\ in^3$ ✓✓ O.K

Check shear

$f_v = \frac{V}{Ag} = \frac{10.7^k}{2 \times 3/8 \times 12} = 1.18 < 0.4F_y = 14.4$ ksi

O.K

$A_n = 2\,[3(3-(0.75+0.125)) + ((1.5-(0.75+0.125)/2)\ (0.375)$

$A_n = 2\,[6.375 + 1.06] \times 0.375 = 5.57$

$f_v = \frac{V}{An} = \frac{18.73}{5.57} = 3.36$ ksi $< 0.3F_y = 17.4$ ksi

O.K

Use two plates 3/8" x 12"

Flange Splice

$T = C = \frac{M}{d - t_f} = \frac{1244\ kip\cdot in}{16 - 0.505} = 80.3$ kips

Net flange area = (gross width − holes out + $s^2/4g$)

Consider two holes:

Gross flange width = 7.0 in
2 holes out = 2(3/4 + 1/8) = −1.75 in
$s^2/4g$ = 0
5.25 in

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

Subject Water Tower - Afghanistan File No. _____ Pages, Page 3

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Consider 4 holes:

Gross flange width = 7.0 in
4 holes out = $4(3/4 + 1/8)$ = −3.5 in
$S^2/4g = [3^2/4 \times 2] \times 2$ = +2.25
5.75

Use net width = 5.25 in

$0.5 F_u A_{fn} = 0.5(58) \times 5.25 \times 0.505 = 76.8$ kip

$0.6 F_y A_{fg} = 0.6(36) \times 7 \times 0.505 = 76.3$ kips

$f_b = \frac{Mc}{I} = \frac{1244 \text{ kip-in} \times 16}{518 \times 2} = 19.2 < 0.6F_y = 21.6$ ksi

✓ O.K

# of bolts in double shear:

$80.3^{kips} / 8.8 = 9.125$ (use 10 bolts)

$80.3/10 = 8.03$ kips/bolt

$A_{n\,req} = \frac{I}{0.50F_u} = \frac{80.3}{0.5(58)} = 2.76$ in² req.

$A_{g\,req} = \frac{80.3}{21.6} = 3.71$ in² req.

3/4" × 7"

$A_g = 3/4'' \times 7 = 5.25 \text{ in}^2$

$A_g = 5.25 \text{ in}^2 > 3.71 \text{ in}^2$ req. ✓ O.K

$f_t = P/A_g = 80.3/5.25 \text{ in}^2 = 15.29 < 0.6F_y = 21.6$ ksi

Subject Water-Tower- Afghanistan File No. ____ Pages, Page 4

Date ____

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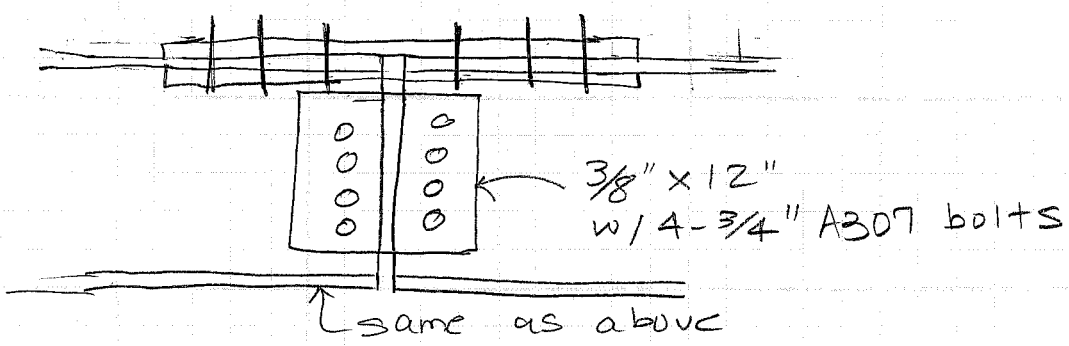
Max. eff. net area

$A_e \leq 0.85 A_g = 0.85 \times 5.25 = 4.46 \text{ in}^2$

Total gross area = 5.25 in²
2 holes out = −1.75
Net area 3.5 in²

$2.76 \text{ in}^2 < 3.5 \text{ in}^2 < 4.46 \text{ in}^2$ O.K

$f_t = P/A = 80.3/3.5 \text{ in}^2 = 22.9 < 29 \text{ ksi}$ (0.5(58)) O.K



Alt design to flange splice

$T = \frac{M}{d} = \frac{1244}{16} = 77.8 \text{ kips}$

No. bolts ~~single~~ Double shear

$77.8^k / \cancel{4.4}\ 8.8 = \cancel{17.68}\ 8.8$ ~~(use 18)~~ 8.84 bolts

$77.8/18 = 4.32$ kip/bolt use 12 bolts

Try 3/4 x 7" splice plate top + bottom

$A_g = 3/4 \times 7 = 5.25 \text{ in}^2 > \frac{77.8^k}{21.6} = 3.6 \text{ in}^2$

Subject Water Tower-Afghanistan File No. _____ Pages, Page 5

Date _____

Computed by ASP Checked by MDT Approved by _____ Symbol _____

$$A_{e\,req} = \frac{77.8}{0.5 \times 58} = 2.68 \text{ in}^2$$

$$A_{e\,max} = 0.85 A_g = 0.85 \times 5.25 = 4.46 \text{ in}^2$$

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Subject: Water Tower - Afghanistan
Moment Conn. IPE 300
File No. ____ Pages, Page ____ Date ____
Computed by: ASP Checked by: MDT Approved by: ____ Symbol: ____

$M = 173^{k \cdot in}(2) = 346^{k \cdot in}$

$V = 0$ (splice @ midpoint)

IPE 300 (W12x19)

$K = 7/8$

$d = 12.2''$ $b = 4.01$

$t_w = 0.235$ $t_f = 0.350$ $I_x = 130$ $S_x = 21.3$

Allowable load for 3/4" A307 bolts
$F_v = 10$ ksi

Single shear $= 4.4^{k}$/bolt

Double Shear $= 8.8$ k/bolt

$P = C \times r_v = 2.54 \times 4.4 = 11.17^{k} > 0^{k}$ ✓ O.K

$C = 2.54$ Use 4 bolts

Splice plate Design

$M = 0^{k} \times 1\frac{3}{4} = 0$

Use 3/8 x 6" plate

Flange Splice

$T = \frac{346^{k \cdot in}}{12.2 - 0.350} = 29.2^{kips}$

Consider two holes:

Gross flange width = 4.01 in
2 holes out = $2(3/4 + 1/8) = -1.75$
S2/4g = 0
2.26 in

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

Subject Water Tower- Afghanistan File No. ____ Pages, Page ____

Computed by ASF Checked by MDT Approved by ____ Date ____ Symbol ____

$0.5 F_u A_{fn} = 0.5(58) \times 2.26 \times 0.350 = 22.9^k$

$0.6 F_y A_g = 0.6(36) \times 4.01 \times 0.350 = 30.3^k$

$f_b = \frac{346^{k\cdot in} \times 12}{130 \times 2} = 15.9 < 0.6F_y = 21.6$ ksi ✓ O.K

bolts in single shear

$29.2^k / 4.4 = 6.6$ (Use 8 bolts)

$29.2 / 8 = 3.65^k$/bolt

$A_{n_{req.}} = \frac{29.2}{0.5(58)} = 1.0 = in^2$ req

$A_{g_{req}} = \frac{29.2}{21.6} = 1.35\ in^2$ req

$A_g = \frac{1}{2}'' \times 4.01'' = 2\ in^2 > 1.35\ in^2$ ✓ O.K

$f_t = \frac{P}{A_g} = \frac{29.2}{2.0\ in^2} = 14.6$ ksi $< 0.6F_y = 21.6$ ksi ✓ O.K

$A_e \leq 0.85 A_g = 0.85 \times 2 = 1.7\ in^2$

Total gross Area = 2.00
2 holes out = −1.75
0.25 in²

$0.25\ in^2 < 1.0\ in^2$ req'd

If use the IPE300 equivalent $b \leq 6.0$ in

Therefore,

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$A_g = \frac{1}{2} \times 6'' = 3 \text{ in}^2$

$A_g > A_{g\,req}$ ✓

$A_n = 3.00 \text{ in}^2 - 1.75 \text{ in}^2 = 1.25 \text{ in}^2$

$1.25 \text{ in}^2 > A_{n\,req} = 1.0 \text{ in}^2$ ✓ O.K

$f_t = 29.2/1.25 = 23.36 < 0.5(58) = 29 \text{ ksi}$ ✓ O.K

☆ Use ½" x 6" plate
w/ 4 bolts on each side of
splice (T + B flange)

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

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Beam shear connection

- Beam b2 - W12 x 19 (W310 x 28) framed into W16 x 45 (W410 x 60)
- Use A307 Bolts
- Reaction = 9.23 kips

Beam web side:

Bolt shear capacity:

Table II A (4-19 ASD) for 3 - 3/4" dia A307 bolt:

$R_B = 26.5$ kips > 9.23 kips ✓ O.K

Web bearing capacity:

Top bolt with $l_v = 1\frac{1}{2}$ (Table 1-F) $52.2^k \times 0.235$ (t_f)
Remaining 2 bolts (Table 1-E) $13.1^k \times 2 \times 0.235$

18.4 kips O.K

Gross shear capacity

$V_g = 0.4 F_y A_w = 0.4(36 \text{ ksi})[(12.2 - 3 - 3) \times 0.235] = 20.9^k$

$20.9^k > 9.23$ ✓ O.K

$V_n = 0.3 F_u A_n = 0.3(58)[(12.2 - 3 - 3 - 3(3/4" + 1/16")) \times 0.235]$

$= 15.4^k > 9.23^k$ ✓ O.K

Block shear capacity

$l_v = 1\frac{1}{2}$ $l_h = 1\frac{3}{4}$ Table 1-G, $C_1 + C_2 = 1.33 + 0.99 \Rightarrow 2.32$

$R_{BS} = (C_1 + C_2) F_u t = 2.32 \times 58 \times 0.235 = 31.6^k > 9.23^k$ O.K

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Web bending capacity

$c = 2 < 2d = 2(12.2) = 24.4 in$

$d_c = 2 < 0.2d = 0.2(12.2) = 2.4 in$

$f_d = 3.5 - 7.5(d_c/d) = 3.5 - 7.5(2.4/12.2) = 2.03 in$

$F_{BC} = 33{,}820 \frac{t_w^2}{ch_0} f_d = 33{,}280 \frac{(0.235)^2}{(2)(12-3-3)}(2.03) = 316 ksi$

316 ksi > 0.6 Fy (yielding controls)

$M = 9.23^{kips} \times 2 in = 18.46 kip\text{-}in$

$S = \frac{bd^2}{6} = \frac{0.235(12.2-3-3)^2}{6} = 1.41 in^2$

$f_b = \frac{M}{S} = \frac{18.46^{k\text{-}in}}{1.41 in^2} = 13.09 ksi < 0.6 F_y$ O.K

Support Side:

Bolt shear capacity

Try 6 - 3/4" dia A307 in single shear

Table I-D

$R_B = 6 \text{ bolts} \times 4.4^{kips/bolt} = 26.4 kips$ OK

Support Bearing capacity (I-E)

$R_B = 6 \text{ bolts} \times 13.1^{kips/in} \times 0.345 = 27.1^{kips}$ O.K
(t_w of 16x45)

Framing angles

Min thickness =

Gross shear:

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$V_g = 0.4 F_y A_g = 0.4 F_y \times 2t \times L$

$t_{min} = \frac{9.23^k}{0.8 \times 36 \times 8.5 \text{ in}} = 0.037 \text{ in}$

Net shear

$V_n = 0.3 F_u A_n$

$t_{min} = \frac{9.23^k}{0.6 \times 58 \times}$

Use 1/4" in. angle

Try 3 1/2 x 3 1/2 x 1/4

$l_v = 1\frac{1}{2}$ $l_h = 1\frac{3}{4}$

Table 1-G

$C_1 = 1.33$ $C_2 = 0.99$ =

R_{BS} = 2 angles x (0.99 + 1.33) 58 x 1/4" = 67.3 kip

67.3 kips > 9.23k ✓ O.K

Use 2 - L 3 1/2 x 3 1/2 x 1/4"

w/ 3 - 3/4" bolts

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

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Subject Railing Design File No. _____ Pages, Page _____

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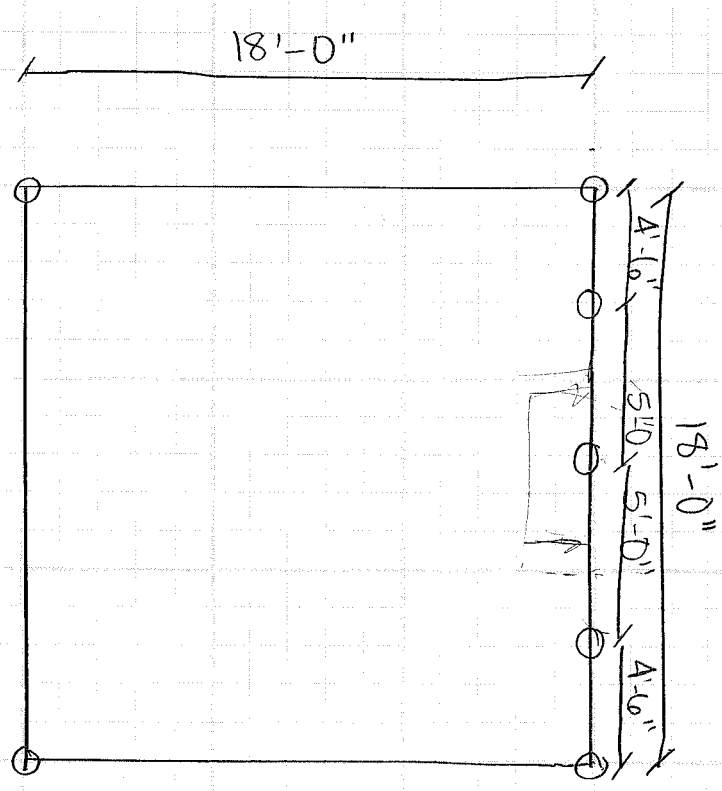
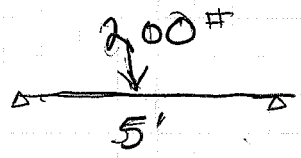


IBC 1607.7

50 plf OR 200# Point Load

Span = 5'-0"



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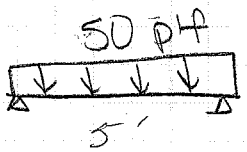

74A

Steel Check Report

Element: **Handrail**
Description:
Date: **11/17/2009 08:43 AM**

Company:
User:
Software: **Digital Canal Steel Beam Design**

GENERAL INFORMATION

Description	Value	Description	Value
Design Criteria	Check	Steel Yield Stress	50 K/In^2
Design Code	AISC LRFD (1994)	Section Shape	
Total Span Length	5.00 Ft	Maximum Section Depth	
First Node Support	Pinned	Minimum Section Depth	
Last Node Support	Pinned	Back-Back Distance (double angles only)	
Total Load Deflection	L/240.00	Section Width (angles and tubes only)	
Live Load Deflection	L/360.00	Number of Solutions	
Maximum Stress Ratio	1.000	Live Load Patterning	Yes
Bending Coefficient	1.0	Check Section List	L2x2x.25
		LTB Length	0.00, 5.00 Ft

SPAN LENGTH DATA (Unit: Ft)

Span 1	5.00	-	-	-	-	-	-

LOAD INFORMATION

LOADS

Ref. No.	Load Case	Load Type	Dir	Begin Value	Begin Position	End Value	End Position
1	Dead	Linear	Y	-0.050 (K/Ft)	0.00 (Ft)	-0.050 (K/Ft)	5.000 (Ft)

LOAD COMBINATIONS

LC1: 1.4DL
LC2: 1.2DL+1.6LL+0.5SL
LC3: 1.2DL+1.6SL+0.5LL
LC4: 1.2DL+1.6SL+0.8WL
LC5: 1.2DL+1.3WL+0.5LL+0.5SL
LC6: 1.2DL+0.5LL+0.2SL
LC7: 0.9DL+1.3WL
LC8: 0.9DL-1.3WL

ELEMENT REPORTS

Note: Deflections are calculated based on E*I = 1e+3 In^2

SPAN 1

Load Comb	Node No.	Inflection Points (Ft)	Axial (K)	Shear (K)	Moment (K-Ft)	Max Moment (K-Ft)	Distance (Ft)	Max Deflection (In)	Distance (Ft)
1	1	0.000	0.000	0.175	0.000	0.219	2.500	-0.703	2.500
	2	5.000	0.000	-0.175	0.000				
2	1	0.000	0.000	0.150	0.000	0.187	2.500	-0.703	2.500
	2	5.000	0.000	-0.150	0.000				
3	1	0.000	0.000	0.150	0.000	0.187	2.500	-0.703	2.500
	2	5.000	0.000	-0.150	0.000				
4	1	0.000	0.000	0.150	0.000	0.187	2.500	-0.703	2.500
	2	5.000	0.000	-0.150	0.000				
5	1	0.000	0.000	0.150	0.000	0.187	2.500	-0.703	2.500
	2	5.000	0.000	-0.150	0.000				
6	1	0.000	0.000	0.150	0.000	0.187	2.500	-0.703	2.500
	2	5.000	0.000	-0.150	0.000				
7	1	0.000	0.000	0.112	0.000	0.141	2.500	-0.703	2.500

	2	5.000	0.000	-0.112	0.000				
8	1	0.000	0.000	0.112	0.000	0.141	2.500	-0.703	2.500
	2	5.000	0.000	-0.112	0.000				

REACTIONS

Node No.	Load Comb	PX (K)	PY (K)	Moment (K-Ft)
1	LC1: 1.4DL	0.000	0.175	0.000
"	LC2: 1.2DL+1.6LL+0.5SL	0.000	0.150	0.000
"	LC3: 1.2DL+1.6SL+0.5LL	0.000	0.150	0.000
"	LC4: 1.2DL+1.6SL+0.8WL	0.000	0.150	0.000
"	LC5: 1.2DL+1.3WL+0.5LL+0.5SL	0.000	0.150	0.000
"	LC6: 1.2DL+0.5LL+0.2SL	0.000	0.150	0.000
"	LC7: 0.9DL+1.3WL	0.000	0.112	0.000
"	LC8: 0.9DL-1.3WL	0.000	0.112	0.000
2	LC1: 1.4DL	0.000	0.175	0.000
"	LC2: 1.2DL+1.6LL+0.5SL	0.000	0.150	0.000
"	LC3: 1.2DL+1.6SL+0.5LL	0.000	0.150	0.000
"	LC4: 1.2DL+1.6SL+0.8WL	0.000	0.150	0.000
"	LC5: 1.2DL+1.3WL+0.5LL+0.5SL	0.000	0.150	0.000
"	LC6: 1.2DL+0.5LL+0.2SL	0.000	0.150	0.000
"	LC7: 0.9DL+1.3WL	0.000	0.112	0.000
"	LC8: 0.9DL-1.3WL	0.000	0.112	0.000

CRITICAL MOMENT/SHEAR DETAILS

Section Name: L2x2x.25 Status: OK

SPAN 1

	Unit	Load Effects	Resistance	Ratio	Load Combination
Bending-X	K-Ft	0.154	1.563	0.291	LC1: 1.4DL
Shear-Y	K	0.175	13.500	0.013	LC1: 1.4DL
Total Deflection-Y	In	-0.070	0.250	0.279	LC1: 1.4DL
Live Deflection-Y	In	-0.000	0.167	0.000	LC1: 1.4DL

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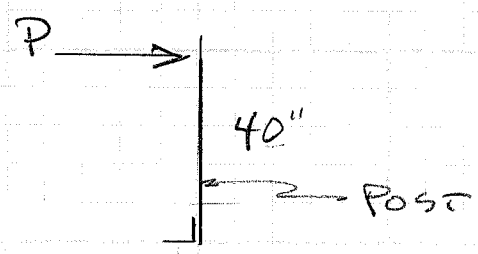
HANDRAIL POST



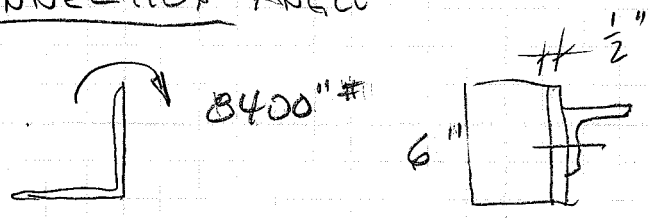
$P = 200^{\#}$

$M = 200(40) = 8000^{"\#}$

$S = \frac{8000}{.6(36{,}000)} = .370 \text{ in}^3$

$L\ 2 \times 2 \times 1/4 \Rightarrow S = .391 \text{ in}^3$

CONNECTION ANGLE



CHECK L w/ 1/2" LEG x 8" LG

$S_{REQ'D} = .370 = \frac{6(t)^2}{6}$

$t = .60"$

USE $L\ 5 \times 3\ 1/2 \times 5/8 \times 6"$

$L\ 130 \times 90 \times 14$

CORPS OF ENGINEERS, U.S. ARMY
MOBILE DISTRICT

File No. _____

Subject WATER TANK AFGHANISTAN — Pages, Page _____ Date 11/09

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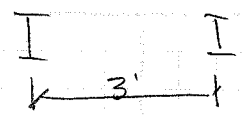
CATWALK

DL = 25 psf

LL = 40 psf L = 16.4'



$W = \frac{3'}{2}(65) = 98 \text{ plf}$

$M = \frac{98(16.4)^2}{8} = 3295'^{\#}$

$S = \frac{3295(12)}{.6(36000)} = 1.83 \text{ in}^3$

C6x8.2 ⇒ $S = 4.38 \text{ in}^3$

USED UPN 200

$V = 98(16.4/2) = 803^{\#}$

2 - 3/4" ϕ BOLTS SINGLE SHEAR >> $803^{\#}$

USE 1/4" CLIP ANGLES

PLACE AUXILIARY COMPUTATIONS NEAR BOTTOM OF SHEET

Foundation Stability & BP for 20 Meter Tower

Use reactions of joint 1 and 11 from STAAD printout for foundation stability
Using only 2 joints, stability is for 1/2 foundation
Design load case 8 controls (DL + Seismic)

Frame Base Dimension, ft	16.33	16.33	
Footing size, LxWxT, ft	25	25	2.25
Earth cover,ft	1.75		
Earth wt, lb/ft3	0.11		
Base Moment if inertia, I	16276		

Sum moments about the bottom right corner of the base

	Reaction, k	Arm, ft	Moment, ft-k
vertical load, jt 1	33.77	20.67	697.9
vertical load, jt 11	-31.63	4.34	-137.1
base shear, jt 1	8.83	3.75	33.1
vertical concrete load	-105.47	12.50	-1318.4
vert earth	-60.16	12.50	-752.0
TOTAL	-154.66		-1476.5
Mot	731.0		
Mr	2207.4		

Resultant, X, ft	9.55	
1/3 base width, ft	8.33	
e, ft	2.95	
distance outside mid 1/3, ft	-1.21	
FSot	**3.02**	* CONTROLS
Bearing Pressure Max, psf	**846**	**< 1500 psf**
Bearing Pressure Min	**144**	

Foundation Stability & BP for 20 Meter Tower

Use reactions of joint 6 and 16 from STAAD printout for foundation stability
Using only 2 joints, stability is for 1/2 foundation
Design load case 6 [redacted] (DL + Seismic)

Frame Base Dimension, ft	16.33	16.33	
Footing size, LxWxT, ft	25	25	2.25
Earth cover,ft	1.75		
Earth wt, lb/ft3	0.11		
Base Moment if inertia, I	16276		

Sum moments about the bottom right corner of the base

	Reaction, k	Arm, ft	Moment, ft-k
vertical load, jt 6	-0.43	20.67	-8.9
vertical load, jt 16	-56.25	4.34	-243.8
base shear, jt 1	8.83	3.75	33.1
vertical concrete load	-105.47	12.50	-1318.4
vert earth	-60.16	12.50	-752.0
TOTAL	-213.48		-2289.9
Mot	24.2		
Mr	2314.2		
Resultant, X, ft	10.73		
1/3 base width, ft	8.33		
e, ft	1.77		
distance outside mid 1/3, ft	-2.39		
FSot	**96**		
Bearing Pressure Max, psf	**974**	**< 1500 psf**	
Bearing Pressure Min	**392**		

Foundation Stability & BP for 20 Meter Tower

Use reactions of joint 6 and 16 from STAAD printout for foundation stability
Using only 2 joints, stability is for 1/2 foundation
Design load case 7[redacted] (DL + Seismic)

Frame Base Dimension, ft	16.33	16.33	
Footing size, LxWxT, ft	25	25	2.25
Earth cover,ft	1.75		
Earth wt, lb/ft3	0.11		
Base Moment if inertia, I	16276		

Sum moments about the bottom right corner of the base

	Reaction, k	Arm, ft	Moment, ft-k
vertical load, jt 1	-15.08	20.67	-311.6
vertical load, jt 11	-56.94	4.34	-246.8
base shear, jt 1	5.82	3.75	21.8
vertical concrete load	-105.47	12.50	-1318.4
vert earth	-60.16	12.50	-752.0
TOTAL	-231.83		-2607.0
Mot	21.8		
Mr	2628.8		

Resultant, X, ft	11.25		
1/3 base width, ft	8.33		
e, ft	1.25		
distance outside mid 1/3, ft	-2.91		
FSot	**120**		
Bearing Pressure Max, psf	**965**	**< 1500 psf**	* CONTROLS
Bearing Pressure Min	**518**		

Foundation Stability & BP for 20 Meter Tower

Use reactions of joint 6 and 16 from STAAD printout for foundation stability
Using only 2 joints, stability is for 1/2 foundation
Design load case 6 (DL +LL)

Frame Base Dimension, ft	16.33	16.33	
Footing size, LxWxT, ft	25	25	2.25
Earth cover,ft	1.75		
Earth wt, lb/ft3	0.11		
Base Moment if inertia, I	16276		

Sum moments about the bottom right corner of the base

	Reaction, k	Arm, ft	Moment, ft-k
vertical load, jt 6	-30.54	20.67	-631.1
vertical load, jt 16	-30.54	4.34	-132.4
base shear, jt 1	0.00	3.75	0.0
vertical concrete load	-105.47	12.50	-1318.4
vert earth	-60.16	12.50	-752.0
TOTAL	-226.71		-2833.8

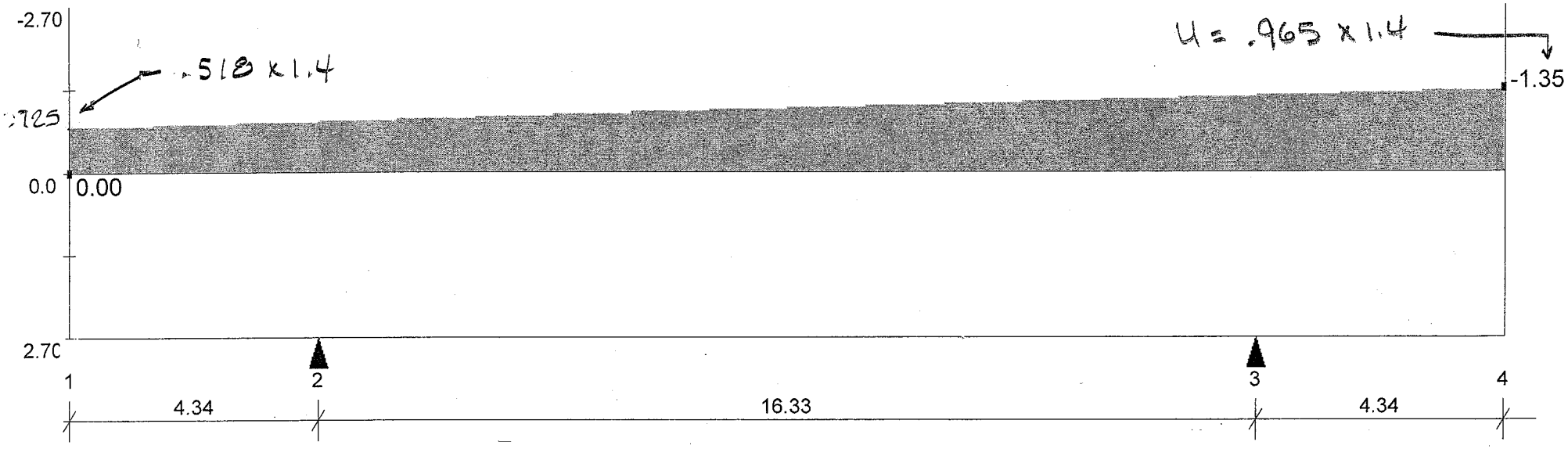
Mot	NA
Mr	2202.7

Resultant, X, ft	12.50
1/3 base width, ft	8.33
e, ft	0.00
distance outside mid 1/3, ft	-4.17
FSot	**NA**
Bearing Pressure Max, psf	**725** **< 1500 psf**
Bearing Pressure Min	**725**

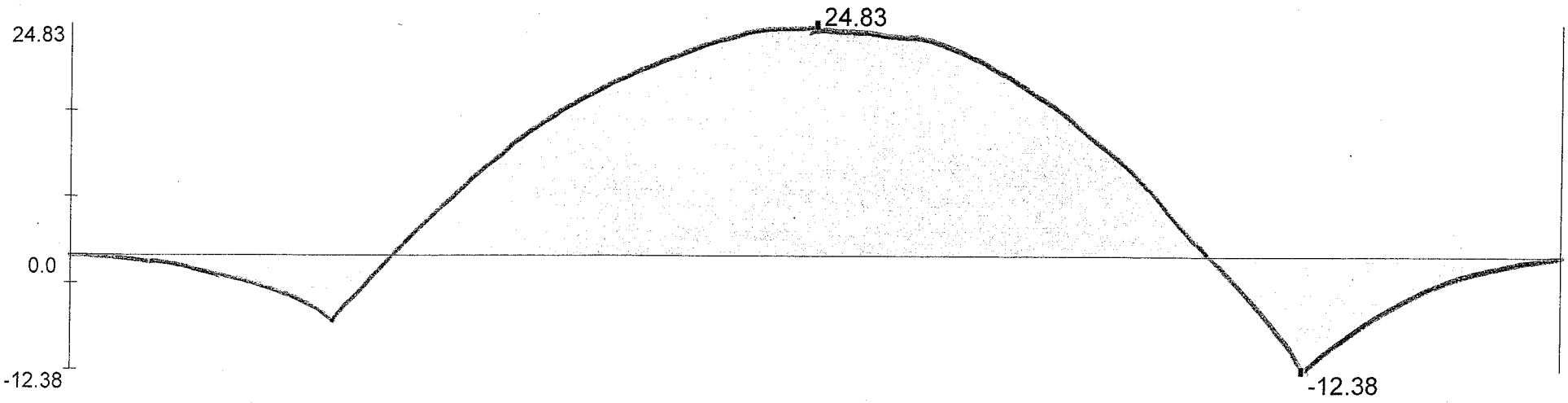
Descrip
Unit: ft, ip-ft

LOAD CASE 7

Load distribution: (Unit: kip(/ft))
[Left scale is for linear loads and right scale is for concentrated loads]



Moment diagram: (Unit: kip-ft)



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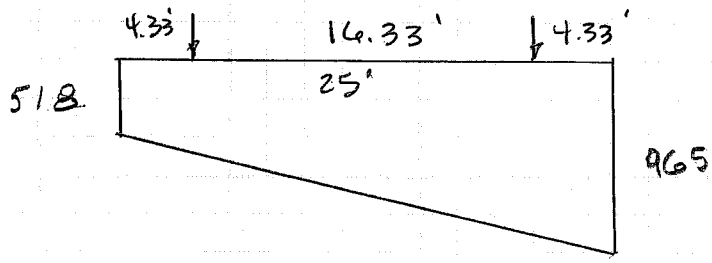
FOUNDATION DESIGN (1' STRIP DESIGN)

BASE PRESSURES MAX (PSF)



$b = 12''$

$d = 27 - 4 = 23''$

FROM BEAM SOFTWARE

$M_{u_{MAX}} = 24.83^{'K}$

$$R_u = \frac{24.83\,(12{,}000)}{12\,(23)^2} = 47 \ll R_{u_{MIN}} = 173$$

$\rho_{MIN} = .0033$ $\quad A_s = .0033(12)(23) = .91$

#8 @ 10"

CHECK REQ'D A_s BY DESIGN

ASSUME $a = 1''$

$$A_s = \frac{M_u}{\phi f_y (d - a/2)} = \frac{24.83\,(12000)}{.9(60000)(23 - 1/2)} = .25\ IN^2$$

CHECK a: $\quad a = \dfrac{A_s f_y}{.85 f'_c b} = \dfrac{.25\,(60)}{.85\,(4)(12)} = .37$

$$A_s = \frac{24.83\,(12000)}{.9\,(60000)(23 - .37/2)} = .24\ IN^2$$

USE 1.33 A_s AS REQ'D BY DESIGN

$A_s = 1.33\,(.24) = .32 \Rightarrow$ USE #5 @ 12"

$= .31\ IN^2$

Steel Design Report

CONSTRUCTION LIFTING BEAM

Element: **Untitled1 (C:\DCC\steel\)**
Description:
Date: **11/24/2009 08:37 AM**

Company:
User:
Software: **Digital Canal Steel Beam Design**

GENERAL INFORMATION

Description	Value	Description	Value
Design Criteria	Design	Steel Yield Stress	50 K/In^2
Design Code	AISC ASD (1990)	Section Shape	2L
Total Span Length	16.40 Ft	Maximum Section Depth	8.00 In
First Node Support	Pinned	Minimum Section Depth	1.00 In
Last Node Support	Pinned	Back-Back Distance (double angles only)	0.38 In
Total Load Deflection	L/240.00	Section Width (angles and tubes only)	4.00 In
Live Load Deflection	L/360.00	Number of Solutions	10
Maximum Stress Ratio	1.000	Live Load Patterning	Yes
Bending Coefficient	1.0	Check Section List	
		LTB Length	0.00, 16.40 Ft

SPAN LENGTH DATA (Unit: Ft)

Span 1	16.40	-	-	-	-	-	-

LOAD INFORMATION

LOADS

Ref. No.	Load Case	Load Type	Dir	Begin Value	Begin Position	End Value	End Position
1	Dead	Concen	Y	-0.500 (K)	8.20 (Ft)	-	-

LOAD COMBINATIONS

LC1: DL Only

ELEMENT REPORTS

Note: Deflections are calculated based on E*I = 1e+3 In^2

SPAN 1

Load Comb	Node No.	Inflection Points (Ft)	Axial (K)	Shear (K)	Moment (K-Ft)	Max Moment (K-Ft)	Distance (Ft)	Max Deflection (In)	Distance (Ft)
1	1	0.000	0.000	0.250	0.000	2.050	8.200	-79.397	8.200
	2	16.400	0.000	-0.250	0.000				

REACTIONS

Node No.	Load Comb	PX (K)	PY (K)	Moment (K-Ft)
1	LC1: DL Only	0.000	0.250	0.000
2	LC1: DL Only	0.000	0.250	0.000

CRITICAL STRESS DETAILS

Section Name: 2L3x4x.375x.375 Status: OK

SPAN 1

	Unit	Actual	Allowable	Ratio	Load Combination
Bending-X	K/In^2	14.220	30.000	0.474	LC1: DL Only
Shear-Y	K/In^2	-0.111	20.000	0.006	LC1: DL Only
Total Deflection-Y	In	-0.713	0.820	0.869	LC1: DL Only
Live Deflection-Y	In	-0.000	0.547	0.000	LC1: DL Only

Section Name: 2L3.5x4x.25x.375 Status: OK

SPAN 1

	Unit	Actual	Allowable	Ratio	Load Combination
Bending-X	K/In^2	15.185	30.000	0.506	LC1: DL Only
Shear-Y	K/In^2	-0.143	20.000	0.007	LC1: DL Only
Total Deflection-Y	In	-0.653	0.820	0.797	LC1: DL Only
Live Deflection-Y	In	-0.000	0.547	0.000	LC1: DL Only

Section Name: 2L4x4x.25x.375 Status: OK

SPAN 1

	Unit	Actual	Allowable	Ratio	Load Combination
Bending-X	K/In^2	11.770	30.000	0.392	LC1: DL Only
Shear-Y	K/In^2	-0.125	20.000	0.006	LC1: DL Only
Total Deflection-Y	In	-0.450	0.820	0.549	LC1: DL Only
Live Deflection-Y	In	-0.000	0.547	0.000	LC1: DL Only

Section Name: 2L6x4x.375x.375 Status: OK

SPAN 1

	Unit	Actual	Allowable	Ratio	Load Combination
Bending-X	K/In^2	3.705	30.000	0.124	LC1: DL Only
Shear-Y	K/In^2	-0.056	20.000	0.003	LC1: DL Only
Total Deflection-Y	In	-0.102	[illegible]	[illegible]	[illegible]
Live Deflection-Y	In	[illegible]	[illegible]	[illegible]	[illegible]

Section Name: 2L7x4x.375x.375 Status: OK

SPAN 1

	Unit	Actual	Allowable	Ratio	Load Combination
Bending-X	K/In^2	2.770	30.000	0.092	LC1: DL Only
Shear-Y	K/In^2	-0.048	20.000	0.002	LC1: DL Only
Total Deflection-Y	In	-0.067	0.820	0.081	LC1: DL Only
Live Deflection-Y	In	-0.000	0.547	0.000	LC1: DL Only

Section Name: 2L8x4x.5x.375 Status: OK

SPAN 1

	Unit	Actual	Allowable	Ratio	Load Combination
Bending-X	K/In^2	1.640	30.000	0.055	LC1: DL Only
Shear-Y	K/In^2	-0.031	20.000	0.002	LC1: DL Only
Total Deflection-Y	In	-0.036	0.820	0.043	LC1: DL Only
Live Deflection-Y	In	-0.000	0.547	0.000	LC1: DL Only