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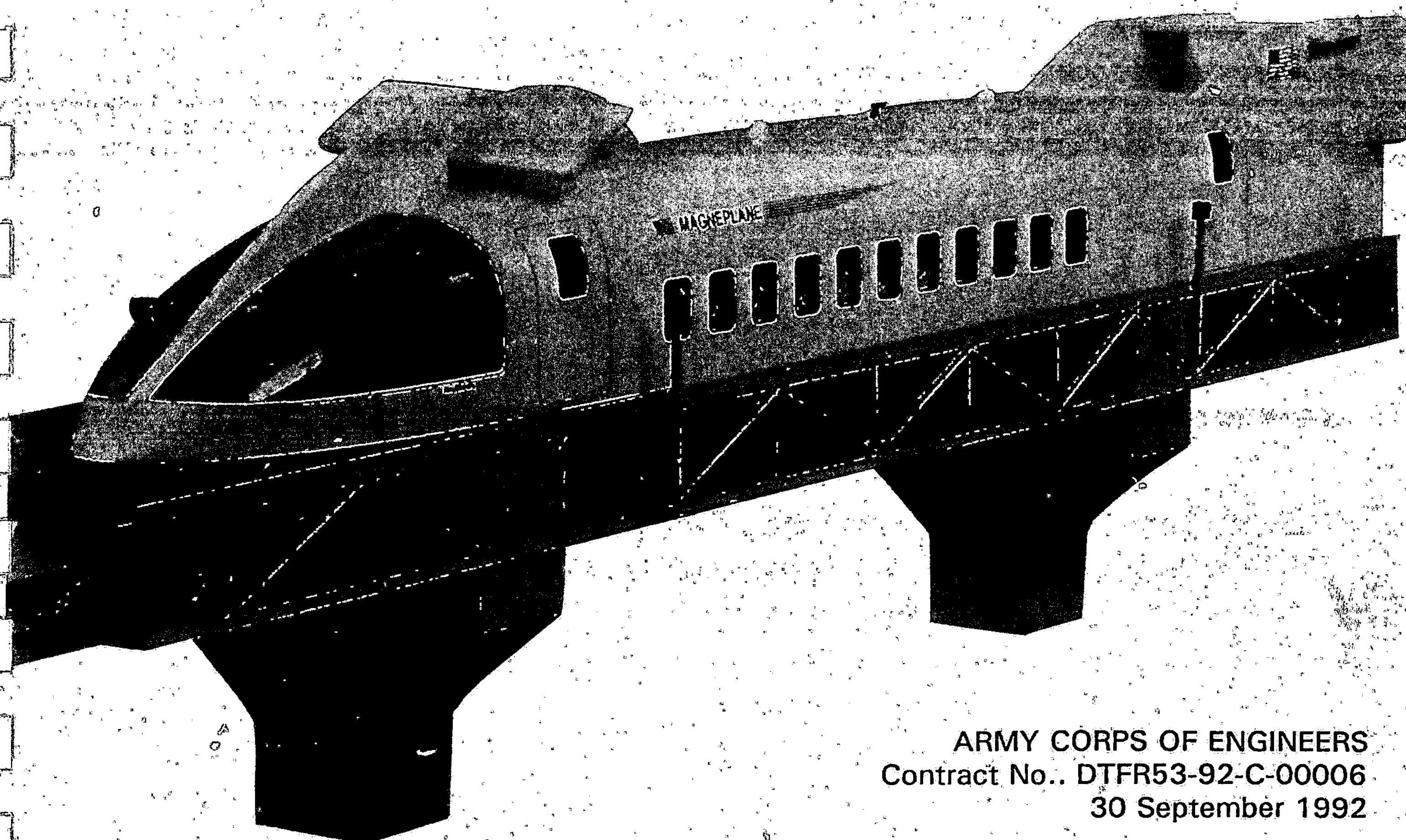
SYSTEM CONCEPT DEFINITION REPORT
for the
NATIONAL MAGLEV INITIATIVE

Volume
7B

SUPPLEMENT C: BACKUP MATERIALS FOR MAGWAY STRUCTURE - PART 2 OF 2



ARMY CORPS OF ENGINEERS
Contract No.. DTFR53-92-C-00006
30 September 1992

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11 - Advanced Systems

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MAGNEPLANE INTERNATIONAL

SYSTEM CONCEPT DEFINITION REPORT

SUPPLEMENT C

Backup Material - Magway Structure

Contents

L - Levitation Plates (Aluminum Box Beams)
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} VOLUME 7A

S - Structural Steel Truss
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30 September 1992
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6869.002

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

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NAME OF COMPANY MI /MIT UNIT/S

SUBJECT MAGNEPLANE

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MAGNEPLANE INTERNATIONAL - SYSTEM CONCEPT DEFINITION REPORT

SUPPLEMENT C
BACKUP MATERIALS-MAGWAY STRUCTURE

STRUCTURAL STEEL TRUSS (Report reference section 3.2.2.a & 5.3.2.23)

The following pages provide preliminary calculations for the steel trusses. The primary design tool is MICASPLUS version 4.0 by INTERGRAPH corp. This program calculates natural frequency and is capable of dynamic analysis which is required due to the speed of the vehicle. Please refer to the report for further discussion; ie, section 3.2.2.a.2 outlines the structural design criteria. Of particular importance for this design is the natural frequency and the LL deflection requirement which generally controlled the truss designs even when dynamic increase factors are included on the stresses. Section 5.3.2.23 in the Trade Study Section includes a summary of material quantities and costs for various spans and heights. IT SHOULD BE NOTED THAT THE PRELIMINARY TRUSS DESIGN SHOWN HEREIN IS GENERALLY CONSERVATIVE ESPECIALLY FOR THE LONGER SPANS. The eigen-values and mode shapes are included for the 120′ span - other spans are similar.

CONTENTS:

S-1 thru S-16 General
S-17 thru S-24 30′ Span Single
S-25 thru S-31 75′ Span Single
S-32 thru S-46 120′ Span Single
S-47 thru S-53 At Grade Single
S-54 Loading for Switch Design
S-55 thru S-64 30′ Span Double
S-65 thru S-74 75′ Span Double
S-75 thru S-78 At Grade Double

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GENERAL COMPUTATION SHEET

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

NAME OF COMPANY MAGNEPLANE INT'L. UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

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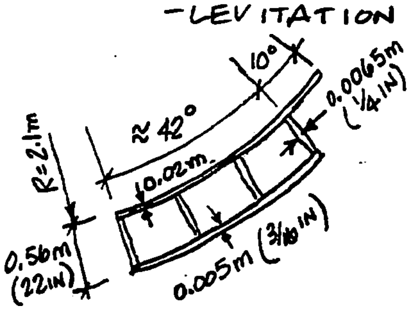
LOADS-

[D] - DEAD LOADS-

- WEIGHT OF STRUCTURAL MEMBERS, I.E. BODY LOAD

$$\text{STEEL} = 490\ \text{LB/FT}^3 \times 4.448\ \text{N/LB} \times \left(\frac{\text{FT}}{0.305\text{m}}\right)^3 = 76.8\ \text{kN/m}^3$$

-LEVITATION BOX BEAMS-

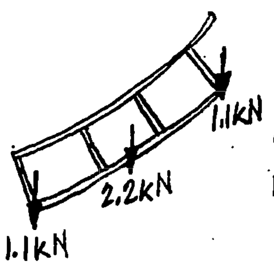


$$\text{CURVED PLATES} = \pi r\left(\frac{\alpha}{180°}\right) = \pi(2.1\text{ m})\left(\frac{52°}{180}\right) = 1.91\text{ m}$$
$$= \pi(2.66)\left(\frac{42°}{180}\right) = 1.95\text{ m}$$

$$\text{FLAT PLATES} = 0.56\text{m}(4) = 1.68\text{ m}$$

LENGTH BETWEEN SUPPORTS = 4.58m (15 FT)

$$\rightarrow \text{VOLUME} = 4.58\text{m}\left[1.91\text{m}(0.02\text{m}) + 1.95\text{m}(0.005\text{m}) + 1.68\text{m}(0.0065\text{m})\right]$$
$$= 0.27\text{ m}^3\text{, USE } 0.3\text{ m}^3$$



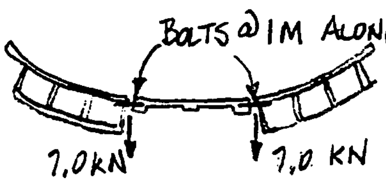
$\text{ALUMINUM} \approx 170\ \text{LB/FT}^3 \approx 26.7\ \text{kN/m}^3$

REACTIONS @ EACH SUPPORT = $0.3(26.7)(\tfrac{1}{2}) = 4.0$ kN, USE 4.4kN

-LSM PROPULSION WINDING- TO BE DETERMINED

-UTILITIES - TO BE DETERMINED

} USE 3 kN/M (100 PLF EACH)



REACTIONS AT GUIDEWAY SUPPORTS = 3kN/M * 4.58M / 2 = 7.0 KN

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GENERAL COMPUTATION SHEET

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

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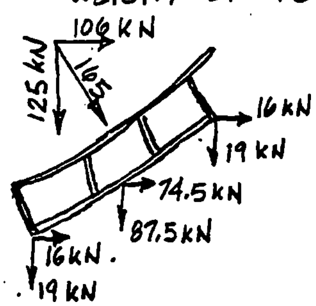
LOADS CONT-

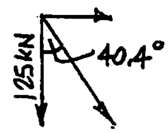
[L] -LIVE LOADS-

- WEIGHT OF VEHICLE - REF: FAX FROM MIT PLASMA FUSION 26 MAR 92 BASELINE VEHICLE DIMENSIONS & LOADS (REV. 2)



WT = 110000 LB = 489.5 KN, USE 500 KN

REACTION @ EA. LIFT MODULE = 500/4 = 125 KN



NORMAL LOAD = 125 KN / cos 40.4° = 165 KN

HORIZ. LOAD = 125 KN tan 40.4° = 106 KN

FOR DISTRIBUTION: REF. MIT FAX, PAGE 4, ROWS 117-127.

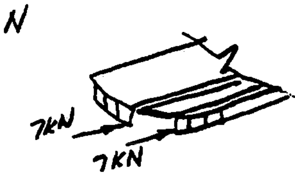
- DRAG LOADS -

WHILE CRUISING, THE PROPULSION WINDINGS MUST PRODUCE ENOUGH FORCE TO OVERCOME ELECTROMAGNETIC AND AERODYNAMIC DRAG. HOWEVER, SINCE THE ELECTROMAGNETIC DRAG IS A FORCE EXERTED BY THE LEVITATION BEAMS, THE NET LOAD APPLIED TO THE STRUCTURE IS DUE TO AERODYNAMIC DRAG.

IGNORE: BRAKING CONTROLS

AERO DRAG PER BOGIE = 12.05 KN, USE 14 KN

BOLTS ALONG PROPULSION WINDINGS → REACTIONS AT GUIDEWAY SUPPORTS = 14/2 = 7 KN



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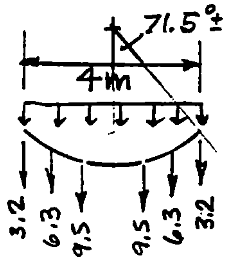
NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

- LOADS, CONT -

[S] - SNOW LOAD - USE 40 PSF OVER LEVITATION BEAMS AND PROPULSION WINDINGS.



$(2.1\ m)\sin 71.5° = 2.0\ m$

$40\ PSF \times 4.448\ N/LB \times \left(\frac{FT}{0.305 m}\right)^2 = 1.91\ kN/m^2$

$1.91\ kN/m^2 \times 4.58\ m = 8.8\ kN/m$, USE $9\ kN/m$

$9\ kN/m \times (0.7m + 0.35m) = 9.5\ kN$

$9\ kN/m \times (0.7m) = 6.3\ kN$

$9\ kN/m \times (0.35m) = 3.2\ kN$

$[E_L]$ LONGITUDINAL
- EARTHQUAKE LOADS - ZONE 2 - REF. ANSI A58.1-1982
$[E_T]$ TRANSVERSE

$f = ZIKCS(LOAD) = 3/8(1.0)(2.0)(0.14)(LOAD) = 0.105 * LOAD$

WHERE Z = SEISMIC ZONE COEFFICIENT = 3/8
I = IMPORTANCE FACTOR = 1.0
K = 2.00 FOR STRUCTURES OTHER THAN BUILDINGS
CS = 0.14 MAXIMUM

SEISMIC BODY LOADS = $0.105 * 76.8 = 8.1\ kN/m^3$

SEISMIC DEAD LOADS = $0.105 * 1.1\ kN = 0.12\ kN$
= $0.105 * 2.2\ kN = 0.23\ kN$
= $0.105 * 7.0\ kN = 0.74\ kN$

SEISMIC LIVE LOADS = $0.105 * 19 = 2.0\ kN$
= $0.105 * 87.5 = 9.2\ kN$

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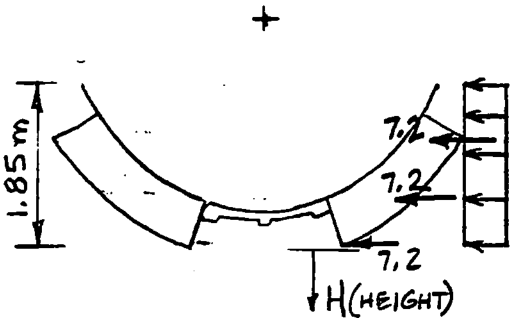
SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

LOADS, CONT-

[W_L] [W_T] - WIND ON STRUCTURE -



WIND ON LEVITATION BEAMS

$H < 5.2m$ (17 FT)

$F = 1.07(1.32)(1.6)(1.85)$

$= 4.2\ kN/m * 4.58\ m$

$= 19.2\ kN/3 = 6.4\ kN$

$5.2m < H < 20\ m$ (75 FT)

$F = 0.95(6.4) = 6.1\ kN$

USE 7.2 kN

$H > 20\ m$ (75 FT)

$F = 1.25(0.9)(6.4) = 7.2\ kN$ ← CONSERVATIVE

*USE 3.6 @ ENDS OF SPANS -

WIND ON TRUSS MEMBERS

$F = 1.25(0.9)(1.07)(1.32)(1.5) A_f$

$= 2.4\ kN/m^2\ A_f$

2"φ → 2.4×0.051 = 0.12 kN/m

3"φ → 2.4×0.076 = 0.18 kN/m

4"φ → 2.4×0.102 = 0.24 kN/m

6"φ → 2.4×0.153 = 0.37 kN/m

8"φ → 2.4×0.203 = 0.49 kN/m

10"φ → 2.4×0.254 = 0.61 kN/m

REF: MEMO LEVER TO HARDING, 14 MAR 92
ASCE 7-88. ALSO, ANSI A58.1-1982.

$F = q_z G_h C_f A_f$

$q_z = 0.613\ K_z (IV)^2$

K_z = EXPOSURE COEFFICIENT = 1.0 FOR HEIGHT TO 30 FT.

USE FACTOR 1.25 FOR 75 FT. HEIGHT.

I = IMPORTANCE FACTOR = 1.10

V = BASIC WIND SPEED = 38 M/S (85 MPH)

→ $q_z = 0.613(1.0)[(1.10)(38)]^2 = 1.07\ kN/m^2$

G_h = GUST RESPOSE FACTOR = 1.32 FOR HEIGHT TO 17 FT. CONSERVATIVELY.

USE FACTOR $\left(\frac{1.25}{1.32}\right) = 0.95$ FOR 25 & 30 FT. HEIGHTS.

USE FACTOR $\left(\frac{1.19}{1.32}\right) = 0.90$ FOR 75 FT. HEIGHT.

C_f = FORCE COEFFICIENT

= 1.6 CONSERVATIVELY FOR LEVITATION BEAMS

= 1.5 CONSERVATIVELY FOR TRUSS MEMBERS

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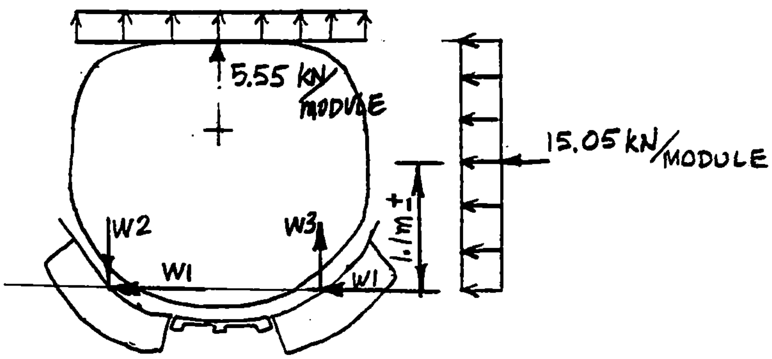
SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.		J.O 6869.002				

LOADS, CONT. -

[W_V] - WIND ON OPERATING VEHICLE -

REF: FAX FROM MIT PLASMAFUSION 26 MAR 92
BASELINE VEHICLE DIMENSIONS & LOADS - PAGE 5

WIND CONDITION 2 - 50 MPH GUST @ CRUISE



$W1 = 15.05/2 = 7.53\,k$, USE 8 KN

$W2 = \dfrac{15.05\,kN\,(1.1\,m)}{3.45\,m} - 5.55/2 = 2.02\,k$, USE 2.25 KN DOWNWARD

$W3 = \dfrac{15.05\,(1.1)}{3.45} + 5.55/2 = 7.57\,k$, USE 8 KN UPWARD

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NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

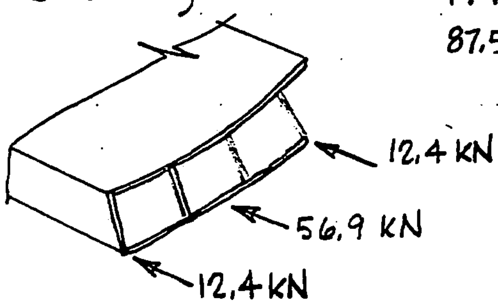
LOADS, CONT-

[B] - EMERGENCY BRAKING LOADS -

B = 0.65 g

19 kN x 0.65 = 12.4 kN

87.5 kN x 0.65 = 56.9 kN



[T1][T2] - THERMAL LOADS -

$\epsilon = 0.0000065$ FOR EACH °F.

DESIGN TEMPERATURES = -30°F & +120°F

$\Rightarrow T1 = (+)150°F$; $T2 = (-)150°F$.

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(DISCIPLINE) STRUCTURAL — UNITED ENGINEERS & CONSTRUCTORS

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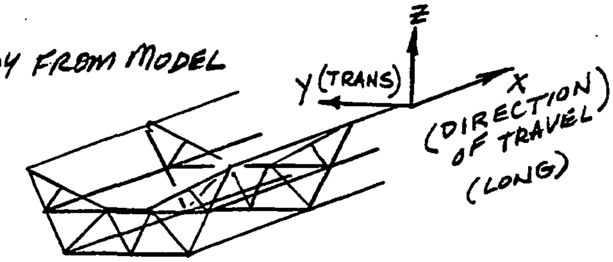
NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

LOAD COMBINATIONS -

"DEAD" REFERS TO DEAD + BODY FROM MODEL



COMB 1 = DEAD + THERMAL 1
COMB 2 = DEAD + THERMAL 2
COMB 3 = DEAD + SNOW + THERMAL 1
COMB 4 = DEAD + SNOW + THERMAL 2
COMB 5 = DEAD + LIVE + THERMAL 1
COMB 6 = DEAD + LIVE + THERMAL 2
COMB 7 = DEAD + WINDLONG + THERMAL 1
COMB 8 = DEAD + WINDLONG + THERMAL 2
COMB 9 = DEAD + WINDTRANS + THERMAL 1
COMB 10 = DEAD + WINDTRANS + THERMAL 2
COMB 11 = DEAD + EARTHQUAKELONG
COMB 12 = DEAD + EARTHQUAKETRANS
COMB 13 = DEAD + LIVE + $\left[(30/85)^2 \text{WINDLONG}\right]$
COMB 14 = DEAD + LIVE + $\left[(30/85)^2 \text{WINDTRANS} + \text{WINDVEHICLE}\right]$
COMB 15 = [DEAD + LIVE + EARTHQUAKE LONG] × 0.75
COMB 16 = [DEAD + LIVE + EARTHQUAKETRANS] × 0.75
COMB 17 = [DEAD + LIVE + BRAKING] × 0.75
COMB 18 = [DEAD + LIVE − BRAKING] × 0.75

b5'41 62e' 8'

S-8

DATE: 14 March 1992

TO: John Harding, John Loyd

FROM: Jim Lever

SUBJECT: Wind Specifications for Maglev System Concept Definitions

1. At your request, I have developed the enclosed wind specifications for the current Maglev SCD work. Hopefully these are in a form that you may easily forward to the contractors. I have included my rationale for each specification, so that contractors wishing to deviate from these have a basis for argument.

2. I recommend that the MNI establish two threshold wind conditions as minimum requirements. Threshold I would represent wind conditions below which Maglev should operate at 100% capability; threshold II would represent minimum structural design conditions.

3. I also recommend that the SCD contractors determine two additional wind thresholds for their concepts. Threshold III would define the maximum wind conditions for vehicles to be safely present on the guideway. Threshold IV would define the maximum wind conditions during which vehicles may operate with acceptable levels of ride comfort. These thresholds will fall between I & II. We could specify them with some additional work. However, requesting this information should ensure that the contractors consider how wind affects both the safety and the ride comfort of their concepts.

4. Please let me know if you need any further information regarding these specifications (603-646-4309). I hope they serve your purposes.

Sincerely,

J

Wind Specifications for Maglev System Concept Definitions

1. To ensure that Maglev systems possess superior adverse weather performance than alternative modes, SCD contractors shall treat wind thresholds I & II (defined below) as minimum requirements.

2. Threshold I - Operational Wind Threshold

   During wind conditions less severe than this threshold, a Maglev system will operate at 100% capability. That is, the system will maintain its maximum potential throughput and acceptable levels of safety and ride comfort during wind conditions below threshold I.

   Threshold-I wind conditions are as follows:

   1-hr average wind speed of 13.4 m/s (30 mph)
   1-s peak gust of 21 m/s (47 mph)
   any direction
   gust velocity spectrum as defined in Attachment A

   These conditions occur, on average, 6 times/year at Boston, MA, and 13.4 m/s represents roughly twice the cross-wind speed that disrupts landings of light commercial aircraft. Also, the 1-hr average and 1-s gust specifications are compatible with the referenced spectrum.

3. Threshold II - Structural Wind Threshold

   For wind conditions less severe than this threshold, a Maglev system will experience no structural failure. That is, the support structure (guideway, piers, footings, and all attachments including motor elements), any vehicles on it, and all power, communications, command and control equipment will be fully operational following an occurrence of wind conditions below threshold II.

Contractors shall use the methodology defined below for determining wind loads at threshold II:

Reference:

Section 6. - Wind Loads, in *Minimum Design Loads for Buildings and Other Structures*, American Society of Civil Engineers, ASCE 7-88, NY.

Methodology:

$F = q_z G_h C_f A_f$

where: F is the wind load, N
q_z is the velocity pressure, $0.613\, K_z\, (I\, V)^2$, N/m^2
K_z is the exposure coefficient
I is the importance factor
V is the basic wind speed, m/s
G_h is the gust response factor
C_f is the force coefficient
A_f is the projected area normal to wind, m^2

Default Values:

$K_z = 1.0$
$I = 1.10$
$V = 38$ m/s (85 mph)
$G_h = 1.25$
$C_f = 2.0$

These default values represent wind conditions over flat, open terrain at a height of 10 m. A basic wind speed of 38 m/s or less represents a 50-year mean recurrence speed over about 90% of the continental U.S. An importance factor of 1.10 is suitable for regions within 160 km of a hurricane coastline (e.g., NE corridor).

4. Contractors shall include appropriate analyses to demonstrate that their concepts meet wind thresholds I & II. If they deviate from the values or methodology described above, they shall include appropriate technical justification.

5. In addition, contractors shall include supporting analyses and documentation which establish wind conditions representing thresholds III & IV for their concepts (as defined below).

6. Threshold III - Vehicle Safety Wind Threshold

   During wind conditions less severe than this threshold, Maglev vehicles may be present on the guideway. That is, vehicles may safely operate at reduced speed or may be safely stationary during wind conditions below threshold III. This threshold will be between thresholds I and II. Contractors must consider safety issues such as vehicle/guideway contact and vehicle derailment when determining this threshold.

7. Threshold IV - Ride Comfort Wind Threshold

   During wind conditions less severe than this threshold, a Maglev system will maintain acceptable levels of ride comfort but may reduce throughput to achieve it. This threshold will be between thresholds I and III.

8. Contractors shall specify thresholds III & IV as a 1-hr average wind speed and direction. To analyze dynamic effects, contractors shall use the gust velocity spectrum described in Attachment A or provide technical justification for using an alternative.

9. Contractors should examine relevant wind engineering literature to determine how wind may affect their concepts and to guide their analyses. The following reference constitutes a general survey of this field:

   Simiu, E. and R. H. Scanlan (1978) *Wind effects on structures: an introduction to wind engineering*. Wiley, NY.

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Attachment A - Wind Gust Velocity Spectrum

Reference:

Davenport, A. G. (1961) The spectrum of horizontal gustiness near the ground in high winds. *Quarterly Journal of the Royal Meteorological Society*, 87, 194-211.

Gust Velocity Spectrum:

$$n\,S(n) / u_t^2 = 4.0\,x^2 / (1 + x^2)^{4/3}$$

where: $S(n)$ is the gust velocity spectrum, $(m/s)^2$ / Hz
n is the gust frequency, Hz
u_t is the friction velocity, m/s
$x = 1{,}200\,n / U_{10}$
U_{10} is the 1-hr average wind speed at a 10-m height

also, the standard deviation, u', is assumed to be

$$u' \approx 2.5\,u_t = U_{10} / 5.7$$

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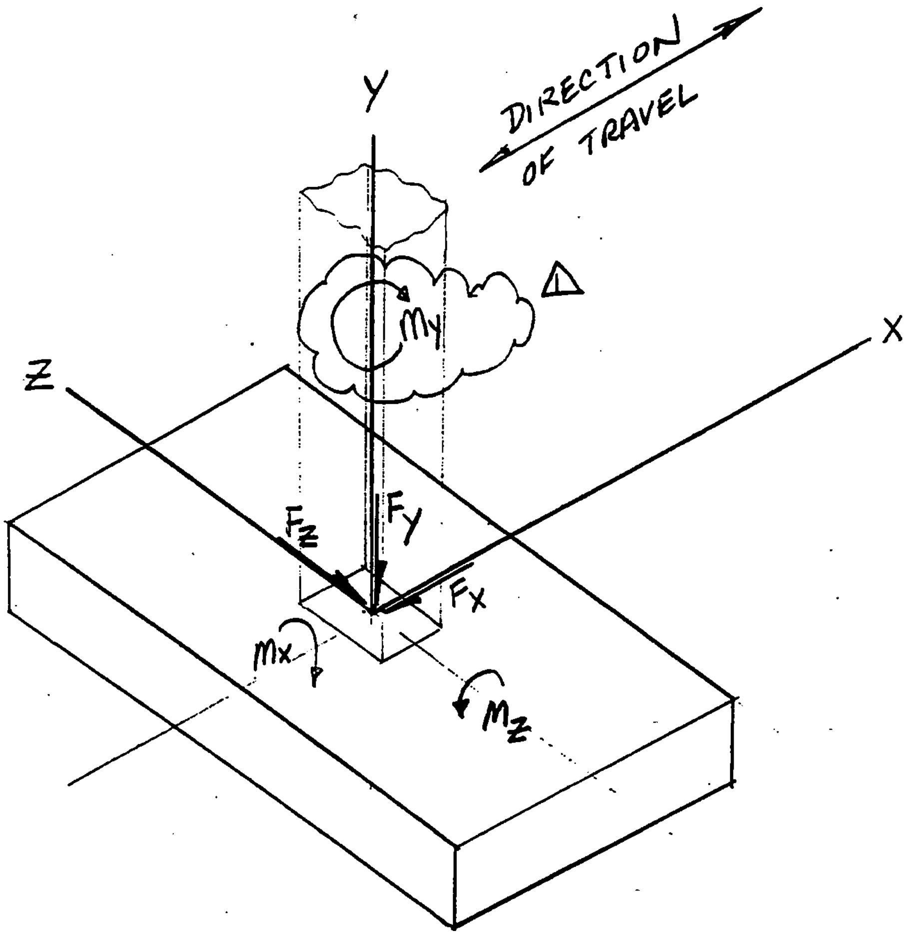
SHEET OF		$\triangle$1	4/16/92 DATE	DATE
J.O 6869.002				

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

COLUMN LOADS TO FOUNDATION -



LOAD COMBINATIONS TO BE CONSIDERED -

D	$D+L \pm \left[\left(\frac{30}{85}\right)^2 W + W_v\right]$
D+S	
D+L	$(D+L \pm E_t) * 0.75$
$D \pm W$	$(D+L \pm E_L) * 0.75$
$D \pm E_t$	$(D+L \pm B) * 0.75$
$D \pm E_L$	

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE) STRUCTURAL

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY MAGNEPLANE INT'L UNIT/S

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.	✓	0	MLG	
FINAL			DATE 04/09/92	DATE
VOID				
SHEET	OF		DATE	DATE
J.O 6869.002				

LATERAL BRACING CONDITIONS -

MEMBER	AXIAL STRONG	AXIAL WEAK	BENDING WEAK	BENDING TOP	BENDING BOTTOM	SIDESWAY STRONG	SIDESWAY WEAK
TOP CHORD	Lu=4.575	Lu=4.575	Lu=4.575	Lu=4.575	Lu=4.575	Br	Br
BOTTOM CHORD	"	"	"	"	"	"	"
MID CHORD	Br-Nds	Br-Nds	Br-Nds	Br-Nds	Br-Nds	"	"
TOP CROSS	Lu=4.67	Lu=4.67	Lu=4.67	Lu=4.67	Lu=4.67	"	"
BOTTOM CROSS	Lu=4.25	Lu=4.25	Lu=4.25	Lu=4.25	Lu=4.25	"	"
PLATE SUPPORT	Lu=2.1	Lu=2.1	Lu=2.1	Lu=2.1	Lu=2.1	"	"
ALL OTHERS	Br-Nds	Br-Nds	Br-Nds	Br-Nds	Br-Nds	"	"

FORM 5007/ B0192016 REV 17/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE) STRUCTURAL

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT DOUBLE GUIDEWAY SUPPORT STRUCT

CALC. SET NO		REV	COMP BY	CHK'D BY
PRELIM.	✓	0	MJG DATE 4/21/92	DATE
FINAL				
VOID				
SHEET	OF		DATE	DATE
J.O	6869.002			

LOAD COMBINATIONS-

"DEAD" REFERS TO DEAD + BODY FROM MODEL

COMB1 = DEAD + THERMAL1

COMB2 = DEAD + THERMAL2

COMB3 = DEAD + SNOW + THERMAL1

COMB4 = DEAD + SNOW + THERMAL2

COMB5 = DEAD + LIVE + THERMAL1

COMB6 = DEAD + LIVE + LIVE2 + THERMAL1

COMB7 = DEAD + LIVE + THERMAL2

COMB8 = DEAD + LIVE + LIVE2 + THERMAL2

COMB9 = DEAD + WINDLONG + THERMAL1

COMB10 = DEAD + WINDLONG + THERMAL2

COMB11 = DEAD + WINDTRANS + THERMAL1

COMB12 = DEAD + WINDTRANS + THERMAL2

COMB13 = DEAD + EARTHQUAKELONG

COMB14 = DEAD + EARTHQUAKETRANS

COMB15 = DEAD + LIVE + $(30/85)^2$ * WINDLONG

COMB16 = DEAD + LIVE + LIVE2 + $(30/85)^2$ * WINDLONG

COMB17 = DEAD + LIVE + $(30/85)^2$ * WINDTRANS + WIND VEHICLE

COMB18 = DEAD + LIVE + LIVE2 + $(30/85)^2$ * WINDTRANS
+ WINDVEHICLE + WINDVEHICLE2

COMB19 = [DEAD + LIVE + EARTHQUAKELONG] * 0.75

COMB20 = [DEAD + LIVE + LIVE2 + EARTHQUAKELONG] * 0.75

COMB21 = [DEAD + LIVE + EARTHQUAKETRANS] * 0.75

COMB22 = [DEAD + LIVE + LIVE2 + EARTHQUAKE TRANS] * 0.75

COMB23 = [DEAD + LIVE + BRAKING] * 0.75

COMB24 = [DEAD + LIVE + LIVE2 + BRAKING + BRAKING2] * 0.75

COMB25 = [DEAD + LIVE - BRAKING] * 0.75

COMB26 = [DEAD + LIVE + LIVE2 - BRAKING - BRAKING2] * 0.75

COMB27 = [DEAD + LIVE + LIVE2 + BRAKING - BRAKING2] * 0.75

FORM 5007/ B0192016 REV 17/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE) STRUCTURAL

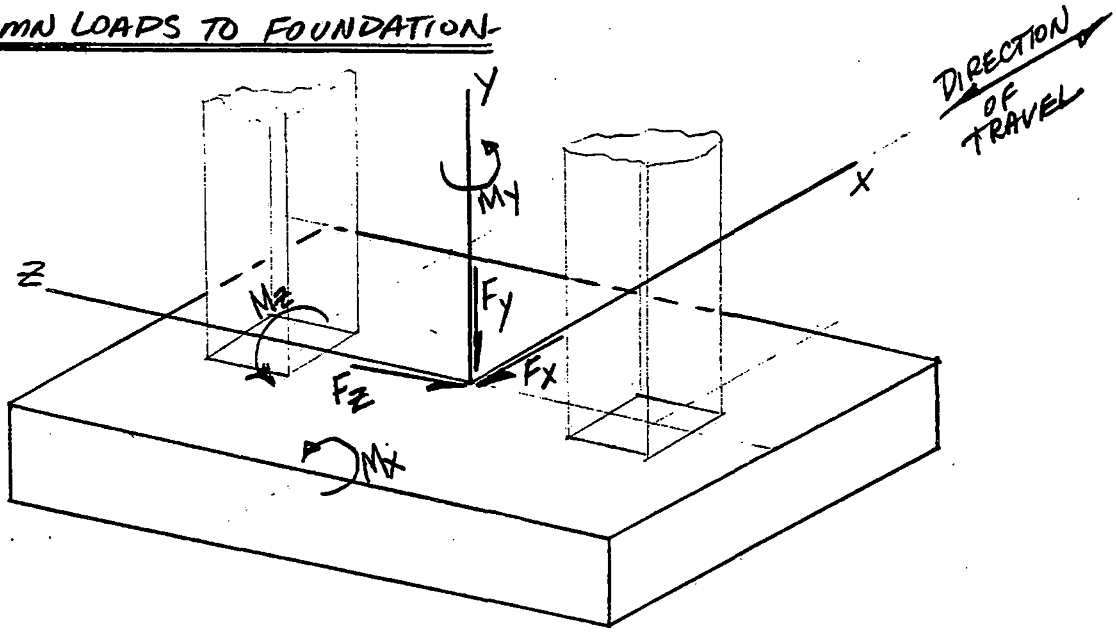
UNITED ENGINEERS & CONSTRUCTORS

CALC. SET NO		REV	COMP BY	CHK'D BY
PRELIM.	✓	0	MJG	
FINAL			DATE 4/ /92	DATE
VOID				
SHEET	OF		DATE	DATE
J.O	6869.002			

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT DOUBLE GUIDEWAY SUPPORT STRUCT.

COLUMN LOADS TO FOUNDATION



LOAD COMBINATIONS TO BE CONSIDERED -

D

$D+S$

$D+L$

$D+L+L2$

$D \pm W$

$D \pm E_t$

$D \pm E_L$

$D+L \pm \left[\left(30/85\right)^2 W + W_V\right]$

$D+L+L2 \pm \left[\left(30/85\right)^2 W + W_V + W_{V2}\right]$

$(D+L \pm E_t) * 0.75$

$(D+L+L2 \pm E_t) * 0.75$

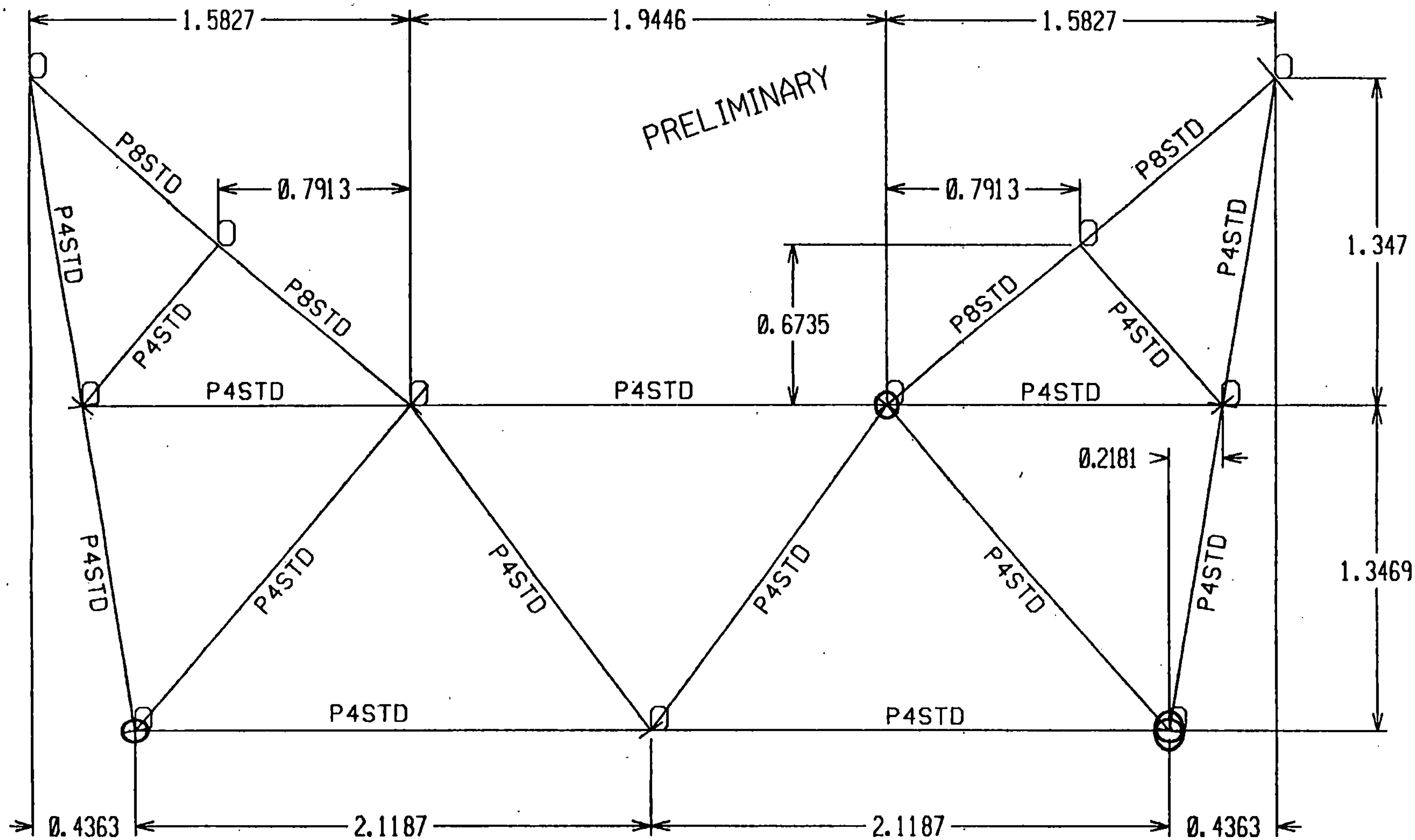
$(D+L \pm E_L) * 0.75$

$(D+L+L2 \pm E_L) * 0.75$

$(D+L \pm B) * 0.75$

$(D+L+L2 \pm [B+B2]) * 0.75$

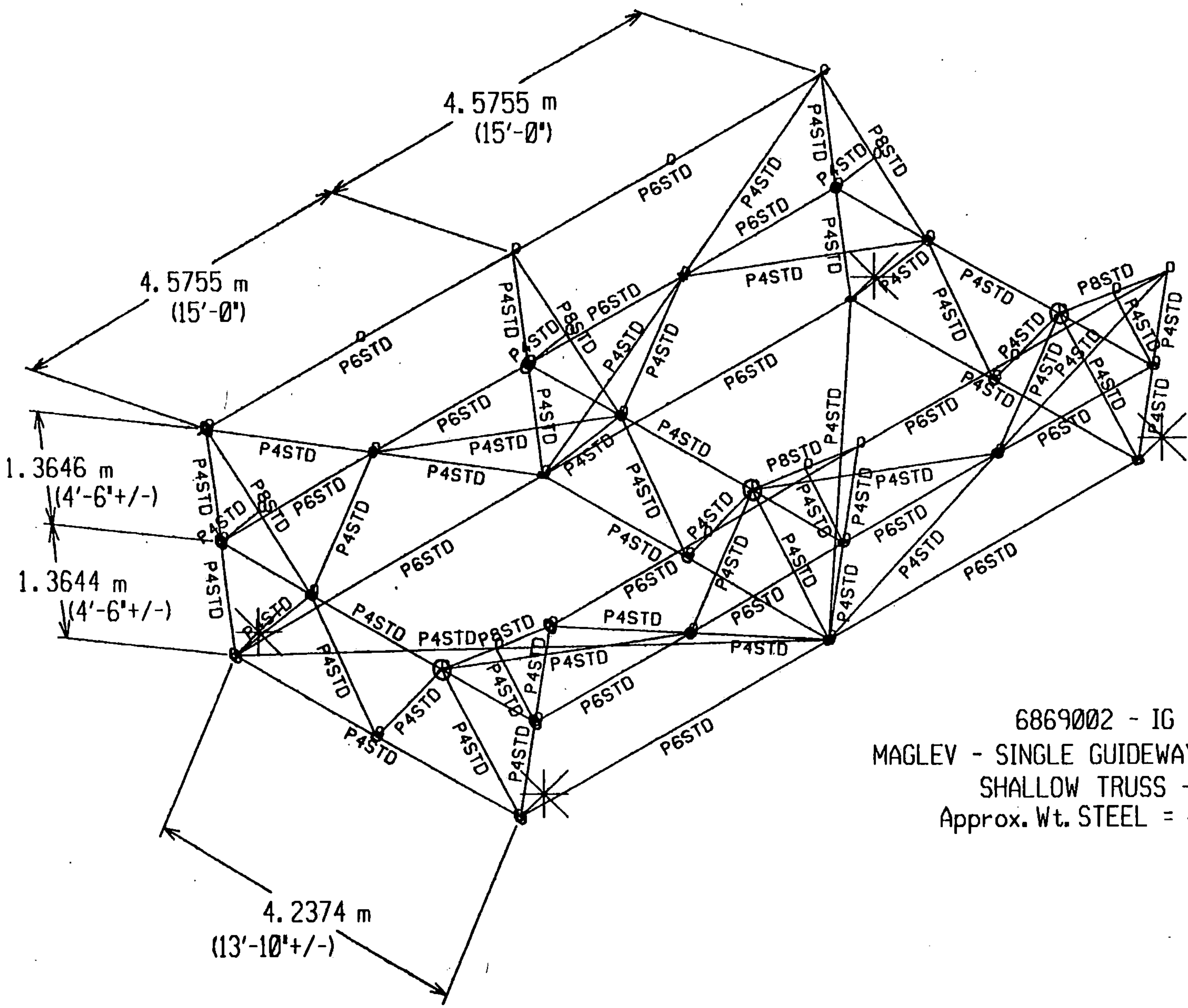
$(D+L+L2 \pm [B-B2]) * 0.75$



ELEVATION - SHALLOW TRUSS

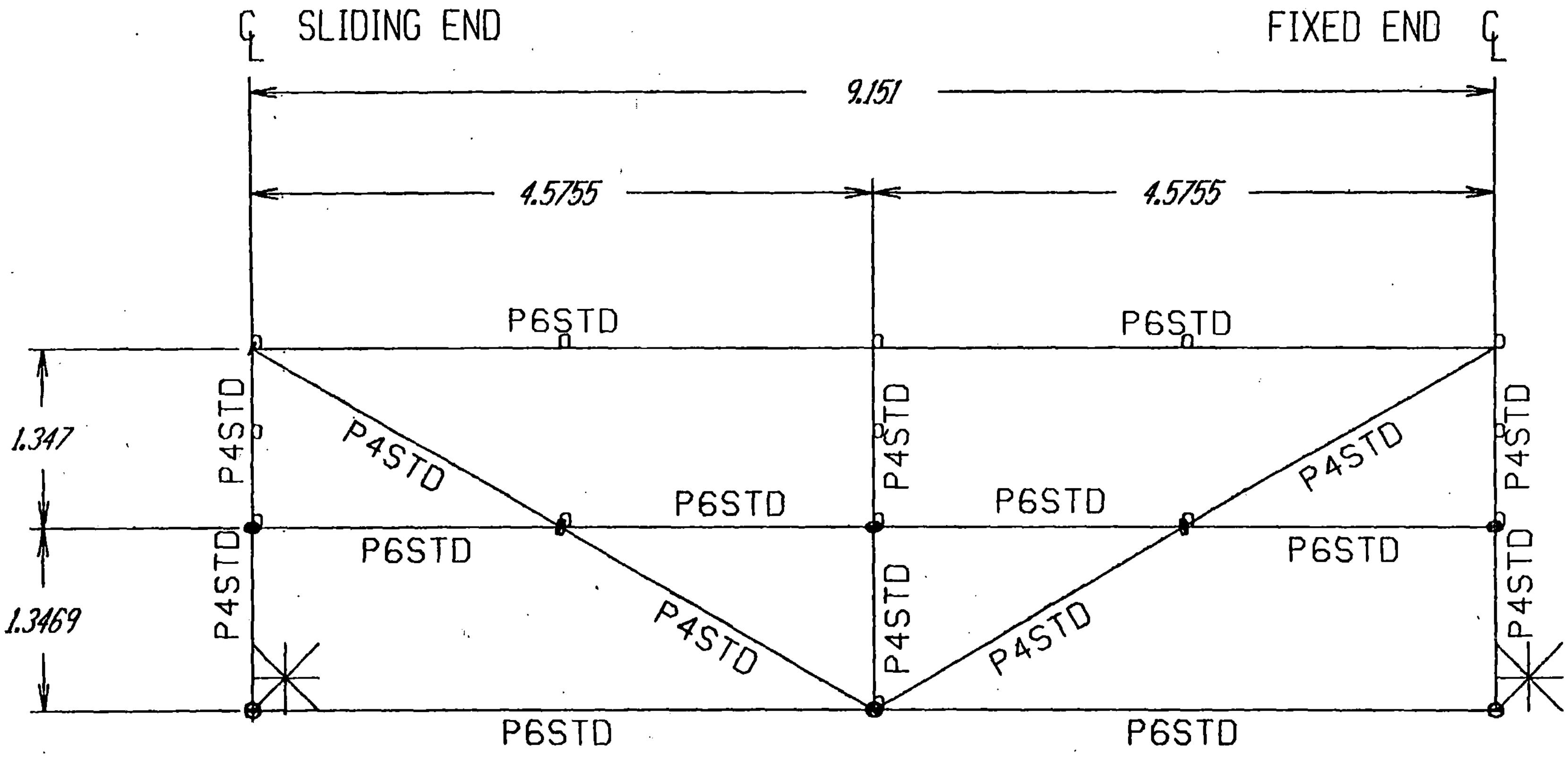
6869002 MAGNEPLANE INTERNATIONAL
SINGLE GUIDEWAY SUPPORT STRUCTURE

S-17



6869002 - IG Model x1s30
MAGLEV - SINGLE GUIDEWAY SUPPORT STRUCTURE
SHALLOW TRUSS - 30 FT. SPAN
Approx. Wt. STEEL = 41.2 kN (9.3 kips)

PRELIMINARY



ELEVATION - SHALLOW TRUSS 30 FT. SPAN

6869002 MAGNEPLANE INTERNATIONAL
SINGLE GUIDEWAY SUPPORT STRUCTURE

S-49

****

x1s30
truss no. 1 with 30 ft. span

****

MicasPlus Rev 4.0.1.0 APR 13, 1992 06:33:36
Analysis No. 22 Thin Shell Page 1

* Material Takeoff * Shape Type : Pipe Shapes

Shape Name	Number Physical Members	Total Length (M)	Total Surface Area (M)**2	Total Weight (kN)
P4STD	53	119.412	42.878	18.822
P5STD	7	17.143	11.799	7.151
P6STD	6	54.906	29.025	15.218
Shape Totals		191.461	83.702	41.191
		627 FT		9.26 KIPS

Bending Member Connections :

Shear & Moment = 12
Shear only = 120

****

x1s30
truss no. 1 with 30 ft. span

****

MicasPlus Rev 4.0.1.0 APR 13, 1992 06:33:36
Analysis No. 22 Thin Shell Page 2

* Material Takeoff * Structure Totals :

Total Length	627 FT	191.461	(M)
Total Surface Area		83.702	(M)**2
Total Weight	9.26 KIPS	41.191	(kN)

Total Bending Member Shear & Moment Connections = 12
Total Bending Shear Connections = 120

$\frac{9.26k}{2} = 4.63$ TON $\therefore \frac{4.63(5280)}{30} = 815$ TON/MILE

S-20

FORM 5007/ B0192016 REV 17/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

CALC SET NO		REV	COMP BY	CHK'D BY
PRELIM	✓	0	MYG DATE 04/10/92	DATE
FINAL				
VOID				
SHEET	OF	△	MYG DATE 04/16/92	DATE
JO 6869.002				

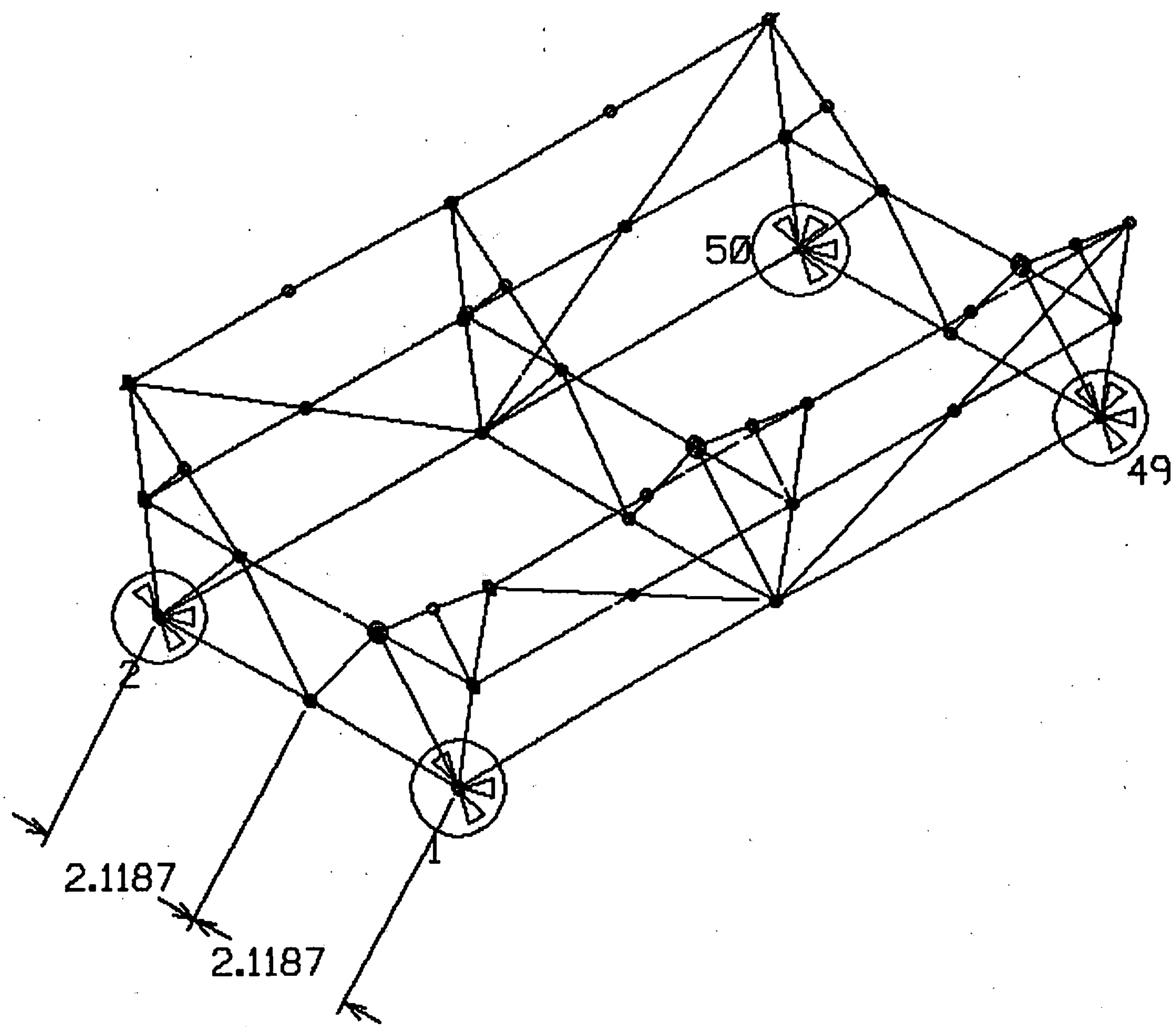
NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

STEEL - SINGLE - SHALLOW TRUSS "X1530"

SUMMARY OF LOADS (UNFACTORED) SPAN = 9.15 m (30 FT)

	LOADS \ COLUMN HT.	h_1 = 5.18m (17.0 FT)	h_2 = 7.62m (25.0 FT)	h_3 = 9.14m (30.0 FT)	h_4 = 20.0 m (65.6 FT)
D	DEAD LOAD Fy	451.5 kN (101.5 kips)	537.1 kN (120.8 kips)	590.6 kN (132.8 kips)	971.5 kN (218.4 kips)
S	SNOW LOAD Fy	120.4 kN (27.1 kips)	120.4 kN (27.1 kips)	120.4 kN (27.1 kips)	120.4 kN (27.1 kips)
L	LIVE LOAD VEHICLE Fy	251 kN (56.4 kips)	251 kN (56.4 kips)	251 kN (56.4 kips)	251 kN (56.4 kips)
E_t	SEISMIC LOAD LATERAL Fz	38.2 kN (8.6 kips)	38.2 kN (8.6 kips)	38.2 kN (8.6 kips)	38.2 kN (8.6 kips)
	Mx	268.5 kN-m (198 k-FT)	361.7 kN-m (267 k-FT)	419.8 kN-m (309 k-FT)	834.6 kN-m (615 k-FT)
	My	19.0 kN-m (14 k-FT)	19.0 kN-m (14 k-FT)	19.0 kN-m (14 k-FT)	19.0 kN-m (14 k-FT)
E_L	SEISMIC LOAD LONGITUDINAL Fx	38.2 kN (8.6 kips)	38.2 kN (8.6 k)	38.2 kN (8.6 k)	38.2 kN (8.6 k)
	Mz	197.9 kN-m (146 k-FT)	291.1 kN-m (215 k-FT)	349.1 kN-m (258 k-FT)	764 kN-m (565 k-FT)
W	WIND LOAD LATERAL Fz	78 kN (17.5 k)	84 kN (18.9 k)	87.5 kN (19.7 k)	114 kN (25.6 k)
	Mx	465.6 kN-m (343 k-FT)	663.8 kN-m (489 k-FT)	792.4 kN-m (584 k-FT)	1885 kN-m (1390 k-FT)
	My	22.9 kN-m (5.1 k-FT)	22.9 kN-m (5.1 k-FT)	22.9 kN-m (5.1 k-FT)	22.9 kN-m (5.1 k-FT)
B	BRAKING LOAD LONGITUDINAL Fx	163.4 kN (36.7 kips)	163.4 kN (36.7 k)	163.4 kN (36.7 k)	163.4 kN (36.7 k)
	Mz	846.4 kN-m (623.9 k-FT)	1245.1 kN-m (917.5 k-FT)	1493.5 kN-m (1101 k-FT)	3268 kN-m (2407.5 k-FT)
W_V	WIND ON OPER. VEHICLE Fy	5.75 kN (1.3 kip)	5.75 kN (1.3 k)	5.75 kN (1.3 k)	5.75 kN (1.3 k)
	Fz	16.0 kN (3.6 kip)	16.0 kN (3.6 k)	16.0 kN (3.6 k)	16.0 kN (3.6 k)
	Mx	133.1 kN-m (98.1 k-FT)	172.1 kN-m (126.9 k-FT)	196.4 kN-m (144.8 k-FT)	370.2 kN-m (272.9 k-FT)


50
49
2
1
2.1187
2.1187

****

max30

truss no. 1 with 30 ft. span

****

MicasPlus Rev 4.0.1.0 APR 20, 1992 13:15:36

Analysis No. 28 Thin Shell Page 11

*** Support Reactions ***

Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
1	DEAD 1	0.0000	6.0423	17.6529	0.0000	0.0000	-4.389e-03
	LIVE 2	0.0000	0.0291	2.252e-04	0.0000	0.0000	-0.0179
	SNOW 3	0.0000	6.8404	30.1041	0.0000	0.0000	-7.872e-03
	EARTHQUAKELONG 4	0.0000	0.7414	-3.8687	0.0000	0.0000	2.878e-03
	EARTHQUAKETRANS 5	0.0000	-2.0430	-8.1450	0.0000	0.0000	-0.0381
	WINDLONG 6	0.0000	0.3229	-1.5874	0.0000	0.0000	0.0705
	WINDTRANS 7	0.0000	-4.5486	-11.0254	0.0000	0.0000	-0.0426
	WINDVEHICLE 8	0.0000	8.993e-03	-0.0389	0.0000	0.0000	6.650e-04
	BRAKING 9	0.0000	3.2113	-18.1214	0.0000	0.0000	0.8417
	BODY 10	0.0000	-0.1155	10.2738	0.0000	0.0000	-5.026e-03
	THERMAL1 11	0.0000	403.3587	-0.1119	0.0000	0.0000	0.0651
	THERMAL2 12	0.0000	-403.3587	0.1119	0.0000	0.0000	-0.0651
	SET 13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	COMB1 1	0.0000	409.4010	17.5410	0.0000	0.0000	0.0607
	COMB2 2	0.0000	-397.3163	17.7648	0.0000	0.0000	-0.0695
	COMB3 3	0.0000	416.2415	47.6451	0.0000	0.0000	0.0528
	COMB4 4	0.0000	-390.4759	47.8689	0.0000	0.0000	-0.0773
	COMB5 5	0.0000	409.4301	17.5412	0.0000	0.0000	0.0428
	COMB6 6	0.0000	-397.2873	17.7650	0.0000	0.0000	-0.0873
	COMB7 7	0.0000	409.7239	15.9536	0.0000	0.0000	0.1312

*** Support Reactions ***

Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
1	COMB8 8	0.0000	-396.9935	16.1774	0.0000	0.0000	1.066e-03
	COMB9 9	0.0000	404.8525	6.5155	0.0000	0.0000	0.0181
	COMB10 10	0.0000	-401.8649	6.7393	0.0000	0.0000	-0.1120
	COMB11 11	0.0000	6.7838	13.7841	0.0000	0.0000	-1.512e-03
	COMB12 12	0.0000	3.9994	9.5079	0.0000	0.0000	-0.0424
	COMB13 13	0.0000	6.1118	17.4547	0.0000	0.0000	-0.0134
	COMB14 14	0.0000	5.5119	16.2360	0.0000	0.0000	-0.0269
	COMB15 15	0.0000	5.1096	10.3383	0.0000	0.0000	-0.0145
	COMB16 16	0.0000	3.0213	7.1311	0.0000	0.0000	-0.0452
	COMB17 17	0.0000	6.9620	-0.3513	0.0000	0.0000	0.6146
	COMB18 18	0.0000	2.1451	26.8309	0.0000	0.0000	-0.6480
2	DEAD 1	0.0000	-6.0546	17.6471	0.0000	0.0000	1.041e-03
	LIVE 2	0.0000	-0.0288	-2.253e-04	0.0000	0.0000	0.0192
	SNOW 3	0.0000	-6.8579	30.0959	0.0000	0.0000	3.509e-03
	EARTHQUAKELONG 4	0.0000	0.3495	-3.8310	0.0000	0.0000	3.865e-03
	EARTHQUAKETRANS 5	0.0000	-14.8736	8.1450	0.0000	0.0000	-0.0424
	WINDLONG 6	0.0000	0.2793	-1.5273	0.0000	0.0000	-0.0661
	WINDTRANS 7	0.0000	-25.2600	11.0254	0.0000	0.0000	-0.0454
	WINDVEHICLE 8	0.0000	-0.0306	0.0389	0.0000	0.0000	6.037e-04
	BRAKING 9	0.0000	1.4820	-17.9548	0.0000	0.0000	-0.8114

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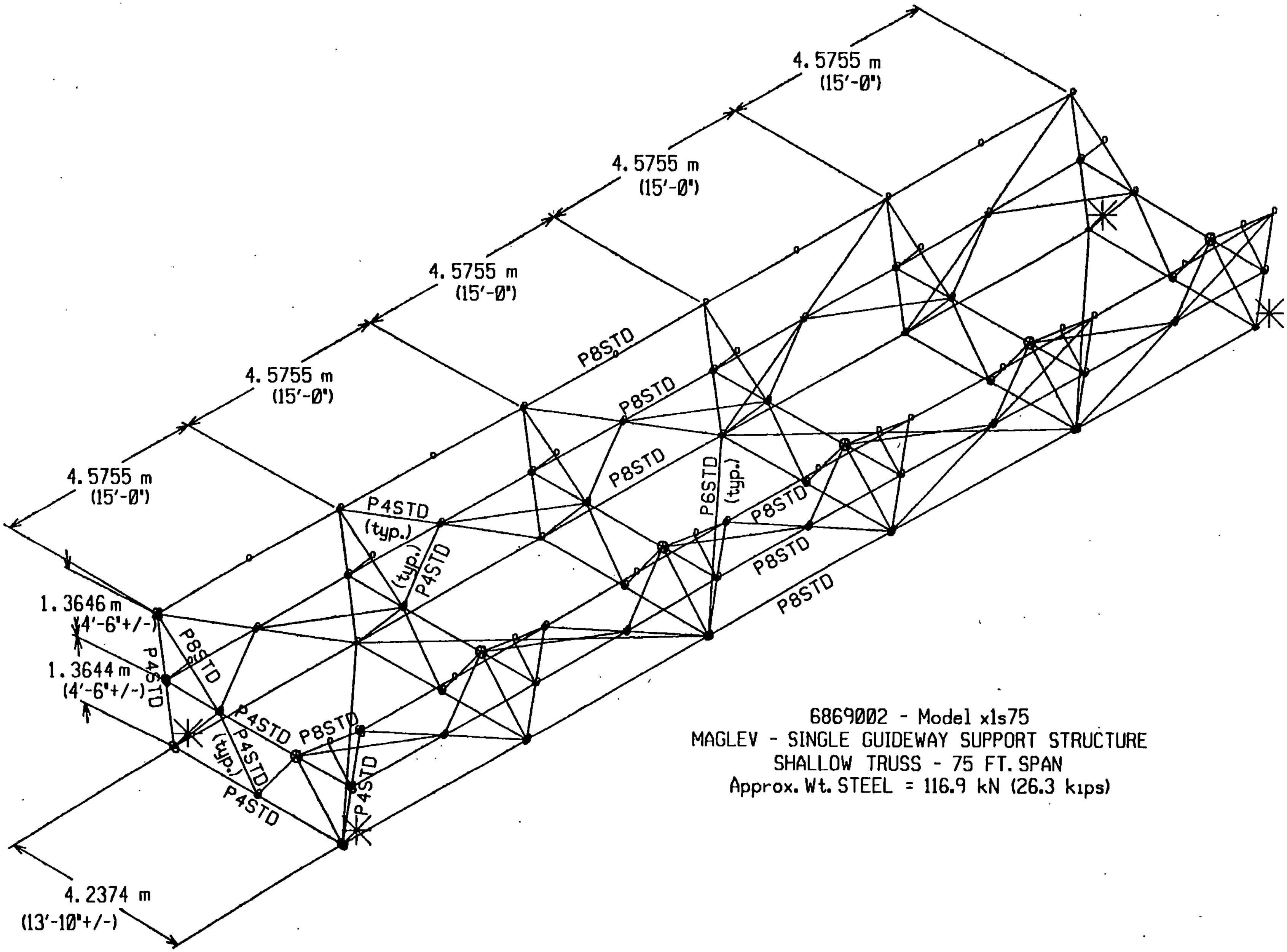
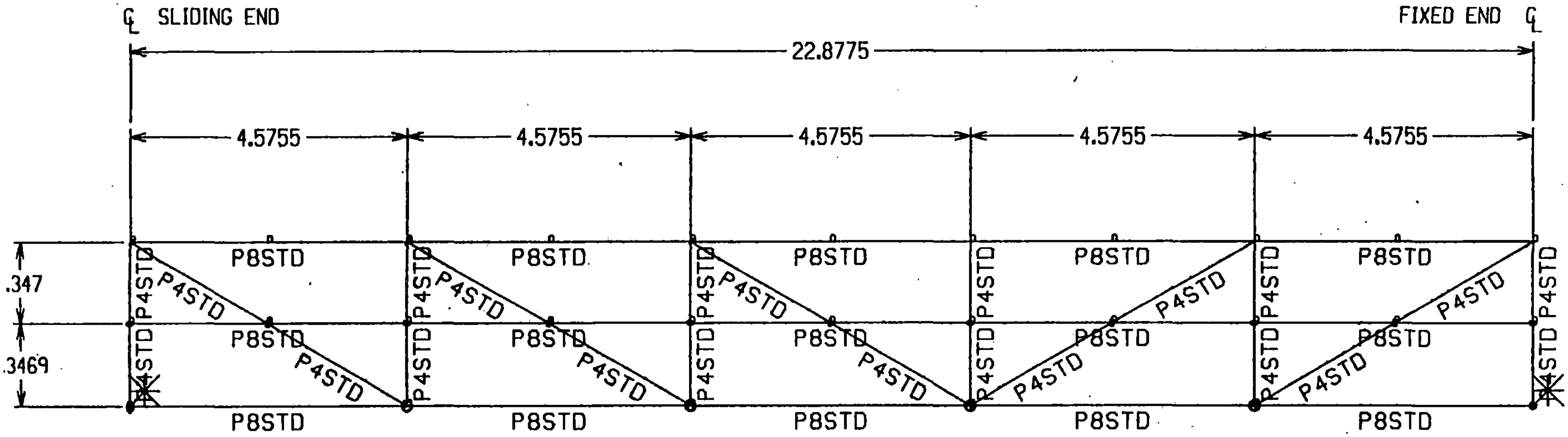


6869002 - Model x1s75
MAGLEV - SINGLE GUIDEWAY SUPPORT STRUCTURE
SHALLOW TRUSS - 75 FT. SPAN
Approx. Wt. STEEL = 116.9 kN (26.3 kips)

S-25

PRELIMINARY



ELEVATION

6869002 MAGNEPLANE INTERNATIONAL
SINGLE GUIDEWAY SUPPORT STRUCTURE

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[redacted]

FORM 5007/ B0192016 REV 17/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

CALC SET NO		REV	COMP BY	CHK'D BY
PRELIM	✓	0	MXG DATE 04/10/92	DATE
FINAL				
VOID				
SHEET	OF	△	MXG DATE 04/16/92	DATE
JO 6869.002				

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

STEEL - SINGLE - SHALLOW TRUSS "X/S75"

SUMMARY OF LOADS (UNFACTORED) SPAN = 22.87m (75 FT)

	LOADS \ COLUMN HT.	h_1 = 5.18m (17.0 FT)	h_2 = 7.62m (25.0 FT)	h_3 = 9.14m (30.0 FT)	h_4 = 20.0 m (65.6 FT)
D	DEAD LOAD FY	595.3 kN (133.8 k)	680.9 KN (153.1 k)	734.4 kN (165.1 k)	1115 kN (250 k)
S	SNOW LOAD FY	247.2 kN (55.6 K)	247.2 kN (55.6 K)	247.2 kN (55.6 k)	247.2 kN (55.6 K)
L	LIVE LOAD VEHICLE FY	251 kN (56.4 K)	251 kN (56.4K)	251 kN (56.4K)	251 kN (56.4K)
E_t	SEISMIC LOAD LATERAL Fz, Mx, My	54.0 kN (12.1 K); 371.7 kN-m (274 k-FT); 74.2 kN-m (55 K-FT)	54.0 kN (12.1K); 503.5 kN-m (371.1 k-FT); 74.2 kN-m (55 K-FT)	54.0 kN (12.1K); 585.6 kN-m (431.7 k-FT); 74.2 kN-m (55 K-FT)	54.0 kN (12.1K); 1172 kN-m (864 k-FT); 74.2 kN-m (55 K-FT)
E_L	SEISMIC LOAD LONGITUDINAL FX, Mz	54.0 kN (12.1 k); 279.7 kN-m (205.7 k-FT)	54.0 kN (12.1K); 411.5 kN-m (302.5 k-FT)	54.0 KN (12.1K); 493.6 kN-m (363 k-FT)	54.0 KN (12.1K); 1080 kN-m (794 k-FT)
W	WIND LOAD LATERAL Fz, Mx, My	128.1 KN (28.8 K); 867.9 kN-m (640 k-FT); 392 kN-m (289 k-FT)	133.9 KN (30.1 k); 1186.8 kN-m (875 k-FT); 392 kN-m (289 k-FT)	137.6 kN (30.9 K); 1393 kN-m (1027 k-FT); 392 kN-m (289 k-FT)	164.2 kN (36.9 k); 3032 kN-m (2235 k-FT); 392 kN-m (289 K-FT)
B	BRAKING LOAD LONGITUDINAL Fx, Mz	163.4 kN (36.7 K); 846.4 kN-m (624 k-FT)	163.4 kN (36.7 K); 1245.1 kN-m (917.5 K-FT)	163.4 kN (36.7 K); 1493.5 kN-m (1101 K-FT)	163.4 KN (36.7K); 3268 KN-m (2407.5 k-FT)
W_V	WIND ON OPER. VEHICLE Fy, Fz, Mx	5.75 kN (1.3K); 16.0 kN (3.6 K); 133.1 kN-m (98.1 k-FT)	5.75 kN (1.3 k); 16.0 kN (3.6 k); 172.1 kN-m (126.9K-FT)	5.75 KN (1.3 k); 16.0 KN (3.6 k); 196.4 kN-m (144.8 K-FT)	5.75 kN (1.3 k); 16.0 kN (3.6 k); 370.2 kN-m (272.9 k-FT)

****

x1s75 75
truss no. 1 with ~~100~~ 75 ft. span

****

MicasPlus Rev 4.0.1.0 APR 13, 1992 08:05:49

Analysis No. 0 Thin Shell Page 1

* Material Takeoff * Shape Type : Pipe Shapes

Shape Name	Number Physical Members	Total Length (M)	Total Surface Area (M)**2	Total Weight (kN)
P4STD	108	227.587	81.721	35.873
P8STD	18	162.205	111.634	67.656
P6STD	9	48.131	25.444	13.340
Shape Totals		437.922	218.798	116.869
		1435.7 FT		26.3 KIPS

Bending Member Connections :

Shear & Moment = 24
Shear only = 246

****

x1s75 75
truss no. 1 with ~~100~~ 75 ft. span

****

MicasPlus Rev 4.0.1.0 APR 13, 1992 08:05:49

Analysis No. 0 Thin Shell Page 2

* Material Takeoff * Structure Totals :

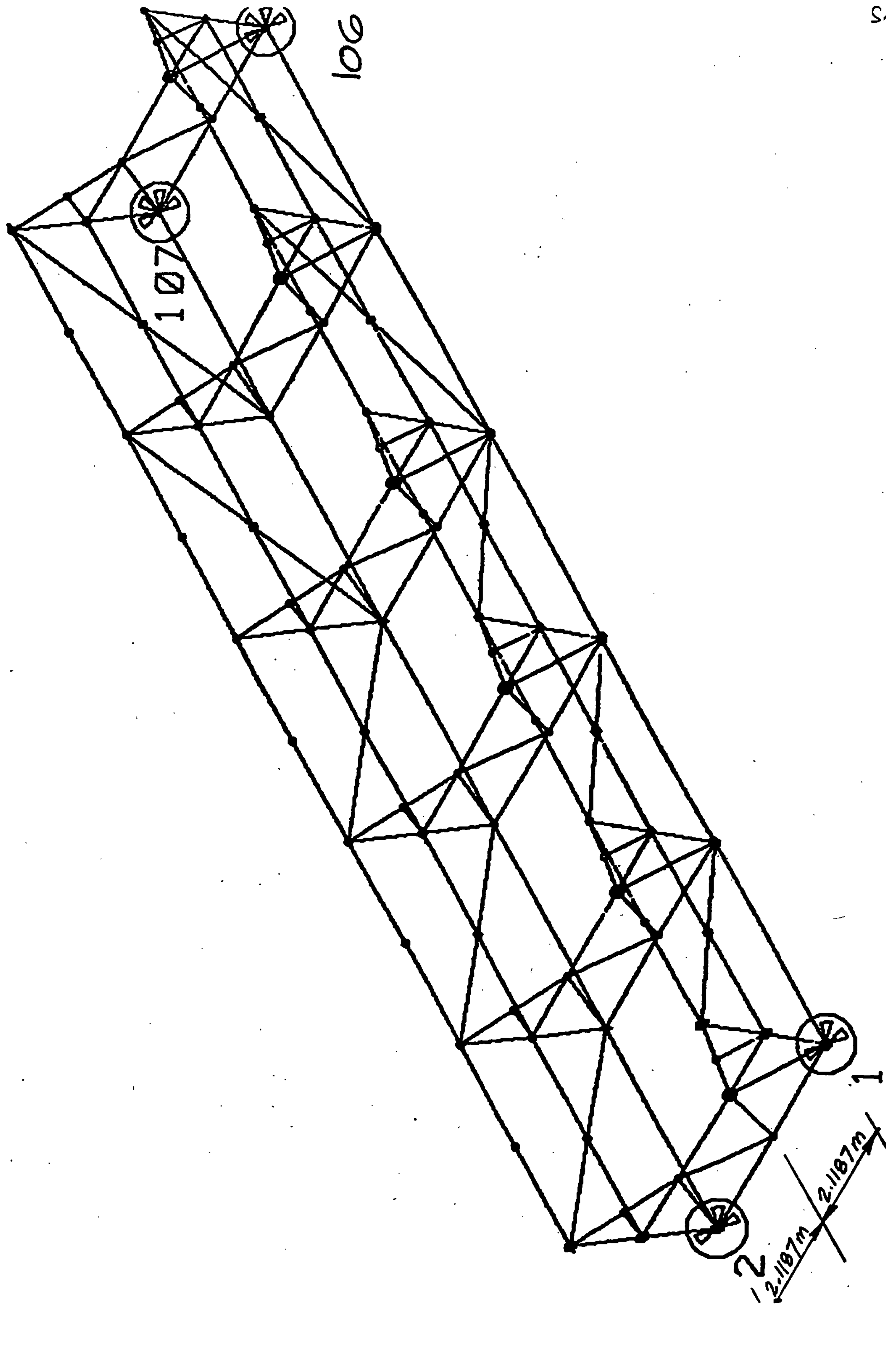
Total Length	1435.7 FT	437.922	(M)
Total Surface Area		218.798	(M)**2
Total Weight	26.3 KIPS	116.869	(kN)

Total Bending Member Shear & Moment Connections = 24
Total Bending Shear Connections = 246

$\frac{26.3k}{2} = 13.15$ TON $\therefore$ $\frac{13.15(5280)}{75} = 926$ TON/MILE

S-28

S-29.



****

max75
truss no. 1 with 75 ft. span

****

MicasPlus Rev 4.0.1.0 APR 20, 1992 13:09:01

Analysis No. 11 Thin Shell Page 10

*** Support Reactions ***

Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
1	DEAD 1	0.0000	3.1324	34.4263	0.0000	0.0000	6.199e-03
	LIVE 2	0.0000	-4.002e-03	-1.751e-05	0.0000	0.0000	-6.073e-04
	SNOW 3	0.0000	2.0854	57.6491	0.0000	0.0000	9.626e-03
	EARTHQUAKELONG 4	0.0000	0.5263	-2.0243	0.0000	0.0000	4.564e-03
	EARTHQUAKETRANS 5	0.0000	-8.5893	-4.5215	0.0000	0.0000	-0.0113
	WINDLONG 6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	WINDTRANS 7	0.0000	-30.9474	-26.4482	0.0000	0.0000	-0.0490
	WINDVEHICLE 8	0.0000	0.0165	-0.0124	0.0000	0.0000	3.134e-04
	BRAKING 9	0.0000	1.7478	-7.2453	0.0000	0.0000	-0.0354
	BODY 10	0.0000	-3.2929	29.2423	0.0000	0.0000	-1.993e-03
	THERMAL1 11	0.0000	411.9338	-0.3372	0.0000	0.0000	-1.474e-03
	THERMAL2 12	0.0000	-411.9338	0.3372	0.0000	0.0000	1.474e-03
	COMB1 1	0.0000	415.0662	34.0891	0.0000	0.0000	4.725e-03
	COMB2 2	0.0000	-408.8014	34.7635	0.0000	0.0000	7.674e-03
	COMB3 3	0.0000	417.1516	91.7381	0.0000	0.0000	0.0144
	COMB4 4	0.0000	-406.7160	92.4126	0.0000	0.0000	0.0173
	COMB5 5	0.0000	415.0622	34.0890	0.0000	0.0000	4.117e-03
	COMB6 6	0.0000	-408.8054	34.7635	0.0000	0.0000	7.066e-03
	COMB7 7	0.0000	415.0662	34.0891	0.0000	0.0000	4.725e-03
	COMB8 8	0.0000	-408.8014	34.7635	0.0000	0.0000	7.674e-03

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max75
truss no. 1 with 75 ft. span

****

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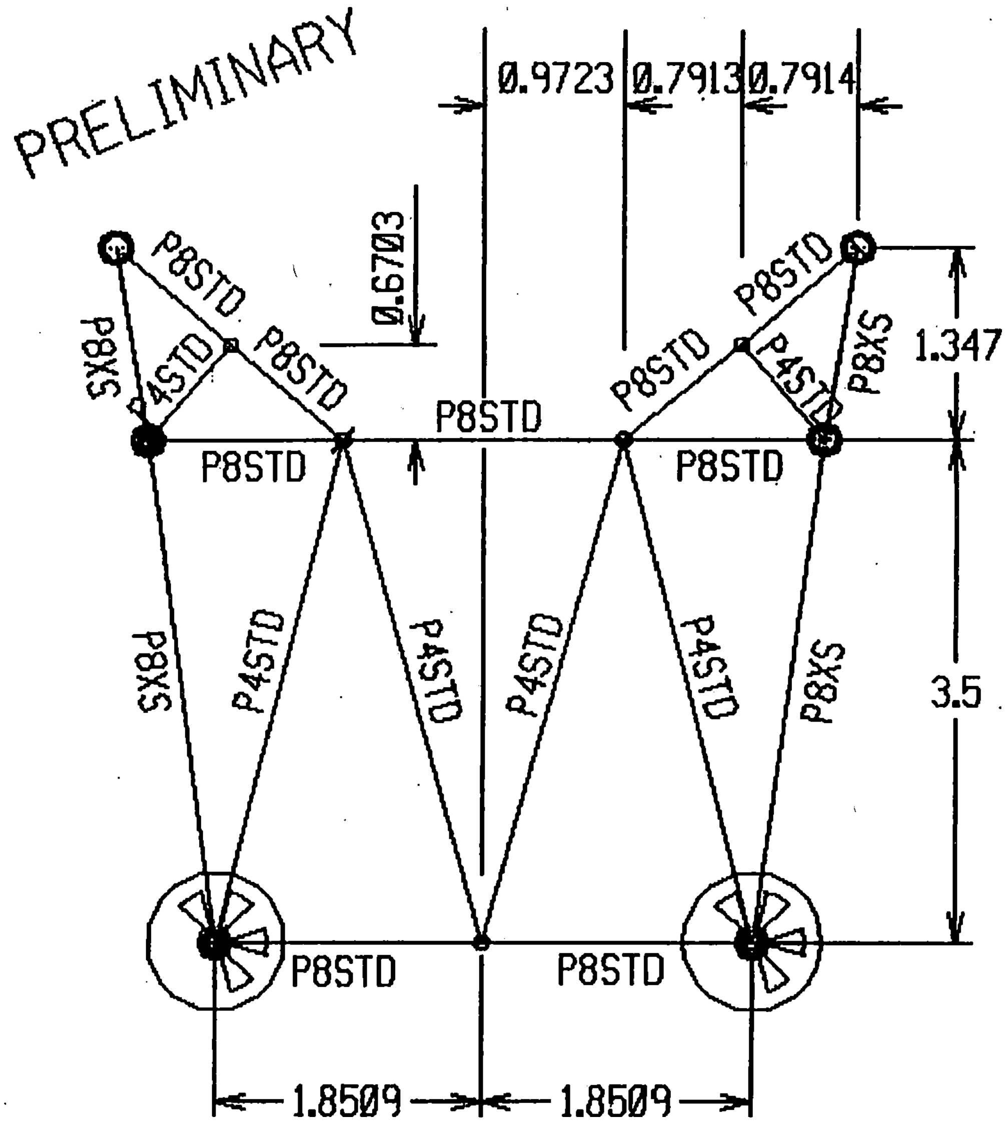
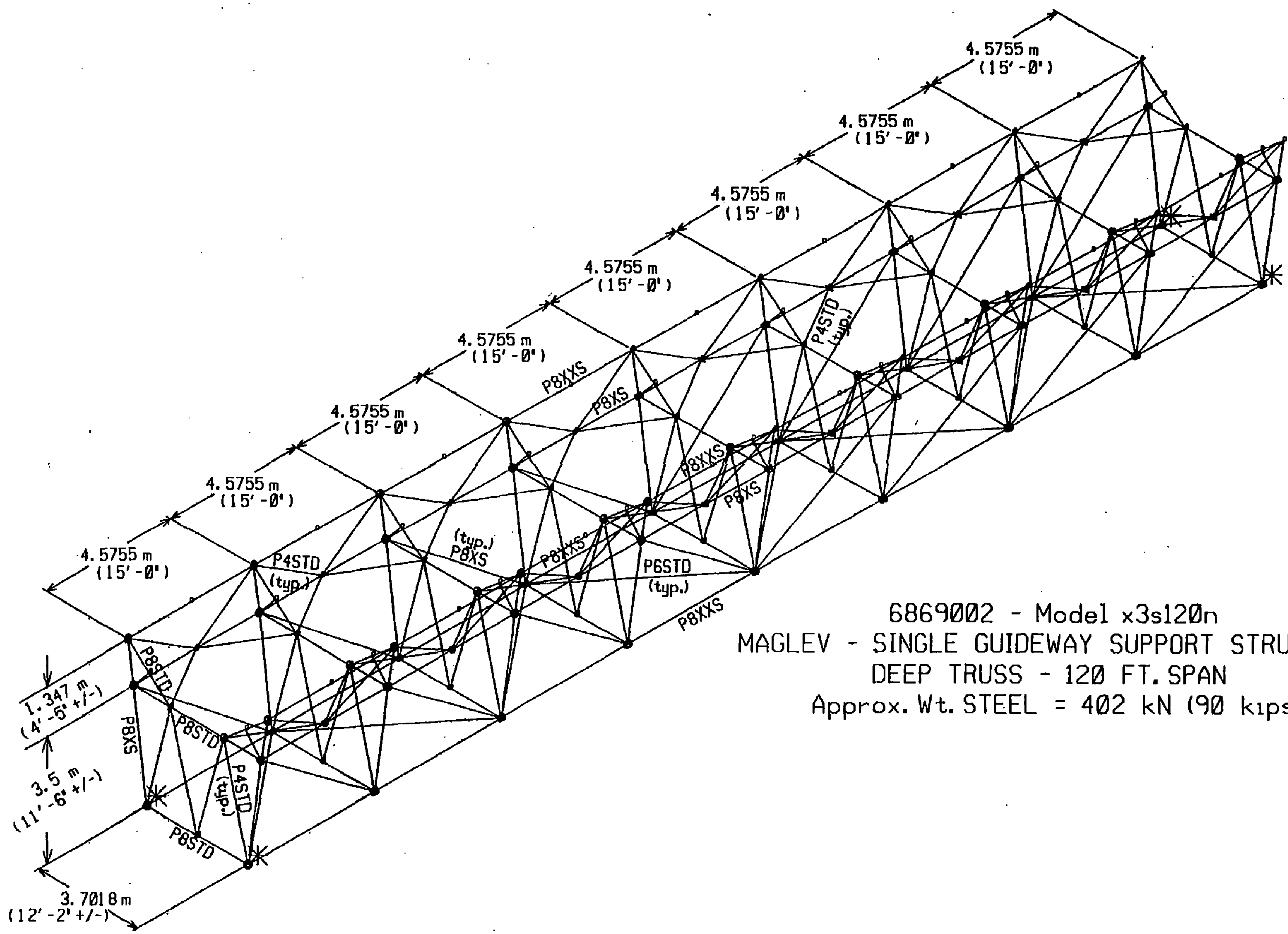
Analysis No. 11 Thin Shell Page 11

*** Support Reactions ***

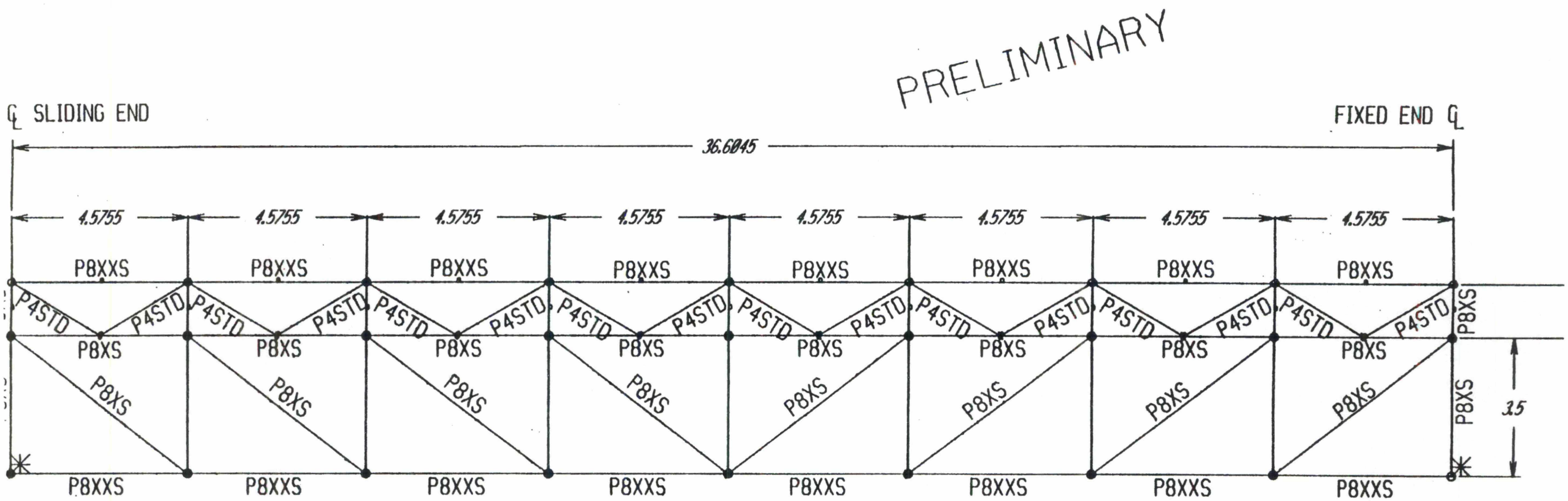
Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
1	COMB9 9	0.0000	384.1189	7.6408	0.0000	0.0000	-0.0442
	COMB10 10	0.0000	-439.7487	8.3153	0.0000	0.0000	-0.0413
	COMB11 11	0.0000	3.6587	32.4020	0.0000	0.0000	0.0108
	COMB12 12	0.0000	-5.4569	29.9048	0.0000	0.0000	-5.117e-03
	COMB13 13	0.0000	3.1284	34.4263	0.0000	0.0000	5.592e-03
	COMB14 14	0.0000	-0.7235	31.1079	0.0000	0.0000	-2.136e-04
	COMB15 15	0.0000	2.7410	24.3015	0.0000	0.0000	7.617e-03
	COMB16 16	0.0000	-4.0957	22.4286	0.0000	0.0000	-4.293e-03
	COMB17 17	0.0000	3.6572	20.3857	0.0000	0.0000	-0.0224
	COMB18 18	0.0000	1.0354	31.2537	0.0000	0.0000	0.0308
2	DEAD 1	0.0000	-2.9983	34.4137	0.0000	0.0000	0.0102
	LIVE 2	0.0000	4.358e-03	1.736e-05	0.0000	0.0000	5.857e-04
	SNOW 3	0.0000	-1.8456	57.6309	0.0000	0.0000	0.0168
	EARTHQUAKELONG 4	0.0000	-0.3740	-2.0043	0.0000	0.0000	-5.279e-03
	EARTHQUAKETRANS 5	0.0000	-1.7363	4.5215	0.0000	0.0000	-0.0159
	WINDLONG 6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	WINDTRANS 7	0.0000	-7.1821	26.4482	0.0000	0.0000	-0.0771
	WINDVEHICLE 8	0.0000	-2.993e-03	0.0124	0.0000	0.0000	2.815e-04
	BRAKING 9	0.0000	-1.3054	-7.1852	0.0000	0.0000	0.0334
	BODY 10	0.0000	3.3991	29.0616	0.0000	0.0000	0.0130



ELEVATION - DEEP TRUSS
6869ØØ2 MAGNEPLANE INTERNATIONAL
SINGLE GUIDEWAY SUPPORT STRUCTURE

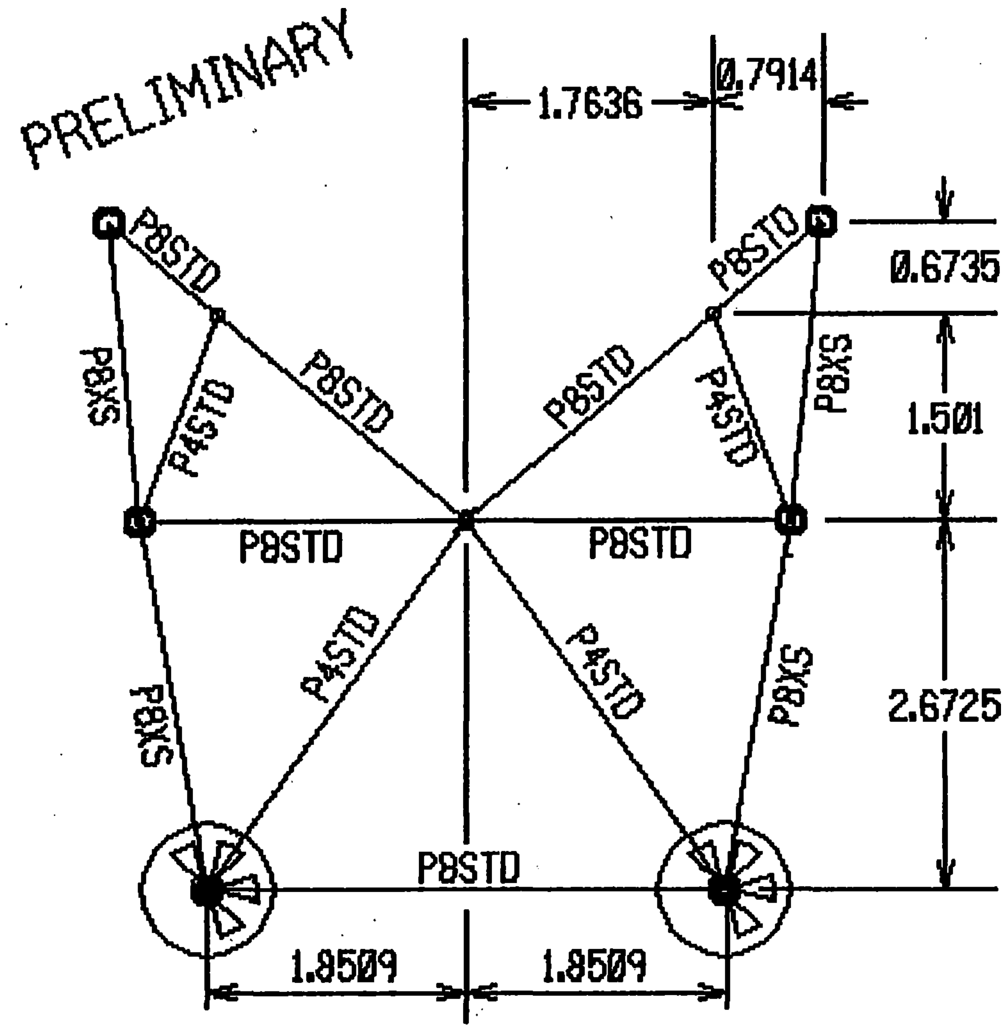


6869002 - Model x3s120n
MAGLEV - SINGLE GUIDEWAY SUPPORT STRUCTURE
DEEP TRUSS - 120 FT. SPAN
Approx. Wt. STEEL = 402 kN (90 kips)



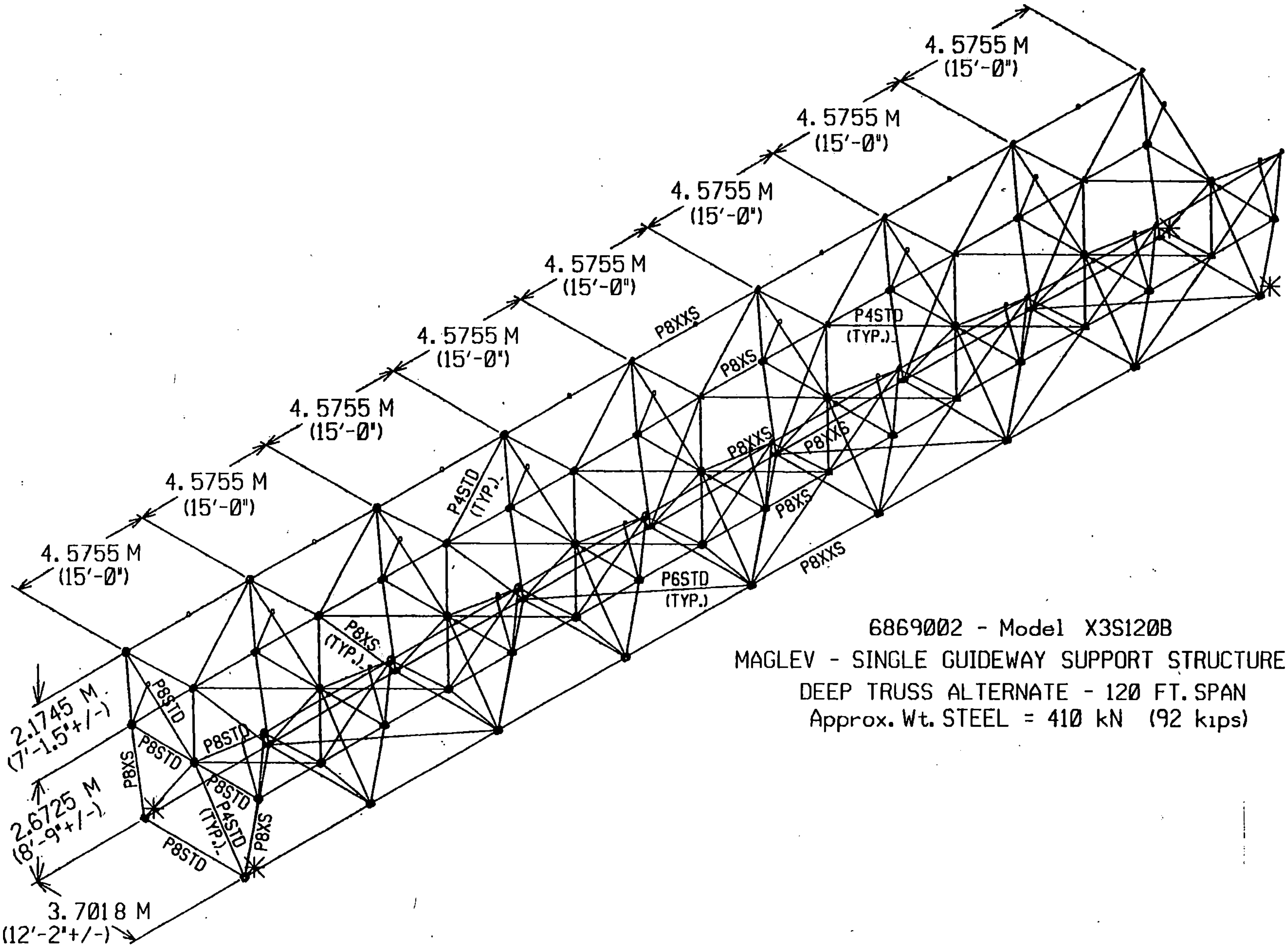
ELEVATION - DEEP TRUSS 120 FT. SPAN

6869002 MAGNEPLANE INTERNATIONAL
SINGLE GUIDEWAY SUPPORT STRUCTURE



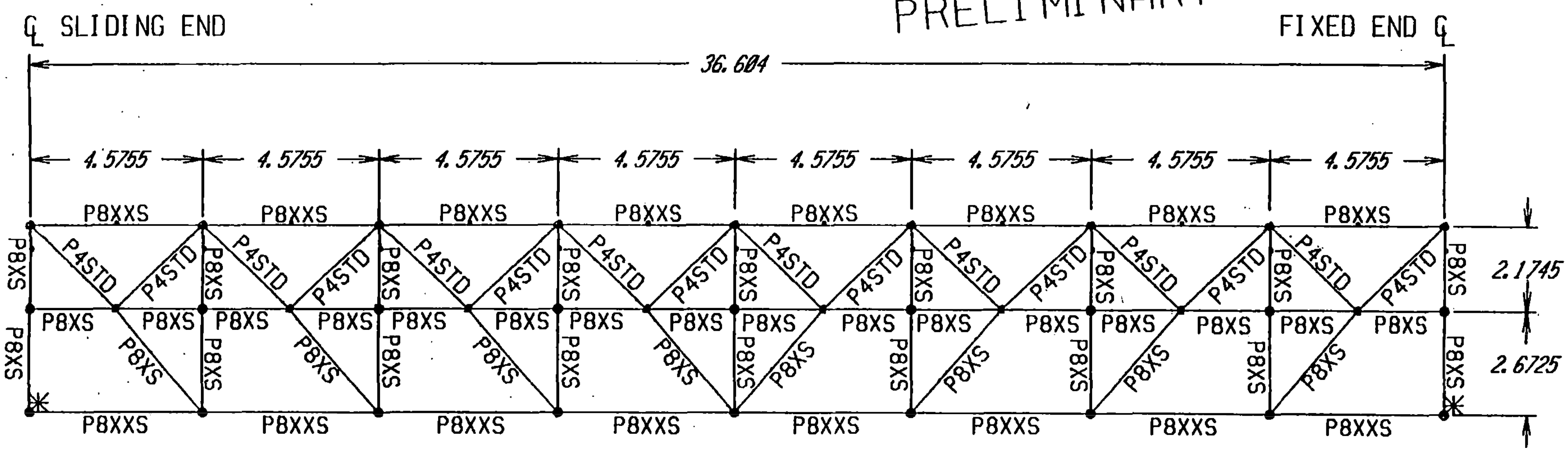
ELEVATION - DEEP TRUSS ALTERNATE

6869002 MAGNEPLANE INTERNATIONAL
SINGLE GUIDEWAY SUPPORT STRUCTURE



6869002 - Model X3S120B
MAGLEV - SINGLE GUIDEWAY SUPPORT STRUCTURE
DEEP TRUSS ALTERNATE - 120 FT. SPAN
Approx. Wt. STEEL = 410 kN (92 kips)

PRELIMINARY



ELEVATION - DEEP TRUSS ALTERNATE 120 FT. SPAN

6869002 MAGNEPLANE INTERNATIONAL
SINGLE GUIDEWAY SUPPORT STRUCTURE

FORM 5007/ B0192016 REV 17/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE) STRUCTURAL

CALC. SET NO		REV	COMP BY	CHK'D BY
PRELIM.	✓	0	MLG	
FINAL			DATE 04/17/92	DATE
VOID				
SHEET	OF		DATE	DATE
J.O 6869.002				

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

PRELIMINARY MATERIAL TAKEOFFS - 120 FT. (36.5 m) SPANS

- DEEP TRUSS - "x3s120n" MODEL

P8 xxs	146.4 m	(480 FT)	154.8 kN	(34.8k)
P8 xs	217.3 m	(712.5 FT)	137.4 kN	(30.9k)
P8 std	112.8 m	(369.8 FT)	47.1 kN	(10.6k)
P6 std.	47.1 m	(154.4 FT)	12.9 kN	(2.9k)
P4 std	317.1 m	(1039.7 FT)	49.8 kN	(11.2k)
	840.7 m	(2756 FT)	402.1 kN	(90.4k)

- DEEP TRUSS ALTERNATE - "x3S120b" MODEL

P8 xxs	146.4 m	(480 FT)	154.8 kN	(34.8k)
P8 xs	218.2 m	(715.4 FT)	137.9 kN	(31.0k)
P8 std	140.8 m	(461.6 FT)	58.7 kN	(13.2k)
P6 std	47.1 m	(154.4 FT)	12.9 kN	(2.9k)
P4 std	293.3 m	(961.6 FT)	46.3 kN	(10.4k)
	845.8 m	(2773 FT)	410.6 kN	(92.3k)

$\frac{92.3k}{2} = 46.15 \text{ TON} \therefore \frac{46.15(5280)}{120} = 2031 \text{ TON/MILE}.$

FORM 5007/ B0192016 REV 17/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

CALC SET NO		REV	COMP BY	CHK'D BY
PRELIM	✓	0	MLG	
FINAL			DATE 04/10/92	DATE
VOID				
SHEET	OF		DATE	DATE
JO 6869.002				

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

STEEL - SINGLE - DEEP TRUSS "x3S120n"

SUMMARY OF LOADS (UNFACTORED) SPAN = 36.5 m (120 FT)

	LOADS \ COLUMN HT.	h_1 = 5.18 m (17.0 FT)	h_2 = 7.62 m (25.0 FT)	h_3 = 9.14 m (30.0 FT)	h_4 = 20.0 m (65.6 FT)
D	DEAD LOAD FY	1007 kN (226 k)	1093 kN (246 k)	1146 kN (258 k)	1530 kN (344 k)
S	SNOW LOAD FY	342 kN (77 k)	342 kN (77 k)	342 kN (77 k)	342 kN (77 k)
L	LIVE LOAD VEHICLE FY	251 kN (56.4 k)	251 kN (56.4 k)	251 kN (56.4 k)	251 kN (56.4 k)
E_t	SEISMIC LOAD LATERAL Fz	96.8 kN (21.8 k)	96.8 kN (21.8 k)	96.8 kN (21.8 k)	96.8 kN (21.8 k)
	Mx	810.5 kN-m (597 k-FT)	1046.7 kN-m (772 k-FT)	1193.9 kN-m (880 k-FT)	2245 kN-m (1655 k-FT)
	My	290.2 kN-m (214 k-FT)	290.2 kN-m (214 k-FT)	290.2 kN-m (214 k-FT)	290.2 kN-m (214 k-FT)
E_L	SEISMIC LOAD LONGITUDINAL Fx	96.8 kN (21.3 k)	94.9 kN (21.3 k)	94.9 kN (21.3 k)	94.9 kN (21.3 k)
	Mz	501.4 kN-m (362 k-FT)	737.6 kN-m (533 k-FT)	884.8 kN-m (639 k-FT)	1936 kN-m (1397 k-FT)
W	WIND LOAD LATERAL Fz	357.1 kN (80.3 k)	362.9 kN (81.6 k)	366.6 kN (82.4 k)	393.2 kN (88.4 k)
	Mx	2790 kN-m (2057 k-FT)	3952 kN-m (2913 k-FT)	4631 kN-m (3414 k-FT)	10307 kN-m (7597 k-FT)
	My	1495 kN-m (1102 k-FT)	1495 kN-m (1102 k-FT)	1495 kN-m (1102 k-FT)	1495 kN-m (1102 k-FT)
B	BRAKING LOAD LONGITUDINAL Fx	163.4 kN (36.7 k)	163.4 kN (36.7 k)	163.4 kN (36.7 k)	163.4 kN (36.7 k)
	Mz	846.4 kN-m (624 k-FT)	1245.1 kN-m (917.5 k-FT)	1493.5 kN-m (1101 k-FT)	3268 kN-m (2407.5 k-FT)
W_V	WIND ON OPER. VEHICLE Fy	5.75 kN (1.3 k)	5.75 kN (1.3 k)	5.75 kN (1.3 k)	5.75 kN (1.3 k)
	Fz	16.0 kN (3.6 k)	16.0 kN (3.6 k)	16.0 kN (3.6 k)	16.0 kN (3.6 k)
	Mx	133.1 kN-m (98.1 k-FT)	172.1 kN-m (126.9 k-FT)	196.4 kN-m (144.8 k-FT)	370.2 kN-m (272.9 k-FT)

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FORM 5007/ 80192016 REV 17/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

NAME OF COMPANY MAGNEPLANE INT'L UNITS

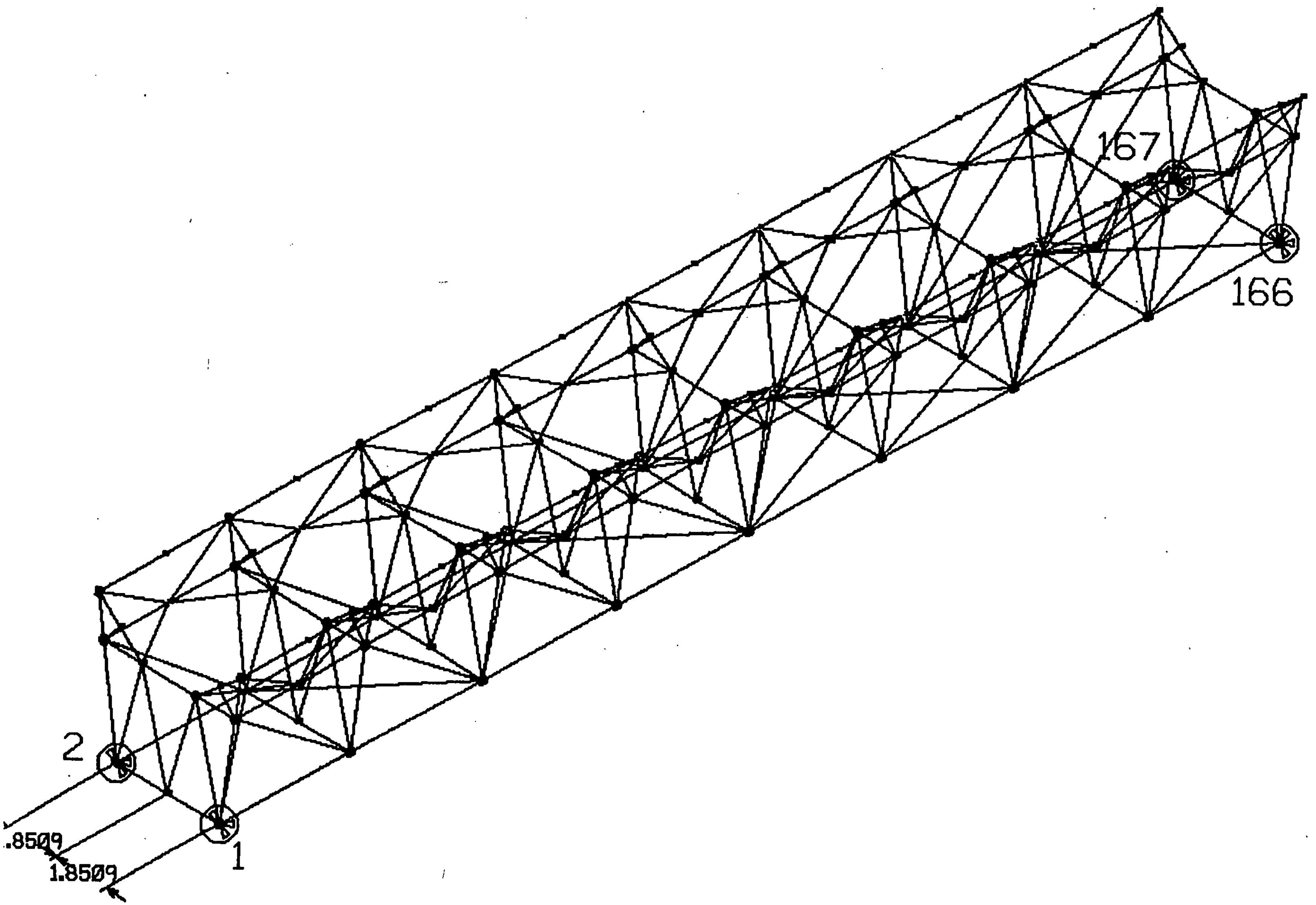
SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

CALC SET NO		REV	COMP BY	CHK'D BY
PRELIM	✓	0	MXG	
FINAL			DATE 04/92	DATE
VOID				
SHEET OF			DATE	DATE
JO 6869.002				

STEEL - SINGLE - DEEPTRUSS ALTERNATE - "X3S1206"

SUMMARY OF LOADS (UNFACTORED) SPAN = 36.5 m (120 FT)

	LOADS \ COLUMN HT.	h_1 = 5.18 m (17.0 FT)	h_2 = 7.62 m (25.0 FT)	h_3 = 9.14 m (30.0 FT)	h_4 = 20.0 m (65.6 FT)
D	DEAD LOAD FY	1000 kN (225 k)	1085 kN (244 k)	1138 kN (256 k)	1520 kN (342 k)
S	SNOW LOAD FY	342 kN (77 k)	342 kN (77 k)	342 kN (77 k)	342 kN (77 k)
L	LIVE LOAD VEHICLE FY	251 kN (56.4 k)	251 kN (56.4 k)	251 kN (56.4 k)	251 kN (56.4 k)
E_t	SEISMIC LOAD LATERAL FZ	96.8 kN (21.8 k)	96.8 kN (21.8 k)	96.8 kN (21.8 k)	96.8 kN (21.8 k)
	MX	757.9 kN-m (559 k-FT)	994.1 kN-m (733 k-FT)	1141.3 kN-m (841 k-FT)	2193 kN-m (1617 k-FT)
	MY	116.6 kN-m (86 k-FT)	116.6 kN-m (86 k-FT)	116.6 kN-m (86 k-FT)	116.6 kN-m (86 k-FT)
E_L	SEISMIC LOAD LONGITUDINAL FX	96.8 kN (21.8 k)	96.8 kN (21.8 k)	96.8 kN (21.8 k)	96.8 kN (21.8 k)
	MZ	501.4 kN-m (362 k-FT)	737.6 kN-m (533 k-FT)	884.8 kN-m (639 k-FT)	1936 kN-m (1397 k-FT)
W	WIND LOAD LATERAL FZ	588.6 kN (132 k-FT)	588.6 kN (132 k-FT)	588.6 kN (132 k-FT)	588.6 kN (132 k-FT)
	MX	5036.8 kN-m (3713 k-FT)	6473 kN-m (4771 k-FT)	7368 kN-m (5431 k-FT)	13760 kN-m (10143 k-FT)
	MY	1162 kN-m (857 k-FT)	1162 kN-m (857 k-FT)	1162 kN-m (857 k-FT)	1162 kN-m (857 k-FT)
B	BRAKING LOAD LONGITUDINAL FX	163.4 kN (36.7 k)	163.4 kN (36.7 k)	163.4 kN (36.7 k)	163.4 kN (36.7 k)
	MZ	846.4 kN-m (624 k-FT)	1245.1 kN-m (917.5 k-FT)	1493.5 kN-m (1101 k-FT)	3268 kN-m (2407.5 k-FT)
W_V	WIND ON OPER. VEHICLE FY	5.75 kN (1.3 k)	5.75 kN (1.3 k)	5.75 kN (1.3 k)	5.75 kN (1.3 k)
	FZ	16.0 kN (3.6 k)	16.0 kN (3.6 k)	16.0 kN (3.6 k)	16.0 kN (3.6 k)
	MX	133.1 kN-m (98.1 k-FT)	172.1 kN-m (126.9 k-FT)	196.4 kN-m (144.8 k-FT)	370.2 kN-m (272.9 k-FT)



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max120n
truss no. 3 with 120 ft. span

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Analysis No. 37 Thin Shell Page 10

Support Reactions

Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
1	DEAD 1	0.0000	-3.7335	51.3170	0.0000	0.0000	2.454e-03
	LIVE 2	0.0000	1.109e-03	4.284e-03	0.0000	0.0000	-7.226e-05
	SNOW 3	0.0000	-7.3785	85.5280	0.0000	0.0000	3.512e-03
	EARTHQUAKELONG 4	0.0000	0.4330	-4.1132	0.0000	0.0000	1.373e-03
	EARTHQUAKETRANS 5	0.0000	-5.8426	-11.6167	0.0000	0.0000	-0.0595
	WINDLONG 6	0.0000	-40.7473	-42.4995	0.0000	0.0000	-0.2872
	WINDTRANS 7	0.0000	-109.5953	-127.9194	0.0000	0.0000	-0.9233
	WINDVEHICLE 8	0.0000	0.2582	-0.4948	0.0000	0.0000	-2.228e-03
	BRAKING 9	0.0000	1.1043	-9.2866	0.0000	0.0000	7.147e-04
	BODY 10	0.0000	-13.9872	111.4857	0.0000	0.0000	-0.0111
	THERMAL1 11	0.0000	1061.2046	-0.1375	0.0000	0.0000	-0.0668
	THERMAL2 12	0.0000	-1061.2046	0.1375	0.0000	0.0000	0.0668
	COMB1 1	0.0000	1057.4712	51.1795	0.0000	0.0000	-0.0643
	COMB2 2	0.0000	-1064.9381	51.4545	0.0000	0.0000	0.0692
	COMB3 3	0.0000	1050.0927	136.7075	0.0000	0.0000	-0.0608
	COMB4 4	0.0000	-1072.3167	136.9824	0.0000	0.0000	0.0727
	COMB5 5	0.0000	1057.4723	51.1838	0.0000	0.0000	-0.0644
	COMB6 6	0.0000	-1064.9370	51.4587	0.0000	0.0000	0.0691
	COMB7 7	0.0000	1016.7239	8.6800	0.0000	0.0000	-0.3515
	COMB8 8	0.0000	-1105.6854	8.9549	0.0000	0.0000	-0.2180

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max120n
truss no. 3 with 120 ft. span

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MicasPlus Rev 4.0.1.0 APR 20, 1992 12:54:08
Analysis No. 37 Thin Shell Page 11

Support Reactions

Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
1	COMB9 9	0.0000	947.8759	-76.7399	0.0000	0.0000	-0.9876
	COMB10 10	0.0000	-1174.5334	-76.4650	0.0000	0.0000	-0.8541
	COMB11 11	0.0000	-3.3005	47.2037	0.0000	0.0000	3.827e-03
	COMB12 12	0.0000	-9.5761	39.7003	0.0000	0.0000	-0.0570
	COMB13 13	0.0000	-8.8258	46.0088	0.0000	0.0000	-0.0335
	COMB14 14	0.0000	-17.1736	34.8365	0.0000	0.0000	-0.1153
	COMB15 15	0.0000	-2.4745	35.4060	0.0000	0.0000	2.816e-03
	COMB16 16	0.0000	-7.1812	29.7784	0.0000	0.0000	-0.0428
	COMB17 17	0.0000	-1.9711	31.5260	0.0000	0.0000	2.322e-03
	COMB18 18	0.0000	-3.6275	45.4559	0.0000	0.0000	1.250e-03
2	DEAD 1	0.0000	3.8484	51.2830	0.0000	0.0000	-0.0111
	LIVE 2	0.0000	4.046e-04	-4.284e-03	0.0000	0.0000	3.929e-04
	SNOW 3	0.0000	7.5687	85.4721	0.0000	0.0000	-0.0177
	EARTHQUAKELONG 4	0.0000	-0.6128	-4.2437	0.0000	0.0000	-2.154e-03
	EARTHQUAKETRANS 5	0.0000	-2.0633	11.6167	0.0000	0.0000	-0.0616
	WINDLONG 6	0.0000	-12.7405	42.4995	0.0000	0.0000	-0.2981
	WINDTRANS 7	0.0000	-29.3172	127.9194	0.0000	0.0000	-0.9598
	WINDVEHICLE 8	0.0000	-4.107e-04	0.4948	0.0000	0.0000	-2.199e-03
	BRAKING 9	0.0000	-1.3341	-9.3439	0.0000	0.0000	-2.044e-03
	BODY 10	0.0000	14.7818	120.0111	0.0000	0.0000	-0.0344

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120new
Single guideway support structure for 120 ft. spans

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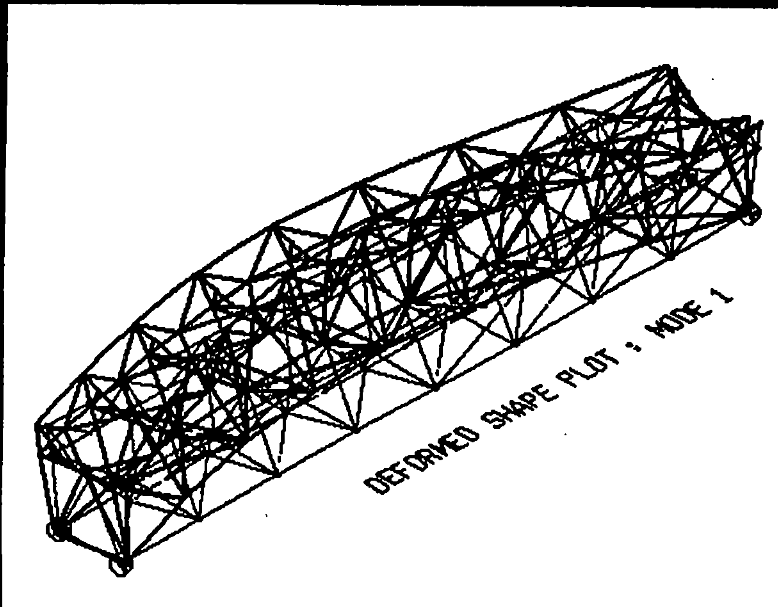
MicasPlus Rev. 4.0.1.0 APR 30, 1992 07:56:22
Analysis No. 48 Thin Shell Page 10

*** Eigenvalues (Frequencies) ***

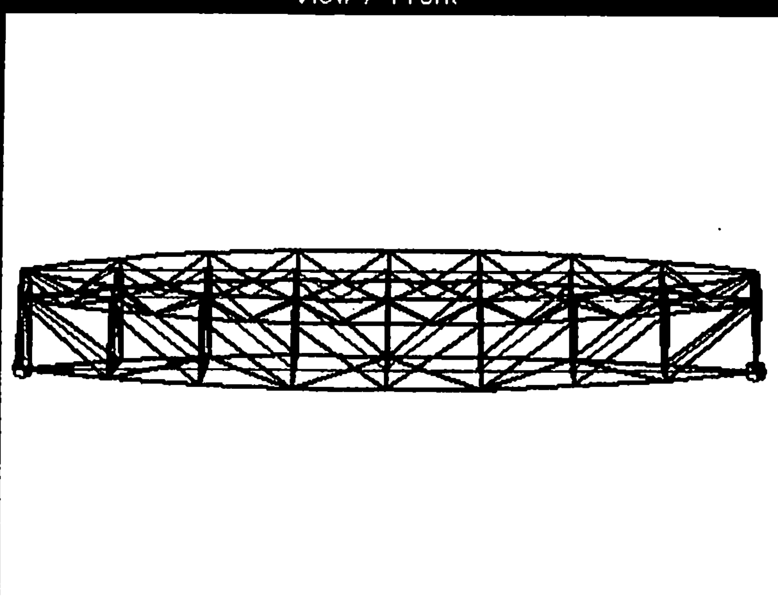
Mode No.	Frequency (CPS)	Error Norms	Effective Weight (x)	Effective Weight (y)	Effective Weight (z)
1	3.6865	1.210e-12	8.982e-03	770.7528	1.2176
2	4.4547	1.668e-08	34.1617	1.1133	743.9813
3	7.8104	6.616e-12	0.5145	0.7478	0.0341
4	7.8857	2.700e-07	4.0980	32.6829	0.0401
5	7.9716	2.944e-08	2.2443	0.0975	0.0844
6	9.5049	9.895e-08	762.9397	0.1555	18.4811
7	9.9572	1.483e-07	0.4154	5.110e-03	0.0673
8	10.9431	2.980e-08	117.5641	1.532e-03	2.0052
9	11.9190	8.182e-08	0.6018	74.1956	1.568e-04
10	13.9565	2.782e-07	0.6683	2.988e-04	7.935e-04
11	15.1260	5.812e-08	0.8856	0.0138	15.7773
12	15.1494	1.743e-08	5.2459	0.0124	48.5489
13	16.9916	3.089e-06	0.1158	8.194e-03	0.0103
14	17.2871	1.952e-06	0.3460	3.263e-03	0.0284
15	17.6376	7.299e-06	1.784e-03	10.9819	0.0157
16	18.1434	1.746e-05	0.1005	1.0367	1.4644
17	18.5445	3.365e-05	0.0126	0.0467	6.7619
18	19.1697	8.394e-05	1.024e-03	0.2616	1.167e-07
19	19.3806	5.426e-05	4.650e-04	2.285e-07	1.286e-05
20	19.4138	5.457e-05	2.970e-03	6.764e-05	8.177e-05
21	19.6094	3.031e-04	5.979e-03	2.243e-03	1.285e-04
22	19.8913	3.526e-04	3.165e-03	3.6803	5.659e-03
Summation of Effective Weights =			929.9387	895.7997	838.5248
Total Model Weight =			956.9978	946.2795	946.2795

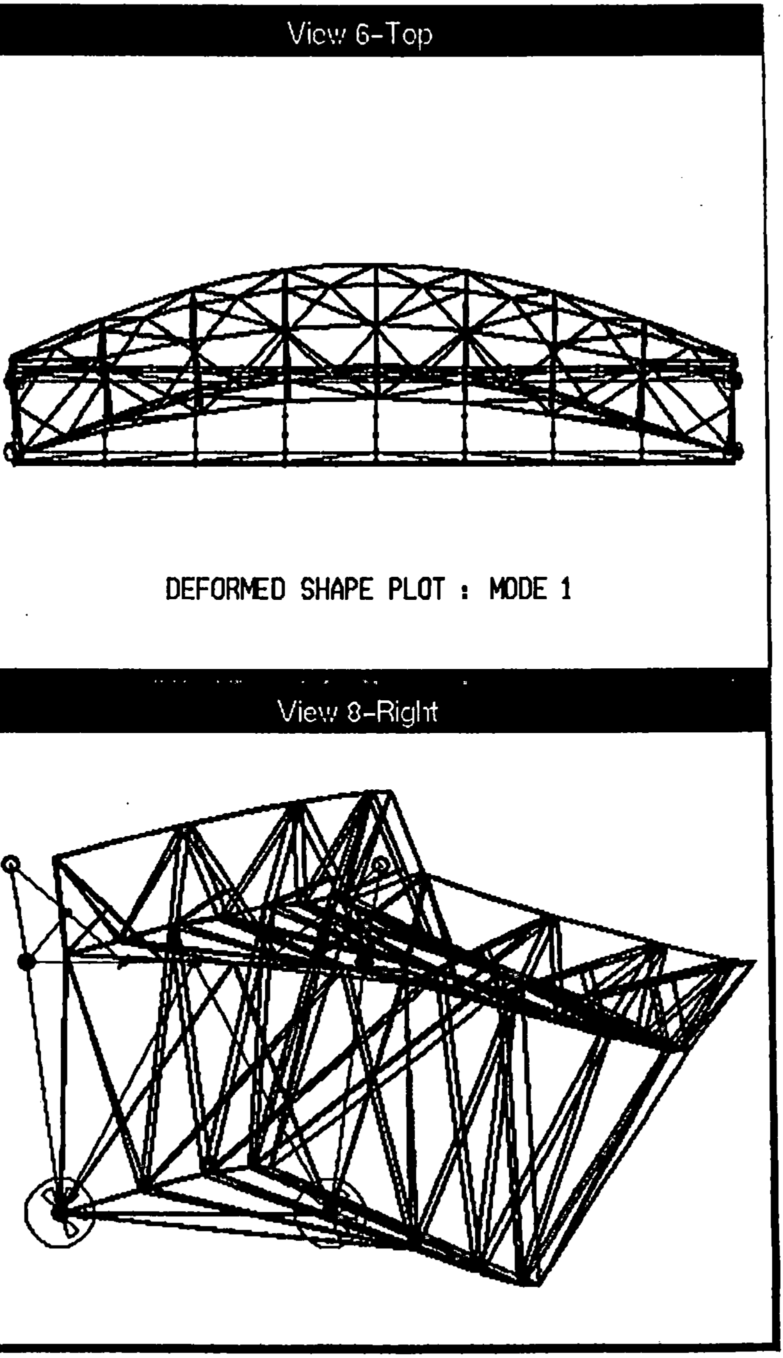
5-44

View 5-Iso

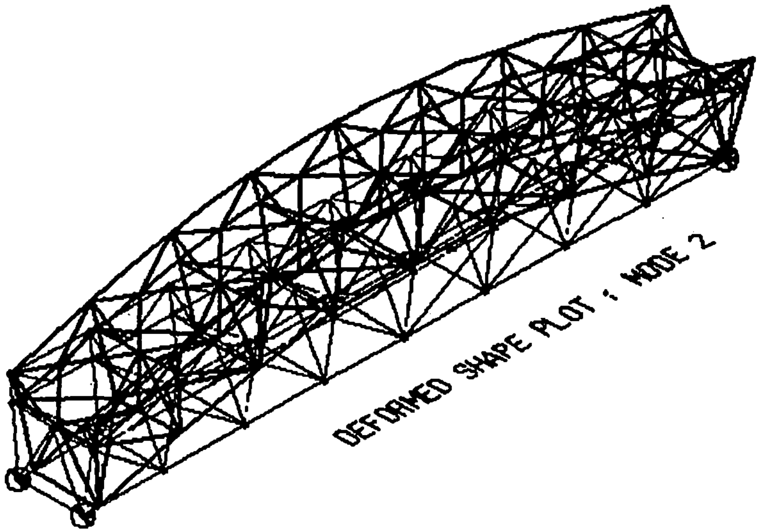


View 7-Front

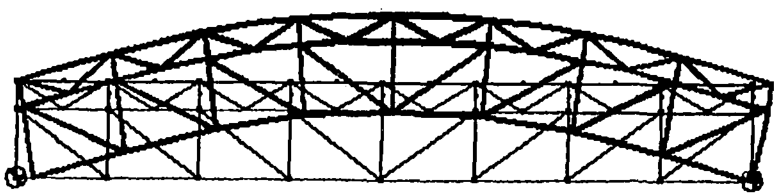



View 6-Top
DEFORMED SHAPE PLOT : MODE 1
View 8-Right

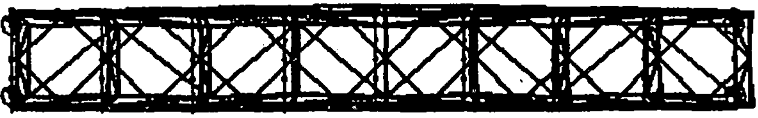
View 5-Iso



View 7-Front

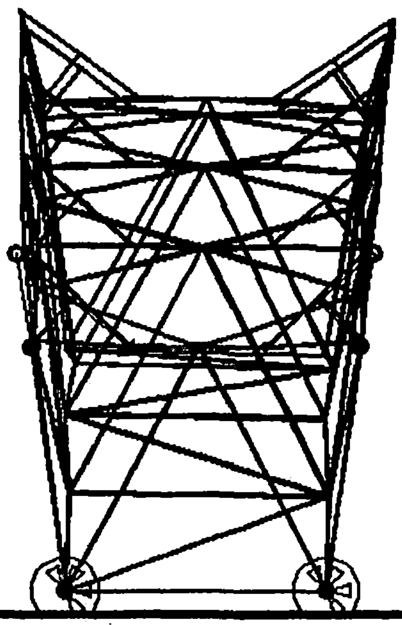


View 6-Top



DEFORMED SHAPE PLOT : MODE 2

View 8-Right



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GENERAL COMPUTATION SHEET

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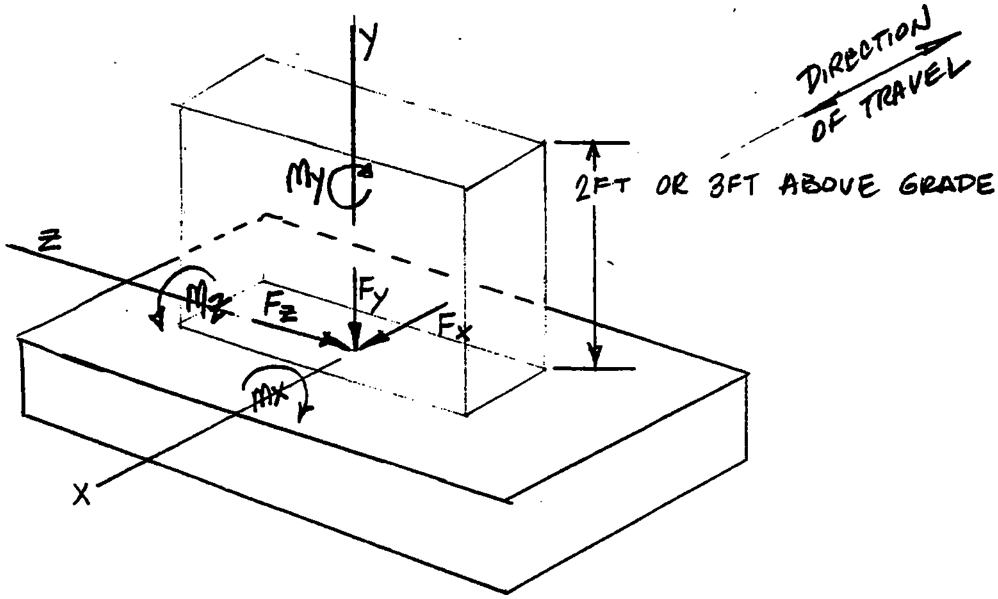
J.O	6869.002			

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

LOADS TO FOUNDATIONS FOR "AT GRADE" TRUSSES-



LOAD COMBINATIONS TO BE CONSIDERED-

D	$D+L\pm\left[\left(\frac{30}{85}\right)^2 W+W_V\right]$
D+S	
D+L	$(D+L\pm E_t)*0.75$
D ± W	$(D+L\pm E_L)*0.75$
D ± E_t	$(D+L\pm B)*0.75$
D ± E_L	

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GENERAL COMPUTATION SHEET

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NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

STEEL-SINGLE - SHALLOW TRUSS "X1S30"

SUMMARY OF LOADS - (UNFACTORED) SPAN = 9.15 m (30 FT)

	LOADS \ PEDASTAL HT.	h_1 = 0.61 m (2'-0")	h_2 = 0.915 m (3'-0")
D	DEAD LOAD F_y	156.3 kN (35.1 k)	179.7 kN (40.4 k)
S	SNOW LOAD F_y	120.4 kN (27.1 k)	120.4 kN (27.1 k)
L	LIVE LOAD VEHICLE F_y	251 kN (56.4 k)	251 kN (56.4 k)
E_t	SEISMIC LOAD LATERAL F_z M_x M_y	38.2 kN (8.6 k) 95 kN-m (70 k-FT) 19 kN-m (14 k-FT)	38.2 kN (8.6 k) 105 kN-m (77.5 k-FT) 19 kN-m (14 k-FT)
E_L	SEISMIC LOAD LONGITUDINAL F_x M_z	38.2 kN (8.6 k) 23.3 kN-m (17 k-FT)	38.2 kN (8.6 k) 34.9 kN-m (26 k-FT)
W	WIND LOAD LATERAL F_z M_x M_y	65 kN (14.6 k) 135 kN-m (100 k-FT) 22.9 kN-m (5.1 k-FT)	65 kN (14.6 k) 155 kN-m (115 k-FT) 22.9 kN-m (5.1 k-FT)
B	BRAKING LOAD LONGITUDINAL F_x M_z	163.4 kN (36.7 k) 100 kN-m (74 k-FT)	163.4 kN (36.7 k) 150 kN-m (110 k-FT)
W_v	WIND ON OPER. VEHICLE F_y F_z M_x	5.75 kN (1.3 k) 16.0 kN (3.6 k) 72.3 kN-m (54 k-FT)	5.75 kN (1.3 k) 16.0 kN (3.6 k) 77.1 kN-m (57 k-FT)

FORM 5007/ B0192016 REV 17/79 GENERAL COMPUTATION SHEET

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SHEET	OF		DATE	DATE
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(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

STEEL-SINGLE - SHALLOW TRUSS "X/S75"

SUMMARY OF LOADS - (UNFACTORED) SPAN = 22.87 m (75 FT)

	LOADS \ PEDASTAL HT.	h_1 = 0.61 m (2'-0")	h_2 = 0.915 m (3'-0")
D	DEAD LOAD F_y	300.1 kN (67.5 k)	323.5 kN (72.7 k)
S	SNOW LOAD F_y	247.2 kN (55.6 k)	247.2 kN (55.6 k)
L	LIVE LOAD VEHICLE F_Y	251 kN (56.4 k)	251 kN (56.4 k)
E_t	SEISMIC LOAD LATERAL F_z M_x M_y	54.0 kN (12.1 k) 125 kN-m (92 k-FT) 74 kN-m (55 k-FT)	54.0 kN (12.1 k) 142 kN-m (105 k-FT) 74 kN-m (55 k-FT)
E_L	SEISMIC LOAD LONGITUDINAL F_x M_z	54.0 kN (12.1 k) 33 kN-m (24.5 k-FT)	54.0 kN (12.1 k) 50 kN-m (37 k-FT)
W	WIND LOAD LATERAL F_z M_x M_y	115 kN (26 k) 308 kN-m (227 k-FT) 392 kN-m (289 k-FT)	115 kN (26 k) 343 kN-m (253 k-FT) 392 kN-m (289 k-FT)
B	BRAKING LOAD LONGITUDINAL F_x M_z	163.4 kN (36.7 k) 100 kN-m (74 k-FT)	163.4 kN (36.7 k) 150 kN-m (110 k-FT)
W_V	WIND ON OPER. VEHICLE F_y F_z M_x	5.75 kN (1.3 k) 16.0 kN (3.6 k) 104 kN-m (77 k-FT)	5.75 kN (1.3 k) 16.0 kN (3.6 k) 106 kN-m (78 k-FT)

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GENERAL COMPUTATION SHEET

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NAME OF COMPANY MAGNEPLANE INT'L UNITS ______

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

STEEL-SINGLE - DEEP TRUSS "X3S120N"

SUMMARY OF LOADS - (UNFACTORED) SPAN = 36.5 m (120 FT)

	LOADS \ PEDASTAL HT.	h_1 = 0.61 m (2'-0")	h_2 = 0.915 m (3'-0")
D	DEAD LOAD Fy	706.6 kN (159 k)	727.4 kN (164 k)
S	SNOW LOAD Fy	342 kN (77 k)	342 kN (77 k)
L	LIVE LOAD VEHICLE FY	251 kN (56.4 k)	251 kN (56.4 k)
E_t	SEISMIC LOAD LATERAL Fz Mx My	96.8 kN (21.3 k) 279 kN-m (206 k-FT) 290 kN-m (214 k-FT)	96.8 kN (21.3 k) 309 kN-m (228 k-FT) 290 kN-m (214 k-FT)
E_L	SEISMIC LOAD LONGITUDINAL Fx Mz	96.8 kN (21.3 k) 59 kN-m (44 k-FT)	96.8 kN (21.3 k) 88.5 kN-m (65 k-FT)
W	WIND LOAD LATERAL Fz Mx My	344.2 kN (77 k) 1324 kN-m (975 k-FT) 1495 kN-m (1102 k-FT)	344.2 kN (77 k) 1429 kN-m (1053 k-FT) 1495 kN-m (1102 k-FT)
B	BRAKING LOAD LONGITUDINAL Fx Mz	163.4 kN (36.7 k) 100 kN-m (74 k-FT)	163.4 kN (36.7 k) 150 kN-m (110 k-FT)
W_V	WIND ON OPER. VEHICLE Fy Fz Mx	5.75 kN (1.3 k) 16.0 kN (3.6 k) 194 kN-m (143 k-FT)	5.75 kN (1.3 k) 16.0 kN (3.6 k) 195 kN-m (144 k-FT)

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NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

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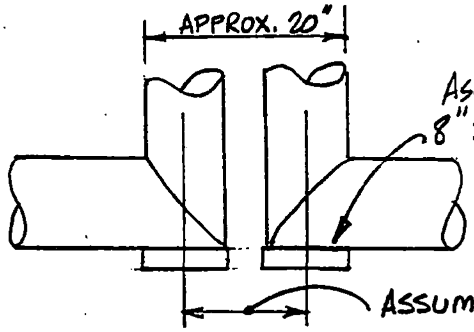
J.O	6869.002			

PEDASTALS "AT GRADE"-



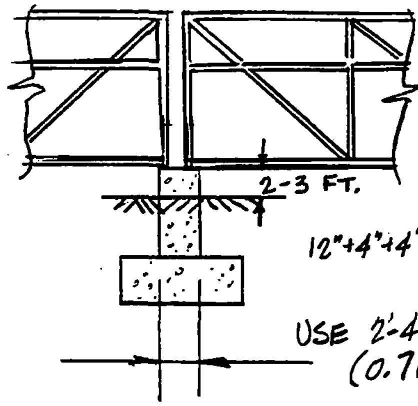


PLATE BEARING ON CONCRETE-

MAX. LOADS : 30 FT. SPAN → 121 kN × 4/3 = 161 kN, USE 165 kN
NODE 49, COMB. 17 [(D+L+B) * 0.75]

75 FT. SPAN → 133 kN × 4/3 = 178 kN, USE 180 kN
NODE 107, COMB. 16 [(D+L+E_t) * 0.75]

120 FT. SPAN → 163 kN × 4/3 = 217 kN, USE 220 kN
NODE 167, COMB. 16 [(D+L+E_t) * 0.75]

$F_p = 0.35 f'_c$ (AISC J9) → $F_p = 0.35(3000\text{ PSI, ASSUMED}) = 1050\text{ PSI}$

$A_{REQ'D} = \dfrac{\text{LOAD, LB.}}{F_p\text{, PSI}}$: 30 FT SPAN → $A = \dfrac{165\text{ kN}\left(\frac{1000\text{ LB}}{4.448\text{ KN}}\right)}{1050\text{ PSI}} = 35\text{ IN}^2$

∴ ASSUME 6 IN SQ. PL'S

75 FT SPAN → $A = \dfrac{180\left(\frac{1000}{4.448}\right)}{1050} = 38.5\text{ IN}^2$

∴ ASSUME 8 IN SQ. PL'S

120 FT. SPAN → $A = \dfrac{220\left(\frac{1000}{4.448}\right)}{1050} = 47.1\text{ IN}^2$

∴ ASSUME 8 IN SQ. PL'S

→ 1'-0" ASSUMPTION, OK

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UNITED ENGINEERS & CONSTRUCTORS

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NAME OF COMPANY MAGNE PLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

PEDASTALS "AT GRADE", CONT-

APPROX. TRUSS WIDTH: 30 FT SPAN → $4.2374m * \frac{1 FT}{0.305m} = 13.9 FT$

75 FT. SPAN → $4.2374 m * \frac{1 FT}{0.305m} = 13.9 FT$

120 FT SPAN → $3.7018 m * \frac{1 FT}{0.305m} = 12.1 FT$

APPROX. PEDASTAL SIZE: 30 & 75 FT. SPANS,

13.9 = 13'-11" + 4" + 4" = 14'-7"

USE 15'-0" x 2'-4"

120 FT SPAN

12.1 = 12'-2" + 4" + 4" = 12'-10"

USE 13'-4" x 2'-4"

VOLUME & WEIGHT OF PEDASTALS:

30 & 75 FT SPANS.

$V = 15'\text{-}0" \times 2'\text{-}4" \times 2'\text{-}0" = 70 FT^3 * \left(\frac{YD}{3 FT}\right)^3 = 2.6$ C.Y. EA.

$W = 70 FT^3 * 150 PCF = 10500$ LB. EA.

$V = 15'\text{-}0" \times 2'\text{-}4" \times 3'\text{-}0" = 105 FT^3 * \left(\frac{YD}{3 FT}\right)^3 = 3.9$ C.Y. EA.

$W = 105 FT^3 * 150 PCF = 15750$ LB. EA.

120 FT. SPANS

$V = 13'\text{-}4" \times 2'\text{-}4" \times 2'\text{-}0" = 62 FT^3/27 = 2.3$ C.Y. EA.

W = 62 X 150 = 9333 LB. EA.

$V = 13'\text{-}4" \times 2'\text{-}4" \times 3'\text{-}0" = 93 FT^3/27 = 3.5$ C.Y. EA.

W = 93 X 150 = 14000 LB. EA.

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NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

PEDASTALS "AT GRADE", CONT.-

SPAN (FT)	30	30	75	75	120	120
HEIGHT (FT)	2	3	2	3	2	3
VOLUME (CY, EA)	2.6	3.9	2.6	3.9	2.3	3.5
VOLUME (CY/MILE)	458	687	183	275	102	154

$$\frac{[\text{VOL. (CY. EA)}][5280\ \text{FT/MILE}]}{[\text{SPAN (FT)}]}$$

$$\frac{2.6(5280)}{30} = 457.6\ \text{C.Y./MILE}$$

$$\frac{2.6(5280)}{75} = 183.0$$

$$\frac{2.3(5280)}{120} = 101.2$$

$$\frac{3.9(5280)}{30} = 686.4$$

$$\frac{3.9(5280)}{75} = 274.6$$

$$\frac{3.5(5280)}{120} = 154.0$$

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GENERAL COMPUTATION SHEET

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J.O 6869.002				

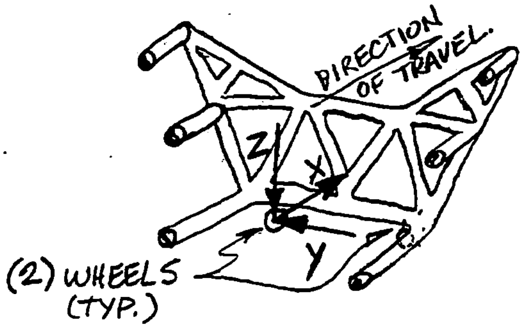
NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

TO: MIKE McDONALD
FROM: MARK JOHNSON

PRELIMINARY

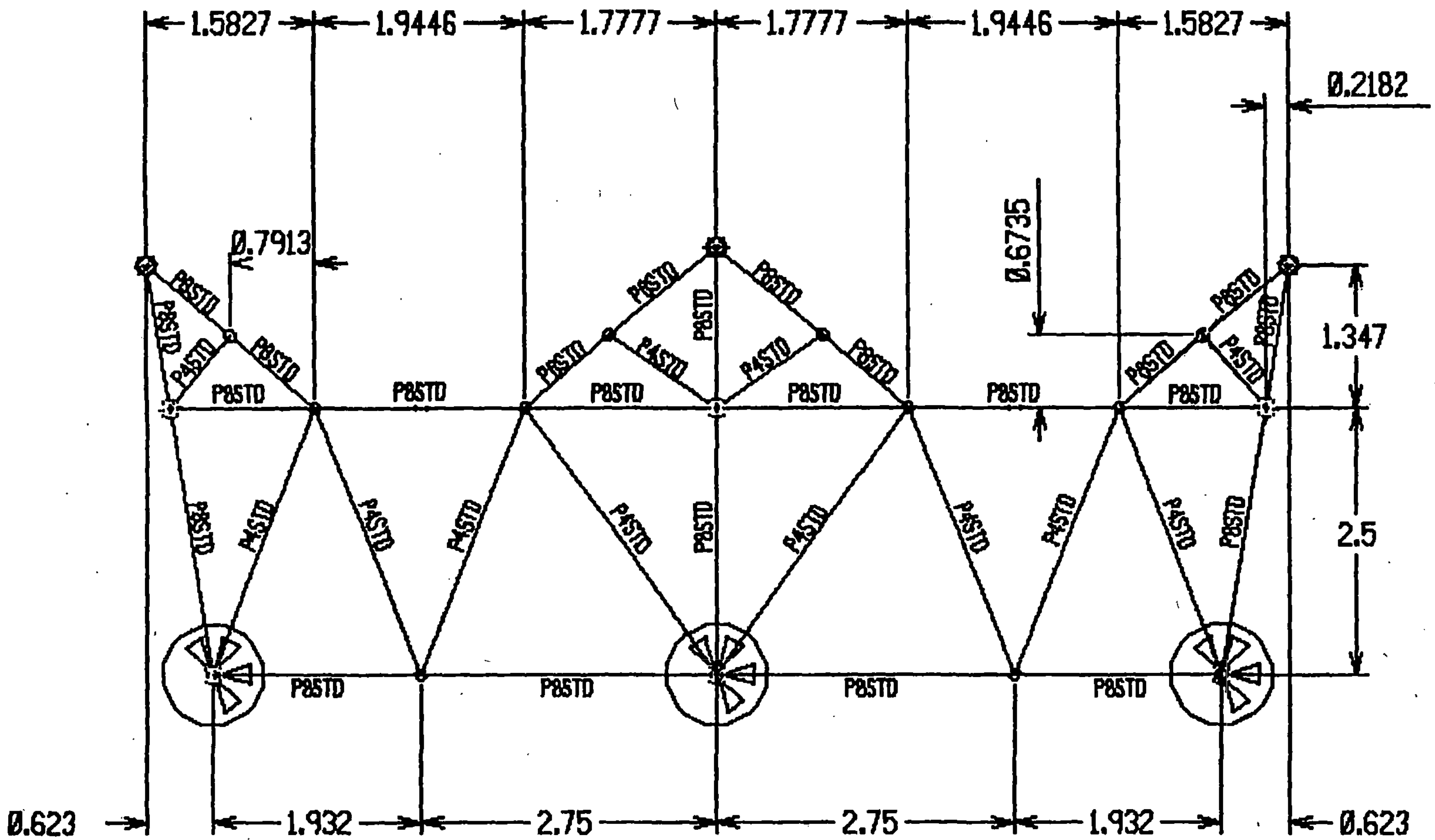
HERE ARE THE WORST CASE SUPPORT REACTIONS FOR YOUR SWITCH DESIGN. PLEASE NOTE THESE RESULTS ARE FOR 30 FT (9.15 m) SPANS, AND ARE FOR STRAIGHT RUNS OF GUIDEWAY. ADDITIONAL LOADS DUE TO BANKING OF THE VEHICLE ARE NOT INCLUDED.



DEAD LOAD*	$F_z = $ 28.3 kN (6.4 KIPS)	$F_x \approx \phi$	$F_y = \pm 6.8$ kN (1.5 KIPS)
LIVE LOAD* (VEHICLE)	$F_z = $ 126.0 kN (28.3 KIPS)	$F_x \approx \phi$	$F_y = \pm 18.0$ kN (4.1 KIPS)
WIND LOAD* ON GUIDEWAY (TRANSVERSE)	$F_z = \pm 37.0$ kN (8.3 KIPS)	$F_x = \pm 6.4$ kN (1.4 KIPS)	$F_y = \pm 57.7$ kN (13.0 KIPS)
WIND LOAD* ON VEHICLE	$F_z = \pm 15$ kN (3.4 KIPS)	$F_x \approx \phi$	$F_y = \pm 9$ kN (2.0 KIPS)
BRAKING LOAD*	$F_z = $ 18 kN (4.1 KIPS)	$F_x = $ 81.8 kN (18.4 KIPS)	$F_y = \pm 5$ kN (1.1 KIPS)
THERMAL LOAD* (ASSUME 0.4 DEAD)	$F_z = \phi$	$F_x = $ 11.3 kN (2.5 KIPS)	$F_y = \phi$

*ALL VALUES ARE PER WHEEL.

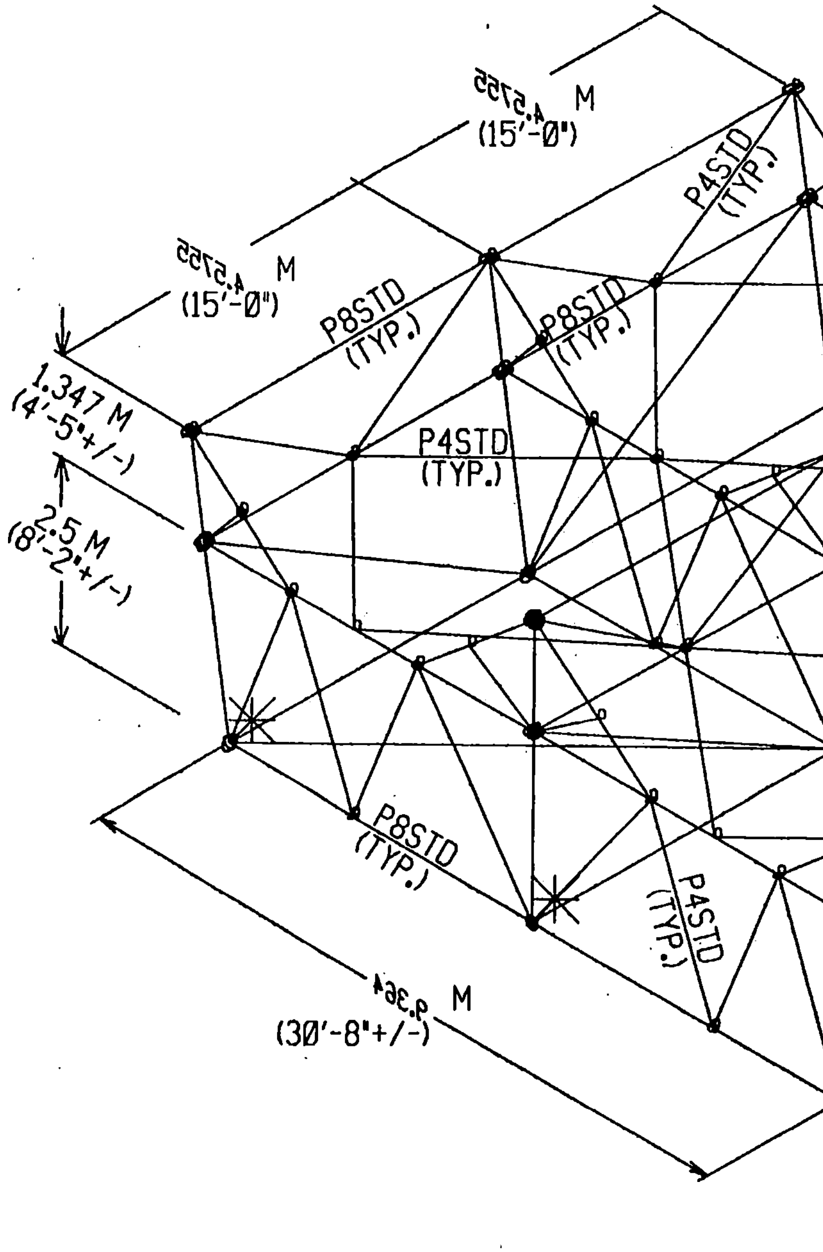
PRELIMINARY

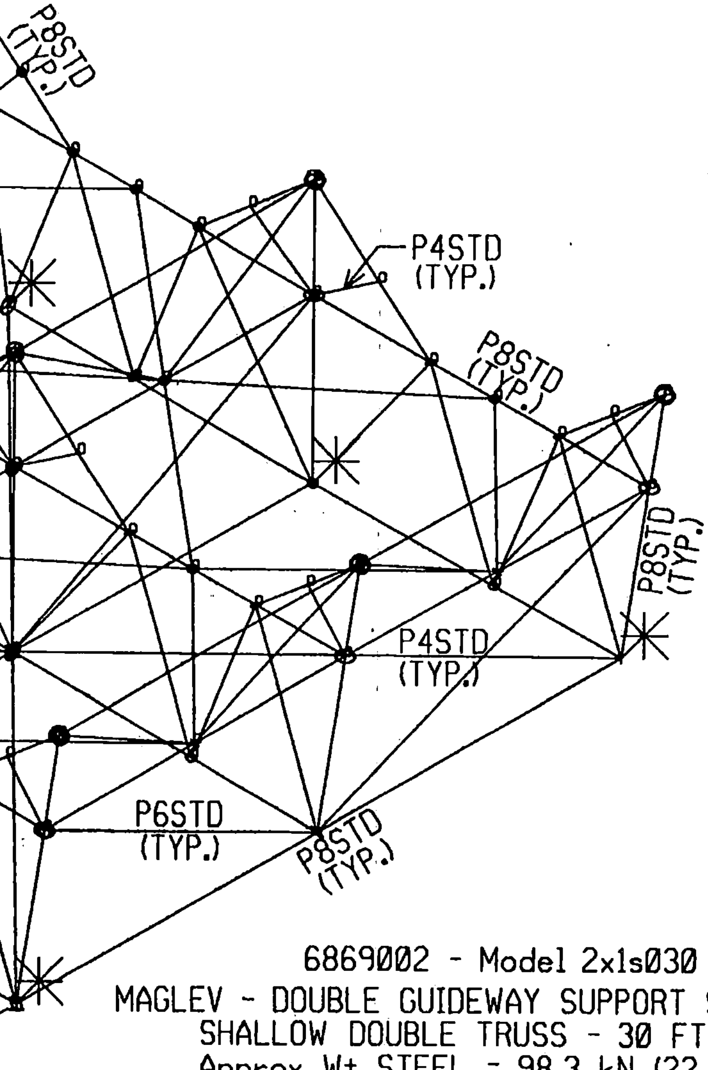


ELEVATION - SHALLOW DOUBLE TRUSS

6869002 MAGNEPLANE INTERNATIONAL
DOUBLE GUIDEWAY SUPPORT STRUCTURE

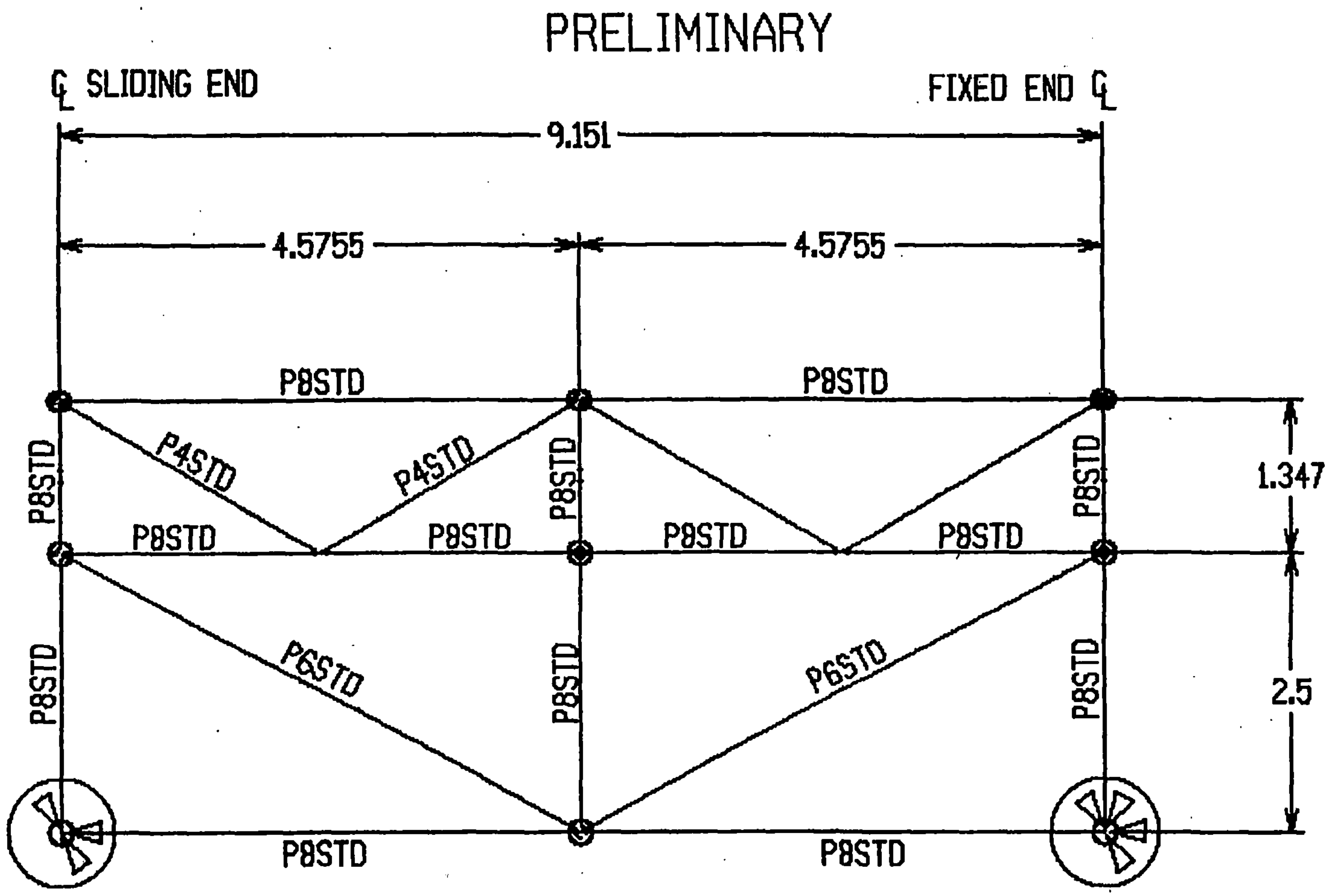
55-5


4.5755 M
(15'-0")
4.5755 M
(15'-0")
P4STD
(TYP.)
P8STD
(TYP.)
P8STD
(TYP.)
1.347 M
(4'-5"+/-)
P4STD
(TYP.)
2.5 M
(8'-2"+/-)
P8STD
(TYP.)
P4STD
(TYP.)
9.364 M
(30'-8"+/-)



6869002 - Model 2x1s030
MAGLEV - DOUBLE GUIDEWAY SUPPORT STRUCTURE
SHALLOW DOUBLE TRUSS - 30 FT. SPAN
Approx. Wt. STEEL = 98.3 kN (22.1 kips)

25-5



ELEVATION - SHALLOW DOUBLE TRUSS 30 FT. SPAN

6869002 MAGNEPLANE INTERNATIONAL
DOUBLE GUIDEWAY SUPPORT STRUCTURE

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```
******************************************************************************
                                  2x1s030
              Double guideway support structure with 30 ft span
******************************************************************************
MicasPlus Rev  4.0.1.0                                  APR 22,1992    09:49:29
Analysis No. 25                   Thin Shell                            Page 1

* Material Takeoff *        Shape Type  :   Pipe Shapes
```

Shape Name	Number Physical Members	Total Length (M)	Total Surface Area (M)**2	Total Weight (kN)
P8STD	34	97.754	67.277	40.773
P4STD	61	158.160	56.791	24.929
P6STD	17	117.718	62.230	32.628
	Shape Totals	373.632	186.298	98.331

```
Bending Member Connections :

    Shear & Moment = 20
    Shear only     = 74
```

```
******************************************************************************
                                  2x1s030
              Double guideway support structure with 30 ft span
******************************************************************************
MicasPlus Rev  4.0.1.0                                  APR 22,1992    09:49:29
Analysis No. 25                   Thin Shell                            Page 2

* Material Takeoff *     Structure Totals :

Total Length                                         373.632     (M   )
Total Surface Area                                   186.298     (M   )**2
Total Weight                                         98.331      (kN  )

Number of Members that failed design                 9

Total Bending Member Shear & Moment Connections =    20
Total Bending Shear Connections                 =    74
```

$$98.3\,\text{kN}\left(\frac{1\ \text{KIP}}{4.448\,\text{kN}}\right)\left(\frac{1\ \text{TON}}{2\ \text{KIPS}}\right)\left(\frac{5280\ \text{FT/MILE}}{30\ \text{FT.}}\right) = 1945\ \text{TON/MILE}$$

85-5

****

2x1s030

Double guideway support structure with 30 ft span

****

MicasPlus Rev 4.0.1.0 APR 22, 1992 09:28:33

Analysis No. 25 Thin Shell Page 1

Support Reactions

Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
10	LIVE 6	0.0000	-0.5197	2.5272	0.0000	0.0000	-1.060e-03
	DEAD 5	0.0000	0.7003	12.3106	0.0000	0.0000	-3.743e-03
	BRAKING 4	0.0000	14.1370	-22.7941	0.0000	0.0000	0.3553
	BODY 3	0.0000	-0.1862	14.9976	0.0000	0.0000	-3.688e-03
	THERMAL2 2	0.0000	-1397.7358	-161.0603	0.0000	0.0000	0.0397
	THERMAL1 1	0.0000	1397.7358	161.0603	0.0000	0.0000	-0.0397
	SNOW 7	0.0000	0.5957	21.0998	0.0000	0.0000	-5.975e-03
	EARTHQUAKELONG 8	0.0000	1.9909	-10.1155	0.0000	0.0000	7.001e-03
	EARTHQUAKETRANS 9	0.0000	-13.7699	-14.1006	0.0000	0.0000	-9.334e-04
	WINDLONG 10	0.0000	1.4846	-4.9872	0.0000	0.0000	0.0122
	WINDTRANS 11	0.0000	-10.0248	-10.3826	0.0000	0.0000	-3.468e-03
	WINDVEHICLE 12	0.0000	-0.1952	-0.9831	0.0000	0.0000	-1.318e-03
	BRAKING2 13	0.0000	-5.8642	-13.6213	0.0000	0.0000	-0.3100
	LIVE2 14	0.0000	-1.1312	-1.8308	0.0000	0.0000	4.396e-03
	WINDVEHICLE2 15	0.0000	-0.3673	-0.9044	0.0000	0.0000	-1.547e-03
	COMB1 1	0.0000	1398.4362	173.3709	0.0000	0.0000	-0.0435
	COMB2 2	0.0000	-1397.0355	-148.7498	0.0000	0.0000	0.0360
	COMB3 3	0.0000	1399.0317	194.4707	0.0000	0.0000	-0.0495
	COMB4 4	0.0000	-1396.4398	-127.6499	0.0000	0.0000	0.0300
	COMB5 5	0.0000	1397.9164	175.8981	0.0000	0.0000	-0.0445

****

2x1s030
Double guideway support structure with 30 ft span

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Analysis No. 25 Thin Shell Page 2

*** Support Reactions ***

Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
10	COMB6 6	0.0000	1396.7852	174.0673	0.0000	0.0000	-0.0401
	COMB7 7	0.0000	-1397.5553	-146.2226	0.0000	0.0000	0.0349
	COMB8 8	0.0000	-1398.6864	-148.0534	0.0000	0.0000	0.0393
	COMB9 9	0.0000	1399.9207	168.3837	0.0000	0.0000	-0.0312
	COMB10 10	0.0000	-1395.5509	-153.7370	0.0000	0.0000	0.0482
	COMB11 11	0.0000	1388.4113	162.9883	0.0000	0.0000	-0.0470
	COMB12 12	0.0000	-1407.0604	-159.1324	0.0000	0.0000	0.0325
	COMB13 13	0.0000	2.6912	2.1951	0.0000	0.0000	3.258e-03
	COMB14 14	0.0000	-13.0696	-1.7900	0.0000	0.0000	-4.676e-03
	COMB15 15	0.0000	2.0362	8.6037	0.0000	0.0000	0.0105
	COMB16 16	0.0000	-0.7650	12.3835	0.0000	0.0000	1.123e-03
	COMB17 17	0.0000	-1.2677	12.5568	0.0000	0.0000	-6.555e-03
	COMB18 18	0.0000	-2.7662	9.8216	0.0000	0.0000	-3.706e-03
	COMB19 19	0.0000	1.6286	3.5417	0.0000	0.0000	1.648e-03
	COMB20 20	0.0000	0.7802	2.1686	0.0000	0.0000	4.945e-03
	COMB21 21	0.0000	-10.1920	0.5529	0.0000	0.0000	-4.302e-03
	COMB22 22	0.0000	-11.0404	-0.8202	0.0000	0.0000	-1.006e-03
	COMB23 23	0.0000	10.7382	-5.9673	0.0000	0.0000	0.2629
	COMB24 24	0.0000	5.4917	-17.5564	0.0000	0.0000	0.0337
	COMB25 25	0.0000	-10.4674	28.2239	0.0000	0.0000	-0.2701

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[redacted]

****

2x1s030

Double guideway support structure with 30 ft span

****

*** Support Reactions ***

Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
10	COMB26 26	0.0000	-6.9176	37.0668	0.0000	0.0000	-0.0343
	COMB27 27	0.0000	14.2879	2.8756	0.0000	0.0000	0.4987
12	LIVE 6	0.0000	2.2918	-0.6844	0.0000	0.0000	0.0428
	DEAD 5	0.0000	-8.722e-03	20.9604	0.0000	0.0000	-1.934e-04
	BRAKING 4	0.0000	10.0631	-20.6348	0.0000	0.0000	-2.7782
	BODY 3	0.0000	-0.1649	20.3578	0.0000	0.0000	2.190e-04
	THERMAL2 2	0.0000	18.5070	334.2827	0.0000	0.0000	-1.0109
	THERMAL1 1	0.0000	-18.5070	-334.2827	0.0000	0.0000	1.0109
	SNOW 7	0.0000	-0.0110	33.9768	0.0000	0.0000	-3.005e-04
	EARTHQUAKELONG 8	0.0000	0.2880	-10.6161	0.0000	0.0000	0.0150
	EARTHQUAKETRANS 9	0.0000	-19.4962	-0.3931	0.0000	0.0000	-0.1272
	WINDLONG 10	0.0000	0.1978	-5.5149	0.0000	0.0000	6.909e-03
	WINDTRANS 11	0.0000	-16.7269	3.2023	0.0000	0.0000	-0.0808
	WINDVEHICLE 12	0.0000	-0.6310	-4.891e-03	0.0000	0.0000	-0.0281
	BRAKING2 13	0.0000	-9.1130	-20.8327	0.0000	0.0000	2.7773
	LIVE2 14	0.0000	-2.2106	-0.6987	0.0000	0.0000	-0.0418
	WINDVEHICLE2 15	0.0000	-0.5506	-0.0169	0.0000	0.0000	-0.0269
	COMB1 1	0.0000	-18.5157	-313.3223	0.0000	0.0000	1.0107
	COMB2 2	0.0000	18.4983	355.2430	0.0000	0.0000	-1.0111
	COMB3 3	0.0000	-18.5267	-279.3456	0.0000	0.0000	1.0104

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FORM 5007/ B0192016 REV 17/79 GENERAL COMPUTATION SHEET

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

CALC SET NO		REV	COMP BY	CHK'D BY
PRELIM	✓	0	MXG DATE 04/22/92	DATE
FINAL				
VOID				
SHEET OF		1	MXG DATE 4/23/92	DATE
JO 6869.002				

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT DOUBLE GUIDEWAY SUPPORT STRUCT.

STEEL - DOUBLE "2x1SØ3Ø"

SUMMARY OF LOADS (UNFACTORED) SPAN = 9.15m (30 FT)

	COLUMN HT. / LOADS	h_1 = 5.18m (17.0 FT)	h_2 = 7.62m (25.0 FT)	h_3 = 9.14m (30.0 FT)	h_4 = 20.0m (65.6 FT)
D	DEAD LOAD FY	880 kN (198 k)	1050 kN (236 k)	1157 kN (260 k)	1920 kN (432 k)
S	SNOW LOAD FY	241 kN (54 k)	241 kN (54 k)	241 kN (54 k)	241 kN (54 k)
L	LIVE LOAD VEHICLE FY, Mx	251 kN (56.4 k) -684 kN-m (504 k-FT)	251 kN (56.4 k) -684 kN-m (504 k-FT)	251 kN (56.4 k) -684 kN-m (504 k-FT)	251 kN (56.4 k) -684 kN-m (504 k-FT)
L2	LIVE LOAD OF SECOND VEHICLE Fy, Mx	251 kN (56.4 k) 684 kN-m (504 k-FT)	251 kN (56.4 k) 684 kN-m (504 k-FT)	251 kN (56.4 k) 684 kN-m (504 k-FT)	251 kN (56.4 k) 684 kN-m (504 k-FT)
E_L	SEISMIC LOAD LONGITUDINAL FX, Mz	100 kN (22.5 k) 518 kN-m (383 k-FT)	100 kN (22.5 k) 762 kN-m (563 k-FT)	100 kN (22.5 k) 914 kN-m (675 k-FT)	100 kN (22.5 k) 2000 kN-m (1476 k-FT)
E_t	SEISMIC LOAD LATERAL Fz, Mx, My	100 kN (22.5 k) 800 kN-m (590 k-FT) -38 kN-m (-28 k-FT)	100 kN (22.5 k) 1043 kN-m (769 k-FT) -38 kN-m (-28 k-FT)	100 kN (22.5 k) 1195 kN-m (881 k-FT) -38 kN-m (-28 k-FT)	100 kN (22.5 k) 2281 kN-m (1681 k-FT) -38 kN-m (-28 k-FT)
W	WIND LOAD LATERAL Fz, Mx, My	93 kN (21 k) 623 kN-m (459 k-FT) -27 kN-m (-20 k-FT)	99 kN (22 k) 857 kN-m (632 k-FT) -27 kN-m (-20 k-FT)	103 kN (23 k) 1013 kN-m (747 k-FT) -27 kN-m (-20 k-FT)	129 kN (29 k) 2264 kN-m (1669 k-FT) -27 kN-m (-20 k-FT)

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FORM 5007/ B0192018 REV 17/79 GENERAL COMPUTATION SHEET

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

CALC SET NO		REV	COMP BY	CHK'D BY
PRELIM	✓	0	MLJ DATE 4/22/92	DATE
FINAL				
VOID		1	MLJ DATE 4/23/92	DATE
SHEET OF				
JO 6869.002				

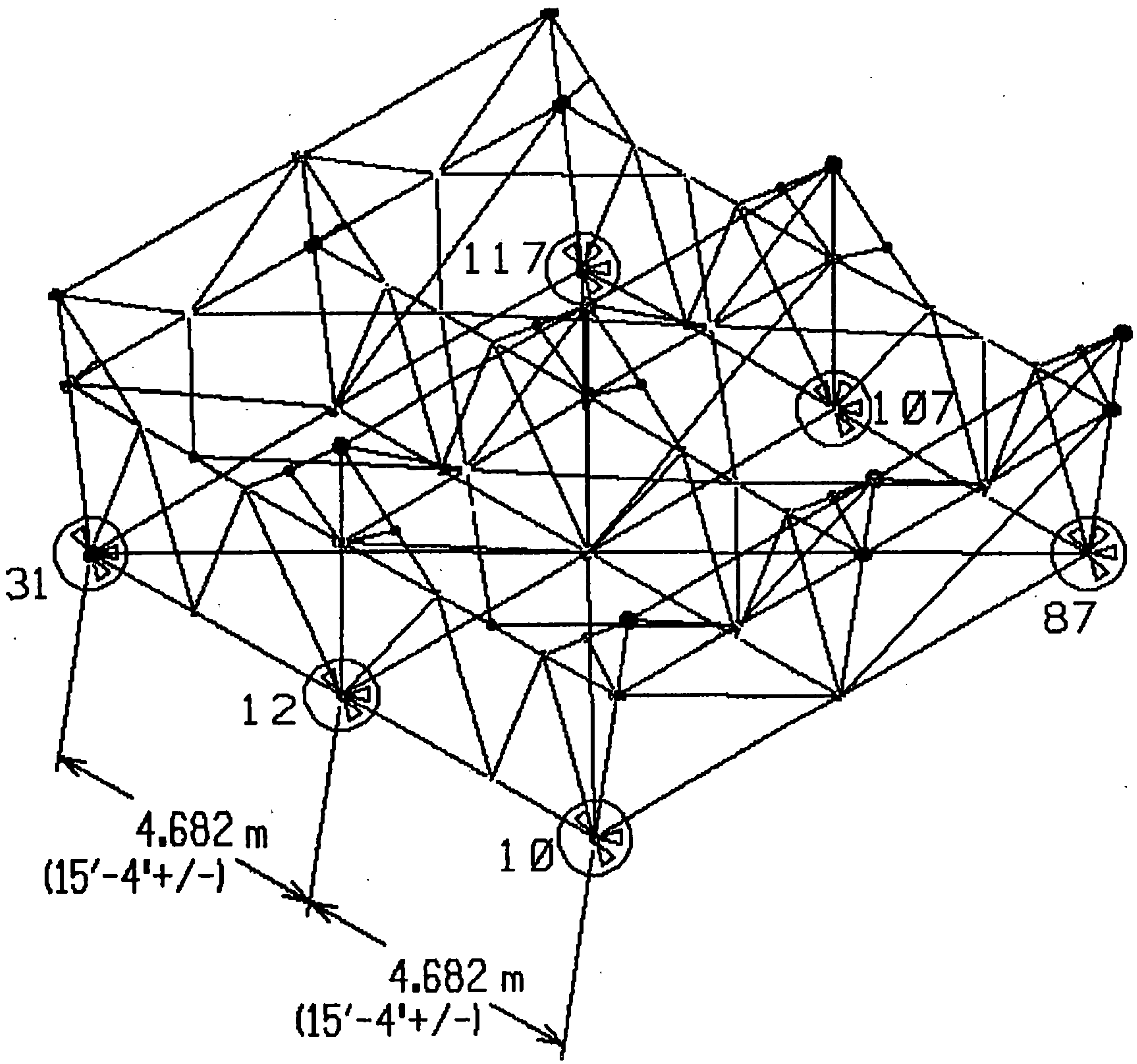
NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT DOUBLE GUIDEWAY SUPPORT STRUCT.

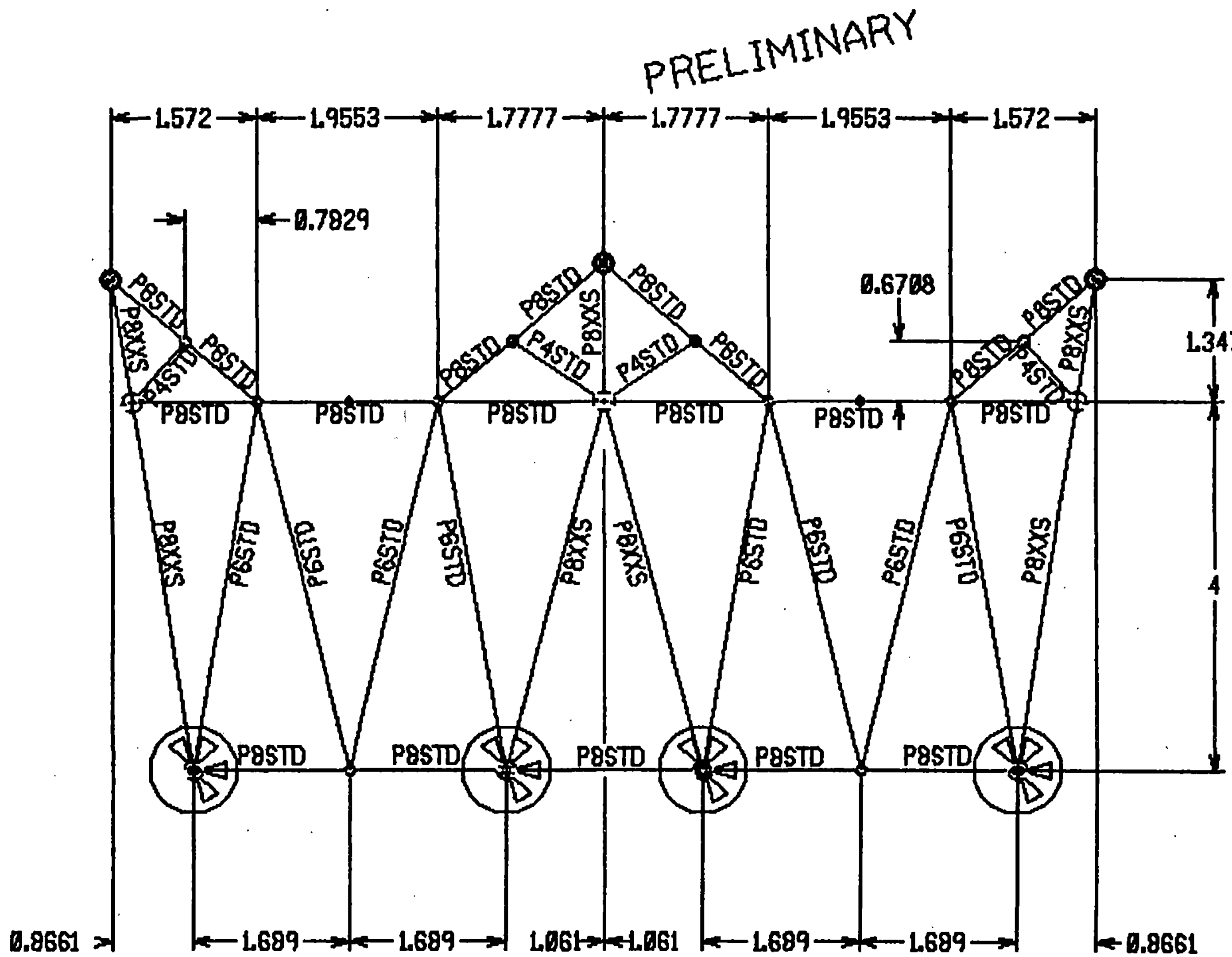
STEEL - DOUBLE, CONT - "2x15ϕ3ϕ" SPAN = 9.15 m (30 FT)

SUMMARY OF LOADS, CONT -

	LOADS \ COLUMN HT,	h_1 = 5.18 m (17.0 FT)	h_2 = 7.62 m (25.0 FT)	h_3 = 9.14 m (30.0 FT)	h_4 = 20.0 m (65.6 FT)
W_V	WIND ON OPER. VEHICLE F_Y	5.75 kN (1.3 k)	5.75 kN (1.3 k)	5.75 kN (1.3 k)	5.75 kN (1.3 k)
	F_Z	16 kN (3.6 k)	16 kN (3.6 k)	16 kN (3.6 k)	16 kN (3.6 k)
	M_X	158 kN-m (117 k-FT)	197 kN-m (145 k-FT)	222 kN-m (164 k-FT)	395 kN-m (291 k-FT)
W_{V2}	WIND ON 2nd VEHICLE F_Y	5.75 kN (1.3 k)	5.75 kN (1.3 k)	5.75 kN (1.3 k)	5.75 kN (1.3 k)
	F_Z	16 kN (3.6 k)	16 kN (3.6 k)	16 kN (3.6 k)	16 kN (3.6 k)
	M_X	55 kN-m (40.5 k-FT)	55 kN-m (40.5 k-FT)	55 kN-m (40.5 k-FT)	55 kN-m (40.5 k-FT)
B	BRAKING LOAD LONGITUDINAL F_X	163.4 kN (36.7 k)	163.4 kN (36.7 k)	163.4 kN (36.7 k)	163.4 kN (36.7 k)
	M_Z	846.4 kN-m (624 k-FT)	1245 kN-m (918 k-FT)	1494 kN-m (1101 k-FT)	3268 kN-m (2408 k-FT)
	M_Y	383 kN-m (282 k-FT)	383 kN-m (282 k-FT)	383 kN-m (282 k-FT)	383 kN-m (282 k-FT) △1
B2	BRAKING OF 2nd VEHICLE LONGITUDINAL F_X	163.4 kN (36.7 k)	163.4 kN (36.7 k)	163.4 kN (36.7 k)	163.4 kN (36.7 k) △1
	M_Z	846.4 kN-m (624 k-FT)	1245 kN-m (918 k-FT)	1494 kN-m (1101 k-FT)	3268 kN-m (2408 k-FT)
	M_Y	-383 kN-m (-282 k-FT)	-383 kN-m (-282 k-FT)	-383 kN-m (-282 k-FT)	-383 kN-m (-282 k-FT) △1



5-04

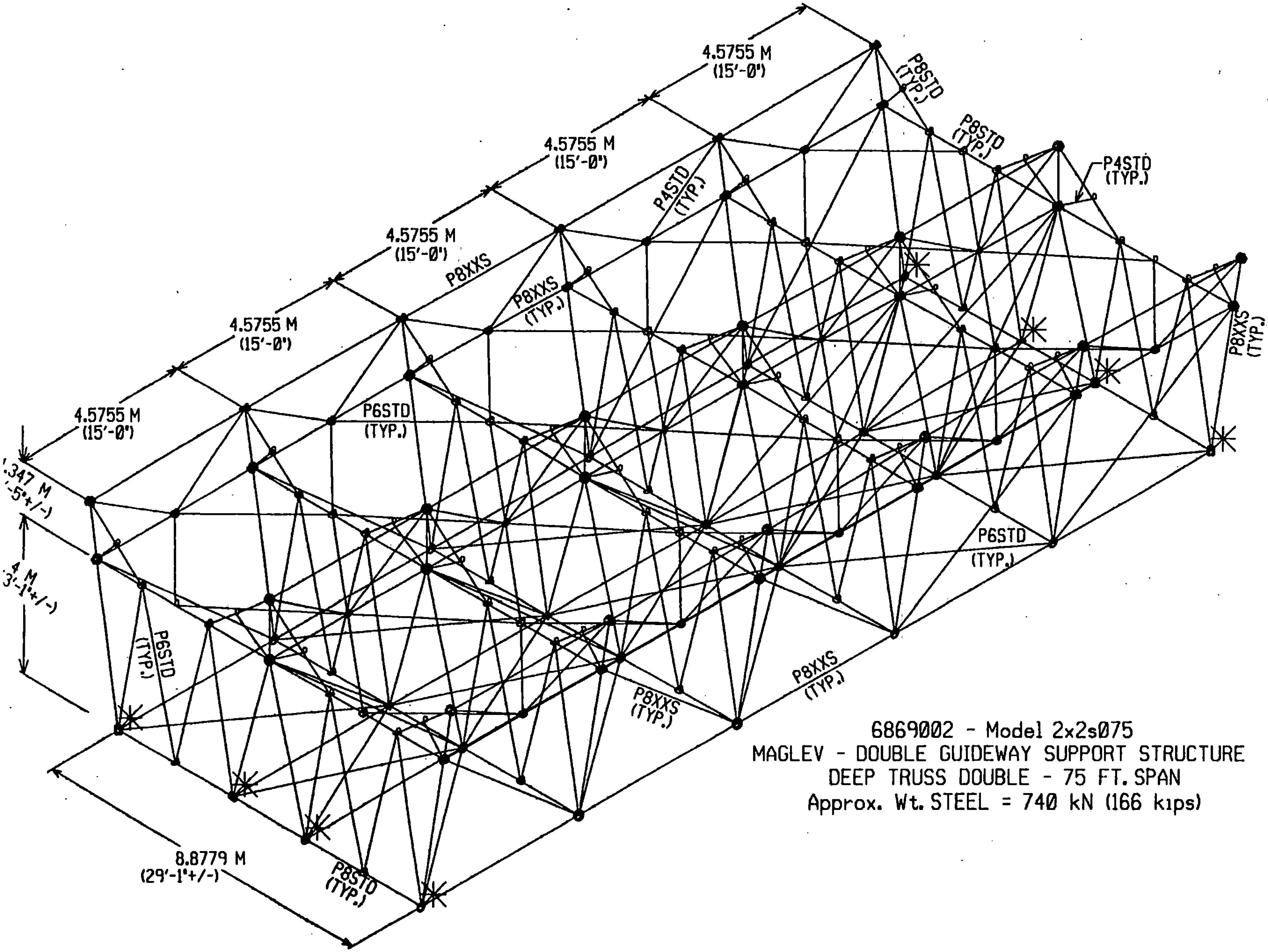


ELEVATION - DEEP TRUSS DOUBLE

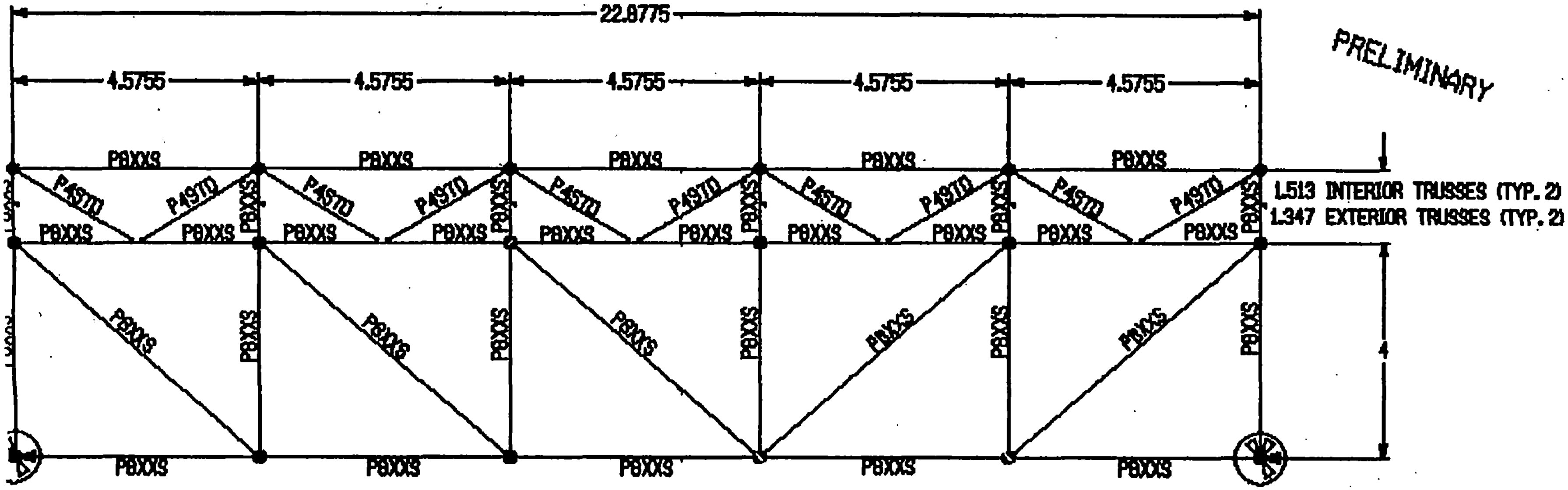
6869002 MAGNEPLANE INTERNATIONAL

DOUBLE GUIDEWAY SUPPORT STRUCTURE

59-5



6869002 - Model 2x2s075
MAGLEV - DOUBLE GUIDEWAY SUPPORT STRUCTURE
DEEP TRUSS DOUBLE - 75 FT. SPAN
Approx. Wt. STEEL = 740 kN (166 kips)



ELEVATION - DEEP TRUSS DOUBLE 75 FT. SPAN
8889002 MAGNEPLANE INTERNATIONAL
DOUBLE GUIDEWAY SUPPORT STRUCTURE

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*******************************************************************************
                                   2x2s075
        Alternate double guideway support structure with 75 ft. span
*******************************************************************************
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Analysis No. 36                   Thin Shell                              Page 1

* Material Takeoff *         Shape Type  :   Pipe Shapes
```

Shape Name	Number Physical Members	Total Length (M)	Total Surface Area (M)**2	Total Weight (kN)
P8XXS	86	520.105	357.950	550.242
P6STD	112	449.080	237.400	124.470
P8STD	36	113.897	78.387	47.507
P4STD	54	105.607	37.921	16.646
Shape Totals		1188.689	711.659	738.865

```
Bending Member Connections :

   Shear & Moment = 90
   Shear only     = 146
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*******************************************************************************
                                   2x2s075
        Alternate double guideway support structure with 75 ft. span
*******************************************************************************
MicasPlus Rev  4.0.1.0                                   APR 23, 1992    08:26:21
Analysis No. 36                   Thin Shell                              Page 2

* Material Takeoff *      Structure Totals :

Total Length                                          1188.689    (M   )
Total Surface Area                                    711.659     (M   )**2
Total Weight                                          738.865     (kN  )

Total Bending Member Shear & Moment Connections =    90
Total Bending Shear Connections                 =    146
```

$738.9\,kN \left(\frac{1\ KIP}{4.448\ KN}\right)\left(\frac{1\ TON}{2\ KIP}\right)\left(\frac{5280\ FT/MILE}{75\ FT}\right) = 5847\ TON/MILE$

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FORM 5007/ B0192016 REV 17/79 GENERAL COMPUTATION SHEET

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

CALC SET NO		REV	COMP BY	CHK'D BY
PRELIM	✓	0	MXG DATE 04/23/92	DATE
FINAL				
VOID				
SHEET	OF		DATE	DATE
JO 6869.002				

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT DOUBLE GUIDEWAY SUPPORT STRUCT.

STEEL - DOUBLE "2x25 Ø75"

SUMMARY OF LOADS (UNFACTORED) SPAN = 22.87m (75 FT)

	LOADS \ COLUMN HT.	h_1 = 5.18m (17.0 FT)	h_2 = 7.62m (25.0 FT)	h_3 = 9.14m (30.0 FT)	h_4 = 20.0 m (65.6 FT)
D	DEAD LOAD FY	1662 kN (374 kip)	1833 kN (412 k)	1940 kN (436 k)	2702 kN (608 k)
S	SNOW LOAD FY	422 kN (95 k)	422 kN (95 k)	422 kN (95 k)	422 kN (95 k)
L	LIVE LOAD VEHICLE FY M_x	251 kN (56.4 k) -690 kN-m (-509 k-FT)	251 kN (56.4 k) -690 kN-m (-509 k-FT)	251 kN (56.4 k) -690 kN-m (-509 k-FT)	251 kN (56.4 k) -690 kN-m (-509 k-FT)
L2	LIVE LOAD OF SECOND VEHICLE F_y M_x	251 kN (56.4 k) 690 kN-m (509 k-FT)	251 kN (56.4 k) 690 kN-m (509 k-FT)	251 kN (56.4 k) 690 kN-m (509 k-FT)	251 kN (56.4 k) 690 kN-m (509 k-FT)
E_L	SEISMIC LOAD LONGITUDINAL FX M_z	362 kN (81 k) 1875 kN-m (1382 k-FT)	362 kN (81 k) 2758 kN-m (2033 k-FT)	362 kN (81 k) 3309 kN-m (2439 k-FT)	362 kN (81 k) 7240 kN-m (5338 k-FT)
E_t	SEISMIC LOAD LATERAL F_z M_x M_y	362 kN (81 k) 3407 kN-m (2511 k-FT) 550 kN-m (405 k-FT)	362 kN (81 k) 4290 kN-m (3162 k-FT) 550 kN-m (405 k-FT)	362 kN (81 k) 4841 kN-m (3568 k-FT) 550 kN-m (405 k-FT)	362 kN (81 k) 8772 kN-m (6466 k-FT) 550 kN-m (405 k-FT)
W	WIND LOAD LATERAL F_z M_x M_y	271 kN (61 k) 2108 kN-m (1554 k-FT) 362 kN-m (267 k-FT)	276 kN (62 k) 2769 kN-m (2041 k-FT) 362 kN-m (267 k-FT)	280 kN (63 k) 3194 kN-m (2354 k-FT) 362 kN-m (267 k-FT)	307 kN (69 k) 6387 kN-m (4708 k-FT) 362 kN-m (267 k-FT)

FORM 5007/80192018 REV 17/79 GENERAL COMPUTATION SHEET

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

CALC SET NO		REV	COMP BY	CHK D BY
PRELIM	✓	0	MYG DATE 4/23/92	DATE
FINAL				
VOID			DATE	DATE
SHEET OF				
JO 6869.002				

NAME OF COMPANY MAGNEPLANE INT'L UNITS

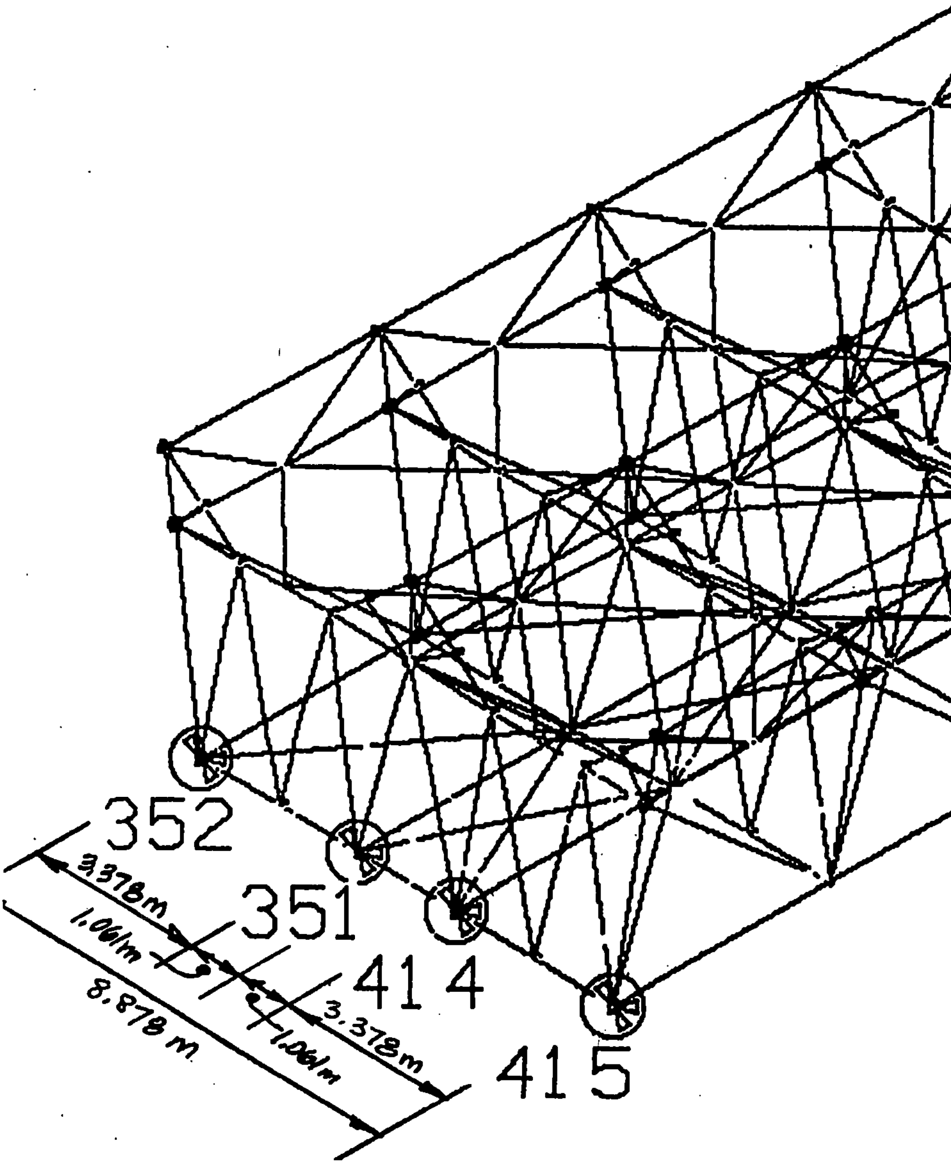
SUBJECT DOUBLE GUIDEWAY SUPPORT STRUCT.

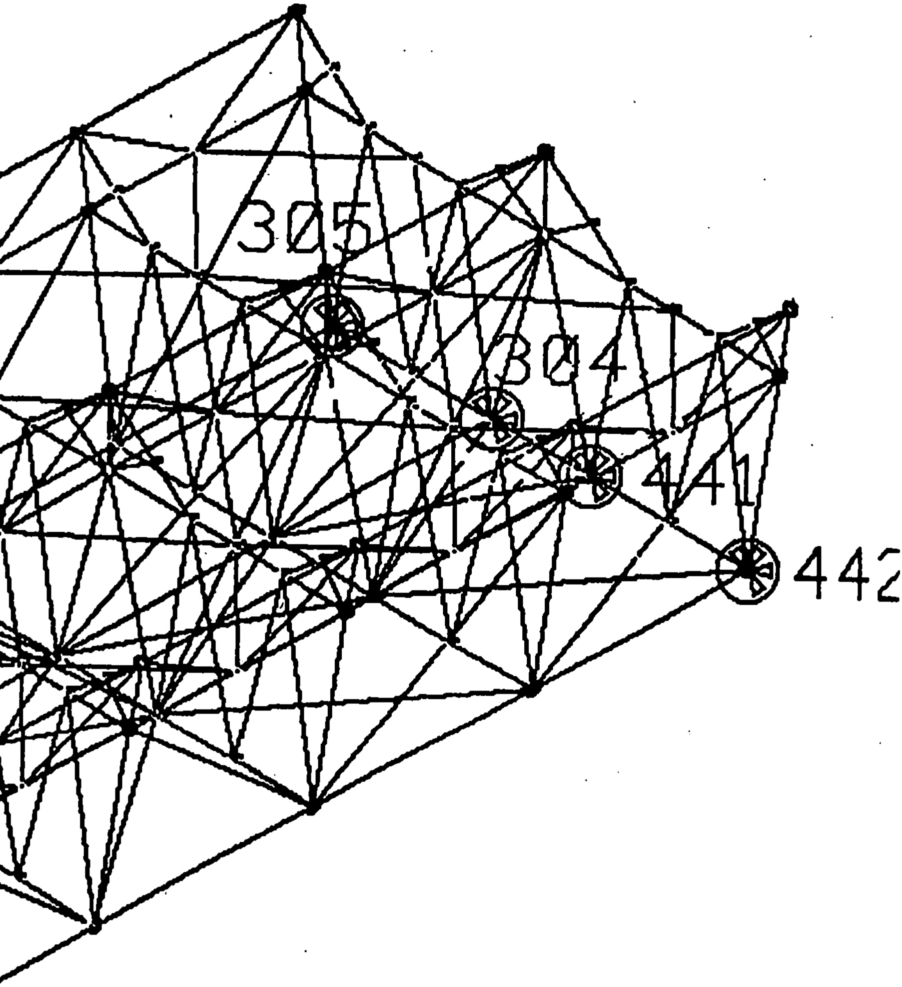
STEEL - DOUBLE, CONT - "2x25Φ75"

SUMMARY OF LOADS, CONT -

SPAN = 22.87m (75 FT)

	LOADS \ COLUMN HT.	h_1 = 5.18 m (17.0 FT)	h_2 = 7.62 m (25.0 FT)	h_3 = 9.14 m (30.0 FT)	h_4 = 20.0 m (65.6 FT)
W_V	WIND ON OPER. VEHICLE F_y F_z M_x	5.75 kN (1.3k) 16 kN (3.6k) 272 kN-m (201 k-FT)	5.75 kN (1.3k) 16 kN (3.6k) 311 kN-m (229 k-FT)	5.75 kN (1.3k) 16 kN (3.6k) 335 kN-m (247 k-FT)	5.75 kN (1.3k) 16 kN (3.6k) 509 kN-m (375 k-FT)
W_{V2}	WIND ON 2nd VEHICLE F_y F_z M_x	5.75 kN (1.3k) 16 kN (3.6k) 149 kN-m (110 k-FT)	5.75 kN (1.3k) 16 kN (3.6k) 188 kN-m (139 k-FT)	5.75 kN (1.3k) 16 kN (3.6k) 212 kN-m (156 k-FT)	5.75 kN (1.3k) 16 kN (3.6k) 386 kN-m (285 k-FT)
B	BRAKING LOAD LONGITUDINAL F_x M_z M_y	163.4 kN (36.7k) 846 kN-m (624 k-FT) 450 kN-m (331 k-FT)	163.4 kN (36.7k) 1245 kN-m (918 k-FT) 450 kN-m (331 k-FT)	163.4 kN (36.7k) 1494 kN-m (1101 k-FT) 450 kN-m (331 k-FT)	163.4 kN (36.7k) 3268 kN-m (2408 k-FT) 450 kN-m (331 k-FT)
B2	BRAKING OF 2nd VEHICLE LONGITUDINAL F_x M_z M_y	163.4 kN (36.7k) 846 kN-m (624 k-FT) -450 kN-m (-331 k-FT)	163.4 kN (36.7k) 1245 kN-m (918 k-FT) -450 kN-m (-331 k-FT)	163.4 kN (36.7k) 1494 kN-m (1101 k-FT) -450 kN-m (-331 k-FT)	163.4 kN (36.7k) 3268 kN-m (2408 k-FT) -450 kN-m (-331 k-FT)


352
3.378m
1.061m
351
8.878 m
414
1.061m
3.378m
415


305
304
441
442

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2x2s075

Alternate double guideway support structure with 75 ft. span

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MicasPlus Rev 4.0.1.0 APR 23, 1992 09:54:17

Analysis No. 37 Thin Shell Page 1

*** Support Reactions ***

Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
304	LIVE 6	-0.3671	-10.3442	45.9860	0.0000	0.0000	0.0110
	DEAD 5	1.7500	-4.7667	26.9374	0.0000	0.0000	0.0429
	BRAKING 4	-40.0594	-9.0400	19.0432	0.0000	0.0000	-1.8188
	BODY 3	6.0651	-15.6178	81.1974	0.0000	0.0000	0.2809
	THERMAL2 2	-134.1597	56.5282	67.7844	0.0000	0.0000	-0.7338
	THERMAL1 1	134.1597	-56.5282	-67.7844	0.0000	0.0000	0.7338
	SNOW 7	3.3222	-8.4006	44.7766	0.0000	0.0000	0.0731
	EARTHQUAKELONG 8	-84.1954	-9.7342	15.9381	0.0000	0.0000	0.1430
	EARTHQUAKETRANS 9	-40.5868	-66.7131	110.2192	0.0000	0.0000	0.2861
	WINDLONG 10	-46.9512	-4.7081	6.4785	0.0000	0.0000	0.9472
	WINDTRANS 11	-31.2170	-42.9632	64.7921	0.0000	0.0000	0.1925
	WINDVEHICLE 12	-0.3342	-5.9703	13.2822	0.0000	0.0000	5.704e-03
	BRAKING2 13	-39.6214	-0.0200	1.2072	0.0000	0.0000	1.6591
	LIVE2 14	-4.0642	-18.5231	68.1104	0.0000	0.0000	-0.0130
	WINDVEHICLE2 15	-0.8825	-5.7213	6.2776	0.0000	0.0000	3.407e-03
	COMB1 1	135.9097	-61.2949	-40.8470	0.0000	0.0000	0.7767
	COMB2 2	-132.4098	51.7615	94.7218	0.0000	0.0000	-0.6908
	COMB3 3	139.2319	-69.6955	3.9296	0.0000	0.0000	0.8498
	COMB4 4	-129.0876	43.3609	139.4984	0.0000	0.0000	-0.6178
	COMB5 5	135.5426	-71.6391	5.1390	0.0000	0.0000	0.7878

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2x2s075

Alternate double guideway support structure with 75 ft. span

****

MicasPlus Rev 4.0.1.0 APR 23, 1992 09:54:29

Analysis No. 37 Thin Shell Page 2

*** Support Reactions ***

Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
304	COMB6 6	131.4785	-90.1622	73.2494	0.0000	0.0000	0.7748
	COMB7 7	-132.7768	41.4173	140.7078	0.0000	0.0000	-0.6798
	COMB8 8	-136.8410	22.8942	208.8182	0.0000	0.0000	-0.6928
	COMB9 9	88.9585	-66.0030	-34.3685	0.0000	0.0000	1.7239
	COMB10 10	-179.3610	47.0534	101.2003	0.0000	0.0000	0.2563
	COMB11 11	104.6926	-104.2581	23.9451	0.0000	0.0000	0.9692
	COMB12 12	-163.6268	8.7983	159.5138	0.0000	0.0000	-0.4984
	COMB13 13	-82.4454	-14.5009	42.8755	0.0000	0.0000	0.1859
	COMB14 14	-38.8368	-71.4798	137.1566	0.0000	0.0000	0.3290
	COMB15 15	-57.3061	-20.9961	81.0215	0.0000	0.0000	1.2380
	COMB16 16	-8.5502	-34.2225	141.8436	0.0000	0.0000	0.1594
	COMB17 17	-2.8534	-26.4516	94.3046	0.0000	0.0000	0.0837
	COMB18 18	-7.8001	-50.6960	168.6926	0.0000	0.0000	0.0742
	COMB19 19	-62.1094	-18.6339	66.6461	0.0000	0.0000	0.1477
	COMB20 20	-65.1575	-32.5262	117.7290	0.0000	0.0000	0.1380
	COMB21 21	-29.4029	-61.3680	137.3570	0.0000	0.0000	0.2550
	COMB22 22	-32.4510	-75.2603	188.4398	0.0000	0.0000	0.2453
	COMB23 23	-29.0074	-18.1132	68.9750	0.0000	0.0000	-1.3236
	COMB24 24	-61.7716	-32.0204	120.9632	0.0000	0.0000	-0.0891
	COMB25 25	31.0818	-4.5532	40.4101	0.0000	0.0000	1.4046

****

2x2s075

Alternate double guideway support structure with 75 ft. span

****

MicasPlus Rev 4.0.1.0 APR 23, 1992 09:54:29

Analysis No. 37 Thin Shell Page 3

*** Support Reactions ***

Node	Cas/Cmb	FX kN	FY kN	FZ kN	MX M-kN	MY M-kN	MZ M-kN
304	COMB26 26	57.7497	-18.4306	90.5875	0.0000	0.0000	0.1505
	COMB27 27	-2.3395	-31.9905	119.1524	0.0000	0.0000	-2.5777
305	LIVE 6	-2.2088	1.6702	-2.5037	0.0000	0.0000	0.0430
	DEAD 5	-1.9024	4.0198	32.6829	0.0000	0.0000	-0.0219
	BRAKING 4	-30.4605	-4.8451	3.4397	0.0000	0.0000	0.6614
	BODY 3	-6.0938	14.1816	102.9728	0.0000	0.0000	-0.1244
	THERMAL2 2	134.1603	2892.4194	-68.2398	0.0000	0.0000	9.785e-03
	THERMAL1 1	-134.1603	-2892.4194	68.2398	0.0000	0.0000	-9.785e-03
	SNOW 7	-3.9064	7.7371	58.1131	0.0000	0.0000	-0.0341
	EARTHQUAKELONG 8	-96.9502	-5.1276	17.0568	0.0000	0.0000	-0.2026
	EARTHQUAKETRANS 9	-52.1958	-36.6027	66.2361	0.0000	0.0000	1.968e-03
	WINDLONG 10	-51.7137	-3.1533	6.2299	0.0000	0.0000	-0.1571
	WINDTRANS 11	-32.7231	-29.7003	28.4070	0.0000	0.0000	9.237e-04
	WINDVEHICLE 12	0.9024	-2.2893	3.9217	0.0000	0.0000	-0.0110
	BRAKING2 13	-59.3894	0.2466	11.2456	0.0000	0.0000	-2.9069
	LIVE2 14	6.6336	11.3885	139.3441	0.0000	0.0000	0.0461
	WINDVEHICLE2 15	1.3747	-1.2801	6.1585	0.0000	0.0000	-3.339e-03
	COMB1 1	-136.0628	-2888.3997	100.9227	0.0000	0.0000	-0.0317
	COMB2 2	132.2579	2896.4392	-35.5570	0.0000	0.0000	-0.0121
	COMB3 3	-139.9692	-2880.6624	159.0358	0.0000	0.0000	-0.0659

S-74

GENERAL COMPUTATION SHEET

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

CALC SET NO		REV	COMP BY	CHK D BY
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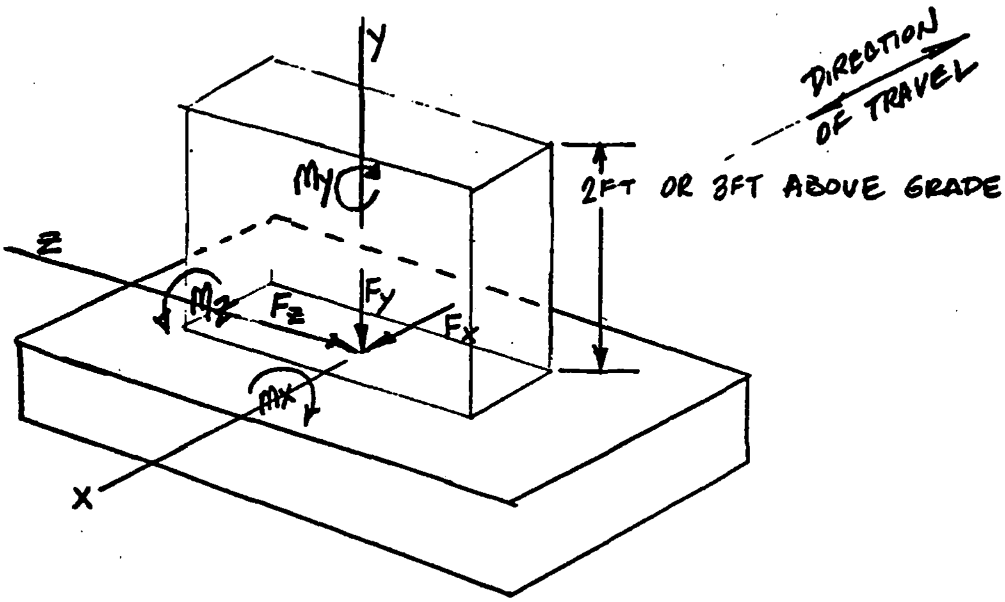
FINAL				
VOID				
SHEET	OF		DATE	DATE
JO 6869.002				

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT DOUBLE GUIDEWAY SUPPORT STRUCT.

S-75

LOADS TO FOUNDATIONS FOR "AT GRADE" TRUSSES-



LOAD COMBINATIONS TO BE CONSIDERED-

D

$D+S$

$D+L$

$D+L+L2$

$D \pm W$

$D \pm E_t$

$D \pm E_L$

$D+L \pm \left[\left(30/85\right)^2 W + W_V\right]$

$D+L+L2 \pm \left[\left(30/85\right)^2 W + W_V + W_{V2}\right]$

$(D+L \pm E_t) * 0.75$

$(D+L+L2 \pm E_t) * 0.75$

$(D+L \pm E_L) * 0.75$

$(D+L+L2 \pm E_L) * 0.75$

$(D+L \pm B) * 0.75$

$(D+L+L2 \pm [B+B2]) * 0.75$

$(D+L+L2 \pm [B-B2]) * 0.75$

FORM 5007/ B0192016 REV 17/79

GENERAL COMPUTATION SHEET

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

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VOID				
SHEET OF		1	MYG DATE 4/23/92	DATE
J.O.	6869.002			

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT DOUBLE GUIDEWAY SUPPORT STRUCT.

STEEL-DOUBLE- "2x15Ø3Ø"

SPAN = 9.15 m (30 FT)

	LOADS \ PEDASTAL HT.	h_1=0.61 m (2'-0")	h_2=0.915m (3'-0")
D	DEAD LOAD F_y	547 kN (123k)	596 kN (134k)
S	SNOW LOAD F_y	241 kN (54k)	241 kN (54k)
L	LIVE LOAD VEHICLE F_y M_x	251 kN (56.4k) -684 kN-m (-504 k-FT)	251 kN (56.4k) -684 kN-m (-504 k-FT)
L2	LIVE LOAD 2nd VEHICLE F_y M_x	251 kN (56.4k) 684 kN-m (504 k-FT)	251 kN (56.4K) 684 kN-m (504 k-FT)
E_L	SEISMIC LOAD LONGITUDINAL F_x M_z	100 kN (22.5k) 61 kN-m (45 k-FT)	100 kN (22.5k) 92 kN-m (68 k-FT)
E_t	SEISMIC LOAD LATERAL F_z M_x M_y	100 kN (22.5k) 342 kN-m (252 k-FT) -38 kN-m (-28 k-FT)	100 kN (22.5k) 373 kN-m (275 k-FT) -38 kN-m (-28 k-FT)
W	WIND LOAD LATERAL F_z M_x M_y	80 kN (18 k) 49 kN-m (36k-FT) -27 kN-m (-20 k-FT)	80 kN (18k) 73 kN-m (54 k-FT) -27 kN-m (-20 k-FT)

	LOADS \ PEDASTAL HT.	h_1=0.61 m (2'-0")	h_2=0.915m (3'-0")
W_V	WIND ON OPER. VEHICLE F_y F_z M_x	5.75 kN (1.3 k) 16 kN (3.6 k) 75 kN-m	5.75 kN (1.3 k) 16 kN (3.6k) 75 kN-m
W_{V2}	WIND ON OPER. 2nd VEHICLE F_y F_z M_x	5.75 kN (1.3 k) 16 kN (3.6 K) -28 kN-m (-20.5 k-FT)	5.75 kN (1.3 k) 16 kN (3.6k) -28 kN-m (-20.5 k-FT)
B	BRAKING LOAD LONGITUDINAL F_x M_z M_y	163.4 kN (36.7 k) 100 kN-m (74 k-FT) 383 kN-m (282 k-FT)	163.4 kN (36.7 k) 150 kN-m (111 k-FT) 383 kN-m (282 k-FT)
B2	BRAKING LOAD OF 2nd VEHICLE LONGITUDINAL F_x M_z M_y	163.4 kN (36.7k) 100 kN-m (74 k-FT) -383 kN-m (-282 k-FT)	163.4 kN (36.7 k) 150 kN-m (111 k-FT) -383 kN-m (-282 k-FT)

FORM 5007/ B0192016 REV 17/79 GENERAL COMPUTATION SHEET
(DISCIPLINE) STRUCTURAL
UNITED ENGINEERS & CONSTRUCTORS

CALC SET NO		REV	COMP BY	CHK'D BY
PRELIM.	✓	0	MLJ DATE 4/23/92	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O. 6869.002				

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT DOUBLE GUIDEWAY SUPPORT STRUCT.

STEEL-DOUBLE- "2x25Ø75"

SUMMARY OF LOADS (UNFACTORED)

SPAN = 22.87 m (75 FT)

	LOADS \ PEDASTAL HT.	h_1=0.61 m (2'-0")	h_2=0.915 m (3'-0")
D	DEAD LOAD F_y	1329 kN (980 k)	1378 kN (1016 k)
S	SNOW LOAD F_y	422 kN (95 k)	422 kN (95 k)
L	LIVE LOAD VEHICLE F_y M_x	251 kN (56.4 k) -690 kN-m (-509 k-FT)	251 kN (56.4 k) -690 kN-m (-509 k-FT)
L2	LIVE LOAD 2nd VEHICLE F_y M_x	251 kN (56.4 k) 690 kN-m (509 k-FT)	251 kN (56.4 k) 690 kN-m (509 k-FT)
E_L	SEISMIC LOAD LONGITUDINAL F_x M_z	362 kN (81 k) 221 kN-m (163 k-FT)	362 kN (81 k) 331 kN-m (244 k-FT)
E_t	SEISMIC LOAD LATERAL F_z M_x M_y	362 kN (81 k) 1753 kN-m (1292 k-FT) 550 kN-m (405 k-FT)	362 kN (81 k) 1863 kN-m (1373 k-FT) 550 kN-m (405 k-FT)
W	WIND LOAD LATERAL F_z M_x M_y	258 kN (58 k) 860 kN-m (634 k-FT) 362 kN-m (267 k-FT)	258 kN (58 k) 940 kN-m (693 k-FT) 362 kN-m (267 k-FT)

	LOADS \ PEDASTAL HT.	h_1=0.61 m (2'-0")	h_2=0.915 m (3'-0")
W_V	WIND ON OPER. VEHICLE F_y F_z M_x	5.75 kN (1.3 k) 16 kN (3.6 k) 199 kN-m (147 k-FT)	5.75 kN (1.3 k) 16 kN (3.6 k) 204 kN-m (150 k-FT)
W_{V2}	WIND ON OPER. 2nd VEHICLE F_y F_z M_x	5.75 kN (1.3 k) 16 kN (3.6 k) 139 kN-m (103 k-FT)	5.75 kN (1.3 k) 16 kN (3.6 k) 144 kN-m (106 k-FT)
B	BRAKING LOAD LONGITUDINAL F_x M_z M_y	163.4 kN (36.7 k) 100 kN-m (74 k-FT) 450 kN-m (331 k-FT)	163.4 kN (36.7 k) 150 kN-m (111 k-FT) 450 kN-m (331 k-FT)
B2	BRAKING LOAD OF 2nd VEHICLE LONGITUDINAL F_x M_z M_y	163.4 kN (36.7 k) 100 kN-m (74 k-FT) 450 kN-m (331 k-FT)	163.4 kN (36.7 k) 150 kN-m (111 k-FT) 450 kN-m (331 k-FT)

FORM 5007/ B0192016 REV 17/79 GENERAL COMPUTATION SHEET

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

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PRELIM.	✓	0	MZG DATE 4/22/92	DATE
FINAL				
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SHEET	OF		DATE	DATE
J.O 6869.002				

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT DOUBLE GUIDEWAY SUPPORT STRUCT

PEDASTALS "AT GRADE" -

VOLUME & WEIGHT OF PEDASTALS.

$WIDTH = 4.682m(2) = 9.36\ m\left(\frac{1\ FT}{0.305\ m}\right) = 30'-8"$, USE 31'-6"

$VOL = 31'-6" \times 2'-4" \times 2'-0" = 147\ FT^3 / 27\ FT^3/C.Y. = 5.4$ C.Y. EA

$WT = 147\ FT^3 \times 150\ PCF = 22050$ LB. EA.

$VOL = 31'-6" \times 2'-4" \times 3'-0" = 220.5\ FT^3/27 = 8.2$ C.Y. EA.

$WT = 220.5 \times 150 = 33075$ LB. EA.

SPAN (FT)	30	30	75	75	120	120
HEIGHT (FT)	2	3	2	3	2	3
VOL. (CY, EA)	5.4	8.2	5.4	8.2	5.4	8.2
VOL. (CY/MILE)	950	1443	380	577	238	361

$$\frac{[VOL(CY/EA)][5280\ FT/MILE]}{[SPAN(FT)]}$$

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY MI / MIT UNIT/S

SUBJECT MAGNEPLANE

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER	
FINAL			DATE 9-30-92	DATE
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SHEET	OF			
J.O 6869002			DATE	DATE

MAGNEPLANE INTERNATIONAL-SYSTEM DEFINITION REPORT

SUPPLEMENT C
BACKUP MATERIAL-MAGWAY STRUCTURE

BENTS-COLUMNS AND CROSSBEAMS SUPPORTING THE ALUMINUM BOX BEAMS (Report Reference 3.2.2.a.4)

CONTENTS:

B-1 THRU B-52 Bent for double aluminum magway spanning 30′

B-53 THRU B-120 Bent for magway at a 35 degree bank

6869002

MI - Magneplane Int.

MIT - Magnetic dynamics

UE&C - Struct guideway

Beech - Vehicle

Rajk E. Di - Controls

1 METER = 3.281 FT.

1 FT = .3048 METER

BM WT (

= (4+13) = 34'

= 5'

WT = (.15)(5)(34) = 26 K

FORM 6007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors

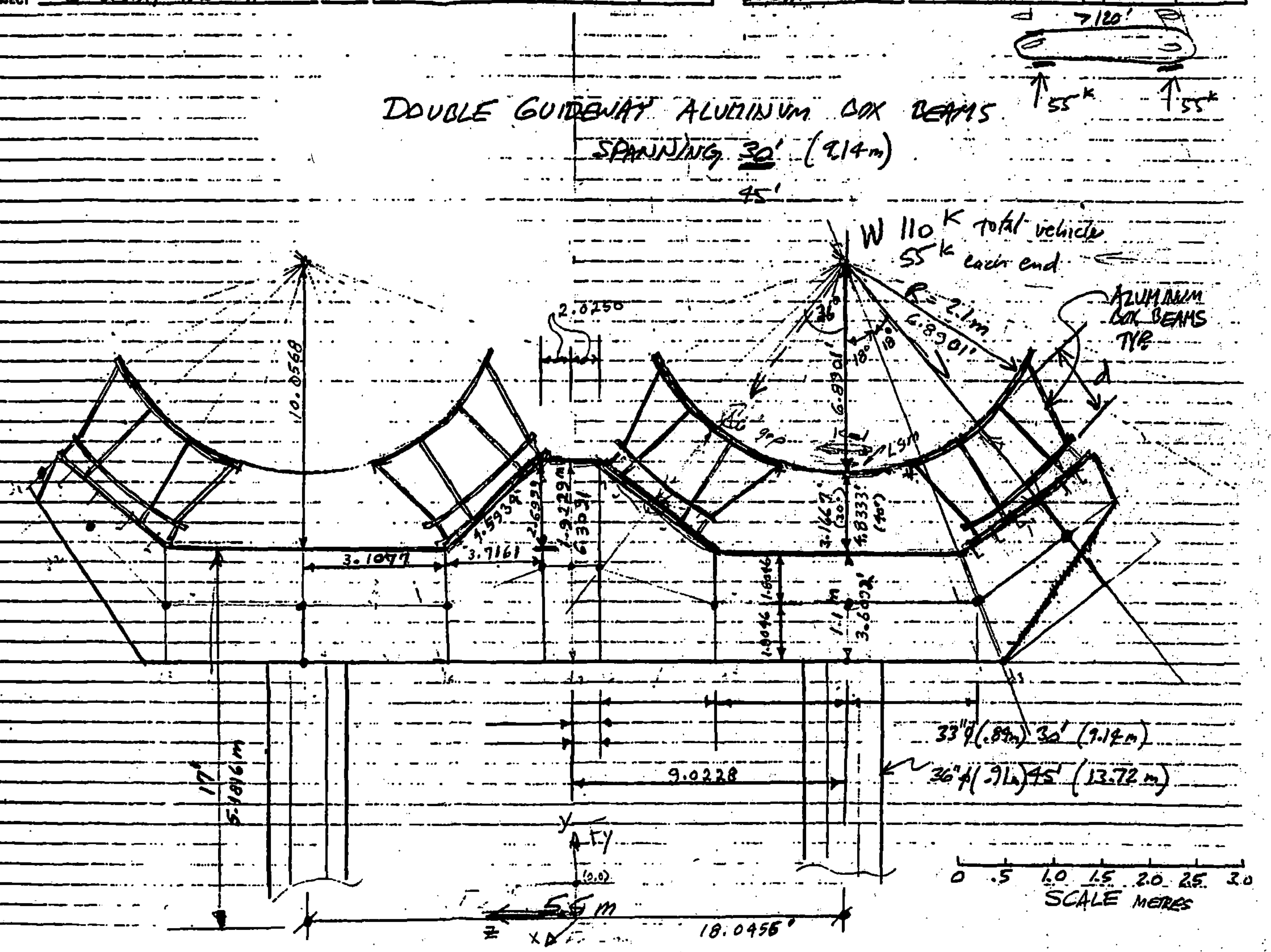
NAME OF COMPANY: MI/MIT UNIT/S

SUBJECT: GUIDEWAY TROUGH

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER	
FINAL			DATE 6-24-90	DATE
VOID				
SHEET	OF		DATE	DATE
J.O				

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER	
FINAL			DATE 6-24-90	DATE
VOID				
SHEET	OF		DATE	DATE
J.O				

DOUBLE GUIDEWAY ALUMINUM BOX BEAMS SPANNING 30' (9.14 m) 45'



B-1

FORM 62 114
REV. 8/84

United Engineers & Constructors
- Raytheon

JOB NO. 6869.002 DATE 7-15-92 BY AWC CH'D

PAGE

CUSTOMER MI/MIT PROJECT

SUBJECT GUIDEWAY TROUGH

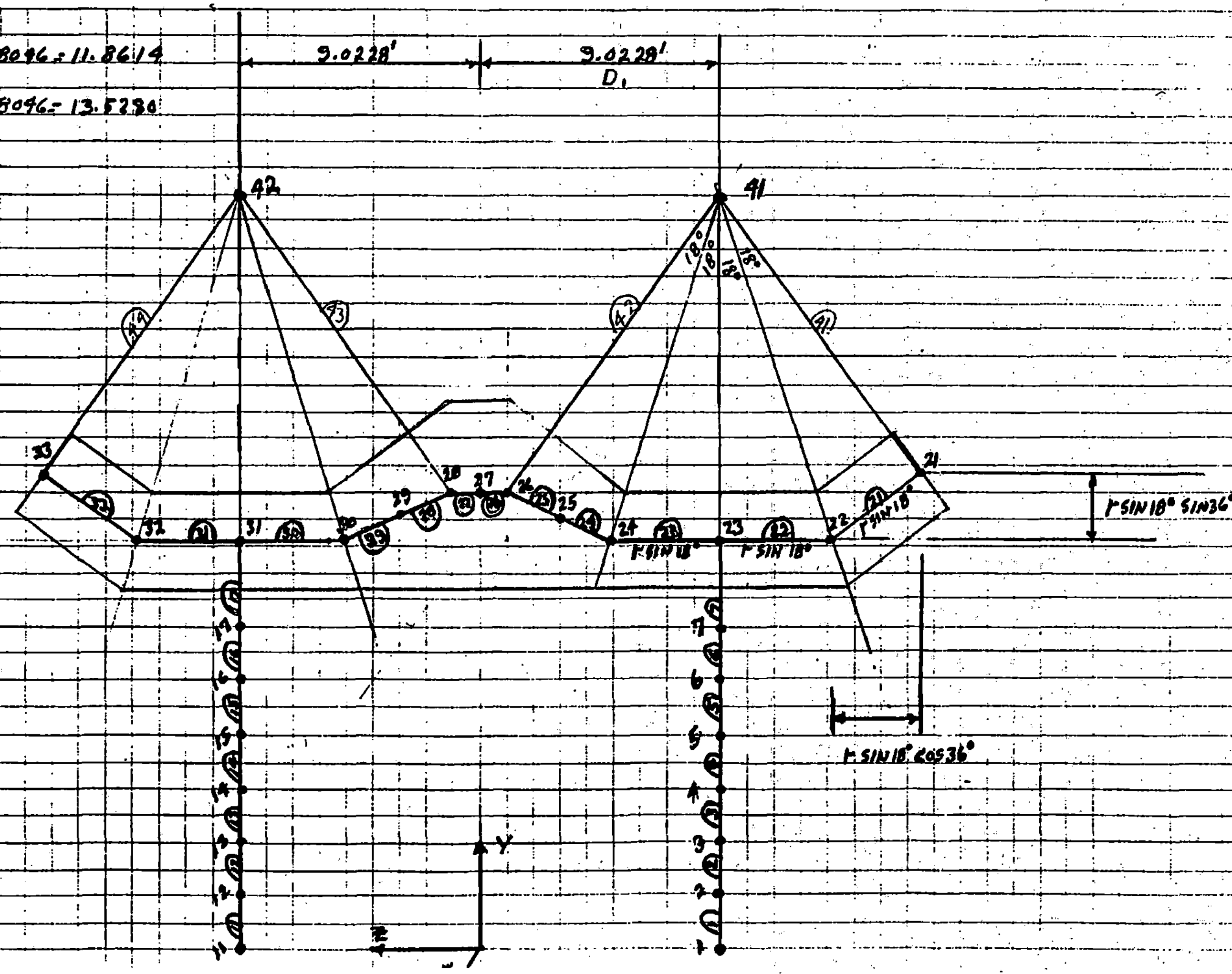
NOTES:

$r_{30} = 6.8901 + 2.6667 + .5 + 1.8046 = 11.8614$

$r_{45} = 6.8901 + 4.3333 + .5 + 1.8046 = 13.5280$

$y = 17$

$y = 15.1954$



B-3

PLINE)
ICTURAL

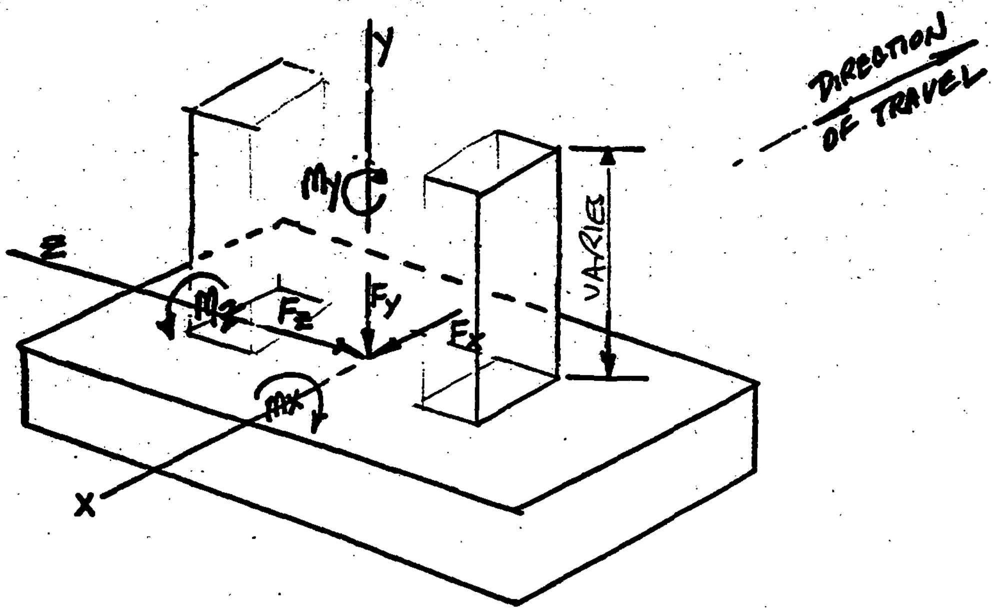
UNITED ENGINEERS
& CONSTRUCTORS

	CALC SET NO	REV	COMP BY	CHK'D BY
PRELIM	✓			
FINAL			7/14/92	
VOID				
SHEET	OF			DATE

NAME OF COMPANY MAGNEPLANE INT'L UNITS

SUBJECT DOUBLE GUIDEWAY SUPP.

LOADS TO FOUNDATIONS



LOAD COMBINATIONS TO BE CONSIDERED:

D ?
$D+S$
$D+L_1$ 1veh
$D+L_1+L2$ 2veh
$D \pm W$ Struct only
WIND CONCERNS $D \pm E_t$
$D \pm E_L$

$D+L_1 \pm \left[\left(\frac{30}{85}\right)^2 W + W_v\right]$ wveh

$D+L_1+L2 \pm \left[\left(\frac{30}{85}\right)^2 W + W_v + W_{v2}\right]$

$(D+L_1 \pm E_t) * 0.75$
$(D+L_1+L2 \pm E_t) * 0.75$
$(D+L_1 \pm E_L) * 0.75$
$(D+L_1+L2 \pm E_L) * 0.75$

$(D+L_1 \pm B) * 0.75$
$(D+L_1+L2 \pm [B+B2]) * 0.75$
$(D+L_1+L2 \pm [B-B2]) * 0.75$

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O 6869002				

NAME OF COMPANY MI / MIT UNIT/S

SUBJECT MAGNEPLANE

LOADING ON CONCRETE SUPPORT PER GUIDEWAY TROUGH

DEAD LOAD :

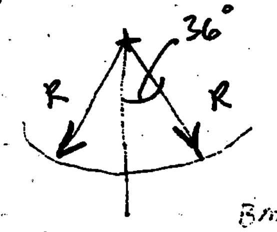
	30'	45'
ALUM BOX BEAM	8.22^k	15.09^k
UTILITIES @ 100 PLF	3.0^k	4.5^k
LSM @ 100 PLF	3.0^k	4.5^k

SELF WEIGHT

SNOW LOAD @ 40 PSF ON HORIZONTAL PROJECTION PER TROUGH

$16.4(40)30 = 19.68^k$ $19.7(40)45 = 35.46^k$

VEHICLE (55^k PER END)



$R = \dfrac{55}{2(\cos 36^\circ)} = 34.0^k$

[illegible] $.105(26) = 2.7$

SEIS WILL NOT GOVERN (Z DIR)

SEISMIC COEF $= 0.105$ $\begin{bmatrix} 30 \\ 45 \end{bmatrix}$ $(.105)(55+55+16.44+6+6) = 14.54^k$

$(.105)(55+55+30.18+9+9) = 16.61^k$

WIND USE 56 PSF ON PROJECTED VERTICAL AREA OF ONE TROUGH

& $56/2 = 28$ PSF ON 2ND TROUGH

ONE TROUGH: $56(6.56)30 = 11.^k$ $56(8.53)45 = 21.5^k$

2ND TROUGH: $28(6.56)30 = \underline{5.5^k}$ $28(8.53)45 = \underline{10.8^k}$

	30'	45'
	16.5	32.3
VEHICLE	6.8	6.8
	23.3	39.1

∴ [illegible] GOVERNS (Z DIR)

B-5

FORM 5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY: MI/MIT UNIT/S:

SUBJECT: MAGNEPLANE

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
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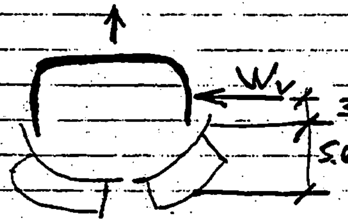
VOID			DATE	DATE
SHEET	OF			
J.O	6869002			

30' 45'

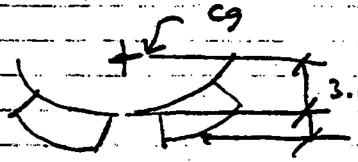
WIND ON VEHICLE : UP = 2.5 ^{K} UP = 2.5 ^{K}

$W_V = 6.8$



BREAKING 0.65 g (.65)(110) = 71.5 ^{K} / VEHICLE

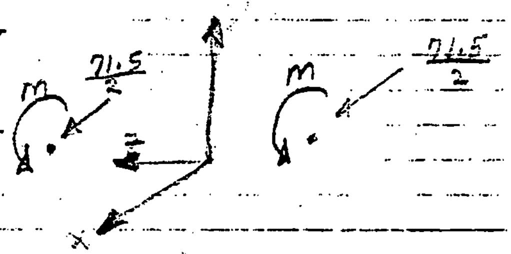
BREAK PADS @ RAILS



MOMENT ARM = [illegible] + 1 = 5.6 [30]
5.9 + 1 = [illegible] [45]

$M_{30} = \left(\frac{71.5}{2}\right)(5.6) = 200$ K-FT

$M_{45} = \left(\frac{71.5}{2}\right)(6.9) = 247$ K-FT



B-6

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors

A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARCEL	
FINAL			DATE 6-24-92	DATE
VOID				
SHEET	OF		DATE	DATE
J.O.				

NAME OF COMPANY MI/MIT UNIT/S

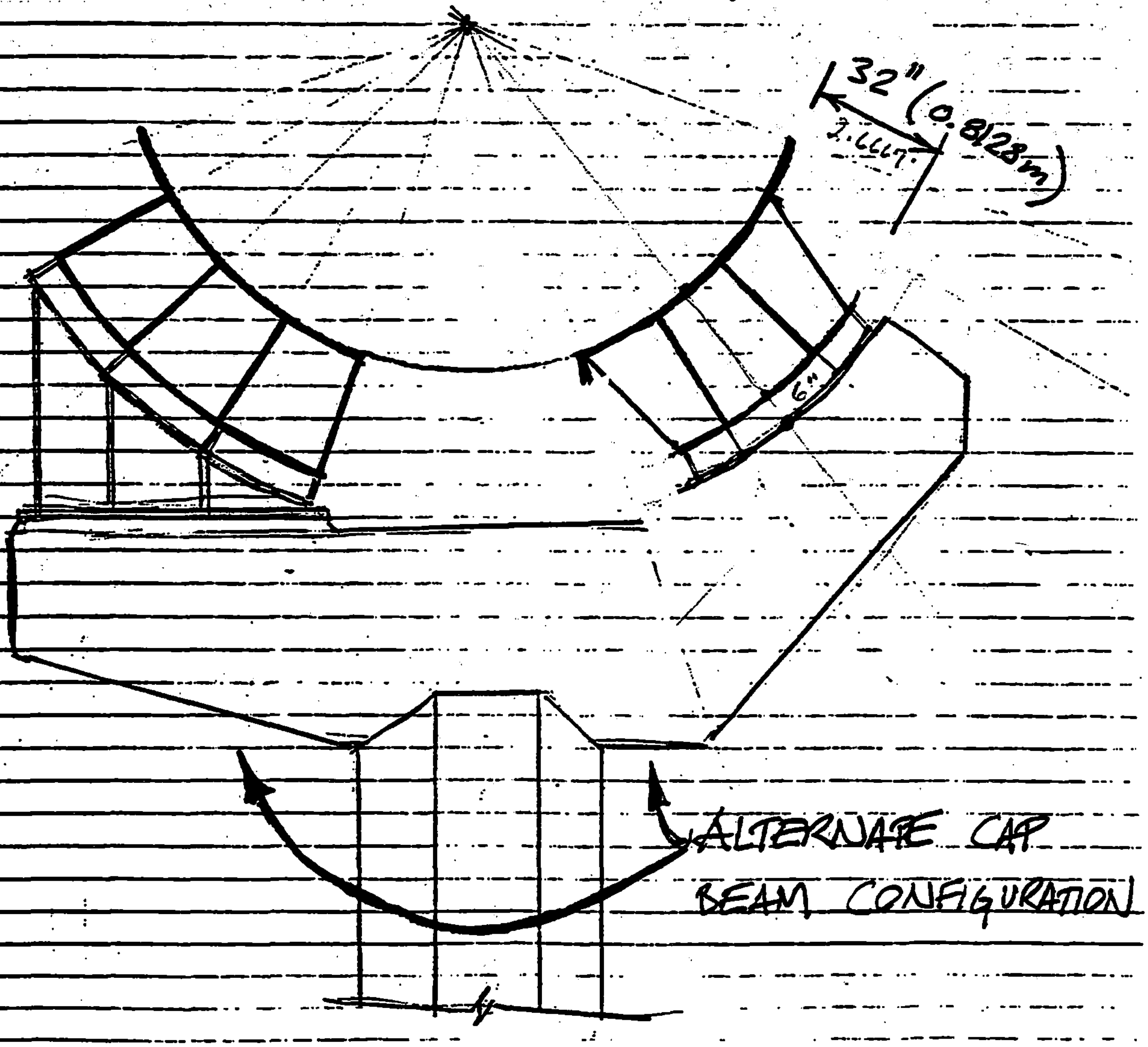
SUBJECT GUIDEWAY TROUGH

1" = 1m

9.14m (30' SPAN)

d = 0.8128 m (32")

ELEVATED ALUMINUM BOX BEAM SPANNING 30' BETWEEN SUPPORTING CONCRETE PIERS



ALTERNATE CAP BEAM CONFIGURATION

B-7

FORM 5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER	
FINAL			DATE 6-24-92	DATE
VOID				
SHEET	OF		DATE	DATE
J.O				

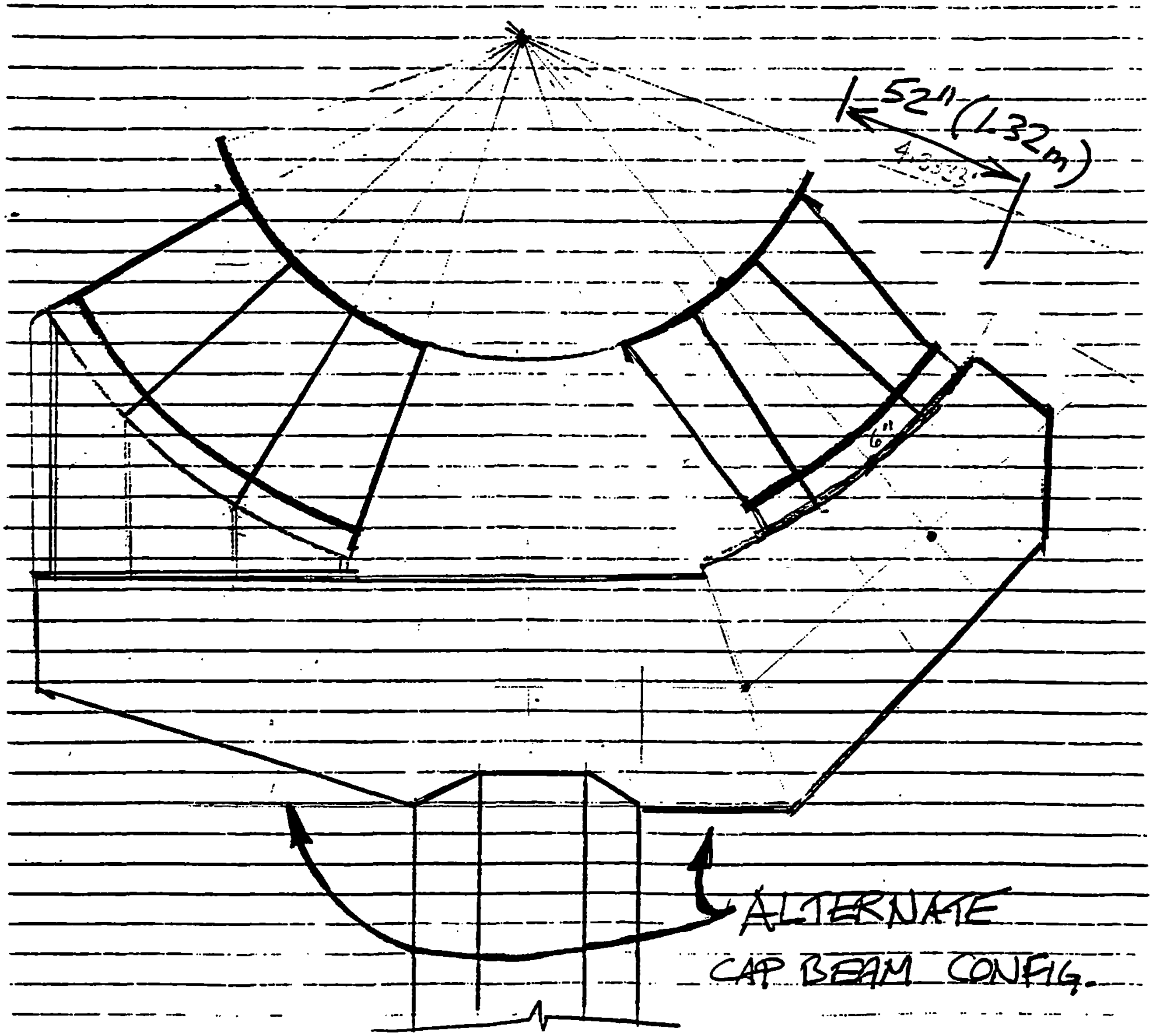
NAME OF COMPANY MI/MIT UNIT/S

SUBJECT GUIDEWAY TROUGH

13.716 m (45')

d = 1.3208 m (52")

ELEVATED
ALUMINUM BOX BEAM
SPANNING 45' BETWEEN
SUPPORTING PIERS



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**************************************************
*                                                *
*            S T A A D - III                     *
*            REVISION 14.1c(VERSION 14 LEVEL 1)  *
*            PROPRIETARY PROGRAM OF              *
*            RESEARCH ENGINEERS,INC.             *
*            DATE=    JUL 17, 1992               *
*            TIME=    15:52: 2                   *
*                                                *
**************************************************

STAAD SPACE MAGRAIL 30 FT SPAN
UNIT KIP FEET
INPUT WIDTH 79
JOINT COORDINATES
*  JOINT       X        Y        Z
       1       0        0  -9.0228
       2       0        2  -9.0228
       3       0        4  -9.0228
       4       0        6  -9.0228
       5       0        8  -9.0228
       6       0       10  -9.0228
       7       0       12  -9.0228
      11       0        0   9.0228
      12       0        2   9.0228
      13       0        4   9.0228
      14       0        6   9.0228
      15       0        8   9.0228
      16       0       10   9.0228
      17       0       12   9.0228
      21       0 17.349 -15.6535
      22       0 15.195 -12.6882
      23       0 15.195  -9.0228
      24       0 15.195  -5.3574
      25       0 16.195  -3.3574
      26       0 17.195  -1.3574
      27       0 17.195   0.0000
      28       0 17.195   1.3574
      29       0 16.195   3.3574
      30       0 15.195   5.3574
      31       0 15.195   9.0228
      32       0 15.195  12.6882
      33       0 17.349  15.6535
      41       0 27.056  -9.0228
      42       0 27.056   9.0228
MEMBER INCIDENCES
       1       1        2
       2       2        3
       3       3        4
       4       4        5
       5       5        6
       6       6        7
       7       7       23
      11      11       12
      12      12       13
      13      13       14
      14      14       15
      15      15       16
```

```
 49.        17      17      31
 50.        21      21      22
 51.        22      22      23
 52.        23      23      24
 53.        24      24      25
 54.        25      25      26
 55.        26      26      27
 56.        27      27      28
 57.        28      28      29
 58.        29      29      30
 59.        30      30      31
 60.        31      31      32
 61.        32      32      33
 62.        41      21      41
 63.        42      26      41
 64.        43      28      42
 65.        44      33      42
 66. UNIT KIP IN
 67. MEMBER PROPERTIES
 68.         1 PRISM  YD          33           IZ  29106.8 IY 29106.88
 69.         2 PRISM  YD          33           IZ  29106.8 IY 29106.88
 70.         3 PRISM  YD          33           IZ  29106.8 IY 29106.88
 71.         4 PRISM  YD          33           IZ  29106.8 IY 29106.88
 72.         5 PRISM  YD          33           IZ  29106.8 IY 29106.88
 73.         6 PRISM  YD          33           IZ  29106.8 IY 29106.88
 74.         7 PRISM  YD          33           IZ  29106.8 IY 29106.88
 75.        11 PRISM  YD          33           IZ  29106.8 IY 29106.88
 76.        12 PRISM  YD          33           IZ  29106.8 IY 29106.88
 77.        13 PRISM  YD          33           IZ  29106.8 IY 29106.88
 78.        14 PRISM  YD          33           IZ  29106.8 IY 29106.88
 79.        15 PRISM  YD          33           IZ  29106.8 IY 29106.88
 80.        16 PRISM  YD          33           IZ  29106.8 IY 29106.88
 81.        17 PRISM  YD          33           IZ  29106.8 IY 29106.88
 82.        21 PRISM  YD          44 ZD     33 IZ   117128 IY  65884.5
 83.        22 PRISM  YD          44 ZD     33 IZ   117128 IY  65884.5
 84.        23 PRISM  YD          44 ZD     33 IZ   117128 IY  65884.5
 85.        24 PRISM  YD          44 ZD     33 IZ   117128 IY  65884.5
 86.        25 PRISM  YD          76 ZD     33 IZ   603592 IY 113800.5
 87.        26 PRISM  YD          76 ZD     33 IZ   603592 IY 113800.5
 88.        27 PRISM  YD          76 ZD     33 IZ   603592 IY 113800.5
 89.        28 PRISM  YD          76 ZD     33 IZ   603592 IY 113800.5
 90.        29 PRISM  YD          44 ZD     33 IZ   117128 IY  65884.5
 91.        30 PRISM  YD          44 ZD     33 IZ   117128 IY  65884.5
 92.        31 PRISM  YD          44 ZD     33 IZ   117128 IY  65884.5
 93.        32 PRISM  YD          44 ZD     33 IZ   117128 IY  65884.5
 94.        41 PRISM  YD          12 ZD     12 IZ     1000 IY     1000
 95.        42 PRISM  YD          12 ZD     12 IZ     1000 IY     1000
 96.        43 PRISM  YD          12 ZD     12 IZ     1000 IY     1000
 97.        44 PRISM  YD          12 ZD     12 IZ     1000 IY     1000
 98. SUPPORTS
 99. 1 11     FIXED
100. MEMBER RELEASES
101. 41 42 43 44          START MZ
102. 41 42 43 44            END MZ
103. CONSTANTS
104. E        CONCRETE      ALL
105. DEN      CONCRETE      ALL
106. PRINT MEMBER INFORMATION
```

MEMBER INFORMATION

MEMBER	START JOINT	END JOINT	LENGTH (IN)	BETA (DEG)	RELEASES
1	1	2	24.000	0.00	000000000000
2	2	3	24.000	0.00	000000000000
3	3	4	24.000	0.00	000000000000
4	4	5	24.000	0.00	000000000000
5	5	6	24.000	0.00	000000000000
6	6	7	24.000	0.00	000000000000
7	7	23	38.340	0.00	000000000000
11	11	12	24.000	0.00	000000000000
12	12	13	24.000	0.00	000000000000
13	13	14	24.000	0.00	000000000000
14	14	15	24.000	0.00	000000000000
15	15	16	24.000	0.00	000000000000
16	16	17	24.000	0.00	000000000000
17	17	31	38.340	0.00	000000000000
21	21	22	43.981	0.00	000000000000
22	22	23	43.985	0.00	000000000000
23	23	24	43.985	0.00	000000000000
24	24	25	26.833	0.00	000000000000
25	25	26	26.833	0.00	000000000000
26	26	27	16.289	0.00	000000000000
27	27	28	16.289	0.00	000000000000
28	28	29	26.833	0.00	000000000000
29	29	30	26.833	0.00	000000000000
30	30	31	43.985	0.00	000000000000
31	31	32	43.985	0.00	000000000000
32	32	33	43.981	0.00	000000000000
41	21	41	141.066	0.00	000001000001
42	26	41	149.879	0.00	000001000001
43	28	42	149.879	0.00	000001000001
44	33	42	141.066	0.00	000001000001

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

107. PRINT MEMBER PROPERTIES

MEMBER PROPERTIES. UNIT - INCH

MEMB	PROFILE	AX/ AY	IZ/ AZ	IY/ SZ	IX/ SY
1	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
2	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
3	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
4	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
5	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
6	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
7	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
11	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
12	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
13	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
14	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
15	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
16	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
17	PRISMATIC	855.30	29106.80	29106.88	58213.68
		855.30	855.30	1764.05	1764.05
21	PRISMATIC	1452.00	117128.00	65884.50	278032.59
		1452.00	1452.00	5324.00	3993.00
22	PRISMATIC	1452.00	117128.00	65884.50	278032.59
		1452.00	1452.00	5324.00	3993.00
23	PRISMATIC	1452.00	117128.00	65884.50	278032.59
		1452.00	1452.00	5324.00	3993.00
24	PRISMATIC	1452.00	117128.00	65884.50	278032.59
		1452.00	1452.00	5324.00	3993.00
25	PRISMATIC	2508.00	603592.00	113800.50	661360.56
		2508.00	2508.00	15884.00	6897.00
26	PRISMATIC	2508.00	603592.00	113800.50	661360.56
		2508.00	2508.00	15884.00	6897.00
27	PRISMATIC	2508.00	603592.00	113800.50	661360.56
		2508.00	2508.00	15884.00	6897.00
28	PRISMATIC	2508.00	603592.00	113800.50	661360.56
		2508.00	2508.00	15884.00	6897.00
29	PRISMATIC	1452.00	117128.00	65884.50	278032.59
		1452.00	1452.00	5324.00	3993.00
30	PRISMATIC	1452.00	117128.00	65884.50	278032.59
		1452.00	1452.00	5324.00	3993.00

MEMBER PROPERTIES. UNIT - INCH

MEMB	PROFILE	AX/ AY	IZ/ AZ	IY/ SZ	IX/ SY
31	PRISMATIC	1452.00	117128.00	65884.50	278032.59
		1452.00	1452.00	5324.00	3993.00
32	PRISMATIC	1452.00	117128.00	65884.50	278032.59
		1452.00	1452.00	5324.00	3993.00
41	PRISMATIC	144.00	1000.00	1000.00	2557.44
		144.00	144.00	166.67	166.67
42	PRISMATIC	144.00	1000.00	1000.00	2557.44
		144.00	144.00	166.67	166.67
43	PRISMATIC	144.00	1000.00	1000.00	2557.44
		144.00	144.00	166.67	166.67
44	PRISMATIC	144.00	1000.00	1000.00	2557.44
		144.00	144.00	166.67	166.67

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

108. PRINT MATERIAL PROPERTIES

MATERIAL PROPERTIES.

ALL UNITS ARE - KIP IN

MEMBER	E	G	DEN	ALPHA
1	3150.0	1575.0	0.00008680	0.00000000
2	3150.0	1575.0	0.00008680	0.00000000
3	3150.0	1575.0	0.00008680	0.00000000
4	3150.0	1575.0	0.00008680	0.00000000
5	3150.0	1575.0	0.00008680	0.00000000
6	3150.0	1575.0	0.00008680	0.00000000
7	3150.0	1575.0	0.00008680	0.00000000
11	3150.0	1575.0	0.00008680	0.00000000
12	3150.0	1575.0	0.00008680	0.00000000
13	3150.0	1575.0	0.00008680	0.00000000
14	3150.0	1575.0	0.00008680	0.00000000
15	3150.0	1575.0	0.00008680	0.00000000
16	3150.0	1575.0	0.00008680	0.00000000
17	3150.0	1575.0	0.00008680	0.00000000
21	3150.0	1575.0	0.00008680	0.00000000
22	3150.0	1575.0	0.00008680	0.00000000
23	3150.0	1575.0	0.00008680	0.00000000
24	3150.0	1575.0	0.00008680	0.00000000
25	3150.0	1575.0	0.00008680	0.00000000
26	3150.0	1575.0	0.00008680	0.00000000
27	3150.0	1575.0	0.00008680	0.00000000
28	3150.0	1575.0	0.00008680	0.00000000
29	3150.0	1575.0	0.00008680	0.00000000
30	3150.0	1575.0	0.00008680	0.00000000
31	3150.0	1575.0	0.00008680	0.00000000
32	3150.0	1575.0	0.00008680	0.00000000
41	3150.0	1575.0	0.00008680	0.00000000
42	3150.0	1575.0	0.00008680	0.00000000
43	3150.0	1575.0	0.00008680	0.00000000
44	3150.0	1575.0	0.00008680	0.00000000

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

```
109. UNIT KIP FEET
110. LOAD 1 SELFWEIGHT
111. SELFWEIGHT Y -1
112. LOAD 2 DEAD LOADS
113. * AL BOX BEAM
114. JOINT LOAD
115. 21 26 28 33                      FY    -4.11
116. * UTILITIES AT 100 PLF
117. 21 26 28 33                      FY     -1.5
118. * LSM AT 100 PLF
119. 21 26 28 33                      FY     -1.5
120. LOAD 3 VEHICLE 1 AT 55 KIP PER END
121. JOINT LOAD
122. 41                               FY      -55
```

```
LOAD 4 VEHICLE 2 AT 55 KIP PER END
JOINT LOAD
42                              FY      -55
LOAD 5 SNOW 1
JOINT LOAD
21 26                           FY    -9.84
LOAD 6 SNOW 2
JOINT LOAD
28 33                           FY    -9.84
LOAD 7 WIND ON STRUCTURE+Z
JOINT LOAD
21 26                           FZ      5.5
28 33                           FZ     2.75
LOAD 8 WIND ON VEHICLE 1 +Z
JOINT LOAD
41                              FZ      6.8
41                              FY      2.5
LOAD 9 WIND ON VEHICLE 2 +Z
JOINT LOAD
42                              FZ      6.8
42                              FY      2.5
LOAD 10 BRAKING VEHICLE 1 +X
JOINT LOAD
21 26                           FX    35.75
21 26                           MZ     -100
LOAD 11 BRAKING VEHICLE 2 +X
JOINT LOAD
28 33                           FX    35.75
28 33                           MZ     -100
*THE FOLLOWING HAVE BEEN FACTORED FOR CONCRETE DESIGN
LOAD COMB 20 SW + DL
1  1.4  2  1.4
LOAD COMB 21 SW + DL + SNOW 1 + SNOW 2
1  1.4  2  1.4  5  1.7  6  1.7
LOAD COMB 22 SW + DL + VEH 1
1  1.4  2  1.4  3  1.4
LOAD COMB 23 SW + DL + VEH 1 + VEH 2
1  1.4  2  1.4  3  1.4  4  1.4
* THE FOLLOWING ARE BRAKING CASES WITH .75 FACTOR
LOAD COMB 24 SW + DL + VEH 1 + BRAKING 1
1  1.05  2  1.05  3  1.05  10  1.05
LOAD COMB 25 SW + DL + VEH 1 - BRAKING 1
1  1.05  2  1.05  3  1.05  10  -1.05
LOAD COMB 26 SW + DL + VEH 1 + VEH 2 + BRAKING 1 + BRAKING 2
1  1.05  2  1.05  3  1.05  4  1.05  10  1.05  11  1.05
LOAD COMB 27 SW + DL + VEH 1 + VEH 2 + BRAKING 1 - BRAKING 2
1  1.05  2  1.05  3  1.05  4  1.05  10  1.05  11 -1.05
* THE FOLLOWING ARE WIND COMBINATIONS
LOAD COMB 28 SW + DL + WIND ON STRUCTURE
1  1.05 2  1.05  7  1.275
LOAD COMB 29 SW + DL + VEH 1 + REDUCED WIND ON VEH 1 AND STRUCTURE +X
1  1.05 2  1.05  3  1.05  7 .166  8  1.275
LOAD COMB 30 SW + DL + VEH 1 + REDUCED WIND ON VEH 1 AND STRUCTURE -X
1  1.05 2  1.05  3  1.05  7 -.166  8  -1.275
LOAD COMB 31 SW + DL + VEH 1 & 2 + REDUCED WIND ON VEHS AND STRUCTURE +X
1  1.05 2  1.05  3  1.05  4  1.05  7 .166  8  1.275  9 1.275
LOAD COMB 32 SW + DL + VEH 1 & 2 + REDUCED WIND ON VEHS AND STRUCTURE -X
1  1.05 2  1.05  3  1.05  4  1.05  7 -.166  8  -1.275  9 -1.275
PERFORM ANALYSIS
```

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

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =    29/   30/    2
ORIGINAL/FINAL BAND-WIDTH =   13/    2
TOTAL PRIMARY LOAD CASES  =   11, TOTAL DEGREES OF FREEDOM =    162
SIZE OF STIFFNESS MATRIX =    2916 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE =   12.12 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.              15:52:10
++ PROCESSING GLOBAL STIFFNESS MATRIX.               15:52:11
++ PROCESSING TRIANGULAR FACTORIZATION.              15:52:12
++ CALCULATING JOINT DISPLACEMENTS.                  15:52:13
++ CALCULATING ELEMENT FORCES.                       15:52:15

 182. PARAMETERS
 183. TRACK 2.0 ALL
 184. LOAD LIST 20 TO 32
 185. START CONCRETE DESIGN

 186. DESIGN COLUMN        1 TO        7
```

COLUMN NO. 1 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 39.650 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
10 - NUMBER 18 (EQUALLY SPACED)	4.677	26	STA	0.829

COLUMN NO. 2 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 35.306 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
28 - NUMBER 10 (EQUALLY SPACED)	4.158	26	STA	0.830

COLUMN NO. 3 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 30.976 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
31 - NUMBER 9 (EQUALLY SPACED)	3.624	26	STA	0.831

COLUMN NO. 4 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 26.659 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
21 - NUMBER 10 (EQUALLY SPACED)	3.118	26	STA	0.832

COLUMN NO. 5 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 22.357 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
10 - NUMBER 14 (EQUALLY SPACED)	2.631	26	STA	0.833

COLUMN NO. 6 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 18.071 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
23 - NUMBER 8 (EQUALLY SPACED)	2.124	26	STA	0.834

COLUMN NO. 7 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 13.805 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI

45 - NUMBER 5 (EQUALLY SPACED)	1.631	26	STA	0.835

********************END OF COLUMN DESIGN RESULTS********************

187. DESIGN COLUMN 11 TO 17

COLUMN NO. 11 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 39.650 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
10 - NUMBER 18 (EQUALLY SPACED)	4.677	26	STA	0.829

COLUMN NO. 12 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 35.306 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
28 - NUMBER 10 (EQUALLY SPACED)	4.158	26	STA	0.830

COLUMN NO. 13 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 30.976 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
31 - NUMBER 9 (EQUALLY SPACED)	3.624	26	STA	0.831

COLUMN NO. 14 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 26.659 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
21 - NUMBER 10 (EQUALLY SPACED)	3.118	26	STA	0.832

C O L U M N N O. 15 D E S I G N R E S U L T S

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 22.357 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
10 - NUMBER 14 (EQUALLY SPACED)	2.631	26	STA	0.833

C O L U M N N O. 16 D E S I G N R E S U L T S

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 18.071 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
23 - NUMBER 8 (EQUALLY SPACED)	2.124	26	STA	0.834

C O L U M N N O. 17 D E S I G N R E S U L T S

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 13.805 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI

45 - NUMBER 5 (EQUALLY SPACED)	1.631	26	STA	0.835

********************END OF COLUMN DESIGN RESULTS********************

188. DESIGN BEAM 21 TO 32

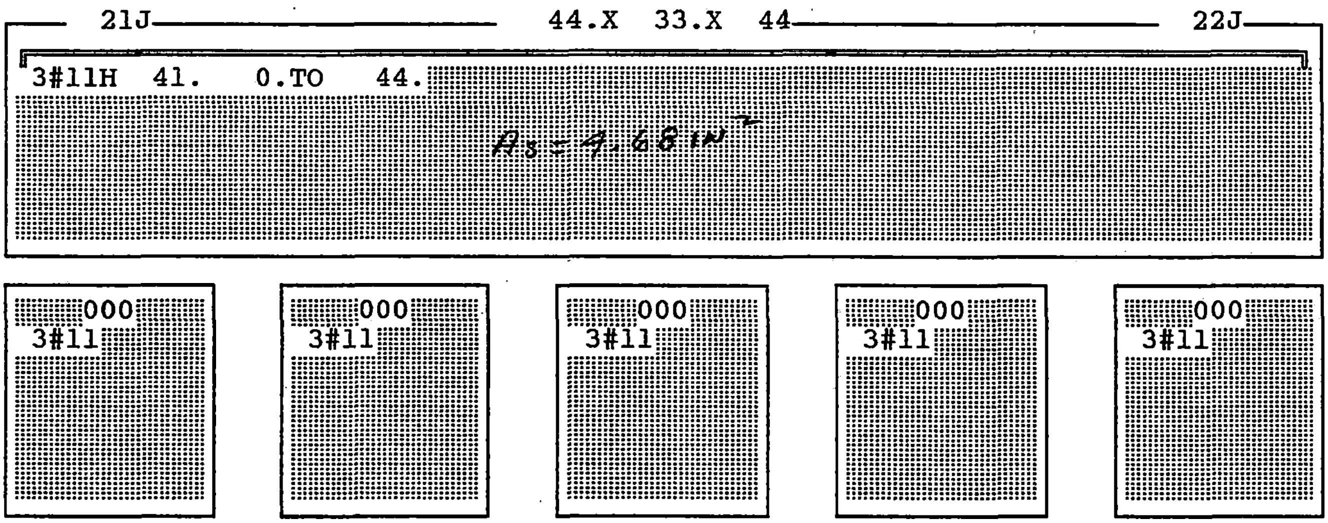
B E A M N O. 21 D E S I G N R E S U L T S - FLEXURE

LEN - 3.67FT. FY - 60000. FC - 4000. SIZE - 33.00 X 44.00 INCHES

LEVEL	HEIGHT FT. + IN.	BAR INFO	FROM FT. + IN.	TO FT. + IN.	ANCHOR STA	ANCHOR END
1	3 + 5-1/2	3-NUM.11	0 + 0-0/0	3 + 8-0/0	YES	YES

B E A M N O. 21 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



B E A M N O. 22 D E S I G N R E S U L T S - FLEXURE

LEN - 3.67FT. FY - 60000. FC - 4000. SIZE - 33.00 X 44.00 INCHES

LEVEL	HEIGHT FT. + IN.	BAR INFO	FROM FT. + IN.	TO FT. + IN.	ANCHOR STA	ANCHOR END
1	3 + 5-1/2	3-NUM.11	0 + 0-0/0	3 + 8-0/0	YES	YES

B E A M N O. 22 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.

```
22J                     44.X  33.X  44                     23J
3#11H  41.   0.TO   44.
```

$A_s = 4.68$ in^2

```
000     000     000     000     000
3#11    3#11    3#11    3#11    3#11
```

==

B E A M   N O.   23   D E S I G N   R E S U L T S -   FLEXURE

LEN - 3.67FT. FY - 60000. FC - 4000. SIZE - 33.00 X 44.00 INCHES

LEVEL	HEIGHT FT.	HEIGHT IN.	BAR INFO	FROM FT.	FROM IN.	TO FT.	TO IN.	ANCHOR STA	ANCHOR END
1	0 +	3-0/0	3-NUM.11	0 +	0-0/0	3 +	8-0/0	YES	YES
2	3 +	5-1/2	3-NUM.11	0 +	0-0/0	3 +	8-0/0	YES	YES

B E A M   N O.   23   D E S I G N   R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.

```
23J                     44.X  33.X  44                     24J
3#11H  41.   0.TO   44.
```

$A_s = 4.68$ in^2 ✓

```
3#11H   3.   0.TO   44.
```

$A_s = 4.68$ in.^{2}

```
000     000     000     000     000
3#11    3#11    3#11    3#11    3#11

3#11    3#11    3#11    3#11    3#11
000     000     000     000     000
```

==

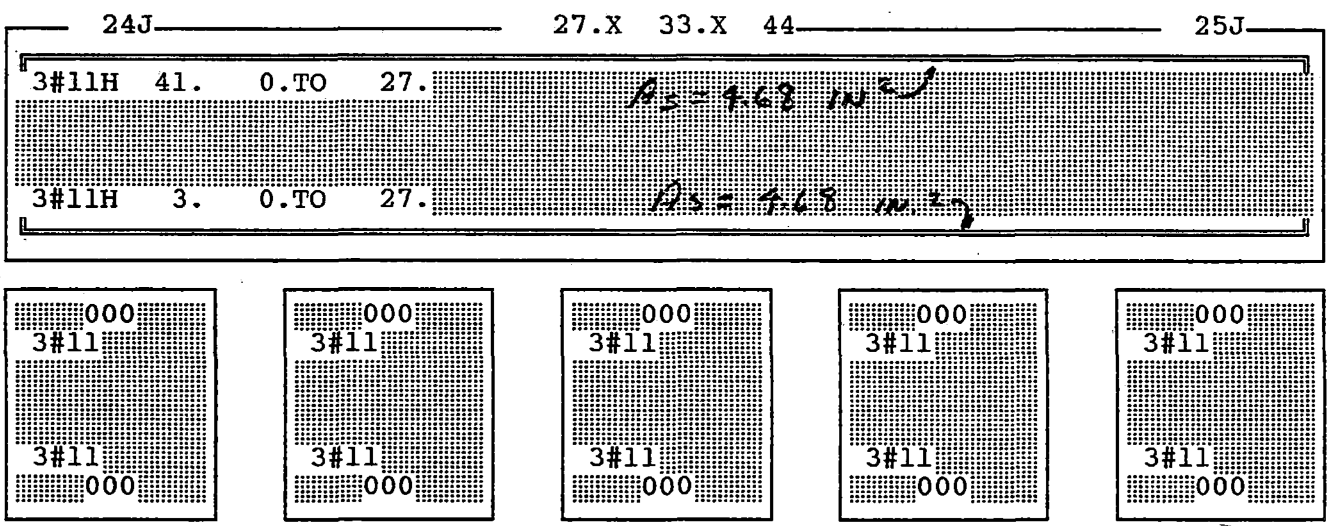
B E A M N O. 24 D E S I G N R E S U L T S - FLEXURE

LEN - 2.24FT. FY - 60000. FC - 4000. SIZE - 33.00 X 44.00 INCHES

LEVEL	HEIGHT FT. + IN.	BAR INFO	FROM FT. + IN.	TO FT. + IN.	ANCHOR STA	ANCHOR END
1	0 + 3-0/0	3-NUM.11	0 + 0-0/0	2 + 3-0/0	YES	YES
2	3 + 5-1/2	3-NUM.11	0 + 0-0/0	2 + 3-0/0	YES	YES

B E A M N O. 24 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



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B E A M N O. 25 D E S I G N R E S U L T S - FLEXURE

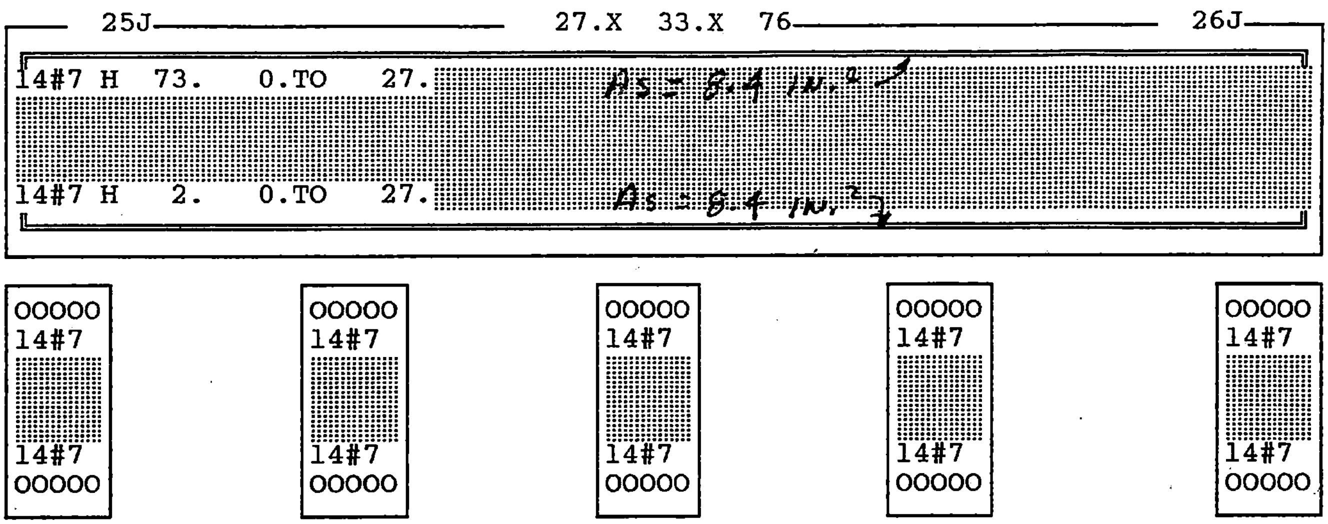
LEN - 2.24FT. FY - 60000. FC - 4000. SIZE - 33.00 X 76.00 INCHES

LEVEL	HEIGHT FT. + IN.	BAR INFO	FROM FT. + IN.	TO FT. + IN.	ANCHOR STA	ANCHOR END
1	0 + 2-1/2	14-NUM.7	0 + 0-0/0	2 + 3-0/0	YES	YES
2	6 + 1-1/2	14-NUM.7	0 + 0-0/0	2 + 3-0/0	YES	YES

B E A M N O. 25 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=221.67 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.

AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=221.67 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



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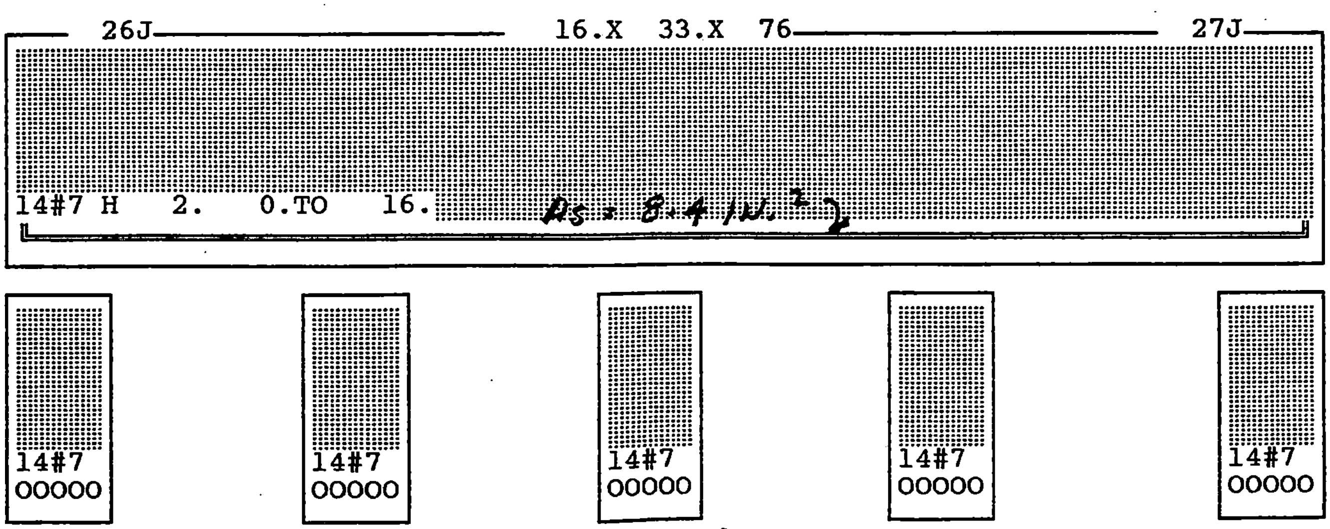
BEAM NO. 26 DESIGN RESULTS - FLEXURE

LEN - 1.36FT. FY - 60000. FC - 4000. SIZE - 33.00 X 76.00 INCHES

LEVEL	HEIGHT FT. IN.	BAR INFO	FROM FT. IN.	TO FT. IN.	ANCHOR STA	ANCHOR END
1	0 + 2-1/2	14-NUM.7	0 + 0-0/0	1 + 4-1/2	YES	YES

BEAM NO. 26 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=221.67 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=221.67 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



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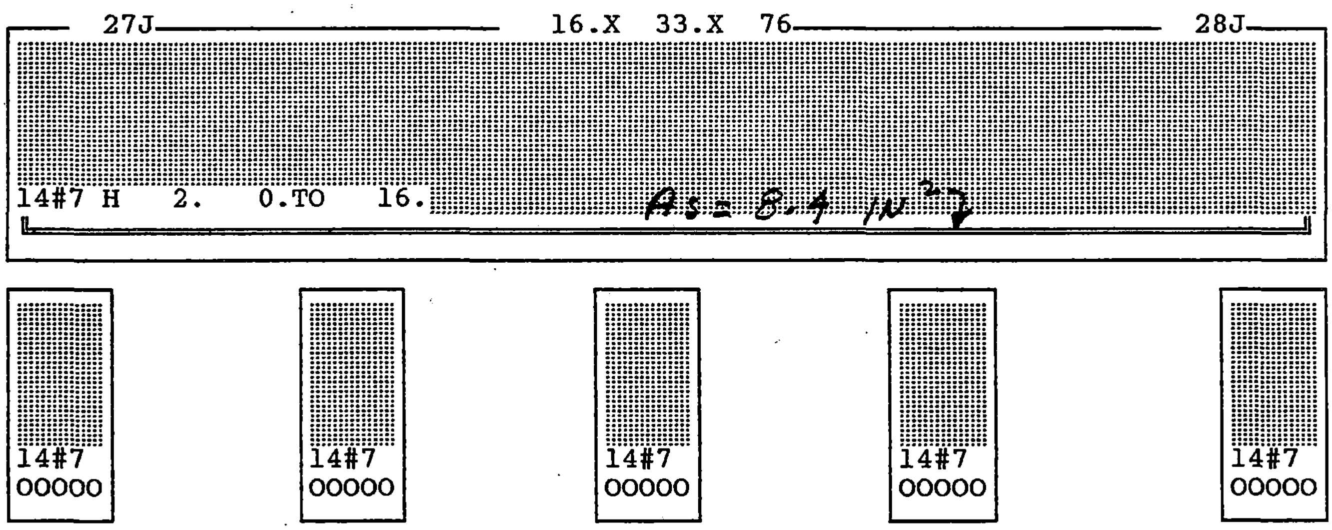
B E A M N O. 27 D E S I G N R E S U L T S - FLEXURE

LEN - 1.36FT. FY - 60000. FC - 4000. SIZE - 33.00 X 76.00 INCHES

LEVEL	HEIGHT FT. + IN.	BAR INFO	FROM FT. + IN.	TO FT. + IN.	ANCHOR STA	ANCHOR END
1	0 + 2-1/2	14-NUM.7	0 + 0-0/0	1 + 4-1/2	YES	YES

B E A M N O. 27 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=221.67 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=221.67 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



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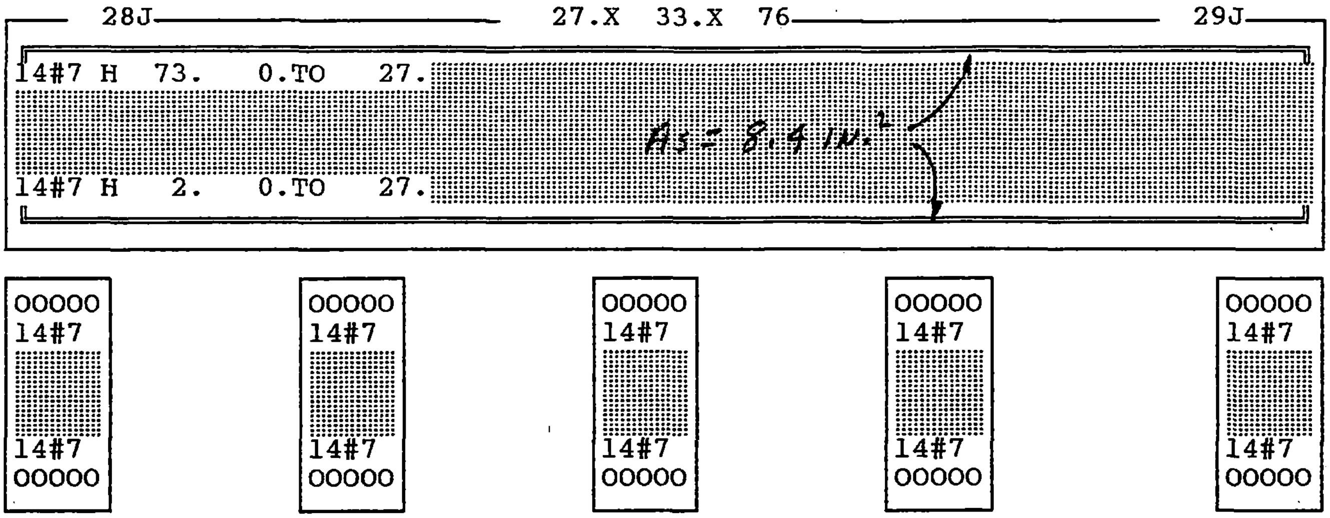
B E A M N O. 28 D E S I G N R E S U L T S - FLEXURE

LEN - 2.24FT. FY - 60000. FC - 4000. SIZE - 33.00 X 76.00 INCHES

LEVEL	HEIGHT FT. + IN.	BAR INFO	FROM FT. + IN.	TO FT. + IN.	ANCHOR STA	ANCHOR END
1	0 + 2-1/2	14-NUM.7	0 + 0-0/0	2 + 3-0/0	YES	YES
2	6 + 1-1/2	14-NUM.7	0 + 0-0/0	2 + 3-0/0	YES	YES

B E A M N O. 28 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=221.67 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=221.67 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



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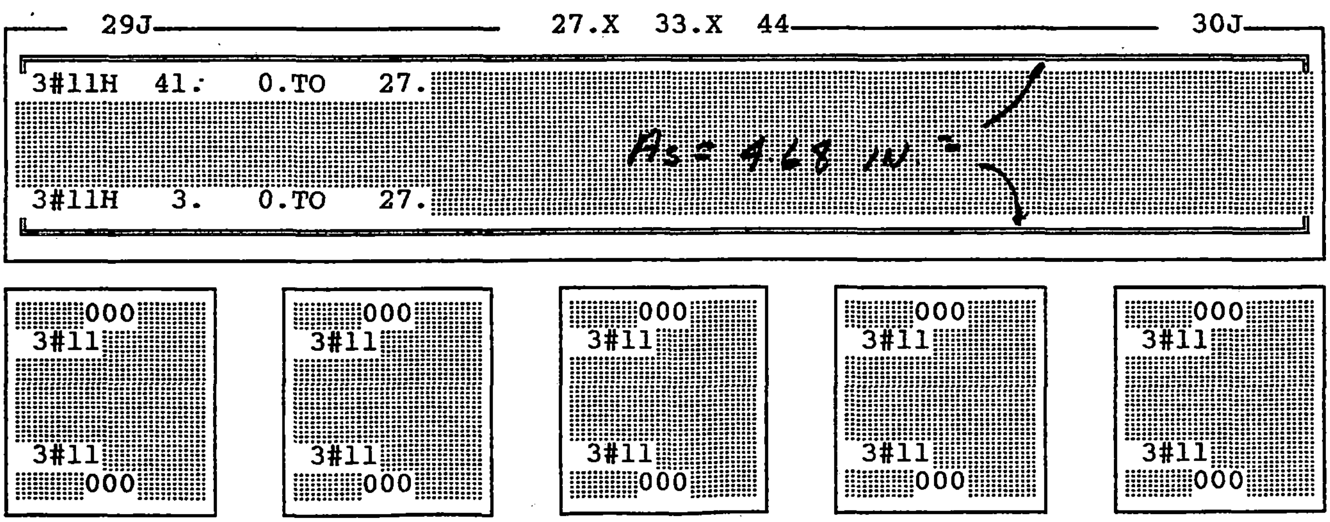
B E A M N O. 29 D E S I G N R E S U L T S - FLEXURE

LEN - 2.24FT. FY - 60000. FC - 4000. SIZE - 33.00 X 44.00 INCHES

LEVEL	HEIGHT FT.	HEIGHT IN.	BAR INFO	FROM FT.	FROM IN.	TO FT.	TO IN.	ANCHOR STA	ANCHOR END
1	0 +	3-0/0	3-NUM.11	0 +	0-0/0	2 +	3-0/0	YES	YES
2	3 +	5-1/2	3-NUM.11	0 +	0-0/0	2 +	3-0/0	YES	YES

B E A M N O. 29 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



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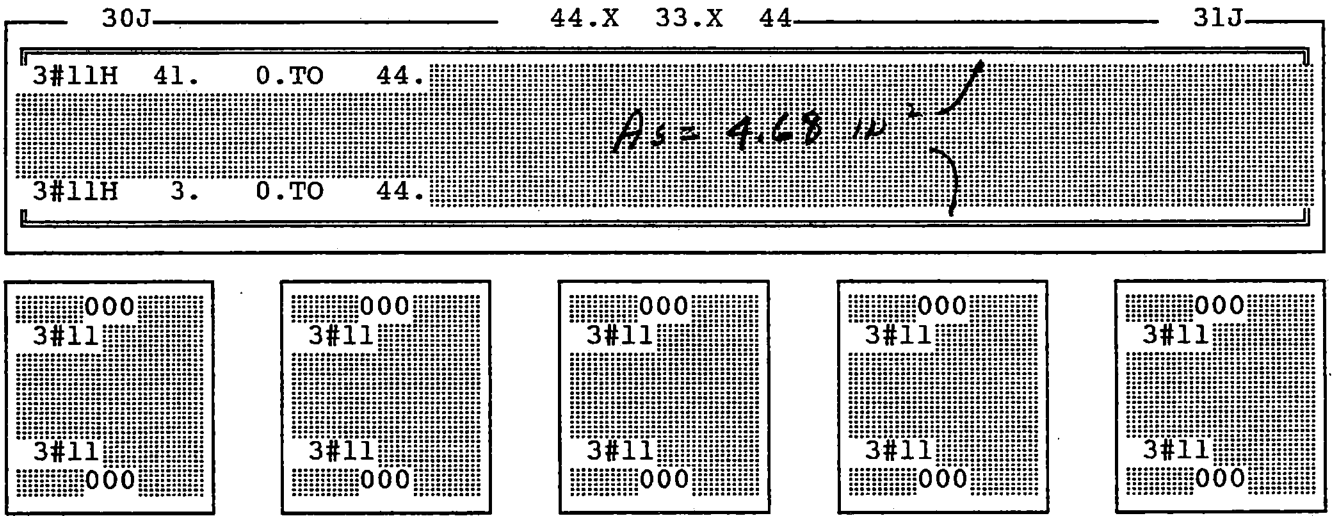
B E A M N O. 30 D E S I G N R E S U L T S - FLEXURE

LEN - 3.67FT. FY - 60000. FC - 4000. SIZE - 33.00 X 44.00 INCHES

LEVEL	HEIGHT FT. + IN.	BAR INFO	FROM FT. + IN.	TO FT. + IN.	ANCHOR STA	ANCHOR END
1	0 + 3-0/0	3-NUM.11	0 + 0-0/0	3 + 8-0/0	YES	YES
2	3 + 5-1/2	3-NUM.11	0 + 0-0/0	3 + 8-0/0	YES	YES

B E A M N O. 30 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



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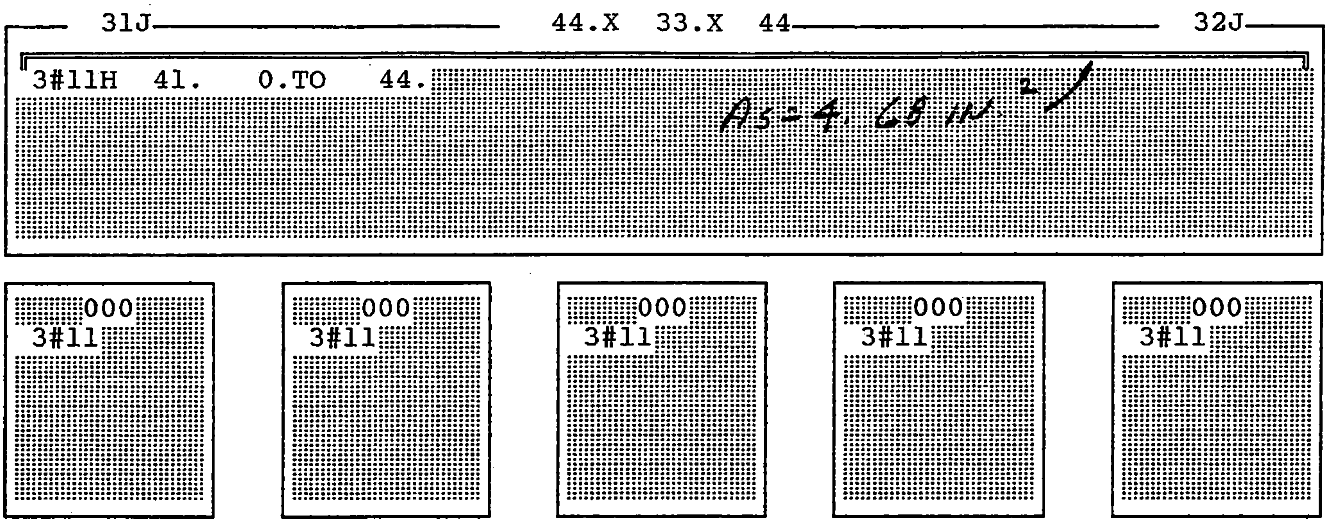
B E A M N O. 31 D E S I G N R E S U L T S - FLEXURE

LEN - 3.67FT. FY - 60000. FC - 4000. SIZE - 33.00 X 44.00 INCHES

LEVEL	HEIGHT FT. + IN.	BAR INFO	FROM FT. + IN.	TO FT. + IN.	ANCHOR STA	ANCHOR END
1	3 + 5-1/2	3-NUM.11	0 + 0-0/0	3 + 8-0/0	YES	YES

B E A M N O. 31 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



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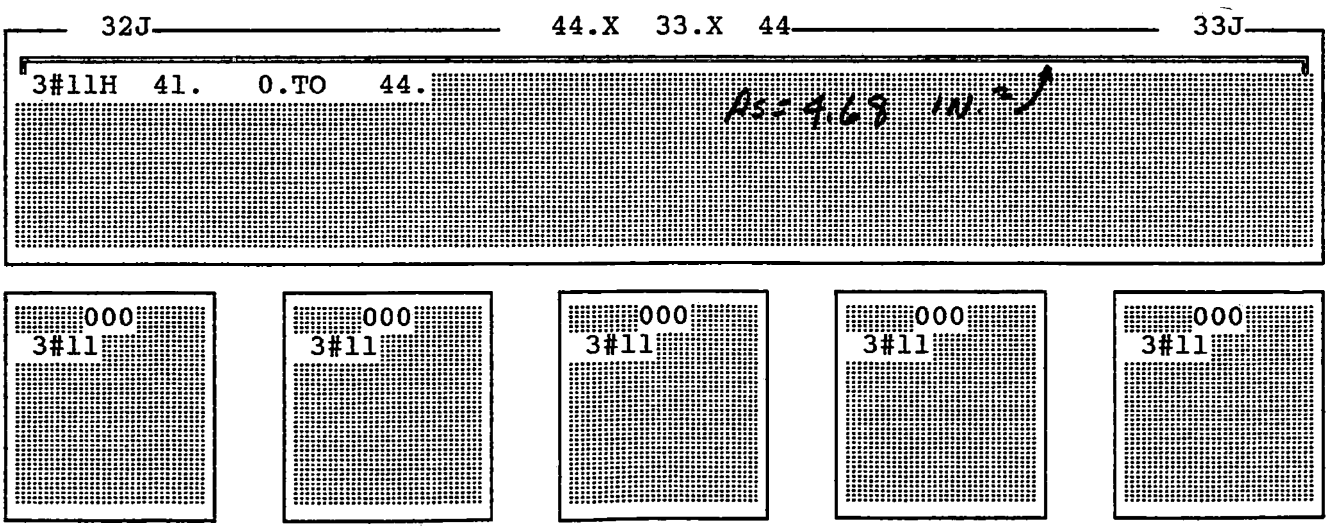
B E A M N O. 32 D E S I G N R E S U L T S - FLEXURE

LEN - 3.67FT. FY - 60000. FC - 4000. SIZE - 33.00 X 44.00 INCHES

LEVEL	HEIGHT FT.	HEIGHT IN.	BAR INFO	FROM FT.	FROM IN.	TO FT.	TO IN.	ANCHOR STA	ANCHOR END
1	3 +	5-1/2	3-NUM.11	0 +	0-0/0	3 +	8-0/0	YES	YES

B E A M N O. 32 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=125.16 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



********************END OF BEAM DESIGN**************************

189. END CONCRETE DESIGN
190. LOAD LIST 1 TO 11
191. PRINT SUPPORT REACTIONS

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	0.00	46.57	0.16	1.01	0.00	0.00
	2	0.00	14.22	-0.66	-3.29	0.00	0.00
	3	0.00	54.31	-2.05	-3.91	0.00	0.00
	4	0.00	0.69	-2.05	-16.37	0.00	0.00
	5	0.00	18.93	-0.46	-0.62	0.00	0.00
	6	0.00	0.75	-0.46	-3.93	0.00	0.00
	7	0.00	-8.46	-8.18	-65.86	0.00	0.00
	8	0.00	-9.54	-2.53	-23.97	0.00	0.00
	9	0.00	-7.11	-4.09	-31.39	0.00	0.00
	10	-60.54	0.00	0.00	0.00	90.45	934.71
	11	-10.96	0.00	0.00	0.00	-70.36	500.24
11	1	0.00	46.57	-0.16	-1.01	0.00	0.00
	2	0.00	14.22	0.66	3.29	0.00	0.00
	3	0.00	0.69	2.05	16.37	0.00	0.00
	4	0.00	54.31	2.05	3.91	0.00	0.00
	5	0.00	0.75	0.46	3.93	0.00	0.00
	6	0.00	18.93	0.46	0.62	0.00	0.00
	7	0.00	8.46	-8.32	-66.51	0.00	0.00
	8	0.00	7.04	-4.27	-32.88	0.00	0.00
	9	0.00	4.61	-2.71	-24.33	0.00	0.00
	10	-10.96	0.00	0.00	0.00	70.36	500.24
	11	-60.54	0.00	0.00	0.00	-90.45	934.71

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

192. 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	0.00000	0.00000	0.00000
	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	10	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	11	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	1	0.00000	-0.00041	-0.00004	0.00000	0.00000	0.00000
	2	0.00000	-0.00013	0.00012	0.00001	0.00000	0.00000
	3	0.00000	-0.00048	0.00013	0.00001	0.00000	0.00000
	4	0.00000	-0.00001	0.00060	0.00004	0.00000	0.00000
	5	0.00000	-0.00017	0.00002	0.00000	0.00000	0.00000
	6	0.00000	-0.00001	0.00014	0.00001	0.00000	0.00000
	7	0.00000	0.00008	0.00242	0.00018	0.00000	0.00000
	8	0.00000	0.00009	0.00089	0.00007	0.00000	0.00000
	9	0.00000	0.00006	0.00115	0.00009	0.00000	0.00000
	10	0.03479	0.00000	0.00000	0.00000	-0.00028	-0.00275
	11	0.01878	0.00000	0.00000	0.00000	0.00022	-0.00154
3	1	0.00000	-0.00080	-0.00013	0.00000	0.00000	0.00000
	2	0.00000	-0.00025	0.00039	0.00001	0.00000	0.00000
	3	0.00000	-0.00097	0.00025	0.00000	0.00000	0.00000
	4	0.00000	-0.00001	0.00213	0.00008	0.00000	0.00000
	5	0.00000	-0.00034	0.00002	0.00000	0.00000	0.00000
	6	0.00000	-0.00001	0.00052	0.00002	0.00000	0.00000
	7	0.00000	0.00015	0.00858	0.00031	0.00000	0.00000
	8	0.00000	0.00017	0.00320	0.00012	0.00000	0.00000
	9	0.00000	0.00013	0.00406	0.00015	0.00000	0.00000
	10	0.13092	0.00000	0.00000	0.00000	-0.00057	-0.00511
	11	0.07361	0.00000	0.00000	0.00000	0.00044	-0.00300
4	1	0.00000	-0.00117	-0.00024	-0.00001	0.00000	0.00000
	2	0.00000	-0.00038	0.00070	0.00001	0.00000	0.00000
	3	0.00000	-0.00145	0.00005	-0.00002	0.00000	0.00000
	4	0.00000	-0.00002	0.00427	0.00010	0.00000	0.00000
	5	0.00000	-0.00051	-0.00008	-0.00001	0.00000	0.00000
	6	0.00000	-0.00002	0.00105	0.00002	0.00000	0.00000
	7	0.00000	0.00023	0.01723	0.00039	0.00000	0.00000
	8	0.00000	0.00026	0.00655	0.00015	0.00000	0.00000
	9	0.00000	0.00019	0.00809	0.00018	0.00000	0.00000
	10	0.27925	0.00000	0.00000	0.00000	-0.00085	-0.00710
	11	0.16285	0.00000	0.00000	0.00000	0.00066	-0.00440
5	1	0.00000	-0.00153	-0.00037	0.00000	0.00000	0.00000
	2	0.00000	-0.00051	0.00096	0.00001	0.00000	0.00000
	3	0.00000	-0.00194	-0.00079	-0.00005	0.00000	0.00000
	4	0.00000	-0.00002	0.00672	0.00010	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS)   STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	5	0.00000	-0.00067	-0.00033	-0.00002	0.00000	0.00000
	6	0.00000	-0.00003	0.00166	0.00003	0.00000	0.00000
	7	0.00000	0.00030	0.02715	0.00042	0.00000	0.00000
	8	0.00000	0.00034	0.01057	0.00017	0.00000	0.00000
	9	0.00000	0.00025	0.01265	0.00019	0.00000	0.00000
	10	0.47067	0.00000	0.00000	0.00000	-0.00114	-0.00870
	11	0.28485	0.00000	0.00000	0.00000	0.00088	-0.00573
6	1	0.00000	-0.00188	-0.00047	0.00000	0.00000	0.00000
	2	0.00000	-0.00063	0.00107	0.00000	0.00000	0.00000
	3	0.00000	-0.00242	-0.00257	-0.00010	0.00000	0.00000
	4	0.00000	-0.00003	0.00917	0.00010	0.00000	0.00000
	5	0.00000	-0.00084	-0.00082	-0.00003	0.00000	0.00000
	6	0.00000	-0.00003	0.00230	0.00003	0.00000	0.00000
	7	0.00000	0.00038	0.03709	0.00039	0.00000	0.00000
	8	0.00000	0.00043	0.01488	0.00018	0.00000	0.00000
	9	0.00000	0.00032	0.01711	0.00017	0.00000	0.00000
	10	0.69605	0.00000	0.00000	0.00000	-0.00142	-0.00993
	11	0.43794	0.00000	0.00000	0.00000	0.00110	-0.00700
7	1	0.00000	-0.00220	-0.00053	0.00000	0.00000	0.00000
	2	0.00000	-0.00076	0.00092	-0.00001	0.00000	0.00000
	3	0.00000	-0.00290	-0.00560	-0.00016	0.00000	0.00000
	4	0.00000	-0.00004	0.01130	0.00008	0.00000	0.00000
	5	0.00000	-0.00101	-0.00161	-0.00004	0.00000	0.00000
	6	0.00000	-0.00004	0.00288	0.00002	0.00000	0.00000
	7	0.00000	0.00045	0.04584	0.00032	0.00000	0.00000
	8	0.00000	0.00051	0.01909	0.00017	0.00000	0.00000
	9	0.00000	0.00038	0.02085	0.00013	0.00000	0.00000
	10	0.94625	0.00000	0.00000	0.00000	-0.00170	-0.01077
	11	0.62049	0.00000	0.00000	0.00000	0.00133	-0.00819
11	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	10	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	11	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	1	0.00000	-0.00041	0.00004	0.00000	0.00000	0.00000
	2	0.00000	-0.00013	-0.00012	-0.00001	0.00000	0.00000
	3	0.00000	-0.00001	-0.00060	-0.00004	0.00000	0.00000
	4	0.00000	-0.00048	-0.00013	-0.00001	0.00000	0.00000
	5	0.00000	-0.00001	-0.00014	-0.00001	0.00000	0.00000
	6	0.00000	-0.00017	-0.00002	0.00000	0.00000	0.00000
	7	0.00000	-0.00008	0.00245	0.00018	0.00000	0.00000
	8	0.00000	-0.00006	0.00121	0.00009	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	9	0.00000	-0.00004	0.00090	0.00007	0.00000	0.00000
	10	0.01878	0.00000	0.00000	0.00000	-0.00022	-0.00154
	11	0.03479	0.00000	0.00000	0.00000	0.00028	-0.00275
13	1	0.00000	-0.00080	0.00013	0.00000	0.00000	0.00000
	2	0.00000	-0.00025	-0.00039	-0.00001	0.00000	0.00000
	3	0.00000	-0.00001	-0.00213	-0.00008	0.00000	0.00000
	4	0.00000	-0.00097	-0.00025	0.00000	0.00000	0.00000
	5	0.00000	-0.00001	-0.00052	-0.00002	0.00000	0.00000
	6	0.00000	-0.00034	-0.00002	0.00000	0.00000	0.00000
	7	0.00000	-0.00015	0.00865	0.00031	0.00000	0.00000
	8	0.00000	-0.00013	0.00425	0.00015	0.00000	0.00000
	9	0.00000	-0.00008	0.00322	0.00012	0.00000	0.00000
	10	0.07361	0.00000	0.00000	0.00000	-0.00044	-0.00300
	11	0.13092	0.00000	0.00000	0.00000	0.00057	-0.00511
14	1	0.00000	-0.00117	0.00024	0.00001	0.00000	0.00000
	2	0.00000	-0.00038	-0.00070	-0.00001	0.00000	0.00000
	3	0.00000	-0.00002	-0.00427	-0.00010	0.00000	0.00000
	4	0.00000	-0.00145	-0.00005	0.00002	0.00000	0.00000
	5	0.00000	-0.00002	-0.00105	-0.00002	0.00000	0.00000
	6	0.00000	-0.00051	0.00008	0.00001	0.00000	0.00000
	7	0.00000	-0.00023	0.01736	0.00039	0.00000	0.00000
	8	0.00000	-0.00019	0.00848	0.00019	0.00000	0.00000
	9	0.00000	-0.00012	0.00656	0.00015	0.00000	0.00000
	10	0.16285	0.00000	0.00000	0.00000	-0.00066	-0.00440
	11	0.27925	0.00000	0.00000	0.00000	0.00085	-0.00710
15	1	0.00000	-0.00153	0.00037	0.00000	0.00000	0.00000
	2	0.00000	-0.00051	-0.00096	-0.00001	0.00000	0.00000
	3	0.00000	-0.00002	-0.00672	-0.00010	0.00000	0.00000
	4	0.00000	-0.00194	0.00079	0.00005	0.00000	0.00000
	5	0.00000	-0.00003	-0.00166	-0.00003	0.00000	0.00000
	6	0.00000	-0.00067	0.00033	0.00002	0.00000	0.00000
	7	0.00000	-0.00030	0.02733	0.00042	0.00000	0.00000
	8	0.00000	-0.00025	0.01326	0.00020	0.00000	0.00000
	9	0.00000	-0.00016	0.01050	0.00017	0.00000	0.00000
	10	0.28485	0.00000	0.00000	0.00000	-0.00088	-0.00573
	11	0.47067	0.00000	0.00000	0.00000	0.00114	-0.00870
16	1	0.00000	-0.00188	0.00047	0.00000	0.00000	0.00000
	2	0.00000	-0.00063	-0.00107	0.00000	0.00000	0.00000
	3	0.00000	-0.00003	-0.00917	-0.00010	0.00000	0.00000
	4	0.00000	-0.00242	0.00257	0.00010	0.00000	0.00000
	5	0.00000	-0.00003	-0.00230	-0.00003	0.00000	0.00000
	6	0.00000	-0.00084	0.00082	0.00003	0.00000	0.00000
	7	0.00000	-0.00038	0.03729	0.00039	0.00000	0.00000
	8	0.00000	-0.00031	0.01794	0.00018	0.00000	0.00000
	9	0.00000	-0.00021	0.01465	0.00017	0.00000	0.00000
	10	0.43794	0.00000	0.00000	0.00000	-0.00110	-0.00700
	11	0.69605	0.00000	0.00000	0.00000	0.00142	-0.00993
17	1	0.00000	-0.00220	0.00053	0.00000	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	2	0.00000	-0.00076	-0.00092	0.00001	0.00000	0.00000
	3	0.00000	-0.00004	-0.01130	-0.00008	0.00000	0.00000
	4	0.00000	-0.00290	0.00560	0.00016	0.00000	0.00000
	5	0.00000	-0.00004	-0.00288	-0.00002	0.00000	0.00000
	6	0.00000	-0.00101	0.00161	0.00004	0.00000	0.00000
	7	0.00000	-0.00045	0.04600	0.00031	0.00000	0.00000
	8	0.00000	-0.00038	0.02188	0.00014	0.00000	0.00000
	9	0.00000	-0.00025	0.01858	0.00015	0.00000	0.00000
	10	0.62049	0.00000	0.00000	0.00000	-0.00133	-0.00819
	11	0.94625	0.00000	0.00000	0.00000	0.00170	-0.01077
21	1	0.00000	-0.00565	-0.00174	-0.00005	0.00000	0.00000
	2	0.00000	-0.00786	-0.00273	-0.00011	0.00000	0.00000
	3	0.00000	-0.04483	-0.02998	-0.00063	0.00000	0.00000
	4	0.00000	0.00145	0.01378	0.00002	0.00000	0.00000
	5	0.00000	-0.01166	-0.00758	-0.00016	0.00000	0.00000
	6	0.00000	0.00078	0.00381	0.00001	0.00000	0.00000
	7	0.00000	0.00879	0.05723	0.00011	0.00000	0.00000
	8	0.00000	0.01361	0.02944	0.00019	0.00000	0.00000
	9	0.00000	0.00112	0.02402	0.00001	0.00000	0.00000
	10	1.88055	0.00000	0.00000	0.00000	-0.00279	-0.01180
	11	1.09267	0.00000	0.00000	0.00000	0.00168	-0.00995
22	1	0.00000	-0.00389	-0.00048	-0.00004	0.00000	0.00000
	2	0.00000	-0.00416	-0.00008	-0.00009	0.00000	0.00000
	3	0.00000	-0.02282	-0.01400	-0.00054	0.00000	0.00000
	4	0.00000	0.00078	0.01329	0.00002	0.00000	0.00000
	5	0.00000	-0.00616	-0.00366	-0.00014	0.00000	0.00000
	6	0.00000	0.00041	0.00354	0.00001	0.00000	0.00000
	7	0.00000	0.00483	0.05429	0.00011	0.00000	0.00000
	8	0.00000	0.00707	0.02470	0.00017	0.00000	0.00000
	9	0.00000	0.00084	0.02381	0.00001	0.00000	0.00000
	10	1.48115	0.00000	0.00000	0.00000	-0.00259	-0.01154
	11	0.89521	0.00000	0.00000	0.00000	0.00168	-0.00995
23	1	0.00000	-0.00269	-0.00047	0.00000	0.00000	0.00000
	2	0.00000	-0.00096	-0.00008	-0.00004	0.00000	0.00000
	3	0.00000	-0.00368	-0.01381	-0.00028	0.00000	0.00000
	4	0.00000	-0.00005	0.01329	0.00002	0.00000	0.00000
	5	0.00000	-0.00128	-0.00366	-0.00007	0.00000	0.00000
	6	0.00000	-0.00005	0.00354	0.00001	0.00000	0.00000
	7	0.00000	0.00057	0.05424	0.00009	0.00000	0.00000
	8	0.00000	0.00065	0.02466	0.00011	0.00000	0.00000
	9	0.00000	0.00048	0.02381	0.00001	0.00000	0.00000
	10	1.37474	0.00000	0.00000	0.00000	-0.00216	-0.01133
	11	0.96909	0.00000	0.00000	0.00000	0.00168	-0.00995
24	1	0.00000	-0.00420	-0.00047	0.00003	0.00000	0.00000
	2	0.00000	-0.00024	-0.00008	0.00000	0.00000	0.00000
	3	0.00000	0.00245	-0.01360	-0.00004	0.00000	0.00000
	4	0.00000	-0.00040	0.01331	0.00000	0.00000	0.00000
	5	0.00000	0.00006	-0.00366	-0.00001	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	6	0.00000	-0.00040	0.00355	0.00000	0.00000	0.00000
	7	0.00000	-0.00126	0.05426	0.00001	0.00000	0.00000
	8	0.00000	-0.00246	0.02464	0.00003	0.00000	0.00000
	9	0.00000	0.00096	0.02385	-0.00002	0.00000	0.00000
	10	1.28673	0.00000	0.00000	0.00000	-0.00190	-0.01114
	11	1.04632	0.00000	0.00000	0.00000	0.00181	-0.01035
25	1	0.00000	-0.00495	-0.00013	0.00001	0.00000	0.00000
	2	0.00000	-0.00035	-0.00004	0.00000	0.00000	0.00000
	3	0.00000	0.00219	-0.01341	0.00003	0.00000	0.00000
	4	0.00000	-0.00012	0.01318	-0.00002	0.00000	0.00000
	5	0.00000	-0.00004	-0.00363	0.00001	0.00000	0.00000
	6	0.00000	-0.00044	0.00357	0.00000	0.00000	0.00000
	7	0.00000	-0.00105	0.05420	-0.00002	0.00000	0.00000
	8	0.00000	-0.00273	0.02478	-0.00001	0.00000	0.00000
	9	0.00000	0.00145	0.02365	-0.00002	0.00000	0.00000
	10	1.37410	0.00000	0.00000	0.00000	-0.00192	-0.01099
	11	1.21750	0.00000	0.00000	0.00000	0.00194	-0.01065
26	1	0.00000	-0.00524	0.00000	0.00001	0.00000	0.00000
	2	0.00000	-0.00045	0.00000	0.00000	0.00000	0.00000
	3	0.00000	0.00129	-0.01293	0.00003	0.00000	0.00000
	4	0.00000	0.00042	0.01292	-0.00002	0.00000	0.00000
	5	0.00000	-0.00024	-0.00354	0.00001	0.00000	0.00000
	6	0.00000	-0.00038	0.00354	0.00000	0.00000	0.00000
	7	0.00000	-0.00052	0.05396	-0.00002	0.00000	0.00000
	8	0.00000	-0.00247	0.02465	-0.00001	0.00000	0.00000
	9	0.00000	0.00188	0.02346	-0.00002	0.00000	0.00000
	10	1.45892	0.00000	0.00000	0.00000	-0.00198	-0.01090
	11	1.39367	0.00000	0.00000	0.00000	0.00201	-0.01078
27	1	0.00000	-0.00529	0.00000	0.00000	0.00000	0.00000
	2	0.00000	-0.00046	0.00000	0.00000	0.00000	0.00000
	3	0.00000	0.00083	-0.01293	0.00003	0.00000	0.00000
	4	0.00000	0.00083	0.01293	-0.00003	0.00000	0.00000
	5	0.00000	-0.00032	-0.00354	0.00000	0.00000	0.00000
	6	0.00000	-0.00032	0.00354	0.00000	0.00000	0.00000
	7	0.00000	-0.00013	0.05395	-0.00002	0.00000	0.00000
	8	0.00000	-0.00221	0.02464	-0.00002	0.00000	0.00000
	9	0.00000	0.00214	0.02347	-0.00001	0.00000	0.00000
	10	1.42643	0.00000	0.00000	0.00000	-0.00200	-0.01084
	11	1.42643	0.00000	0.00000	0.00000	0.00200	-0.01084
28	1	0.00000	-0.00524	0.00000	-0.00001	0.00000	0.00000
	2	0.00000	-0.00045	0.00000	0.00000	0.00000	0.00000
	3	0.00000	0.00042	-0.01292	0.00002	0.00000	0.00000
	4	0.00000	0.00129	0.01293	-0.00003	0.00000	0.00000
	5	0.00000	-0.00038	-0.00354	0.00000	0.00000	0.00000
	6	0.00000	-0.00024	0.00354	-0.00001	0.00000	0.00000
	7	0.00000	0.00025	0.05395	-0.00002	0.00000	0.00000
	8	0.00000	-0.00191	0.02463	-0.00002	0.00000	0.00000
	9	0.00000	0.00235	0.02348	-0.00001	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	10	1.39367	0.00000	0.00000	0.00000	-0.00201	-0.01078
	11	1.45892	0.00000	0.00000	0.00000	0.00198	-0.01090
29	1	0.00000	-0.00495	0.00013	-0.00001	0.00000	0.00000
	2	0.00000	-0.00035	0.00004	0.00000	0.00000	0.00000
	3	0.00000	-0.00012	-0.01318	0.00002	0.00000	0.00000
	4	0.00000	0.00219	0.01341	-0.00003	0.00000	0.00000
	5	0.00000	-0.00044	-0.00357	0.00000	0.00000	0.00000
	6	0.00000	-0.00004	0.00363	-0.00001	0.00000	0.00000
	7	0.00000	0.00078	0.05417	-0.00002	0.00000	0.00000
	8	0.00000	-0.00144	0.02484	-0.00002	0.00000	0.00000
	9	0.00000	0.00253	0.02356	0.00000	0.00000	0.00000
	10	1.21750	0.00000	0.00000	0.00000	-0.00194	-0.01065
	11	1.37410	0.00000	0.00000	0.00000	0.00192	-0.01099
30	1	0.00000	-0.00420	0.00047	-0.00003	0.00000	0.00000
	2	0.00000	-0.00024	0.00008	0.00000	0.00000	0.00000
	3	0.00000	-0.00040	-0.01331	0.00000	0.00000	0.00000
	4	0.00000	0.00245	0.01360	0.00004	0.00000	0.00000
	5	0.00000	-0.00040	-0.00355	0.00000	0.00000	0.00000
	6	0.00000	0.00006	0.00366	0.00001	0.00000	0.00000
	7	0.00000	0.00100	0.05423	0.00001	0.00000	0.00000
	8	0.00000	-0.00092	0.02506	-0.00002	0.00000	0.00000
	9	0.00000	0.00224	0.02341	0.00003	0.00000	0.00000
	10	1.04632	0.00000	0.00000	0.00000	-0.00181	-0.01035
	11	1.28673	0.00000	0.00000	0.00000	0.00190	-0.01114
31	1	0.00000	-0.00269	0.00047	0.00000	0.00000	0.00000
	2	0.00000	-0.00096	0.00008	0.00004	0.00000	0.00000
	3	0.00000	-0.00005	-0.01329	-0.00002	0.00000	0.00000
	4	0.00000	-0.00368	0.01381	0.00028	0.00000	0.00000
	5	0.00000	-0.00005	-0.00354	-0.00001	0.00000	0.00000
	6	0.00000	-0.00128	0.00366	0.00007	0.00000	0.00000
	7	0.00000	-0.00057	0.05418	0.00008	0.00000	0.00000
	8	0.00000	-0.00048	0.02502	0.00001	0.00000	0.00000
	9	0.00000	-0.00031	0.02340	0.00009	0.00000	0.00000
	10	0.96909	0.00000	0.00000	0.00000	-0.00168	-0.00995
	11	1.37474	0.00000	0.00000	0.00000	0.00216	-0.01133
32	1	0.00000	-0.00389	0.00048	0.00004	0.00000	0.00000
	2	0.00000	-0.00416	0.00008	0.00009	0.00000	0.00000
	3	0.00000	0.00078	-0.01329	-0.00002	0.00000	0.00000
	4	0.00000	-0.02282	0.01400	0.00054	0.00000	0.00000
	5	0.00000	0.00041	-0.00354	-0.00001	0.00000	0.00000
	6	0.00000	-0.00616	0.00366	0.00014	0.00000	0.00000
	7	0.00000	-0.00424	0.05420	0.00009	0.00000	0.00000
	8	0.00000	-0.00091	0.02502	0.00001	0.00000	0.00000
	9	0.00000	-0.00500	0.02343	0.00012	0.00000	0.00000
	10	0.89521	0.00000	0.00000	0.00000	-0.00168	-0.00995
	11	1.48115	0.00000	0.00000	0.00000	0.00259	-0.01154
33	1	0.00000	-0.00565	0.00174	0.00005	0.00000	0.00000
	2	0.00000	-0.00786	0.00273	0.00011	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	3	0.00000	0.00145	-0.01378	-0.00002	0.00000	0.00000
	4	0.00000	-0.04483	0.02998	0.00063	0.00000	0.00000
	5	0.00000	0.00078	-0.00381	-0.00001	0.00000	0.00000
	6	0.00000	-0.01166	0.00758	0.00016	0.00000	0.00000
	7	0.00000	-0.00747	0.05658	0.00009	0.00000	0.00000
	8	0.00000	-0.00125	0.02527	0.00001	0.00000	0.00000
	9	0.00000	-0.00953	0.02672	0.00013	0.00000	0.00000
	10	1.09267	0.00000	0.00000	0.00000	-0.00168	-0.00995
	11	1.88055	0.00000	0.00000	0.00000	0.00279	-0.01180
41	1	0.00000	-0.00654	-0.00109	0.00000	0.00000	0.00000
	2	0.00000	-0.00539	-0.00635	0.00000	0.00000	0.00000
	3	0.00000	-0.04294	-0.05229	0.00000	0.00000	0.00000
	4	0.00000	0.00128	0.01403	0.00000	0.00000	0.00000
	5	0.00000	-0.00779	-0.01325	0.00000	0.00000	0.00000
	6	0.00000	0.00033	0.00446	0.00000	0.00000	0.00000
	7	0.00000	0.00563	0.06187	0.00000	0.00000	0.00000
	8	0.00000	0.00842	0.04104	0.00000	0.00000	0.00000
	9	0.00000	0.00168	0.02320	0.00000	0.00000	0.00000
	10	3.00536	0.00000	0.00000	0.00000	-0.00267	-0.01141
	11	2.44070	0.00000	0.00000	0.00000	0.00215	-0.01038
42	1	0.00000	-0.00654	0.00109	0.00000	0.00000	0.00000
	2	0.00000	-0.00539	0.00635	0.00000	0.00000	0.00000
	3	0.00000	0.00128	-0.01403	0.00000	0.00000	0.00000
	4	0.00000	-0.04294	0.05229	0.00000	0.00000	0.00000
	5	0.00000	0.00033	-0.00446	0.00000	0.00000	0.00000
	6	0.00000	-0.00779	0.01325	0.00000	0.00000	0.00000
	7	0.00000	-0.00482	0.06047	0.00000	0.00000	0.00000
	8	0.00000	-0.00179	0.02448	0.00000	0.00000	0.00000
	9	0.00000	-0.00451	0.03628	0.00000	0.00000	0.00000
	10	2.44070	0.00000	0.00000	0.00000	-0.00215	-0.01038
	11	3.00536	0.00000	0.00000	0.00000	0.00267	-0.01141

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

193. PRINT MEMBER FORCES

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1	1	46.57	0.00	0.16	0.00	-1.01	0.00
		2	-44.79	0.00	-0.16	0.00	0.69	0.00
	2	1	14.22	0.00	-0.66	0.00	3.29	0.00
		2	-14.22	0.00	0.66	0.00	-1.96	0.00
	3	1	54.31	0.00	-2.05	0.00	3.91	0.00
		2	-54.31	0.00	2.05	0.00	0.19	0.00
	4	1	0.69	0.00	-2.05	0.00	16.37	0.00
		2	-0.69	0.00	2.05	0.00	-12.27	0.00
	5	1	18.93	0.00	-0.46	0.00	0.62	0.00
		2	-18.93	0.00	0.46	0.00	0.30	0.00
	6	1	0.75	0.00	-0.46	0.00	3.93	0.00
		2	-0.75	0.00	0.46	0.00	-3.01	0.00
	7	1	-8.46	0.00	-8.18	0.00	65.86	0.00
		2	8.46	0.00	8.18	0.00	-49.50	0.00
	8	1	-9.54	0.00	-2.53	0.00	23.97	0.00
		2	9.54	0.00	2.53	0.00	-18.92	0.00
	9	1	-7.11	0.00	-4.09	0.00	31.39	0.00
		2	7.11	0.00	4.09	0.00	-23.22	0.00
	10	1	0.00	60.54	0.00	90.45	0.00	934.71
		2	0.00	-60.54	0.00	-90.45	0.00	-813.63
	11	1	0.00	10.96	0.00	-70.36	0.00	500.24
		2	0.00	-10.96	0.00	70.36	0.00	-478.32
2	1	2	44.79	0.00	0.16	0.00	-0.69	0.00
		3	-43.01	0.00	-0.16	0.00	0.38	0.00
	2	2	14.22	0.00	-0.66	0.00	1.96	0.00
		3	-14.22	0.00	0.66	0.00	-0.63	0.00
	3	2	54.31	0.00	-2.05	0.00	-0.19	0.00
		3	-54.31	0.00	2.05	0.00	4.29	0.00
	4	2	0.69	0.00	-2.05	0.00	12.27	0.00
		3	-0.69	0.00	2.05	0.00	-8.17	0.00
	5	2	18.93	0.00	-0.46	0.00	-0.30	0.00
		3	-18.93	0.00	0.46	0.00	1.22	0.00
	6	2	0.75	0.00	-0.46	0.00	3.01	0.00
		3	-0.75	0.00	0.46	0.00	-2.09	0.00
	7	2	-8.46	0.00	-8.18	0.00	49.50	0.00
		3	8.46	0.00	8.18	0.00	-33.13	0.00
	8	2	-9.54	0.00	-2.53	0.00	18.92	0.00
		3	9.54	0.00	2.53	0.00	-13.87	0.00
	9	2	-7.11	0.00	-4.09	0.00	23.22	0.00
		3	7.11	0.00	4.09	0.00	-15.04	0.00
	10	2	0.00	60.54	0.00	90.45	0.00	813.63
		3	0.00	-60.54	0.00	-90.45	0.00	-692.55
	11	2	0.00	10.96	0.00	-70.36	0.00	478.32
		3	0.00	-10.96	0.00	70.36	0.00	-456.40
3	1	3	43.01	0.00	0.16	0.00	-0.38	0.00
		4	-41.23	0.00	-0.16	0.00	0.06	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	2	3	14.22	0.00	-0.66	0.00	0.63	0.00
		4	-14.22	0.00	0.66	0.00	0.70	0.00
	3	3	54.31	0.00	-2.05	0.00	-4.29	0.00
		4	-54.31	0.00	2.05	0.00	8.39	0.00
	4	3	0.69	0.00	-2.05	0.00	8.17	0.00
		4	-0.69	0.00	2.05	0.00	-4.07	0.00
	5	3	18.93	0.00	-0.46	0.00	-1.22	0.00
		4	-18.93	0.00	0.46	0.00	2.14	0.00
	6	3	0.75	0.00	-0.46	0.00	2.09	0.00
		4	-0.75	0.00	0.46	0.00	-1.17	0.00
	7	3	-8.46	0.00	-8.18	0.00	33.13	0.00
		4	8.46	0.00	8.18	0.00	-16.77	0.00
	8	3	-9.54	0.00	-2.53	0.00	13.87	0.00
		4	9.54	0.00	2.53	0.00	-8.81	0.00
	9	3	-7.11	0.00	-4.09	0.00	15.04	0.00
		4	7.11	0.00	4.09	0.00	-6.87	0.00
	10	3	0.00	60.54	0.00	90.45	0.00	692.55
		4	0.00	-60.54	0.00	-90.45	0.00	-571.47
	11	3	0.00	10.96	0.00	-70.36	0.00	456.40
		4	0.00	-10.96	0.00	70.36	0.00	-434.47
4	1	4	41.23	0.00	0.16	0.00	-0.06	0.00
		5	-39.45	0.00	-0.16	0.00	-0.26	0.00
	2	4	14.22	0.00	-0.66	0.00	-0.70	0.00
		5	-14.22	0.00	0.66	0.00	2.03	0.00
	3	4	54.31	0.00	-2.05	0.00	-8.39	0.00
		5	-54.31	0.00	2.05	0.00	12.49	0.00
	4	4	0.69	0.00	-2.05	0.00	4.07	0.00
		5	-0.69	0.00	2.05	0.00	0.03	0.00
	5	4	18.93	0.00	-0.46	0.00	-2.14	0.00
		5	-18.93	0.00	0.46	0.00	3.06	0.00
	6	4	0.75	0.00	-0.46	0.00	1.17	0.00
		5	-0.75	0.00	0.46	0.00	-0.25	0.00
	7	4	-8.46	0.00	-8.18	0.00	16.77	0.00
		5	8.46	0.00	8.18	0.00	-0.40	0.00
	8	4	-9.54	0.00	-2.53	0.00	8.81	0.00
		5	9.54	0.00	2.53	0.00	-3.76	0.00
	9	4	-7.11	0.00	-4.09	0.00	6.87	0.00
		5	7.11	0.00	4.09	0.00	1.31	0.00
	10	4	0.00	60.54	0.00	90.45	0.00	571.47
		5	0.00	-60.54	0.00	-90.45	0.00	-450.40
	11	4	0.00	10.96	0.00	-70.36	0.00	434.47
		5	0.00	-10.96	0.00	70.36	0.00	-412.55
5	1	5	39.45	0.00	0.16	0.00	0.26	0.00
		6	-37.66	0.00	-0.16	0.00	-0.58	0.00
	2	5	14.22	0.00	-0.66	0.00	-2.03	0.00
		6	-14.22	0.00	0.66	0.00	3.36	0.00
	3	5	54.31	0.00	-2.05	0.00	-12.49	0.00
		6	-54.31	0.00	2.05	0.00	16.59	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	4	5	0.69	0.00	-2.05	0.00	-0.03	0.00
		6	-0.69	0.00	2.05	0.00	4.14	0.00
	5	5	18.93	0.00	-0.46	0.00	-3.06	0.00
		6	-18.93	0.00	0.46	0.00	3.98	0.00
	6	5	0.75	0.00	-0.46	0.00	0.25	0.00
		6	-0.75	0.00	0.46	0.00	0.67	0.00
	7	5	-8.46	0.00	-8.18	0.00	0.40	0.00
		6	8.46	0.00	8.18	0.00	15.96	0.00
	8	5	-9.54	0.00	-2.53	0.00	3.76	0.00
		6	9.54	0.00	2.53	0.00	1.29	0.00
	9	5	-7.11	0.00	-4.09	0.00	-1.31	0.00
		6	7.11	0.00	4.09	0.00	9.48	0.00
	10	5	0.00	60.54	0.00	90.45	0.00	450.40
		6	0.00	-60.54	0.00	-90.45	0.00	-329.32
	11	5	0.00	10.96	0.00	-70.36	0.00	412.55
		6	0.00	-10.96	0.00	70.36	0.00	-390.63
6	1	6	37.66	0.00	0.16	0.00	0.58	0.00
		7	-35.88	0.00	-0.16	0.00	-0.89	0.00
	2	6	14.22	0.00	-0.66	0.00	-3.36	0.00
		7	-14.22	0.00	0.66	0.00	4.69	0.00
	3	6	54.31	0.00	-2.05	0.00	-16.59	0.00
		7	-54.31	0.00	2.05	0.00	20.69	0.00
	4	6	0.69	0.00	-2.05	0.00	-4.14	0.00
		7	-0.69	0.00	2.05	0.00	8.24	0.00
	5	6	18.93	0.00	-0.46	0.00	-3.98	0.00
		7	-18.93	0.00	0.46	0.00	4.90	0.00
	6	6	0.75	0.00	-0.46	0.00	-0.67	0.00
		7	-0.75	0.00	0.46	0.00	1.59	0.00
	7	6	-8.46	0.00	-8.18	0.00	-15.96	0.00
		7	8.46	0.00	8.18	0.00	32.33	0.00
	8	6	-9.54	0.00	-2.53	0.00	-1.29	0.00
		7	9.54	0.00	2.53	0.00	6.34	0.00
	9	6	-7.11	0.00	-4.09	0.00	-9.48	0.00
		7	7.11	0.00	4.09	0.00	17.66	0.00
	10	6	0.00	60.54	0.00	90.45	0.00	329.32
		7	0.00	-60.54	0.00	-90.45	0.00	-208.24
	11	6	0.00	10.96	0.00	-70.36	0.00	390.63
		7	0.00	-10.96	0.00	70.36	0.00	-368.71
7	1	7	35.88	0.00	0.16	0.00	0.89	0.00
		23	-33.04	0.00	-0.16	0.00	-1.40	0.00
	2	7	14.22	0.00	-0.66	0.00	-4.69	0.00
		23	-14.22	0.00	0.66	0.00	6.81	0.00
	3	7	54.31	0.00	-2.05	0.00	-20.69	0.00
		23	-54.31	0.00	2.05	0.00	27.24	0.00
	4	7	0.69	0.00	-2.05	0.00	-8.24	0.00
		23	-0.69	0.00	2.05	0.00	14.79	0.00
	5	7	18.93	0.00	-0.46	0.00	-4.90	0.00
		23	-18.93	0.00	0.46	0.00	6.37	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	6	7	0.75	0.00	-0.46	0.00	-1.59	0.00
		23	-0.75	0.00	0.46	0.00	3.06	0.00
	7	7	-8.46	0.00	-8.18	0.00	-32.33	0.00
		23	8.46	0.00	8.18	0.00	58.47	0.00
	8	7	-9.54	0.00	-2.53	0.00	-6.34	0.00
		23	9.54	0.00	2.53	0.00	14.41	0.00
	9	7	-7.11	0.00	-4.09	0.00	-17.66	0.00
		23	7.11	0.00	4.09	0.00	30.72	0.00
	10	7	0.00	60.54	0.00	90.45	0.00	208.24
		23	0.00	-60.54	0.00	-90.45	0.00	-14.82
	11	7	0.00	10.96	0.00	-70.36	0.00	368.71
		23	0.00	-10.96	0.00	70.36	0.00	-333.69
11	1	11	46.57	0.00	-0.16	0.00	1.01	0.00
		12	-44.79	0.00	0.16	0.00	-0.69	0.00
	2	11	14.22	0.00	0.66	0.00	-3.29	0.00
		12	-14.22	0.00	-0.66	0.00	1.96	0.00
	3	11	0.69	0.00	2.05	0.00	-16.37	0.00
		12	-0.69	0.00	-2.05	0.00	12.27	0.00
	4	11	54.31	0.00	2.05	0.00	-3.91	0.00
		12	-54.31	0.00	-2.05	0.00	-0.19	0.00
	5	11	0.75	0.00	0.46	0.00	-3.93	0.00
		12	-0.75	0.00	-0.46	0.00	3.01	0.00
	6	11	18.93	0.00	0.46	0.00	-0.62	0.00
		12	-18.93	0.00	-0.46	0.00	-0.30	0.00
	7	11	8.46	0.00	-8.32	0.00	66.51	0.00
		12	-8.46	0.00	8.32	0.00	-49.88	0.00
	8	11	7.04	0.00	-4.27	0.00	32.88	0.00
		12	-7.04	0.00	4.27	0.00	-24.33	0.00
	9	11	4.61	0.00	-2.71	0.00	24.33	0.00
		12	-4.61	0.00	2.71	0.00	-18.90	0.00
	10	11	0.00	10.96	0.00	70.36	0.00	500.24
		12	0.00	-10.96	0.00	-70.36	0.00	-478.32
	11	11	0.00	60.54	0.00	-90.45	0.00	934.71
		12	0.00	-60.54	0.00	90.45	0.00	-813.63
12	1	12	44.79	0.00	-0.16	0.00	0.69	0.00
		13	-43.01	0.00	0.16	0.00	-0.38	0.00
	2	12	14.22	0.00	0.66	0.00	-1.96	0.00
		13	-14.22	0.00	-0.66	0.00	0.63	0.00
	3	12	0.69	0.00	2.05	0.00	-12.27	0.00
		13	-0.69	0.00	-2.05	0.00	8.17	0.00
	4	12	54.31	0.00	2.05	0.00	0.19	0.00
		13	-54.31	0.00	-2.05	0.00	-4.29	0.00
	5	12	0.75	0.00	0.46	0.00	-3.01	0.00
		13	-0.75	0.00	-0.46	0.00	2.09	0.00
	6	12	18.93	0.00	0.46	0.00	0.30	0.00
		13	-18.93	0.00	-0.46	0.00	-1.22	0.00
	7	12	8.46	0.00	-8.32	0.00	49.88	0.00
		13	-8.46	0.00	8.32	0.00	-33.24	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	8	12	7.04	0.00	-4.27	0.00	24.33	0.00
		13	-7.04	0.00	4.27	0.00	-15.78	0.00
	9	12	4.61	0.00	-2.71	0.00	18.90	0.00
		13	-4.61	0.00	2.71	0.00	-13.48	0.00
	10	12	0.00	10.96	0.00	70.36	0.00	478.32
		13	0.00	-10.96	0.00	-70.36	0.00	-456.40
	11	12	0.00	60.54	0.00	-90.45	0.00	813.63
		13	0.00	-60.54	0.00	90.45	0.00	-692.55
13	1	13	43.01	0.00	-0.16	0.00	0.38	0.00
		14	-41.23	0.00	0.16	0.00	-0.06	0.00
	2	13	14.22	0.00	0.66	0.00	-0.63	0.00
		14	-14.22	0.00	-0.66	0.00	-0.70	0.00
	3	13	0.69	0.00	2.05	0.00	-8.17	0.00
		14	-0.69	0.00	-2.05	0.00	4.07	0.00
	4	13	54.31	0.00	2.05	0.00	4.29	0.00
		14	-54.31	0.00	-2.05	0.00	-8.39	0.00
	5	13	0.75	0.00	0.46	0.00	-2.09	0.00
		14	-0.75	0.00	-0.46	0.00	1.17	0.00
	6	13	18.93	0.00	0.46	0.00	1.22	0.00
		14	-18.93	0.00	-0.46	0.00	-2.14	0.00
	7	13	8.46	0.00	-8.32	0.00	33.24	0.00
		14	-8.46	0.00	8.32	0.00	-16.61	0.00
	8	13	7.04	0.00	-4.27	0.00	15.78	0.00
		14	-7.04	0.00	4.27	0.00	-7.24	0.00
	9	13	4.61	0.00	-2.71	0.00	13.48	0.00
		14	-4.61	0.00	2.71	0.00	-8.05	0.00
	10	13	0.00	10.96	0.00	70.36	0.00	456.40
		14	0.00	-10.96	0.00	-70.36	0.00	-434.47
	11	13	0.00	60.54	0.00	-90.45	0.00	692.55
		14	0.00	-60.54	0.00	90.45	0.00	-571.47
14	1	14	41.23	0.00	-0.16	0.00	0.06	0.00
		15	-39.45	0.00	0.16	0.00	0.26	0.00
	2	14	14.22	0.00	0.66	0.00	0.70	0.00
		15	-14.22	0.00	-0.66	0.00	-2.03	0.00
	3	14	0.69	0.00	2.05	0.00	-4.07	0.00
		15	-0.69	0.00	-2.05	0.00	-0.03	0.00
	4	14	54.31	0.00	2.05	0.00	8.39	0.00
		15	-54.31	0.00	-2.05	0.00	-12.49	0.00
	5	14	0.75	0.00	0.46	0.00	-1.17	0.00
		15	-0.75	0.00	-0.46	0.00	0.25	0.00
	6	14	18.93	0.00	0.46	0.00	2.14	0.00
		15	-18.93	0.00	-0.46	0.00	-3.06	0.00
	7	14	8.46	0.00	-8.32	0.00	16.61	0.00
		15	-8.46	0.00	8.32	0.00	0.03	0.00
	8	14	7.04	0.00	-4.27	0.00	7.24	0.00
		15	-7.04	0.00	4.27	0.00	1.31	0.00
	9	14	4.61	0.00	-2.71	0.00	8.05	0.00
		15	-4.61	0.00	2.71	0.00	-2.63	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	10	14	0.00	10.96	0.00	70.36	0.00	434.47
		15	0.00	-10.96	0.00	-70.36	0.00	-412.55
	11	14	0.00	60.54	0.00	-90.45	0.00	571.48
		15	0.00	-60.54	0.00	90.45	0.00	-450.39
15	1	15	39.45	0.00	-0.16	0.00	-0.26	0.00
		16	-37.66	0.00	0.16	0.00	0.58	0.00
	2	15	14.22	0.00	0.66	0.00	2.03	0.00
		16	-14.22	0.00	-0.66	0.00	-3.36	0.00
	3	15	0.69	0.00	2.05	0.00	0.03	0.00
		16	-0.69	0.00	-2.05	0.00	-4.14	0.00
	4	15	54.31	0.00	2.05	0.00	12.49	0.00
		16	-54.31	0.00	-2.05	0.00	-16.59	0.00
	5	15	0.75	0.00	0.46	0.00	-0.25	0.00
		16	-0.75	0.00	-0.46	0.00	-0.67	0.00
	6	15	18.93	0.00	0.46	0.00	3.06	0.00
		16	-18.93	0.00	-0.46	0.00	-3.98	0.00
	7	15	8.46	0.00	-8.32	0.00	-0.03	0.00
		16	-8.46	0.00	8.32	0.00	16.67	0.00
	8	15	7.04	0.00	-4.27	0.00	-1.31	0.00
		16	-7.04	0.00	4.27	0.00	9.86	0.00
	9	15	4.61	0.00	-2.71	0.00	2.63	0.00
		16	-4.61	0.00	2.71	0.00	2.80	0.00
	10	15	0.00	10.96	0.00	70.36	0.00	412.55
		16	0.00	-10.96	0.00	-70.36	0.00	-390.63
	11	15	0.00	60.54	0.00	-90.45	0.00	450.40
		16	0.00	-60.54	0.00	90.45	0.00	-329.32
16	1	16	37.66	0.00	-0.16	0.00	-0.58	0.00
		17	-35.88	0.00	0.16	0.00	0.89	0.00
	2	16	14.22	0.00	0.66	0.00	3.36	0.00
		17	-14.22	0.00	-0.66	0.00	-4.69	0.00
	3	16	0.69	0.00	2.05	0.00	4.14	0.00
		17	-0.69	0.00	-2.05	0.00	-8.24	0.00
	4	16	54.31	0.00	2.05	0.00	16.59	0.00
		17	-54.31	0.00	-2.05	0.00	-20.69	0.00
	5	16	0.75	0.00	0.46	0.00	0.67	0.00
		17	-0.75	0.00	-0.46	0.00	-1.59	0.00
	6	16	18.93	0.00	0.46	0.00	3.98	0.00
		17	-18.93	0.00	-0.46	0.00	-4.90	0.00
	7	16	8.46	0.00	-8.32	0.00	-16.66	0.00
		17	-8.46	0.00	8.32	0.00	33.30	0.00
	8	16	7.04	0.00	-4.27	0.00	-9.86	0.00
		17	-7.04	0.00	4.27	0.00	18.41	0.00
	9	16	4.61	0.00	-2.71	0.00	-2.80	0.00
		17	-4.61	0.00	2.71	0.00	8.22	0.00
	10	16	0.00	10.96	0.00	70.36	0.00	390.63
		17	0.00	-10.96	0.00	-70.36	0.00	-368.71
	11	16	0.00	60.54	0.00	-90.45	0.00	329.32
		17	0.00	-60.54	0.00	90.45	0.00	-208.24

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
17	1	17	35.88	0.00	-0.16	0.00	-0.89	0.00
		31	-33.04	0.00	0.16	0.00	1.40	0.00
	2	17	14.22	0.00	0.66	0.00	4.69	0.00
		31	-14.22	0.00	-0.66	0.00	-6.81	0.00
	3	17	0.69	0.00	2.05	0.00	8.24	0.00
		31	-0.69	0.00	-2.05	0.00	-14.79	0.00
	4	17	54.31	0.00	2.05	0.00	20.69	0.00
		31	-54.31	0.00	-2.05	0.00	-27.24	0.00
	5	17	0.75	0.00	0.46	0.00	1.59	0.00
		31	-0.75	0.00	-0.46	0.00	-3.06	0.00
	6	17	18.93	0.00	0.46	0.00	4.90	0.00
		31	-18.93	0.00	-0.46	0.00	-6.37	0.00
	7	17	8.46	0.00	-8.32	0.00	-33.30	0.00
		31	-8.46	0.00	8.32	0.00	59.88	0.00
	8	17	7.04	0.00	-4.27	0.00	-18.41	0.00
		31	-7.04	0.00	4.27	0.00	32.06	0.00
	9	17	4.61	0.00	-2.71	0.00	-8.22	0.00
		31	-4.61	0.00	2.71	0.00	16.89	0.00
	10	17	0.00	10.96	0.00	70.36	0.00	368.71
		31	0.00	-10.96	0.00	-70.36	0.00	-333.69
	11	17	0.00	60.54	0.00	-90.45	0.00	208.24
		31	0.00	-60.54	0.00	90.45	0.00	-14.82
21	1	21	0.55	-1.88	0.00	0.00	0.00	0.00
		22	-3.81	6.37	0.00	0.00	0.00	-15.13
	2	21	4.18	-5.75	0.00	0.00	0.00	0.00
		22	-4.18	5.75	0.00	0.00	0.00	-21.08
	3	21	1.03	-35.44	0.00	0.00	0.00	0.00
		22	-1.03	35.44	0.00	0.00	0.00	-129.88
	4	21	0.00	0.00	0.00	0.00	0.00	0.00
		22	0.00	0.00	0.00	0.00	0.00	0.00
	5	21	5.78	-7.96	0.00	0.00	0.00	0.00
		22	-5.78	7.96	0.00	0.00	0.00	-29.18
	6	21	0.00	0.00	0.00	0.00	0.00	0.00
		22	0.00	0.00	0.00	0.00	0.00	0.00
	7	21	4.45	3.23	0.00	0.00	0.00	0.00
		22	-4.45	-3.23	0.00	0.00	0.00	11.85
	8	21	-0.21	7.25	0.00	0.00	0.00	0.00
		22	0.21	-7.25	0.00	0.00	0.00	26.56
	9	21	0.00	0.00	0.00	0.00	0.00	0.00
		22	0.00	0.00	0.00	0.00	0.00	0.00
	10	21	0.00	0.00	-35.62	-79.67	-57.98	0.00
		22	0.00	0.00	35.62	79.67	188.52	0.00
	11	21	0.00	0.00	-0.15	-2.05	0.28	0.00
		22	0.00	0.00	0.15	2.05	0.28	0.00
22	1	22	-0.66	-7.39	0.00	0.00	0.00	15.13
		23	0.66	12.94	0.00	0.00	0.00	-52.38
	2	22	0.00	-7.11	0.00	0.00	0.00	21.08
		23	0.00	7.11	0.00	0.00	0.00	-47.14

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	22	-20.00	-29.27	0.00	0.00	0.00	129.88
		23	20.00	29.27	0.00	0.00	0.00	-237.19
	4	22	0.00	0.00	0.00	0.00	0.00	0.00
		23	0.00	0.00	0.00	0.00	0.00	0.00
	5	22	0.00	-9.84	0.00	0.00	0.00	29.18
		23	0.00	9.84	0.00	0.00	0.00	-65.25
	6	22	0.00	0.00	0.00	0.00	0.00	0.00
		23	0.00	0.00	0.00	0.00	0.00	0.00
	7	22	5.50	0.00	0.00	0.00	0.00	-11.85
		23	-5.50	0.00	0.00	0.00	0.00	11.85
	8	22	4.09	5.99	0.00	0.00	0.00	-26.56
		23	-4.09	-5.99	0.00	0.00	0.00	48.51
	9	22	0.00	0.00	0.00	0.00	0.00	0.00
		23	0.00	0.00	0.00	0.00	0.00	0.00
	10	22	0.00	0.00	-35.62	-175.26	-105.70	0.00
		23	0.00	0.00	35.62	175.26	236.26	0.00
	11	22	0.00	0.00	-0.16	-1.82	0.98	0.00
		23	0.00	0.00	0.16	1.82	-0.41	0.00
23	1	23	-0.50	20.10	0.00	0.00	0.00	53.78
		24	0.50	-14.56	0.00	0.00	0.00	9.73
	2	23	-0.66	7.11	0.00	0.00	0.00	40.33
		24	0.66	-7.11	0.00	0.00	0.00	-14.27
	3	23	-22.05	25.03	0.00	0.00	0.00	209.95
		24	22.05	-25.03	0.00	0.00	0.00	-118.18
	4	23	-2.05	0.69	0.00	0.00	0.00	-14.79
		24	2.05	-0.69	0.00	0.00	0.00	17.32
	5	23	-0.46	9.09	0.00	0.00	0.00	58.88
		24	0.46	-9.09	0.00	0.00	0.00	-25.55
	6	23	-0.46	0.75	0.00	0.00	0.00	-3.06
		24	0.46	-0.75	0.00	0.00	0.00	5.80
	7	23	-2.68	-8.46	0.00	0.00	0.00	-70.32
		24	2.68	8.46	0.00	0.00	0.00	39.32
	8	23	1.56	-3.56	0.00	0.00	0.00	-62.92
		24	-1.56	3.56	0.00	0.00	0.00	49.88
	9	23	-4.09	-7.11	0.00	0.00	0.00	-30.72
		24	4.09	7.11	0.00	0.00	0.00	4.66
	10	23	0.00	0.00	24.92	-160.44	-145.80	0.00
		24	0.00	0.00	-24.92	160.44	54.45	0.00
	11	23	0.00	0.00	10.81	331.86	-69.94	0.00
		24	0.00	0.00	-10.81	-331.86	30.33	0.00
24	1	24	6.06	13.24	0.00	0.00	0.00	-9.73
		25	-4.55	-10.22	0.00	0.00	0.00	35.96
	2	24	2.59	6.66	0.00	0.00	0.00	14.27
		25	-2.59	-6.66	0.00	0.00	0.00	0.61
	3	24	-8.52	32.25	0.00	0.00	0.00	118.18
		25	8.52	-32.25	0.00	0.00	0.00	-46.07
	4	24	-1.52	1.53	0.00	0.00	0.00	-17.32
		25	1.52	-1.53	0.00	0.00	0.00	20.75

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	24	3.66	8.34	0.00	0.00	0.00	25.55
		25	-3.66	-8.34	0.00	0.00	0.00	-6.91
	6	24	-0.08	0.87	0.00	0.00	0.00	-5.80
		25	0.08	-0.87	0.00	0.00	0.00	7.75
	7	24	-6.18	-6.36	0.00	0.00	0.00	-39.32
		25	6.18	6.36	0.00	0.00	0.00	25.08
	8	24	-0.19	-3.88	0.00	0.00	0.00	-49.88
		25	0.19	3.88	0.00	0.00	0.00	41.20
	9	24	-6.83	-4.53	0.00	0.00	0.00	-4.66
		25	6.83	4.53	0.00	0.00	0.00	-5.46
	10	24	0.00	0.00	24.93	-167.85	23.04	0.00
		25	0.00	0.00	-24.93	167.85	-78.77	0.00
	11	24	0.00	0.00	10.81	283.27	-175.54	0.00
		25	0.00	0.00	-10.81	-283.27	151.38	0.00
25	1	25	4.55	10.22	0.00	0.00	0.00	-35.96
		26	-1.94	-4.99	0.00	0.00	0.00	52.97
	2	25	2.59	6.66	0.00	0.00	0.00	-0.61
		26	-2.59	-6.66	0.00	0.00	0.00	15.50
	3	25	-8.52	32.25	0.00	0.00	0.00	46.07
		26	8.52	-32.25	0.00	0.00	0.00	26.05
	4	25	-1.53	1.53	0.00	0.00	0.00	-20.75
		26	1.53	-1.53	0.00	0.00	0.00	24.18
	5	25	3.65	8.34	0.00	0.00	0.00	6.91
		26	-3.65	-8.34	0.00	0.00	0.00	11.74
	6	25	-0.08	0.87	0.00	0.00	0.00	-7.75
		26	0.08	-0.87	0.00	0.00	0.00	9.71
	7	25	-6.18	-6.36	0.00	0.00	0.00	-25.08
		26	6.18	6.36	0.00	0.00	0.00	10.85
	8	25	-0.19	-3.88	0.00	0.00	0.00	-41.20
		26	0.19	3.88	0.00	0.00	0.00	32.52
	9	25	-6.83	-4.53	0.00	0.00	0.00	5.46
		26	6.83	4.53	0.00	0.00	0.00	-15.59
	10	25	0.00	0.00	24.93	-167.85	78.76	0.00
		26	0.00	0.00	-24.93	167.85	-134.51	0.00
	11	25	0.00	0.00	10.80	283.27	-151.36	0.00
		26	0.00	0.00	-10.80	-283.27	127.22	0.00
26	1	26	0.16	3.55	0.00	0.00	0.00	-52.97
		27	-0.16	0.00	0.00	0.00	0.00	55.38
	2	26	-0.66	0.00	0.00	0.00	0.00	-15.50
		27	0.66	0.00	0.00	0.00	0.00	15.50
	3	26	-2.05	-0.69	0.00	0.00	0.00	-26.05
		27	2.05	0.69	0.00	0.00	0.00	25.11
	4	26	-2.05	0.69	0.00	0.00	0.00	-24.18
		27	2.05	-0.69	0.00	0.00	0.00	25.11
	5	26	-0.46	-0.75	0.00	0.00	0.00	-11.74
		27	0.46	0.75	0.00	0.00	0.00	10.72
	6	26	-0.46	0.75	0.00	0.00	0.00	-9.71
		27	0.46	-0.75	0.00	0.00	0.00	10.72

MEMBER END FORCES   STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	26	2.82	-8.46	0.00	0.00	0.00	-10.85
		27	-2.82	8.46	0.00	0.00	0.00	-0.63
	8	26	4.27	-7.04	0.00	0.00	0.00	-32.52
		27	-4.27	7.04	0.00	0.00	0.00	22.96
	9	26	-4.09	-7.11	0.00	0.00	0.00	15.59
		27	4.09	7.11	0.00	0.00	0.00	-25.24
	10	26	0.00	0.00	-10.97	-311.77	43.41	0.00
		27	0.00	0.00	10.97	311.77	-28.55	0.00
	11	26	0.00	0.00	10.96	311.77	13.66	0.00
		27	0.00	0.00	-10.96	-311.77	-28.54	0.00
27	1	27	0.16	0.00	0.00	0.00	0.00	-55.38
		28	-0.16	3.55	0.00	0.00	0.00	52.97
	2	27	-0.66	0.00	0.00	0.00	0.00	-15.50
		28	0.66	0.00	0.00	0.00	0.00	15.50
	3	27	-2.05	-0.69	0.00	0.00	0.00	-25.11
		28	2.05	0.69	0.00	0.00	0.00	24.18
	4	27	-2.05	0.69	0.00	0.00	0.00	-25.11
		28	2.05	-0.69	0.00	0.00	0.00	26.05
	5	27	-0.46	-0.75	0.00	0.00	0.00	-10.72
		28	0.46	0.75	0.00	0.00	0.00	9.71
	6	27	-0.46	0.75	0.00	0.00	0.00	-10.72
		28	0.46	-0.75	0.00	0.00	0.00	11.74
	7	27	2.82	-8.46	0.00	0.00	0.00	0.63
		28	-2.82	8.46	0.00	0.00	0.00	-12.11
	8	27	4.27	-7.04	0.00	0.00	0.00	-22.96
		28	-4.27	7.04	0.00	0.00	0.00	13.39
	9	27	-4.09	-7.11	0.00	0.00	0.00	25.24
		28	4.09	7.11	0.00	0.00	0.00	-34.89
	10	27	0.00	0.00	-10.99	-311.77	28.55	0.00
		28	0.00	0.00	10.99	311.77	-13.66	0.00
	11	27	0.00	0.00	10.98	311.77	28.55	0.00
		28	0.00	0.00	-10.98	-311.77	-43.42	0.00
28	1	28	1.94	-4.99	0.00	0.00	0.00	-52.97
		29	-4.55	10.22	0.00	0.00	0.00	35.96
	2	28	2.59	-6.66	0.00	0.00	0.00	-15.50
		29	-2.59	6.66	0.00	0.00	0.00	0.61
	3	28	-1.53	-1.53	0.00	0.00	0.00	-24.18
		29	1.53	1.53	0.00	0.00	0.00	20.75
	4	28	-8.52	-32.25	0.00	0.00	0.00	-26.05
		29	8.52	32.25	0.00	0.00	0.00	-46.07
	5	28	-0.08	-0.87	0.00	0.00	0.00	-9.71
		29	0.08	0.87	0.00	0.00	0.00	7.75
	6	28	3.66	-8.34	0.00	0.00	0.00	-11.74
		29	-3.66	8.34	0.00	0.00	0.00	-6.91
	7	28	8.76	-5.07	0.00	0.00	0.00	12.11
		29	-8.76	5.07	0.00	0.00	0.00	-23.45
	8	28	6.97	-4.39	0.00	0.00	0.00	-13.39
		29	-6.97	4.39	0.00	0.00	0.00	3.58

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	9	28	0.97	-0.95	0.00	0.00	0.00	34.89
		29	-0.97	0.95	0.00	0.00	0.00	-37.01
	10	28	0.00	0.00	-10.81	-283.27	-127.22	0.00
		29	0.00	0.00	10.81	283.27	151.38	0.00
	11	28	0.00	0.00	-24.93	167.85	134.50	0.00
		29	0.00	0.00	24.93	-167.85	-78.76	0.00
29	1	29	4.55	-10.22	0.00	0.00	0.00	-35.96
		30	-6.06	13.24	0.00	0.00	0.00	9.73
	2	29	2.59	-6.66	0.00	0.00	0.00	-0.61
		30	-2.59	6.66	0.00	0.00	0.00	-14.27
	3	29	-1.52	-1.53	0.00	0.00	0.00	-20.75
		30	1.52	1.53	0.00	0.00	0.00	17.32
	4	29	-8.52	-32.25	0.00	0.00	0.00	46.07
		30	8.52	32.25	0.00	0.00	0.00	-118.18
	5	29	-0.08	-0.87	0.00	0.00	0.00	-7.75
		30	0.08	0.87	0.00	0.00	0.00	5.80
	6	29	3.65	-8.34	0.00	0.00	0.00	6.91
		30	-3.65	8.34	0.00	0.00	0.00	-25.55
	7	29	8.76	-5.07	0.00	0.00	0.00	23.45
		30	-8.76	5.07	0.00	0.00	0.00	-34.80
	8	29	6.97	-4.39	0.00	0.00	0.00	-3.58
		30	-6.97	4.39	0.00	0.00	0.00	-6.24
	9	29	0.97	-0.95	0.00	0.00	0.00	37.01
		30	-0.97	0.95	0.00	0.00	0.00	-39.14
	10	29	0.00	0.00	-10.81	-283.27	-151.38	0.00
		30	0.00	0.00	10.81	283.27	175.54	0.00
	11	29	0.00	0.00	-24.93	167.85	78.78	0.00
		30	0.00	0.00	24.93	-167.85	-23.04	0.00
30	1	30	-0.50	-14.56	0.00	0.00	0.00	-9.73
		31	0.50	20.10	0.00	0.00	0.00	-53.78
	2	30	-0.66	-7.11	0.00	0.00	0.00	14.27
		31	0.66	7.11	0.00	0.00	0.00	-40.33
	3	30	-2.05	-0.69	0.00	0.00	0.00	-17.32
		31	2.05	0.69	0.00	0.00	0.00	14.79
	4	30	-22.05	-25.03	0.00	0.00	0.00	118.18
		31	22.05	25.03	0.00	0.00	0.00	-209.95
	5	30	-0.46	-0.75	0.00	0.00	0.00	-5.80
		31	0.46	0.75	0.00	0.00	0.00	3.06
	6	30	-0.46	-9.09	0.00	0.00	0.00	25.55
		31	0.46	9.09	0.00	0.00	0.00	-58.88
	7	30	5.57	-8.46	0.00	0.00	0.00	34.80
		31	-5.57	8.46	0.00	0.00	0.00	-65.80
	8	30	4.27	-7.04	0.00	0.00	0.00	6.24
		31	-4.27	7.04	0.00	0.00	0.00	-32.06
	9	30	0.44	-1.28	0.00	0.00	0.00	39.14
		31	-0.44	1.28	0.00	0.00	0.00	-43.83
	10	30	0.00	0.00	-10.81	-331.87	-30.33	0.00
		31	0.00	0.00	10.81	331.87	69.94	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	11	30	0.00	0.00	-24.92	160.44	-54.46	0.00
		31	0.00	0.00	24.92	-160.44	145.80	0.00
31	1	31	-0.66	12.94	0.00	0.00	0.00	52.38
		32	0.66	-7.39	0.00	0.00	0.00	-15.13
	2	31	0.00	7.11	0.00	0.00	0.00	47.14
		32	0.00	-7.11	0.00	0.00	0.00	-21.08
	3	31	0.00	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00	0.00
	4	31	-20.00	29.27	0.00	0.00	0.00	237.19
		32	20.00	-29.27	0.00	0.00	0.00	-129.88
	5	31	0.00	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00	0.00
	6	31	0.00	9.84	0.00	0.00	0.00	65.25
		32	0.00	-9.84	0.00	0.00	0.00	-29.18
	7	31	-2.75	0.00	0.00	0.00	0.00	5.92
		32	2.75	0.00	0.00	0.00	0.00	-5.92
	8	31	0.00	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00	0.00
	9	31	-2.27	3.33	0.00	0.00	0.00	26.94
		32	2.27	-3.33	0.00	0.00	0.00	-14.75
	10	31	0.00	0.00	0.15	1.82	0.41	0.00
		32	0.00	0.00	-0.15	-1.82	-0.98	0.00
	11	31	0.00	0.00	35.62	175.25	-236.26	0.00
		32	0.00	0.00	-35.62	-175.25	105.70	0.00
32	1	32	3.81	6.37	0.00	0.00	0.00	15.13
		33	-0.55	-1.88	0.00	0.00	0.00	0.00
	2	32	4.18	5.75	0.00	0.00	0.00	21.08
		33	-4.18	-5.75	0.00	0.00	0.00	0.00
	3	32	0.00	0.00	0.00	0.00	0.00	0.00
		33	0.00	0.00	0.00	0.00	0.00	0.00
	4	32	1.03	35.44	0.00	0.00	0.00	129.88
		33	-1.03	-35.44	0.00	0.00	0.00	0.00
	5	32	0.00	0.00	0.00	0.00	0.00	0.00
		33	0.00	0.00	0.00	0.00	0.00	0.00
	6	32	5.78	7.96	0.00	0.00	0.00	29.18
		33	-5.78	-7.96	0.00	0.00	0.00	0.00
	7	32	-2.22	1.62	0.00	0.00	0.00	5.92
		33	2.22	-1.62	0.00	0.00	0.00	0.00
	8	32	0.00	0.00	0.00	0.00	0.00	0.00
		33	0.00	0.00	0.00	0.00	0.00	0.00
	9	32	0.12	4.03	0.00	0.00	0.00	14.75
		33	-0.12	-4.03	0.00	0.00	0.00	0.00
	10	32	0.00	0.00	0.16	2.05	-0.28	0.00
		33	0.00	0.00	-0.16	-2.05	-0.29	0.00
	11	32	0.00	0.00	35.62	79.67	-188.52	0.00
		33	0.00	0.00	-35.62	-79.67	57.99	0.00
41	1	21	1.90	0.50	0.00	0.00	0.00	0.00
		41	-0.44	0.50	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	2	21	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	3	21	35.45	0.00	0.00	0.00	0.00	0.00
		41	-35.45	0.00	0.00	0.00	0.00	0.00
	4	21	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	5	21	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	6	21	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	7	21	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	8	21	-7.25	0.00	0.00	0.00	0.00	0.00
		41	7.25	0.00	0.00	0.00	0.00	0.00
	9	21	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	10	21	0.00	0.00	-0.13	-0.75	1.26	0.00
		41	0.00	0.00	0.13	0.75	0.31	0.00
	11	21	0.00	0.00	0.15	-0.34	-2.04	0.00
		41	0.00	0.00	-0.15	0.34	0.23	0.00
42	1	26	1.82	0.57	0.00	0.00	0.00	0.00
		41	-0.34	0.57	0.00	0.00	0.00	0.00
	2	26	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	3	26	32.58	0.00	0.00	0.00	0.00	0.00
		41	-32.58	0.00	0.00	0.00	0.00	0.00
	4	26	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	5	26	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	6	26	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	7	26	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	8	26	4.42	0.00	0.00	0.00	0.00	0.00
		41	-4.42	0.00	0.00	0.00	0.00	0.00
	9	26	0.00	0.00	0.00	0.00	0.00	0.00
		41	0.00	0.00	0.00	0.00	0.00	0.00
	10	26	0.00	0.00	-0.13	0.52	2.28	0.00
		41	0.00	0.00	0.13	-0.52	-0.62	0.00
	11	26	0.00	0.00	0.15	0.32	-1.67	0.00
		41	0.00	0.00	-0.15	-0.32	-0.26	0.00
43	1	28	1.82	0.57	0.00	0.00	0.00	0.00
		42	-0.34	0.57	0.00	0.00	0.00	0.00
	2	28	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00
	3	28	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	4	28	32.58	0.00	0.00	0.00	0.00	0.00
		42	-32.58	0.00	0.00	0.00	0.00	0.00
	5	28	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00
	6	28	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00
	7	28	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00
	8	28	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00
	9	28	-7.38	0.00	0.00	0.00	0.00	0.00
		42	7.38	0.00	0.00	0.00	0.00	0.00
	10	28	0.00	0.00	-0.15	-0.33	1.67	0.00
		42	0.00	0.00	0.15	0.33	0.26	0.00
	11	28	0.00	0.00	0.13	-0.52	-2.28	0.00
		42	0.00	0.00	-0.13	0.52	0.62	0.00
44	1	33	1.90	0.50	0.00	0.00	0.00	0.00
		42	-0.44	0.50	0.00	0.00	0.00	0.00
	2	33	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00
	3	33	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00
	4	33	35.45	0.00	0.00	0.00	0.00	0.00
		42	-35.45	0.00	0.00	0.00	0.00	0.00
	5	33	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00
	6	33	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00
	7	33	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00
	8	33	0.00	0.00	0.00	0.00	0.00	0.00
		42	0.00	0.00	0.00	0.00	0.00	0.00
	9	33	4.03	0.00	0.00	0.00	0.00	0.00
		42	-4.03	0.00	0.00	0.00	0.00	0.00
	10	33	0.00	0.00	-0.15	0.34	2.04	0.00
		42	0.00	0.00	0.15	-0.34	-0.23	0.00
	11	33	0.00	0.00	0.13	0.75	-1.26	0.00
		42	0.00	0.00	-0.13	-0.75	-0.31	0.00

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

194. PLOT DISPLACEMENT FILE
195. PLOT SECTION FILE
196. PLOT BENDING FILE
197. FINISH

*************** END OF STAAD-III ***************

****** DATE= JUL 17,1992 TIME= 15:54:29 ******

FORM 62-114A
REV. 5 84

United Engineers & Constructors
A Raytheon Company

NOTES:

PAGE

JOB NO. 6869.002 DATE 7-20-92 BY JWC CH'K.

CUSTOMER MIT PROJECT

SUBJECT MAGRAIL - 35° BANK

ASSUME BANK ANGLE @ 36°

" $d_1 = 3'$ $r_1 = 10 + 3/2 = 11.5'$

" $d_2 = 5'$ $r_2 = 10 + 5/2 = 12.5'$

$d_2 = d_1 + 2$

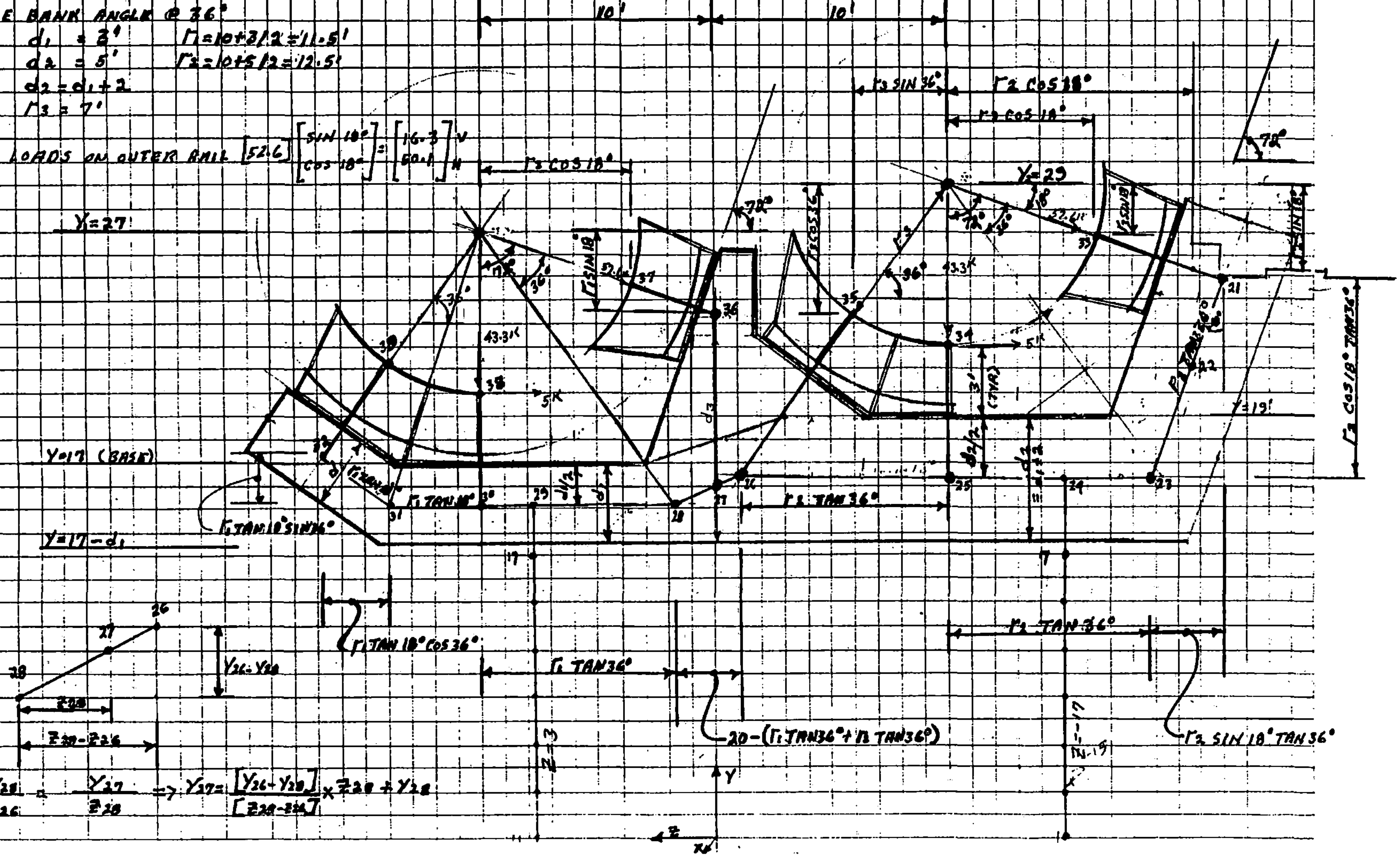
" $r_3 = 7'$

BANK LOADS ON OUTER RAIL $[52.6]\begin{bmatrix} \sin 18° \\ \cos 18° \end{bmatrix} = \begin{bmatrix} 16.3 \\ 50.1 \end{bmatrix} \begin{matrix} V \\ H \end{matrix}$

$Y = 27'$

$Y = 17$ (BASE)

$Y = 17 - d_1$



$$\frac{Y_{26} - Y_{28}}{Z_{28} - Z_{26}} = \frac{Y_{27}}{Z_{28}} \Rightarrow Y_{27} = \frac{[Y_{26} - Y_{28}]}{[Z_{28} - Z_{26}]} \times Z_{28} + Y_{28}$$

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FORM 62 114A
REV. 8-84

United Engineers & Constructors
A Raytheon Company

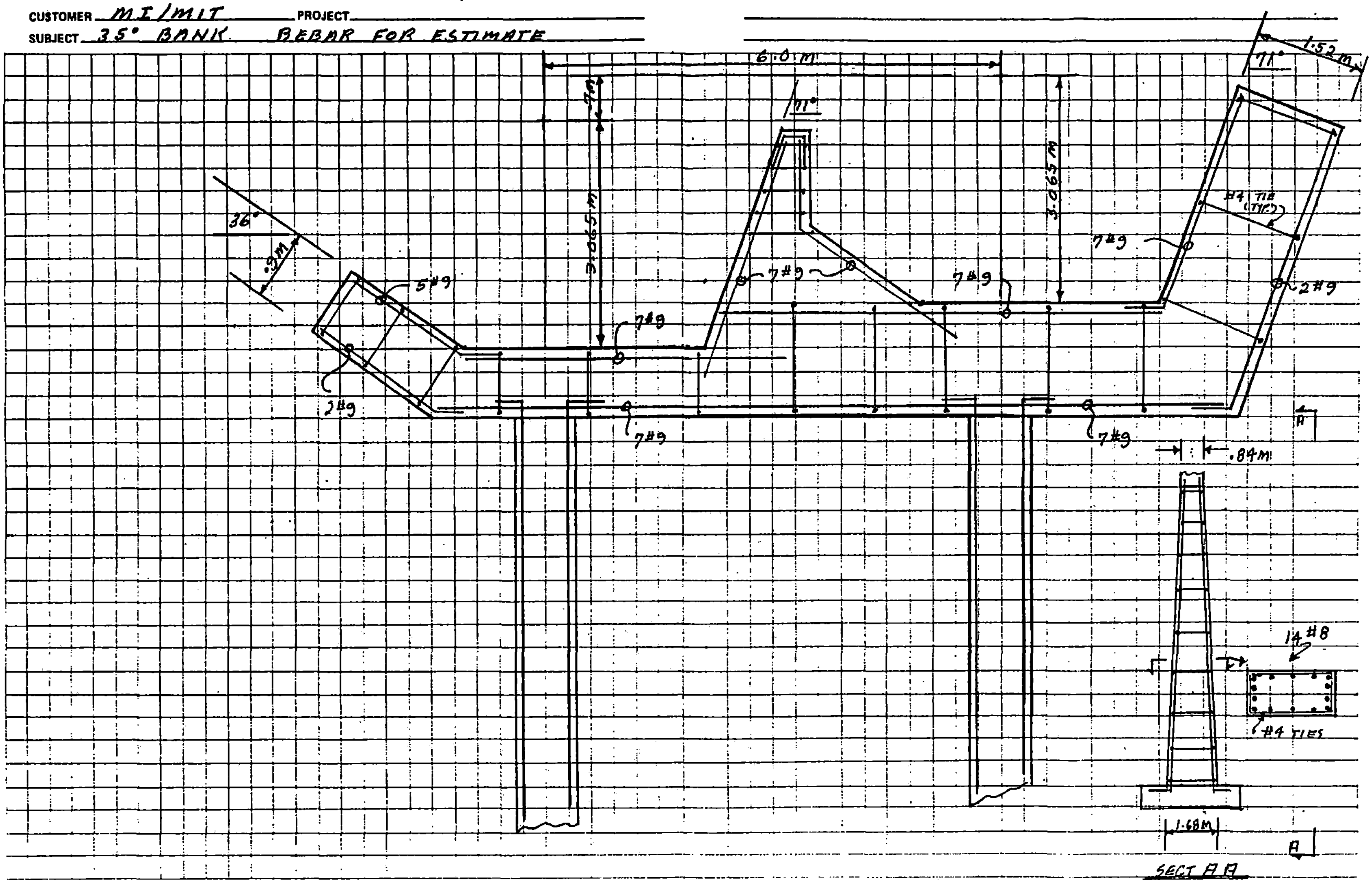
NOTES:

PAGE

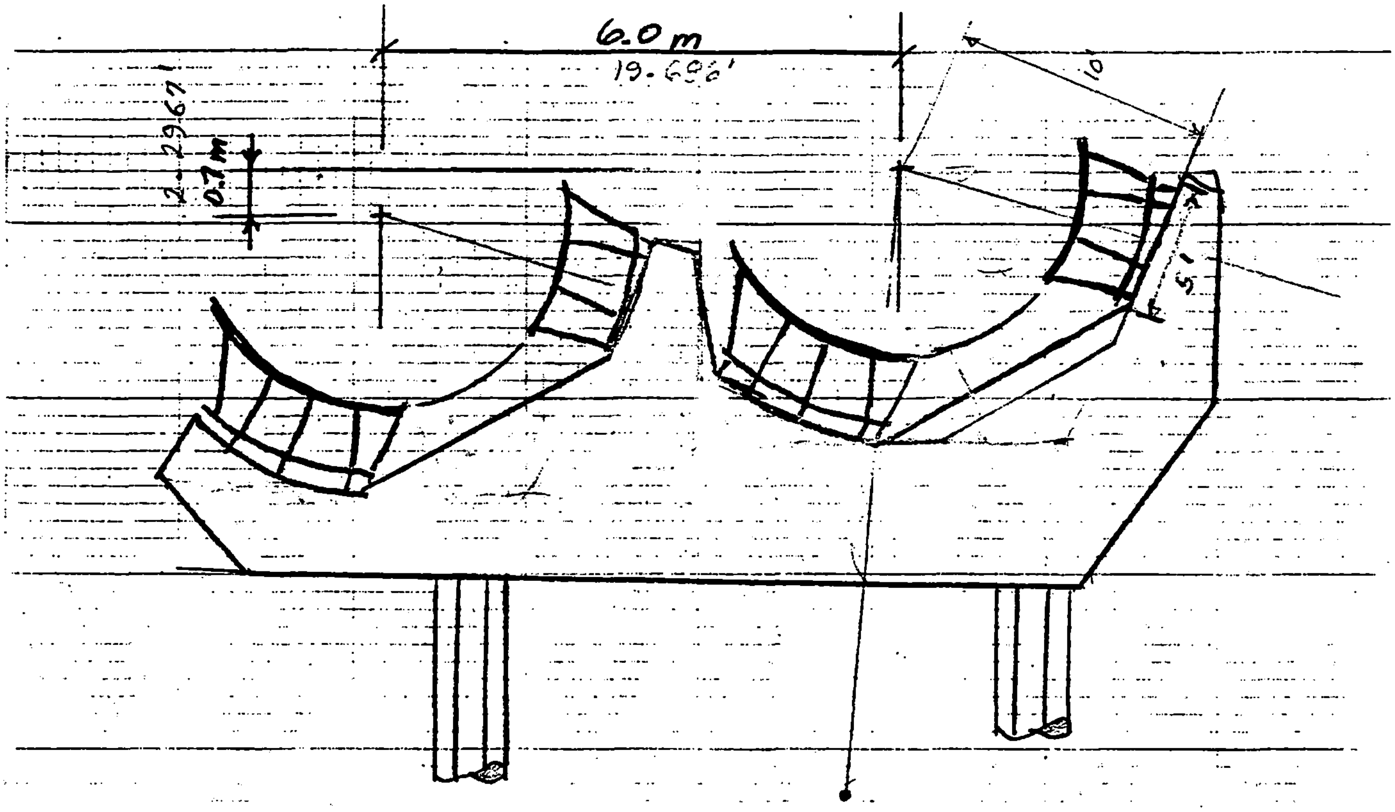
JOB NO. 6869.002 DATE 7-24-92 BY JWC CH'K.

CUSTOMER MI/MIT PROJECT

SUBJECT 35° BANK REBAR FOR ESTIMATE



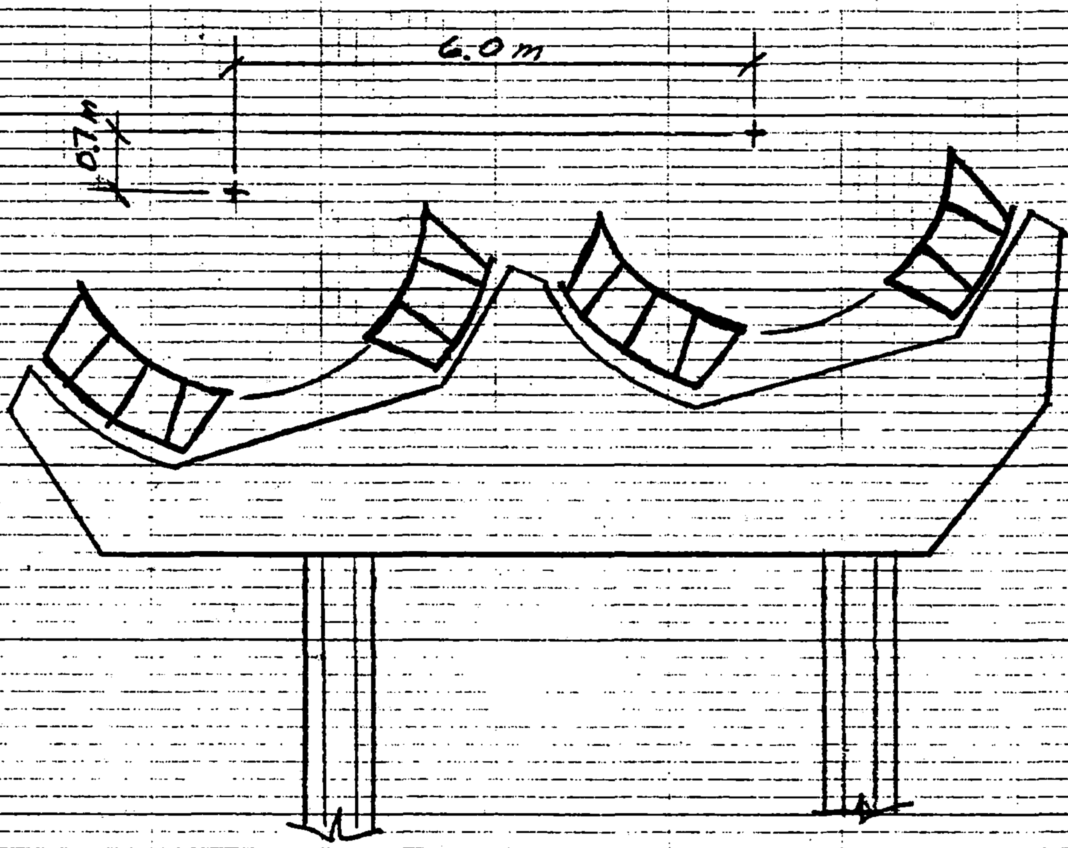
B-57



35° BANK

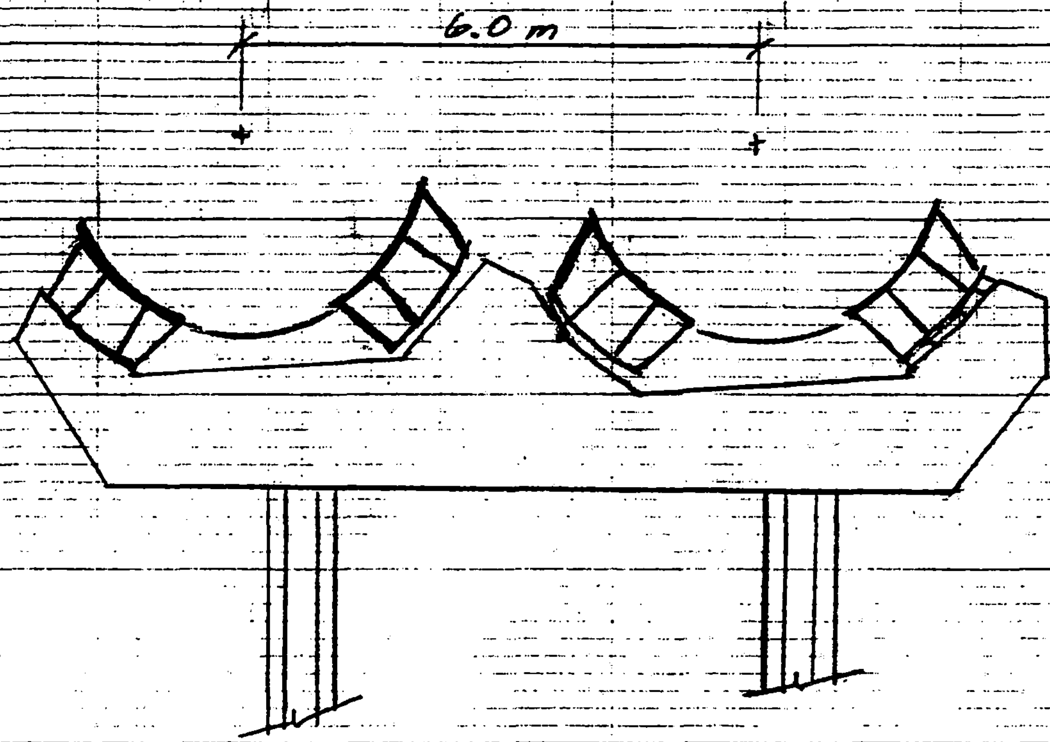
1" = 2m

$$\begin{array}{r} 35^\circ \\ 36^\circ \\ \hline 71^\circ \end{array}$$



24° BANK

1" = 2 m



12° BANK

1" = 2m

B-58

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	AWC	
FINAL			DATE 7-21-92	DATE
VOID				
SHEET	OF		DATE	DATE
J.O 6869002				

NAME OF COMPANY MIT UNIT/S

SUBJECT MAGRAIL 35° BANK

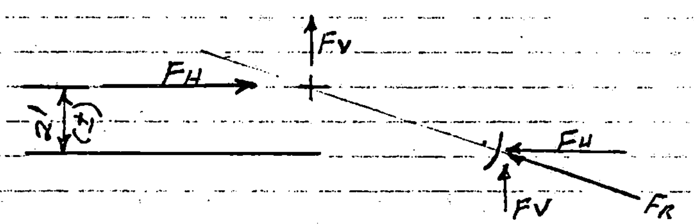
SNOW LOAD @ 40 P.S.F. ON HORIZ PROJ. PER TROUGH

$(18)(40)(30) = 21.6^K$

WIND LOAD @ 56 P.S.F ON VERT PROJ PER TROUGH

ONE TROUGH $(56)(11)(30) = 18.48^K$
OTHER " $(56/2)$ " " $= 9.24^K$

WIND ON VEHICLE @ 6.8^K H @ 2.5^K UPLIFT
NEGLECT UPLIFT



$F_R = 6.8 / \cos 18° = 6.5^K$

$F_V = 6.8 \tan 18° = 2.2^K$

AL BM WT. 30' SPAN
REAC

INSIDE RAIL = 217 P.L.F x30 6.51 / RAIL
OUTSIDE RAIL = 178 P.L.F. x30 5.34 / RAIL

B-59

FORM 5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY ______ UNIT/S ______

SUBJECT ______

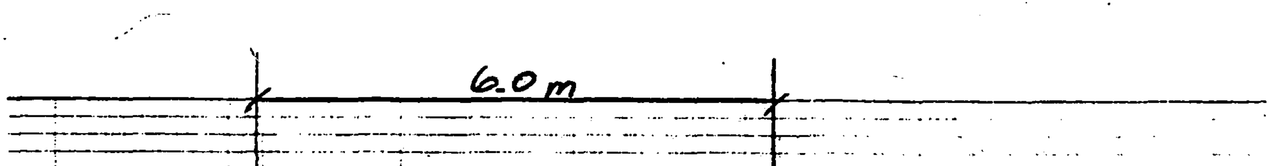
CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET	OF		DATE	DATE
J.O				

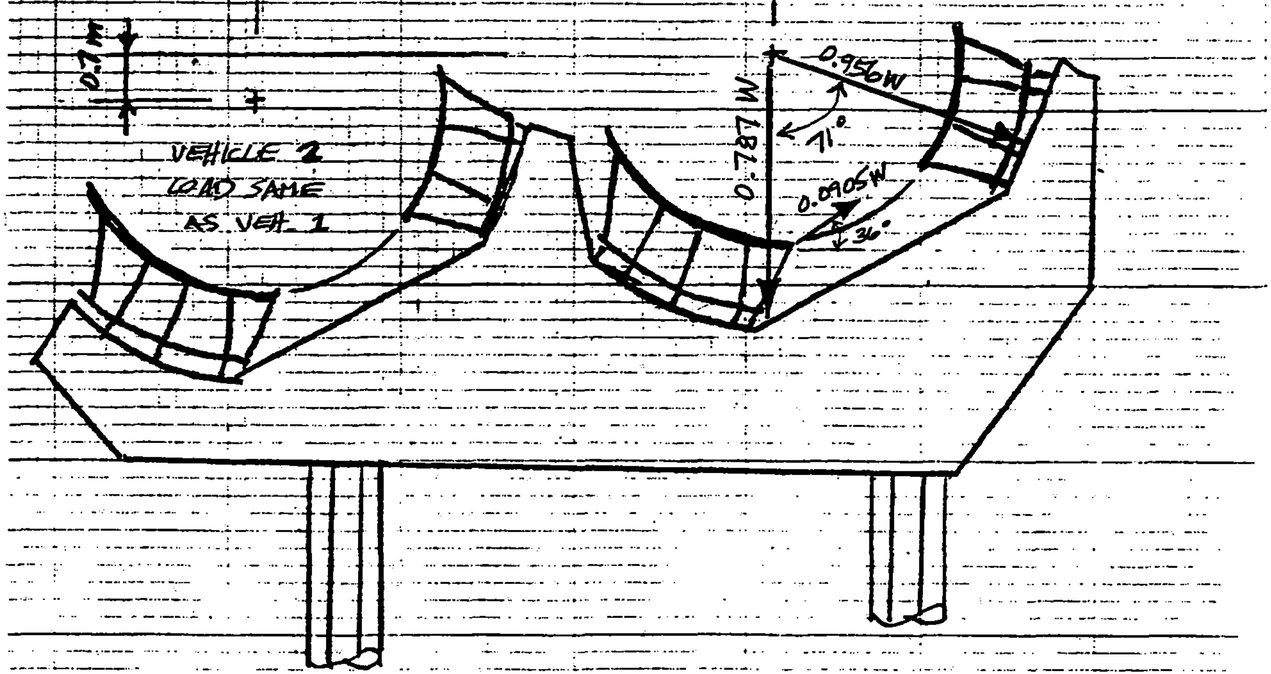
BANK ℄ INVESTIGATION

INCREASE IN ALUMINUM BOX BEAM DUE TO CENTRIP FORCE

FROM DATA FROM M. JUDD:

35° BANK $W = 55^k = 110/2^k$



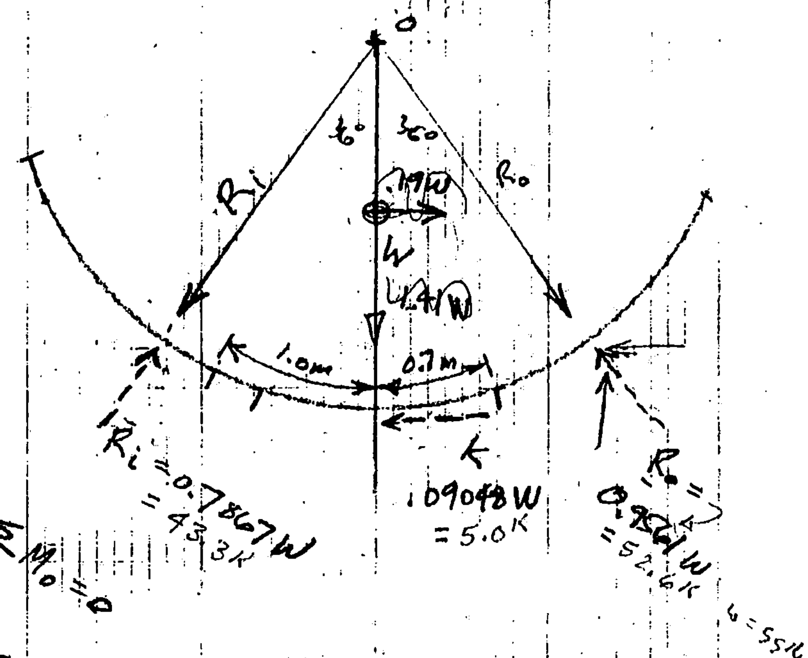


35° BANK

1" = 2m

$$\left(\frac{360}{2\pi}\right)\frac{.3}{2.1} = 8.2^\circ$$

$$[52.6]\left[\quad\right] =$$



$\Sigma M_o = 0$

$K = \dfrac{.19W(1.0)}{2.1} = 0.09048$

$\Sigma H = 0$ $\quad R_i \sin 36 + .19W = .09048W + R_o \sin 36$

$\Sigma V = 0$ $\quad 1.91W = R_i \cos 36 + R_o \cos 36$

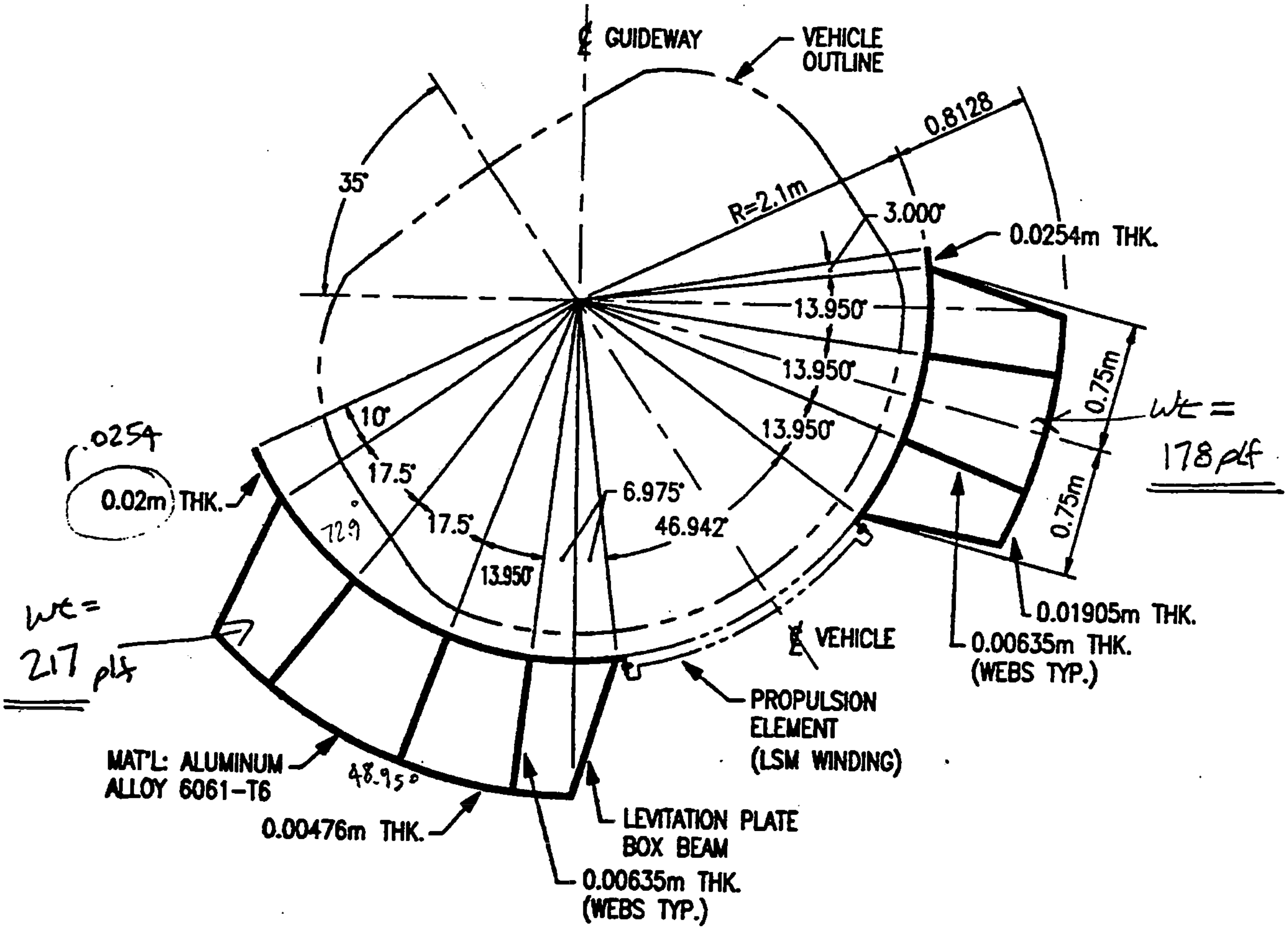
$R_i = 0.7867W = 55^K$

$R_o = 0.9561W$

$K = 0.09048W$

$\dfrac{.9561W}{.618W} = 1.547\%$ $\qquad \dfrac{.7867W}{.618W} = 1.273\%$

$\dfrac{W}{2(\cos 36^\circ)} = .618 \leftarrow R_i = R_o$ – on straight run



35° BANK CURVE

MTD FOR 35° BANK CURVE - DOUBLE GUIDEWAY

ALUM BOX BEAMS : $(178+217)2 * \frac{5280}{2000} = 2086$ TN/MILE

B-62

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE) United Engineers & Constructors

A Raytheon Company

NAME OF COMPANY ________ UNIT/S ________

SUBJECT ________

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O				

for 1/2 gallery "inside" section:

Length	9.144 m	30'	VOLUME
Long Crossection Area:			
72.9° top shell $.0254 * \frac{72.9}{360}\overbrace{(2\pi * 2.1)}^{2.67}$	0.06787	0.7305	21.92
48.95° Bott shell $.00476 * \frac{48.95}{360}\overbrace{(2\pi * (2.1 + .8128))}^{2.49}$	0.01145	0.1232	3.70
stiffeners $.00635 * 5(.8128)$.	0.0258	0.2778	8.33
	0.10512		33.95 ft³

vol = .9612 m³

diaphram stiff

depth = .8128 − (.0254 + .00476) = .7826

$2 * .7826 (.01)\left(\frac{2.67 + 2.49}{2}\right) = 0.04038$ m³ — 1.426 ft³

extension 1 × 2.49 × .01 × .18 = 0.00448 m³ — 0.158 ft³

Stiff & alignment pls

.18 (.33) .01 × 10 = 0.00594 — 0.210 ft³

Base pl .0127 (2.49) .33 × 1 = .0104 — 0.369 ft³

Splice pl (1.00) .0254 (2.67) = .0678 — 2.395 ft³

1.090 m³ — 38.51 ft³

1/2 gallery

$* 169 / 30 = \underline{\underline{217}}$ PLF

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY ______ UNIT/S ______

SUBJECT ______

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0		
FINAL			DATE	DATE
VOID				
SHEET	OF		DATE	DATE
J.O				

% INCREASE IN DL FOR 35° BANKED CURVE

for 1/2 guideway "Outside" section

			V Kure
Length of section	9.144 m	30'	
Longitudinal crossection Area			
top sheet $\frac{44.35}{360}\overbrace{(2(2.1)\pi)}^{1.644}.0254 =$	0.04175	0.4494	13.48 ft³
Bottom sheet $\frac{27.9}{360}\overbrace{(2(2.1+.8128)\pi)}^{1.418}.01905 =$	0.02701	0.2907	8.72
stiffeners (4) .8128 (.00635) =	0.02065	0.2223	6.67
	.089405 m² vol = .8175		28.87
diaphram stiffeners 20 spcg	9.144 m	30'	

depth = 0.8128 - (.0254 + .01905) = 0.7689

$2 \times 0.7684(.01)\left(\frac{1.644+1.418}{2}\right) =$	0.0235 m³	.830
6" extension $1 \times 1.418 \times .01 \times .18 =$	0.00255 m³	.090
Stiff ℞ (& align ℞)		
$.18(.33).01 \times 8 =$	0.00475 m³	.168
Base ℞ $.0127(1.418) .33 \times 1 =$	0.00594 m³	.210
splice ℞ $(1.00) .0254) 1.644 =$	0.04176 m³	1.475
	0.896 m³	31.643 ft³

ONE HALF GUIDEWAY

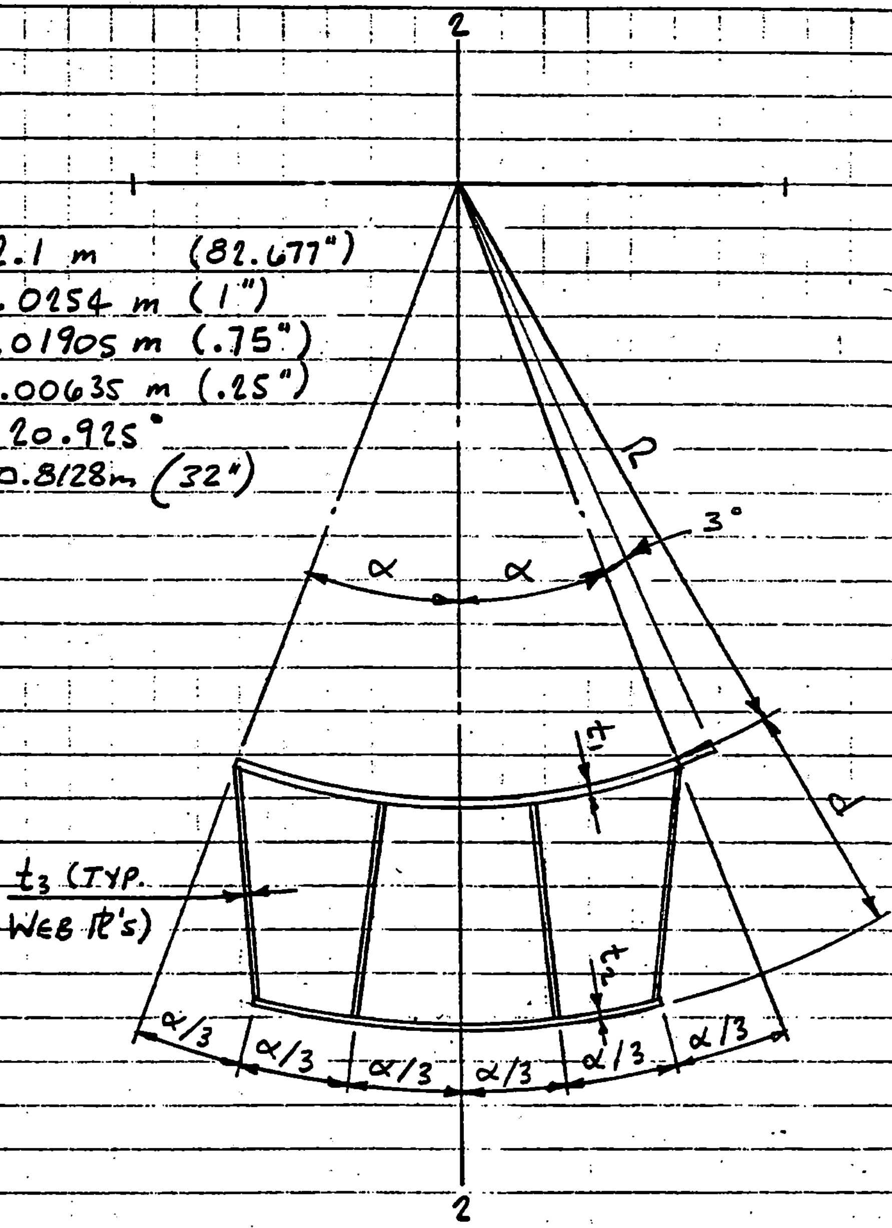
$\times .169 / 30$

178 plf

United Engineers & Constructors
A Raytheon Company

PAGE ____
JOB NO. 6869002 DATE 7/20/92 BY RJC CH'K ____
CUSTOMER MIT MI PROJECT MAGLEV
SUBJECT GUIDEWAY SHEET SECTION IN CURVE

$R = 2.1$ m (82.677")
$t_1 = .0254$ m (1")
$t_2 = .01905$ m (.75")
$t_3 = .00635$ m (.25")
$\alpha = 20.925°$
$d = 0.8128$m (32")



LEVITATION BOX BEAM

FORM 62-114/A0388175I

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY: MIT UNIT/S

SUBJECT

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID			DATE	DATE
SHEET OF				
J.O				

LOADINGS ON BANKED GUIDEWAY: [30' SPAN ONLY]

LOADING (+) [35° BANK]

DEAD LOAD STR = 671 TN/MILE = 127 PLF / Box Beam

				TOTAL	arm m	arm ft	MOMENT
D_I	INSIDE BOX BEAM	127(1.6) = 203(30) = 6.1 k		12.2	-3.9 / +2.0	-12.8 / 6.56	-78.05 / +40.03
D_o	OUTSIDE BOX BEAM	127(1.55) = 197(30) = 5.9 k		11.8	-.75 / +5.3	-2.46 / 17.39	-14.52 / +102.59
D_L	LSM	100(1.7/1.4) = 122(30) = 3.66		7.3	-1.9 / +4.1	-6.23 / 13.45	-22.81 / 49.23
D_u	UTILITIES	100 = 100 * 30 = 3.0		6	-1.9 / +4.1	-6.23 / 13.45	-18.70 / 40.35
D_B	DEAD CROSS BEAM	$259\left(\frac{33}{12}\right) \cdot .15 = 107$ k		107.	2.04	6.69	715.83
			Subtot	144.3		5.64	813.95
D_c	COLUMNS	33ϕ * (18-3.6) = 85.5(.15) = 12.8		25.7	-1.7 / +4.8	-5.58 / 15.75	-71.39 / 201.6
				170.0			944.1

arm = 5.55

SNOW 40 PSF HORIZONTAL PROJECTION $S_m = 16.4$

S = 16.4(40)(30) = 19.68 k

LOAD	Arm m	Arm ft	MOMENT
19.7	-2.5	-8.20	-161.5
19.7	3.5	11.48	226.2
39.4		arm = 1.64'	64.7

SEISMIC COEFF

0.105

	W	V=W*.105	arm (m)	Moment
D_I	6.1	.641	5.9	3.78
D_I	6.1	.641	6.4	4.10
D_{L+u}	6.66	.7	6.2	4.34
D_{L+u}	6.66	.7	6.85	4.80
D_o	5.9	.62	7.5	4.65
D_o	5.9	.62	8.0	4.96
D_B	107	11.24	5.3	59.57
D_c	12.8	2.68	2.0	5.36
		17.84		91.56

DEAD:

300.1 k

V = 17.84 k

$\bar{y}$ = 5.13 = 16.83

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FORM 5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID			DATE	DATE
SHEET	OF			
J.O				

NAME OF COMPANY ______ UNIT/S ______

SUBJECT ______

CROSS BEAM

	arm	b	h	Area ½bh	Moment arm * Area	vertical arm above Bottom	M
1	6.43	.35	2.5	.438	2.813	4.55	2.00
2	6.24	.9	2.5	1.125	7.02	3.23	3.63
3	5.97	3.1	1.25	1.938	11.57	2.42	4.69
4	4.35	2.97	2.42	3.594	15.63	1.43	5.14
5	3.02	9.5	1.65	7.838	23.67	.55	4.31
6	1.66	6.0	.35	1.05	1.743	1.62	1.70
7	1.00	4.8	.68	1.632	1.632	2.00	3.26
8	.50	1.3	1.2	0.78	0.39	2.67	2.08
9	.46	1.55	.52	0.403	0.18	3.66	1.47
					64.65		
10	-.18	4.3	0.50	1.075	-.194	2.19	2.35
11	-3.0	7.6	.68	2.584	-7.752	.50	1.29
12	-4.0	1.57	.92	.722	-2.89	.70	0.51
13	-4.62	1.85	.42	.389	-1.795	1.06	0.41
14	-5.08	1.85	.60	.555	-2.819	1.25	0.69
				24.12	-15.45		33.53
					49.2	$\bar{X} = 2.04$ m	

6.69'

Area = 259 ft²

$\bar{y} = 1.39 \rightarrow 4.56'$

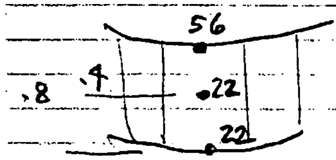
Alum Box (INSIDE BOX)

increase by 35-8 = 27° % incr = (27+45)/45 = 72/45 = 60%

(OUTSIDE BOX)

Load increase = 55%

Locate cg (approx)



$$cg = \frac{.4 * 22 + .8 * 22}{100} = .26 \text{ m from top}$$

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FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY ______ UNIT/S ______

SUBJECT ______

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O				

LOAD ON VEHICLE $\theta = 35+36 = 71°$ $W = 55$

INSIDE VEHICLE

$R_I = .7867\ W = 43.3$

$R_{OH} = .9561\ W \sin 71 = 49.72$

$R_{OV} = .9561\ W \cos 71 = 17.12$

$K_V = .0905\ W \sin 35 = 2.85$

$K_H = .0905\ W \cos 35 = 4.08$

P	arm	M	V	arm	M
43.3	-3.0	-129.9	—	—	—
—	—	—	49.72	8.15	+405.2
17.12	-3.0	-51.4			
-2.85	-1.9	+5.4			
—	—	—	4.08	+6.25	+25.5
Σ 57.6		-175.9	53.8		430.7

$\underbrace{-175.9 \quad 430.7}_{254.8}$

$P = 57.6^k$

$V = 53.8^k$

$M = 254.8^{km} = 836^{\prime k}$ arm $= 14.5'$ $M_{abt\ DLcg} = 836 - 5.55 * 57.6 = 516^{\prime k}$

OUTSIDE VEHICLE

		P	arm	M	V	arm	M
R_I	43.3	43.3	+3.0	129.9	—		
R_{OH}	49.72	—			49.72	8.85	+440.0
OV	17.12	17.12	+3.0	51.4			
K_V	2.85	-2.85	+4.05	-11.5			
H	4.08	—			4.08	6.95	+28.4
	Σ	57.6		169.8	53.8		468.4

$\underbrace{169.8 \quad 468.4}_{638.2}$

$P = 57.6$

$V = 53.8$

$M = 638.2^{km} = 2094^{\prime k}$ arm $= 36.4'$

$M_{abt\ DLcg} = 2094 - 5.55 * 57.6 = 1774^{\prime k}$

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FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O				

NAME OF COMPANY ______ UNIT/S ______

SUBJECT ______

WIND ~~LAT~~ ON GUIDEWAY

$f = 56$ psf $\qquad h = 3.3_m \rightarrow 10.83'$ $\qquad$ arm

$P_{WIND} = 10.83(.056)30 = 18.2 \quad 22.15 \quad 403$

arm 6.75m

$P_{LEE} = .5(18.2) = 9.1 \quad 24.44 \quad 222$

$27.3^k \qquad 625^{\,ik}$

WIND ON VEHICLE

$up = 2.5^k \qquad M = 180^{\,ik}$

$W_V = 6.8^k \qquad 6.8(26.5+2.3) = 196^{\,ik}$

BREAKING LONG $\qquad .65\ g$ on vehicle

$.65(55) = 36^k \qquad arm = 24.93$

7.8m $\qquad M_o = 921^{\,ik}$
7.2m $\qquad M_I = 850^{\,ik}$

SEISMIC ON VEH

$.105(55) = 5.8$

7.8m $\quad 25.6 \quad M = 147^{\,ik}$
7.2m $\quad 23.62 \quad M = 137^{\,ik}$

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY ______ UNIT/S ______

SUBJECT ______

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O				

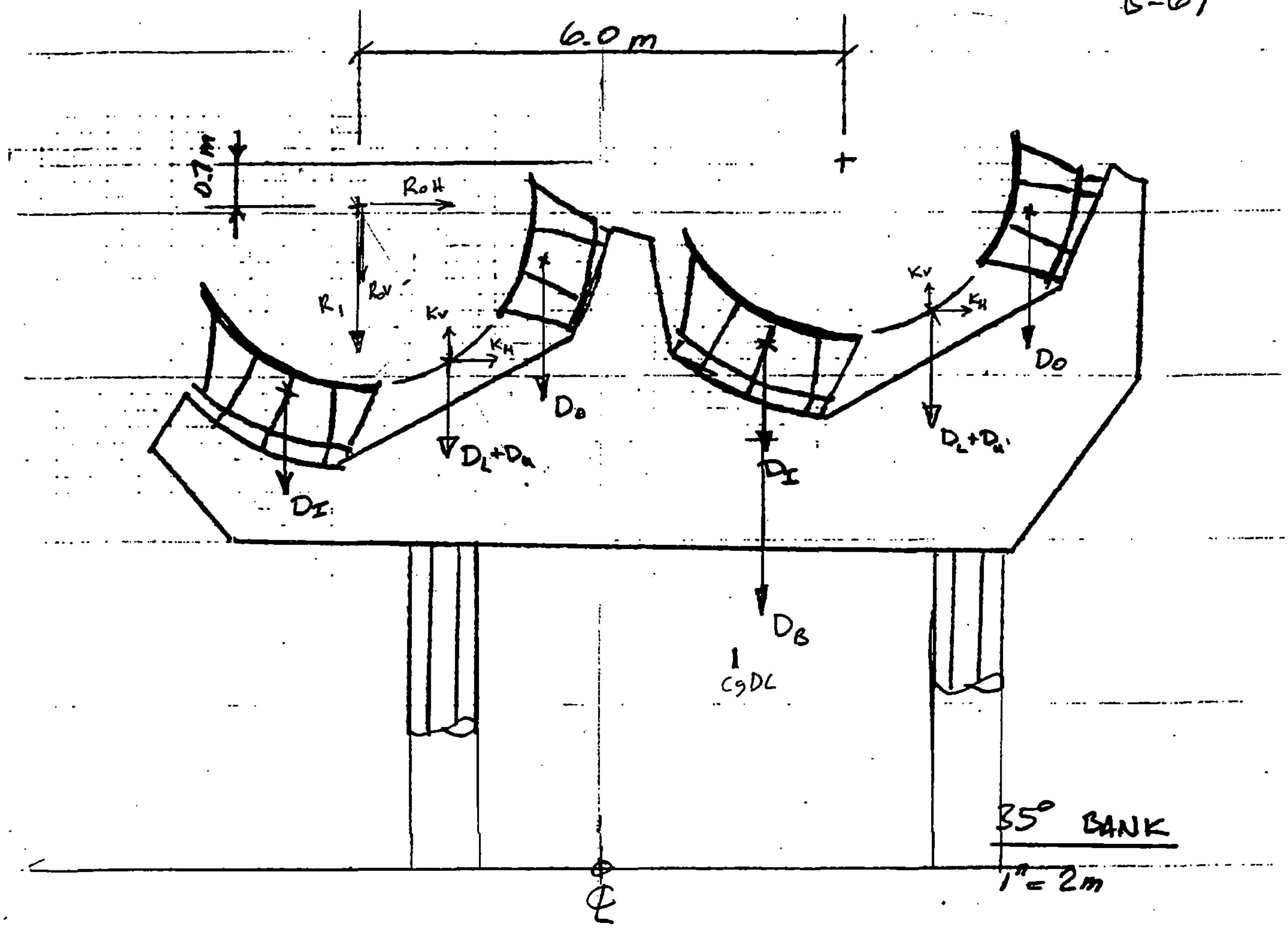
LOAD ON VEHICLE CONT.

INSIDE VEHICLE AT 0 SPEED (L_3)

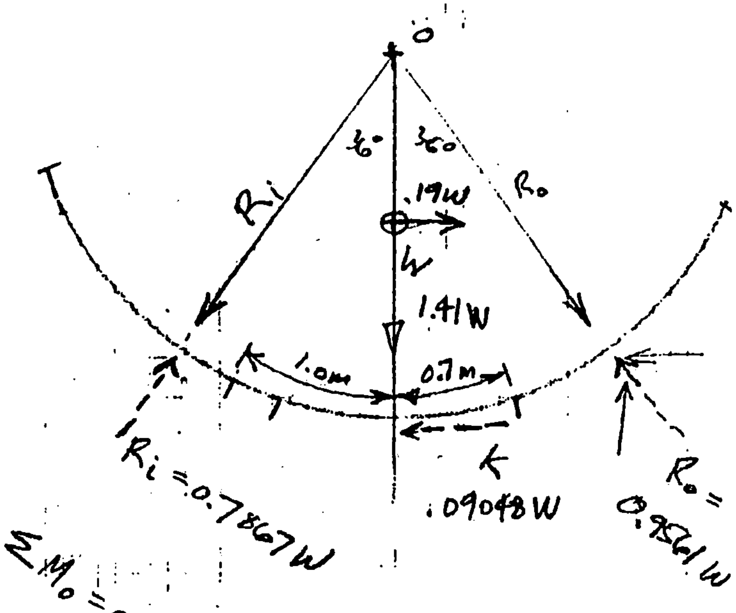
$P = 55'$

$M = 55(-3) = -541^{1k}$ $arm = -9.84'$

$M_{ast\ reg} = 55(5.55 + 9.84) = 846^{1k}$


6.0 m
0.7 m
RoH
R1
RoV
Kv
KH
DL+Da
DI
Do
DB
CgDL
35° BANK
1" = 2m

$$\frac{(360)\ .3}{2\pi\ 2.1} = 8.2$$



$\Sigma M_o = 0$ $\quad K = \frac{.19W(1.0)}{2.1} = 0.09048$

$\Sigma H = 0$ $\quad R_i \sin 36 + .19W = .09048W + R_o \sin 36$

$\Sigma V = 0$ $\quad 1.41W = R_i \cos 36 + R_o \cos 36$

$R_i = 0.7867W$

$R_o = 0.9561W$

$K = 0.09048W$

$$\frac{.9561W}{.618W} = 1.547\% \qquad \frac{.7867W}{.618W} = 1.273\%$$

$$\frac{W}{2(\cos 36°)} = .618 \leftarrow R_i = R_o \text{ - on straight run}$$

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```
**************************************************
*                                                *
*            S T A A D - III                     *
*            REVISION 14.1c(VERSION 14 LEVEL 1)  *
*            PROPRIETARY PROGRAM OF              *
*            RESEARCH ENGINEERS,INC.             *
*            DATE=    JUL 22, 1992               *
*            TIME=     9:24:59                   *
*                                                *
**************************************************
```

```
  1. STAAD SPACE MAGRAIL 35 DEGREE BANK
  2. UNIT KIP FEET
  3. INPUT WIDTH 79
  4. JOINT COORDINATES
  5. *  JOINT       X        Y        Z
  6.        1       0        0 -17.0000
  7.        2       0        2 -17.0000
  8.        3       0        4 -17.0000
  9.        4       0        6 -17.0000
 10.        5       0        8 -17.0000
 11.        6       0       10 -17.0000
 12.        7       0       12 -17.0000
 13.       11       0        0   3.0000
 14.       12       0        2   3.0000
 15.       13       0        4   3.0000
 16.       14       0        6   3.0000
 17.       15       0        8   3.0000
 18.       16       0       10   3.0000
 19.       17       0       12   3.0000
 20.       21       0 25.137 -21.8882
 21.       22       0 20.818 -20.4850
 22.       23       0   16.5 -19.0818
 23.       24       0   16.5      -17
 24.       25       0   16.5      -10
 25.       26       0   16.5  -0.9182
 26.       27       0 16.141   0.0000
 27.       28       0   15.5   1.6448
 28.       29       0   15.5   3.0000
 29.       30       0   15.5  10.0000
 30.       31       0   15.5  13.7366
 31.       32       0 17.696  16.7595
 32.       33       0 26.836 -16.6573
 33.       34       0     22      -10
 34.       35       0 23.336 -5.88550
 35.       36       0 23.446        0
 36.       37       0 24.836 3.342604
 37.       38       0     20       10
 38.       39       0 21.336 14.11449
 39. MEMBER INCIDENCES
 40.        1       1        2
 41.        2       2        3
 42.        3       3        4
 43.        4       4        5
 44.        5       5        6
 45.        6       6        7
 46.        7       7       24
 47.       11      11       12
 48.       12      12       13
```

```
          13        13        14
          14        14        15
          15        15        16
          16        16        17
          17        17        29
          21        21        22
          22        22        23
          23        23        24
          24        24        25
          25        25        26
          26        26        27
          27        27        28
          28        28        29
          29        29        30
          30        30        31
          31        31        32
          32        21        33
          33        25        34
          34        26        35
          35        27        36
          36        36        37
          37        30        38
          38        32        39
     UNIT KIP IN
     MEMBER PROPERTIES
           1 PRISM  YD                 33               IZ 29106.8 IY 29106.8
           2 PRISM  YD                 33               IZ 29106.8 IY 29106.8
           3 PRISM  YD                 33               IZ 29106.8 IY 29106.8
           4 PRISM  YD                 33               IZ 29106.8 IY 29106.8
           5 PRISM  YD                 33               IZ 29106.8 IY 29106.8
           6 PRISM  YD                 33               IZ 29106.8 IY 29106.8
           7 PRISM  YD                 33               IZ 29106.8 IY 29106.8
          11 PRISM  YD                 33               IZ 29106.8 IY 29106.8
          12 PRISM  YD                 33               IZ 29106.8 IY 29106.8
          13 PRISM  YD                 33               IZ 29106.8 IY 29106.8
          14 PRISM  YD                 33               IZ 29106.8 IY 29106.8
          15 PRISM  YD                 33               IZ 29106.8 IY 29106.8
          16 PRISM  YD                 33               IZ 29106.8 IY 29106.8
          17 PRISM  YD                 33               IZ 29106.8 IY 29106.8
          21 PRISM  YD                 60  ZD        33 IZ  297000 IY 89842.5
          22 PRISM  YD                 60  ZD        33 IZ  297000 IY 89842.5
          23 PRISM  YD                 60  ZD        33 IZ  297000 IY 89842.5
          24 PRISM  YD                 60  ZD        33 IZ  297000 IY 89842.5
          25 PRISM  YD                 60  ZD        33 IZ  297000 IY 89842.5
          26 PRISM  YD                 48  ZD        33 IZ  152064 IY   71874
          27 PRISM  YD                 48  ZD        33 IZ  152064 IY   71874
          28 PRISM  YD                 36  ZD        33 IZ   64152 IY 53905.5
          29 PRISM  YD                 36  ZD        33 IZ   64152 IY 53905.5
          30 PRISM  YD                 36  ZD        33 IZ   64152 IY 53905.5
          31 PRISM  YD                 36  ZD        33 IZ   64152 IY 53905.5
          32 PRISM  YD                 12  ZD        12 IZ    1000 IY    1000
          33 PRISM  YD                 12  ZD        12 IZ    1000 IY    1000
          34 PRISM  YD                 12  ZD        12 IZ    1000 IY    1000
          35 PRISM  YD                 24  ZD        33 IZ   19008 IY   35937
          36 PRISM  YD                 12  ZD        12 IZ    1000 IY    1000
          37 PRISM  YD                 12  ZD        12 IZ    1000 IY    1000
          38 PRISM  YD                 12  ZD        12 IZ    1000 IY    1000
     SUPPORTS
     1 11     FIXED
     CONSTANTS
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109. E          CONCRETE       ALL
110. DEN        CONCRETE       ALL
111. BETA             90 MEMB   32 TO 38
112. PRINT MEMBER INFORMATION
```

MEMBER INFORMATION

MEMBER	START JOINT	END JOINT	LENGTH (IN)	BETA (DEG)	RELEASES
1	1	2	24.000	0.00	000000000000
2	2	3	24.000	0.00	000000000000
3	3	4	24.000	0.00	000000000000
4	4	5	24.000	0.00	000000000000
5	5	6	24.000	0.00	000000000000
6	6	7	24.000	0.00	000000000000
7	7	24	54.000	0.00	000000000000
11	11	12	24.000	0.00	000000000000
12	12	13	24.000	0.00	000000000000
13	13	14	24.000	0.00	000000000000
14	14	15	24.000	0.00	000000000000
15	15	16	24.000	0.00	000000000000
16	16	17	24.000	0.00	000000000000
17	17	29	42.000	0.00	000000000000
21	21	22	54.495	0.00	000000000000
22	22	23	54.483	0.00	000000000000
23	23	24	24.982	0.00	000000000000
24	24	25	84.000	0.00	000000000000
25	25	26	108.982	0.00	000000000000
26	26	27	11.831	0.00	000000000000
27	27	28	21.183	0.00	000000000000
28	28	29	16.262	0.00	000000000000
29	29	30	84.000	0.00	000000000000
30	30	31	44.839	0.00	000000000000
31	31	32	44.836	0.00	000000000000
32	21	33	65.999	90.00	000000000000
33	25	34	66.000	90.00	000000000000
34	26	35	101.402	90.00	000000000000
35	27	36	87.660	90.00	000000000000
36	36	37	43.441	90.00	000000000000
37	30	38	54.000	90.00	000000000000
38	32	39	53.994	90.00	000000000000

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

113. PRINT MEMBER PROPERTIES

MEMBER PROPERTIES. UNIT - INCH

MEMB	PROFILE	AX/ AY	IZ/ AZ	IY/ SZ	IX/ SY
1	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
2	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
3	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
4	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
5	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
6	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
7	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
11	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
12	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
13	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
14	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
15	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
16	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
17	PRISMATIC	855.30 855.30	29106.80 855.30	29106.80 1764.05	58213.60 1764.05
21	PRISMATIC	1980.00 1980.00	297000.00 1980.00	89842.50 9900.00	469696.59 5445.00
22	PRISMATIC	1980.00 1980.00	297000.00 1980.00	89842.50 9900.00	469696.59 5445.00
23	PRISMATIC	1980.00 1980.00	297000.00 1980.00	89842.50 9900.00	469696.59 5445.00
24	PRISMATIC	1980.00 1980.00	297000.00 1980.00	89842.50 9900.00	469696.59 5445.00
25	PRISMATIC	1980.00 1980.00	297000.00 1980.00	89842.50 9900.00	469696.59 5445.00
26	PRISMATIC	1584.00 1584.00	152064.00 1584.00	71874.00 6336.00	325948.59 4356.00
27	PRISMATIC	1584.00 1584.00	152064.00 1584.00	71874.00 6336.00	325948.59 4356.00
28	PRISMATIC	1188.00 1188.00	64152.00 1188.00	53905.50 3564.00	182200.59 3267.00
29	PRISMATIC	1188.00 1188.00	64152.00 1188.00	53905.50 3564.00	182200.59 3267.00
30	PRISMATIC	1188.00 1188.00	64152.00 1188.00	53905.50 3564.00	182200.59 3267.00

MEMBER PROPERTIES. UNIT - INCH

MEMB	PROFILE	AX/ AY	IZ/ AZ	IY/ SZ	IX/ SY
31	PRISMATIC	1188.00	64152.00	53905.50	182200.59
		1188.00	1188.00	3564.00	3267.00
32	PRISMATIC	144.00	1000.00	1000.00	2557.44
		144.00	144.00	166.67	166.67
33	PRISMATIC	144.00	1000.00	1000.00	2557.44
		144.00	144.00	166.67	166.67
34	PRISMATIC	144.00	1000.00	1000.00	2557.44
		144.00	144.00	166.67	166.67
35	PRISMATIC	792.00	19008.00	35937.00	82391.04
		792.00	792.00	1584.00	2178.00
36	PRISMATIC	144.00	1000.00	1000.00	2557.44
		144.00	144.00	166.67	166.67
37	PRISMATIC	144.00	1000.00	1000.00	2557.44
		144.00	144.00	166.67	166.67
38	PRISMATIC	144.00	1000.00	1000.00	2557.44
		144.00	144.00	166.67	166.67

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

114. PRINT MATERIAL PROPERTIES

MATERIAL PROPERTIES.

ALL UNITS ARE - KIP IN

MEMBER	E	G	DEN	ALPHA
1	3150.0	1575.0	0.00008680	0.00000000
2	3150.0	1575.0	0.00008680	0.00000000
3	3150.0	1575.0	0.00008680	0.00000000
4	3150.0	1575.0	0.00008680	0.00000000
5	3150.0	1575.0	0.00008680	0.00000000
6	3150.0	1575.0	0.00008680	0.00000000
7	3150.0	1575.0	0.00008680	0.00000000
11	3150.0	1575.0	0.00008680	0.00000000
12	3150.0	1575.0	0.00008680	0.00000000
13	3150.0	1575.0	0.00008680	0.00000000
14	3150.0	1575.0	0.00008680	0.00000000
15	3150.0	1575.0	0.00008680	0.00000000
16	3150.0	1575.0	0.00008680	0.00000000
17	3150.0	1575.0	0.00008680	0.00000000
21	3150.0	1575.0	0.00008680	0.00000000
22	3150.0	1575.0	0.00008680	0.00000000
23	3150.0	1575.0	0.00008680	0.00000000
24	3150.0	1575.0	0.00008680	0.00000000
25	3150.0	1575.0	0.00008680	0.00000000
26	3150.0	1575.0	0.00008680	0.00000000
27	3150.0	1575.0	0.00008680	0.00000000
28	3150.0	1575.0	0.00008680	0.00000000
29	3150.0	1575.0	0.00008680	0.00000000
30	3150.0	1575.0	0.00008680	0.00000000
31	3150.0	1575.0	0.00008680	0.00000000
32	3150.0	1575.0	0.00008680	0.00000000
33	3150.0	1575.0	0.00008680	0.00000000
34	3150.0	1575.0	0.00008680	0.00000000
35	3150.0	1575.0	0.00008680	0.00000000
36	3150.0	1575.0	0.00008680	0.00000000
37	3150.0	1575.0	0.00008680	0.00000000
38	3150.0	1575.0	0.00008680	0.00000000

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

```
115. UNIT KIP FEET
116. LOAD 1 SELFWEIGHT
117. SELFWEIGHT Y -1
118. LOAD 2 DEAD LOADS
119. * AL BOX BEAM
120. JOINT LOAD
121. 21 36                        FY    -5.34
122. 25 26 30 32                  FY   -3.255
123. * UTILITIES AT 100 PLF
124. 21 25 36 30                  FY     -1.5
125. * LSM AT 100 PLF
126. 21 25 36 30                  FY     -1.5
```

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```
127. LOAD 3 VEHICLE 1 AT 55 KIP PER END + CENT. FORCE
128. JOINT LOAD
129. 33                              FY    -16.3
130. 33                              FZ    -50.1
131. 34                              FY    -43.3
132. 34                              FZ       -5
133. LOAD 4 VEHICLE 2 AT 55 KIP PER END + CENT. FORCE
134. JOINT LOAD
135. 37                              FY    -16.3
136. 37                              FZ    -50.1
137. 38                              FY    -43.3
138. 38                              FZ       -5
139. LOAD 5 SNOW 1
140. JOINT LOAD
141. 21 26                           FY    -10.8
142. LOAD 6 SNOW 2
143. JOINT LOAD
144. 36 32                           FY    -10.8
145. LOAD 7 WIND ON STRUCTURE+Z
146. JOINT LOAD
147. 21 26                           FZ     9.24
148. 36 32                           FZ     4.62
149. LOAD 8 WIND ON VEHICLE 1 +Z
150. JOINT LOAD
151. 33                              FZ      6.5
152. 33                              FY     -2.2
153. LOAD 9 WIND ON VEHICLE 2 +Z
154. JOINT LOAD
155. 37                              FZ      6.5
156. 37                              FY     -2.2
157. LOAD 10 BRAKING VEHICLE 1 +X
158. JOINT LOAD
159. 33 34                           FX    35.75
160. LOAD 11 BRAKING VEHICLE 2 +X
161. JOINT LOAD
162. 36 38                           FX    35.75
163. *THE FOLLOWING HAVE BEEN FACTORED FOR CONCRETE DESIGN
164. LOAD COMB 20 SW + DL
165. 1 1.4  2  1.4
166. LOAD COMB 21 SW + DL + SNOW 1 + SNOW 2
167. 1  1.4  2  1.4  5  1.7  6  1.7
168. LOAD COMB 22 SW + DL + VEH 1
169. 1  1.4  2  1.4  3  1.4
170. LOAD COMB 23 SW + DL + VEH 1 + VEH 2
171. 1  1.4  2  1.4  3  1.4  4  1.4
172. * THE FOLLOWING ARE BRAKING CASES WITH .75 FACTOR
173. LOAD COMB 24 SW + DL + VEH 1 + BRAKING 1
174. 1  1.05  2  1.05  3  1.05  10  1.05
175. LOAD COMB 25 SW + DL + VEH 1 - BRAKING 1
176. 1  1.05  2  1.05  3  1.05  10  -1.05
177. LOAD COMB 26 SW + DL + VEH 1 + VEH 2 + BRAKING 1 + BRAKING 2
178. 1  1.05  2  1.05  3  1.05  4  1.05  10  1.05  11  1.05
179. LOAD COMB 27 SW + DL + VEH 1 + VEH 2 + BRAKING 1 - BRAKING 2
180. 1  1.05  2  1.05  3  1.05  4  1.05  10  1.05  11 -1.05
181. * THE FOLLOWING ARE WIND COMBINATIONS
182. LOAD COMB 28 SW + DL + WIND ON STRUCTURE
183. 1  1.05 2  1.05  7  1.275
184. LOAD COMB 29 SW + DL + VEH 1 + REDUCED WIND ON VEH 1 AND STRUCTURE +X
185. 1  1.05 2  1.05  3  1.05  7 .166  8  1.275
186. LOAD COMB 30 SW + DL + VEH 1 + REDUCED WIND ON VEH 1 AND STRUCTURE -X
```

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```
187. 1  1.05 2  1.05  3  1.05  7 -.166  8  -1.275
188. LOAD COMB 31 SW + DL + VEH 1 & 2 + REDUCED WIND ON VEHS AND STRUCTURE +X
189. 1  1.05 2  1.05  3  1.05  4  1.05  7 .166  8  1.275  9 1.275
190. LOAD COMB 32 SW + DL + VEH 1 & 2 + REDUCED WIND ON VEHS AND STRUCTURE -X
191. 1  1.05 2  1.05  3  1.05  4  1.05  7 -.166  8  -1.275  9 -1.275
192. PERFORM ANALYSIS
```

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

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =    33/   32/    2
ORIGINAL/FINAL BAND-WIDTH =   12/    4
TOTAL PRIMARY LOAD CASES  =   11, TOTAL DEGREES OF FREEDOM =   186
SIZE OF STIFFNESS MATRIX =    5580 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE =   12.18 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.                  9:25: 7
++ PROCESSING GLOBAL STIFFNESS MATRIX.                   9:25: 8
++ PROCESSING TRIANGULAR FACTORIZATION.                  9:25:10
++ CALCULATING JOINT DISPLACEMENTS.                      9:25:13
++ CALCULATING ELEMENT FORCES.                           9:25:15

193. PARAMETERS
194. TRACK 2.0 ALL
195. LOAD LIST 20 TO 32
196. START CONCRETE DESIGN

197. DESIGN COLUMN        1 TO        7
```

COLUMN NO. 1 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 43.832 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
11 - NUMBER 18 (EQUALLY SPACED)	5.144	26	STA	0.782

COLUMN NO. 2 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 39.558 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
10 - NUMBER 18 (EQUALLY SPACED)	4.677	26	STA	0.783

COLUMN NO. 3 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 35.399 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
28 - NUMBER 10 (EQUALLY SPACED)	4.158	26	STA	0.784

COLUMN NO. 4 DESIGN RESULTS

B-81

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 31.387 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
14 - NUMBER 14 (EQUALLY SPACED)	3.683	26	STA	0.785

C O L U M N N O. 5 D E S I G N R E S U L T S

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 27.570 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
46 - NUMBER 7 (EQUALLY SPACED)	3.227	26	STA	0.786

C O L U M N N O. 6 D E S I G N R E S U L T S

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 24.015 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
19 - NUMBER 10 (EQUALLY SPACED)	2.821	26	STA	0.787

C O L U M N N O. 7 D E S I G N R E S U L T S

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 20.821 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI

B-82

21 - NUMBER 9 (EQUALLY SPACED)	2.455	26	STA	0.788

********************END OF COLUMN DESIGN RESULTS********************

198. DESIGN COLUMN 11 TO 17

COLUMN NO. 11 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 52.142 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
24 - NUMBER 14 (EQUALLY SPACED)	6.314	26	STA	0.850

COLUMN NO. 12 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 46.246 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
30 - NUMBER 11 (EQUALLY SPACED)	5.472	26	STA	0.851

COLUMN NO. 13 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 40.495 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
18 - NUMBER 14 (EQUALLY SPACED)	4.735	26	STA	0.852

COLUMN NO. 14 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 34.947 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
35 - NUMBER 9 (EQUALLY SPACED)	4.092	26	STA	0.853

COLUMN NO. 15 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 29.698 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
30 - NUMBER 9 (EQUALLY SPACED)	3.508	26	STA	0.854

COLUMN NO. 16 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 24.911 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI
16 - NUMBER 11 (EQUALLY SPACED)	2.918	26	STA	0.855

COLUMN NO. 17 DESIGN RESULTS

FY - 60000 FC - 4000 PSI, CIRC SIZE 33.00 INCHES DIAMETER TIED

AREA OF STEEL REQUIRED = 20.864 SQ. IN.

BAR CONFIGURATION	REINF PCT.	LOAD	LOCATION	PHI

21 - NUMBER 9 (EQUALLY SPACED)	2.455	26	STA	0.856	B-85

********************END OF COLUMN DESIGN RESULTS********************

199. DESIGN BEAM 21 TO 31

B-26

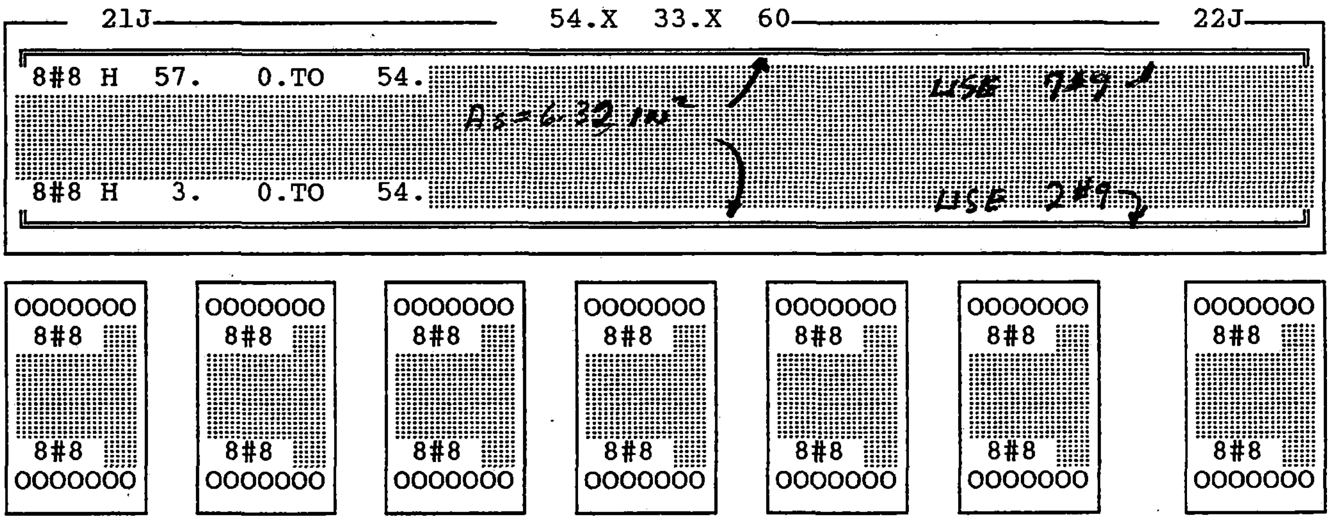
B E A M N O. 21 D E S I G N R E S U L T S - FLEXURE

LEN - 4.54FT. FY - 60000. FC - 4000. SIZE - 33.00 X 60.00 INCHES

LEVEL	HEIGHT FT. IN.	BAR INFO	FROM FT. IN.	TO FT. IN.	ANCHOR STA	ANCHOR END
1	0 + 2-1/2	8-NUM.8	0 + 0-0/0	4 + 6-1/2	YES	YES
2	4 + 9-1/2	8-NUM.8	0 + 0-0/0	4 + 6-1/2	YES	YES

B E A M N O. 21 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=173.41 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=173.41 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



B E A M N O. 22 D E S I G N R E S U L T S - FLEXURE

LEN - 4.54FT. FY - 60000. FC - 4000. SIZE - 33.00 X 60.00 INCHES

LEVEL	HEIGHT FT. IN.	BAR INFO	FROM FT. IN.	TO FT. IN.	ANCHOR STA	ANCHOR END
1	0 + 2-1/2	8-NUM.8	0 + 0-0/0	4 + 6-1/2	YES	YES
2	4 + 9-1/2	8-NUM.8	0 + 0-0/0	4 + 6-1/2	YES	YES

B E A M N O. 22 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=173.41 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.

B-87

```
AT END    SUPPORT - Vu=  0.01 KIPS  vc= 126.49 PSI  øVc=173.41 KIPS
                    SUPPORT -STIRRUPS ARE NOT REQUIRED.

  22J                 54.X  33.X  60                 23J
 8#8 H  57.   0.TO   54.

 8#8 H   3.   0.TO   54.

0000000  0000000  0000000  0000000  0000000  0000000  0000000
  8#8      8#8      8#8      8#8      8#8      8#8      8#8

  8#8      8#8      8#8      8#8      8#8      8#8      8#8
0000000  0000000  0000000  0000000  0000000  0000000  0000000
```

==

B E A M   N O. 23   D E S I G N   R E S U L T S - FLEXURE

LEN -   2.08FT. FY - 60000. FC - 4000. SIZE - 33.00 X 60.00 INCHES

LEVEL	HEIGHT FT.	HEIGHT IN.	BAR INFO	FROM FT.	FROM IN.	TO FT.	TO IN.	ANCHOR STA	ANCHOR END
1	0	+ 2-1/2	8-NUM.8	0	+ 0-0/0	2	+ 1-0/0	YES	YES
2	4	+ 9-1/2	8-NUM.8	0	+ 0-0/0	2	+ 1-0/0	YES	YES

B E A M   N O. 23   D E S I G N   R E S U L T S - SHEAR

```
AT START SUPPORT - Vu=  0.01 KIPS  vc= 126.49 PSI  øVc=173.41 KIPS
                   SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END   SUPPORT - Vu=  0.01 KIPS  vc= 126.49 PSI  øVc=173.41 KIPS
                   SUPPORT -STIRRUPS ARE NOT REQUIRED.

  23J                 25.X  33.X  60                 24J
 8#8 H  57.   0.TO   25.

 8#8 H   3.   0.TO   25.

0000000  0000000  0000000  0000000  0000000  0000000  0000000
  8#8      8#8      8#8      8#8      8#8      8#8      8#8

  8#8      8#8      8#8      8#8      8#8      8#8      8#8
0000000  0000000  0000000  0000000  0000000  0000000  0000000
```

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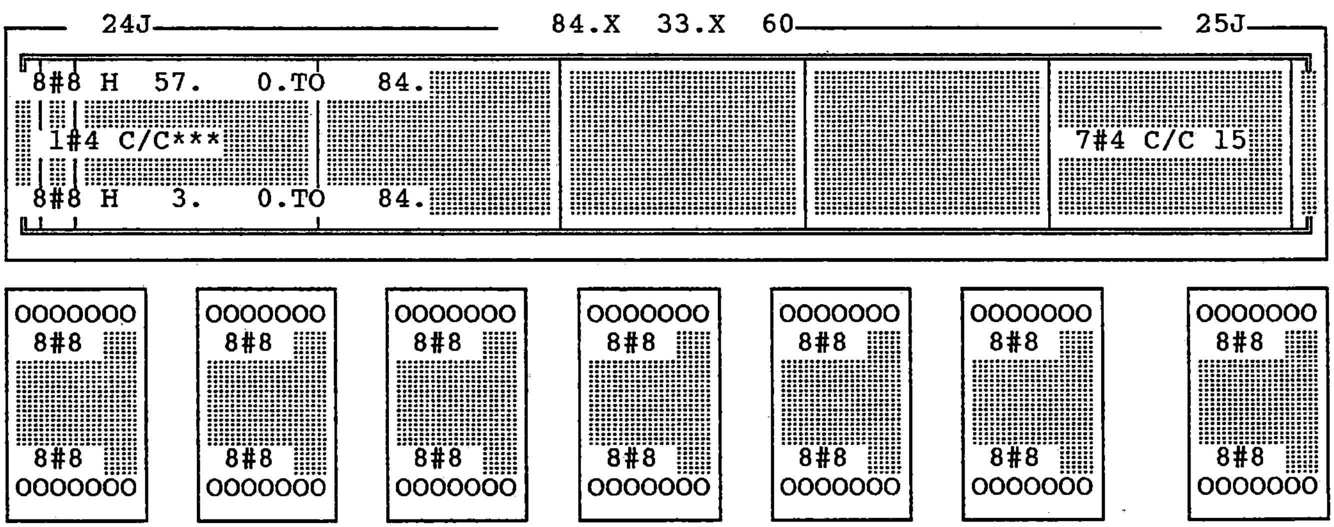
BEAM NO. 24 DESIGN RESULTS - FLEXURE

LEN - 7.00FT. FY - 60000. FC - 4000. SIZE - 33.00 X 60.00 INCHES

LEVEL	HEIGHT FT.	HEIGHT IN.	BAR INFO	FROM FT.	FROM IN.	TO FT.	TO IN.	ANCHOR STA	ANCHOR END
1	0 +	2-1/2	8-NUM.8	0 +	0-0/0	7 +	0-0/0	YES	YES
2	4 +	9-1/2	8-NUM.8	0 +	0-0/0	7 +	0-0/0	YES	YES

BEAM NO. 24 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu=167.67 KIPS vc= 126.49 PSI øVc=173.41 KIPS
PROVIDE NUM. 4 BARS AT **** IN. C/C FOR 84. IN.
AT END SUPPORT - Vu=175.13 KIPS vc= 126.49 PSI øVc=173.41 KIPS
PROVIDE NUM. 4 BARS AT 14.5 IN. C/C FOR 84. IN.



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BEAM NO. 25 DESIGN RESULTS - FLEXURE

LEN - 9.08FT. FY - 60000. FC - 4000. SIZE - 33.00 X 60.00 INCHES

LEVEL	HEIGHT FT.	HEIGHT IN.	BAR INFO	FROM FT.	FROM IN.	TO FT.	TO IN.	ANCHOR STA	ANCHOR END
1	0 +	2-1/2	8-NUM.8	0 +	0-0/0	9 +	1-0/0	YES	YES
2	4 +	9-1/2	8-NUM.8	0 +	0-0/0	9 +	1-0/0	YES	YES

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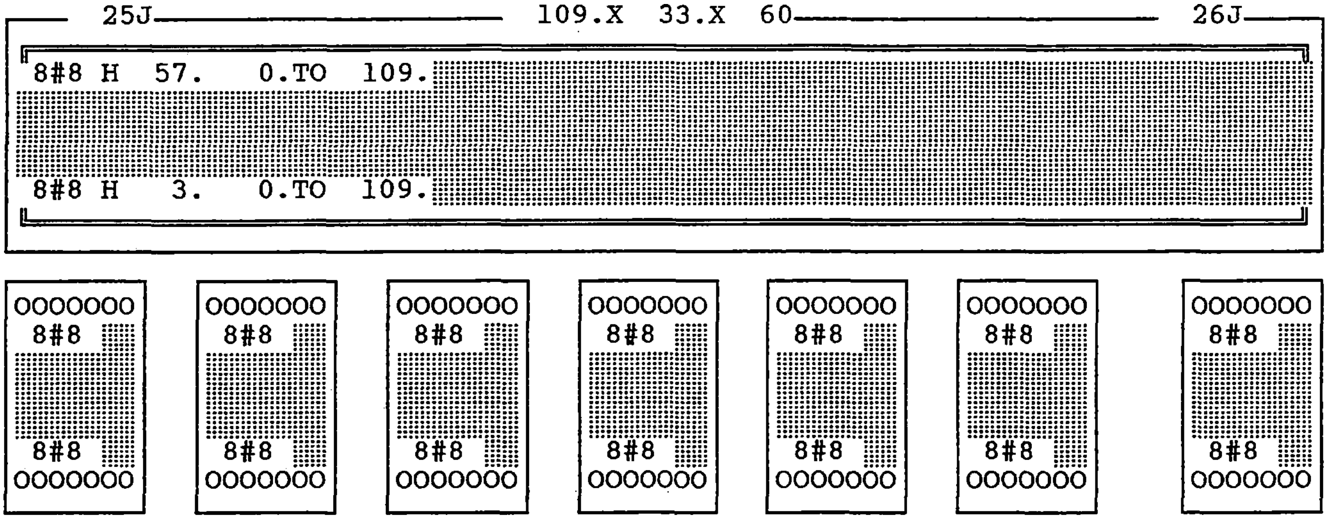
B E A M N O. 25 D E S I G N R E S U L T S - SHEAR

```
AT START SUPPORT - Vu= 76.92 KIPS  vc= 126.49 PSI  øVc=173.41 KIPS
                   SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END   SUPPORT - Vu= 76.11 KIPS  vc= 126.49 PSI  øVc=173.41 KIPS
                   SUPPORT -STIRRUPS ARE NOT REQUIRED.
```



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B E A M N O. 26 D E S I G N R E S U L T S - FLEXURE

LEN - 0.99FT. FY - 60000. FC - 4000. SIZE - 33.00 X 48.00 INCHES

LEVEL	HEIGHT FT.	HEIGHT IN.	BAR INFO	FROM FT.	FROM IN.	TO FT.	TO IN.	ANCHOR STA	ANCHOR END
1	0	+ 3-0/0	5-NUM.9	0	+ 0-0/0	1	+ 0-0/0	YES	YES
2	3	+ 9-1/2	5-NUM.9	0	+ 0-0/0	1	+ 0-0/0	YES	YES

B E A M N O. 26 D E S I G N R E S U L T S - SHEAR

```
AT START SUPPORT - Vu=  0.01 KIPS  vc= 126.49 PSI  øVc=137.22 KIPS
                   SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END   SUPPORT - Vu=  0.01 KIPS  vc= 126.49 PSI  øVc=137.22 KIPS
                   SUPPORT -STIRRUPS ARE NOT REQUIRED.
```

26J 12.X 33.X 48 27J

5#9 H 45. 0.TO 12.

AS = 5.0 IN²

5#9 H 3. 0.TO 12.

00000	00000	00000	00000	00000	00000
5#9	5#9	5#9	5#9	5#9	5#9
5#9	5#9	5#9	5#9	5#9	5#9
00000	00000	00000	00000	00000	00000

==

B E A M N O. 27 D E S I G N R E S U L T S - FLEXURE

LEN - 1.77FT. FY - 60000. FC - 4000. SIZE - 33.00 X 48.00 INCHES

LEVEL	HEIGHT FT. IN.	BAR INFO	FROM FT. IN.	TO FT. IN.	ANCHOR STA	ANCHOR END
1	0 + 3-0/0	5-NUM.9	0 + 0-0/0	1 + 9-1/2	YES	YES
2	3 + 9-1/2	5-NUM.9	0 + 0-0/0	1 + 9-1/2	YES	YES

B E A M N O. 27 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=137.22 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=137.22 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.

27J 21.X 33.X 48 28J

5#9 H 45. 0.TO 21.

5#9 H 3. 0.TO 21.

00000	00000	00000	00000	00000	00000
5#9	5#9	5#9	5#9	5#9	5#9
5#9	5#9	5#9	5#9	5#9	5#9
00000	00000	00000	00000	00000	00000

==

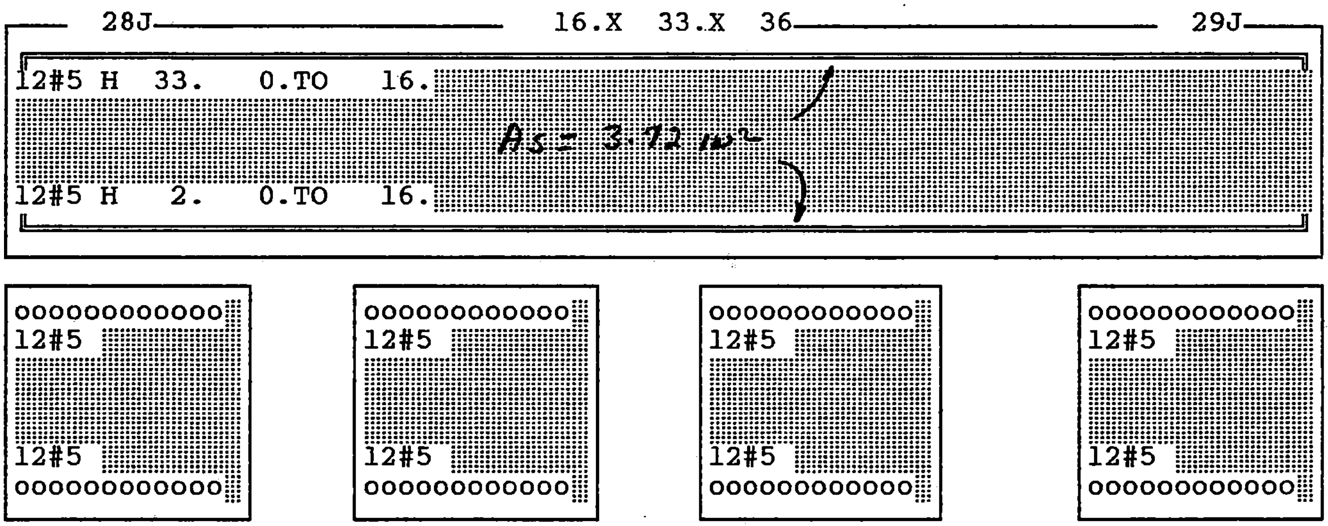
B E A M N O. 28 D E S I G N R E S U L T S - FLEXURE

LEN - 1.36FT. FY - 60000. FC - 4000. SIZE - 33.00 X 36.00 INCHES

LEVEL	HEIGHT FT. IN.	BAR INFO	FROM FT. IN.	TO FT. IN.	ANCHOR STA	ANCHOR END
1	0 + 2-1/2	12-NUM.5	0 + 0-0/0	1 + 4-1/2	YES	YES
2	2 + 9-1/2	12-NUM.5	0 + 0-0/0	1 + 4-1/2	YES	YES

B E A M N O. 28 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=101.03 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 0.01 KIPS vc= 126.49 PSI øVc=101.03 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



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B E A M N O. 29 D E S I G N R E S U L T S - FLEXURE

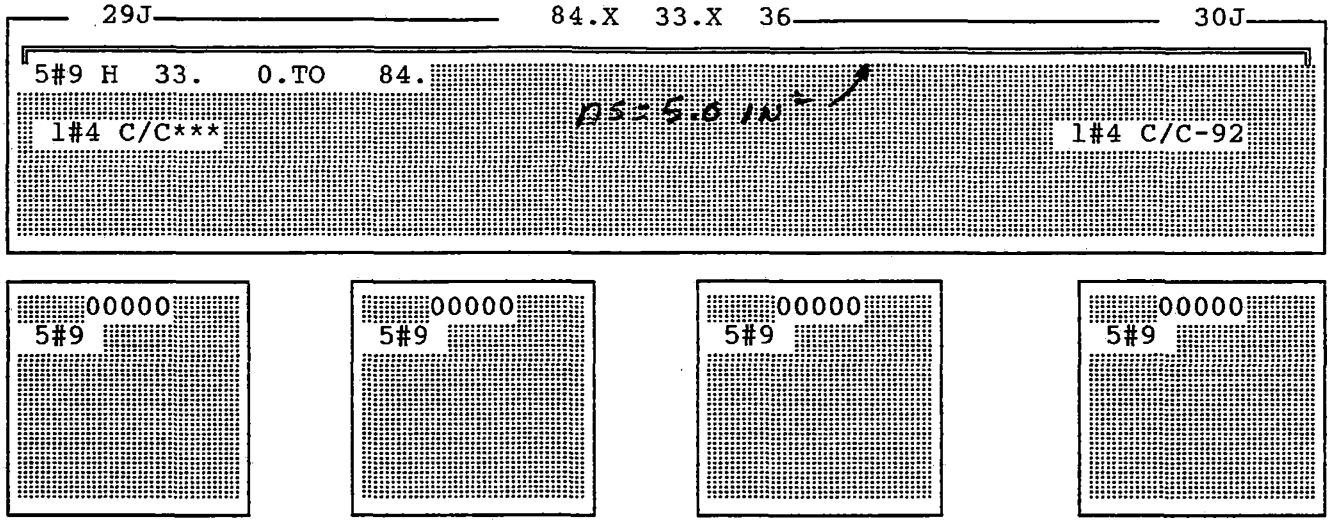
LEN - 7.00FT. FY - 60000. FC - 4000. SIZE - 33.00 X 36.00 INCHES

LEVEL	HEIGHT FT. IN.	BAR INFO	FROM FT. IN.	TO FT. IN.	ANCHOR STA	ANCHOR END
1	2 + 9-1/2	5-NUM.9	0 + 0-0/0	7 + 0-0/0	YES	YES

B E A M N O. 29 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 96.06 KIPS vc= 126.49 PSI øVc=101.03 KIPS
PROVIDE NUM. 4 BARS AT **** IN. C/C FOR 84. IN.

AT END SUPPORT - Vu= 93.61 KIPS vc= 126.49 PSI øVc=101.03 KIPS Δ-92
PROVIDE NUM. 4 BARS AT **** IN. C/C FOR 84. IN.



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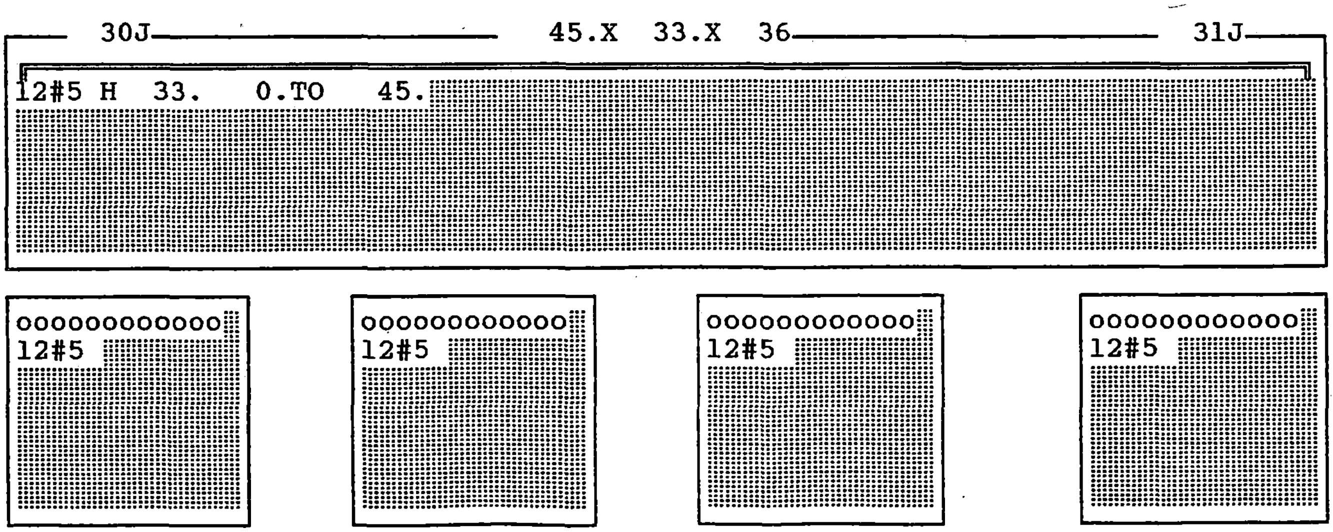
B E A M N O. 30 D E S I G N R E S U L T S - FLEXURE

LEN - 3.74FT. FY - 60000. FC - 4000. SIZE - 33.00 X 36.00 INCHES

LEVEL	HEIGHT FT. IN.	BAR INFO	FROM FT. IN.	TO FT. IN.	ANCHOR STA	ANCHOR END
1	2 + 9-1/2	12-NUM.5	0 + 0-0/0	3 + 9-0/0	YES	YES

B E A M N O. 30 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 31.97 KIPS vc= 126.49 PSI øVc=101.03 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 35.17 KIPS vc= 126.49 PSI øVc=101.03 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



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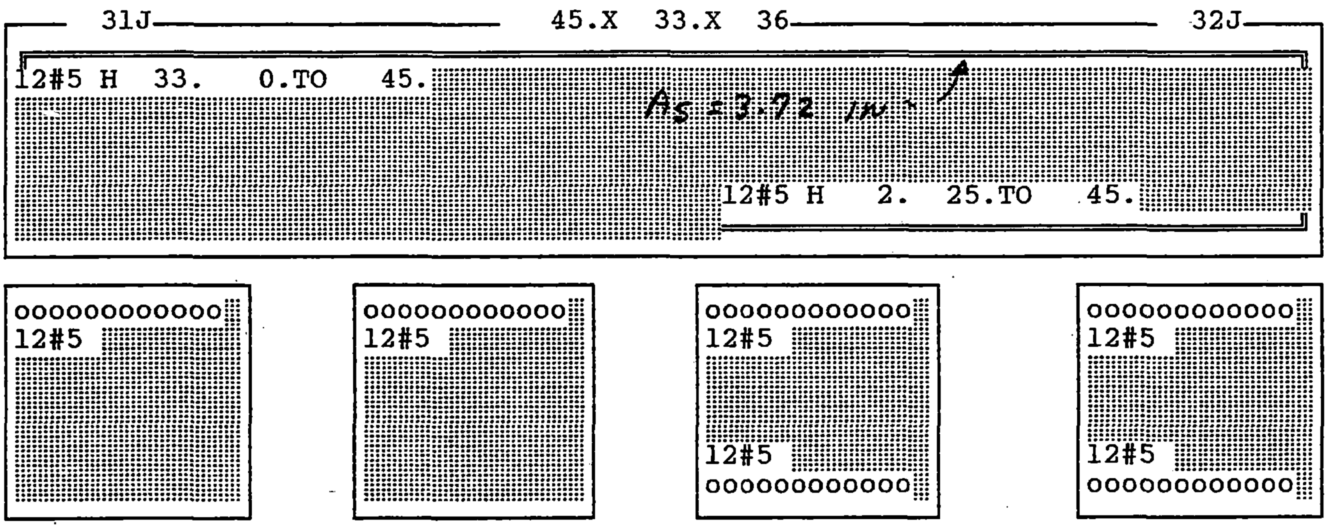
B E A M N O. 31 D E S I G N R E S U L T S - FLEXURE

LEN - 3.74FT. FY - 60000. FC - 4000. SIZE - 33.00 X 36.00 INCHES

LEVEL	HEIGHT FT.	HEIGHT IN.	BAR INFO	FROM FT.	FROM IN.	TO FT.	TO IN.	ANCHOR STA	ANCHOR END
1	0	+ 2-1/2	12-NUM.5	2	+ 1-1/2	3	+ 9-0/0	NO	YES
2	2	+ 9-1/2	12-NUM.5	0	+ 0-0/0	3	+ 9-0/0	YES	YES

B E A M N O. 31 D E S I G N R E S U L T S - SHEAR

AT START SUPPORT - Vu= 20.63 KIPS vc= 126.49 PSI øVc=101.03 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.
AT END SUPPORT - Vu= 23.22 KIPS vc= 126.49 PSI øVc=101.03 KIPS
SUPPORT -STIRRUPS ARE NOT REQUIRED.



********************END OF BEAM DESIGN**************************

200. DESIGN BEAM 35

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==================================================================

      B E A M  N O.  35  D E S I G N  R E S U L T S -  FLEXURE

LEN -   7.30FT.  FY - 60000.  FC - 4000.  SIZE - 33.00 X 24.00 INCHES

LEVEL    HEIGHT      BAR INFO        FROM            TO          ANCHOR
       FT.    IN.                FT.       IN.    FT.      IN.   STA  END
---------------------------------------------------------------------

  1    0 + 2-1/2    3-NUM.8      0 + 0-0/0       7 + 4-0/0     YES  YES
  2    1 + 9-1/2   14-NUM.6      0 + 0-0/0       7 + 4-0/0     YES  YES

      B E A M  N O.  35  D E S I G N  R E S U L T S - SHEAR

 AT START SUPPORT - Vu= 70.14 KIPS  vc= 126.49 PSI  øVc= 64.84 KIPS
                    PROVIDE NUM. 4  BARS AT 10.8 IN. C/C FOR   88. IN.
 AT END   SUPPORT - Vu= 70.14 KIPS  vc= 126.49 PSI  øVc= 64.84 KIPS
                    PROVIDE NUM. 4  BARS AT 10.8 IN. C/C FOR   88. IN.

 27J                    88.X  33.X  24                          36J
14#6 H  21.   0.TO   88.            As=6.16
10#4 C/C 11                                          10#4 C/C 11
 3#8 H   3.   0.TO   88.            As=2.37

  OOOOOOOOOOOOOO        OOOOOOOOOOOOOO        OOOOOOOOOOOOOO
14#6                  14#6                  14#6

 3#8                   3#8                  -3#8
        OOO                   OOO                   OOO

********************END OF BEAM DESIGN*************************

201. END CONCRETE DESIGN
202. LOAD LIST 1 TO 11
203. PRINT SUPPORT REACTIONS
```

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	0.00	57.73	-1.06	-8.29	0.00	0.00
	2	0.00	12.11	-1.02	-7.33	0.00	0.00
	3	0.00	93.46	23.80	213.88	0.00	0.00
	4	0.00	29.53	25.47	211.60	0.00	0.00
	5	0.00	15.46	-0.11	0.37	0.00	0.00
	6	0.00	-5.36	-1.81	-13.94	0.00	0.00
	7	0.00	-17.08	-13.01	-111.76	0.00	0.00
	8	0.00	-3.79	-2.53	-23.73	0.00	0.00
	9	0.00	-5.38	-3.49	-28.58	0.00	0.00
	10	-53.30	0.00	0.00	0.00	37.47	1037.51
	11	-3.21	0.00	0.00	0.00	-87.76	477.08
11	1	0.00	61.93	1.06	2.53	0.00	0.00
	2	0.00	23.59	1.02	3.28	0.00	0.00
	3	0.00	-33.86	31.30	254.68	0.00	0.00
	4	0.00	30.07	29.63	233.37	0.00	0.00
	5	0.00	6.14	0.11	1.62	0.00	0.00
	6	0.00	26.96	1.81	4.98	0.00	0.00
	7	0.00	17.08	-14.71	-121.35	0.00	0.00
	8	0.00	5.99	-3.97	-31.57	0.00	0.00
	9	0.00	7.58	-3.01	-26.07	0.00	0.00
	10	-18.20	0.00	0.00	0.00	64.04	708.38
	11	-68.29	0.00	0.00	0.00	-119.37	1076.12

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

204. 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	0.00000	0.00000	0.00000
	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	10	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	11	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	1	0.00000	-0.00051	0.00030	0.00002	0.00000	0.00000
	2	0.00000	-0.00011	0.00027	0.00002	0.00000	0.00000
	3	0.00000	-0.00083	-0.00789	-0.00060	0.00000	0.00000
	4	0.00000	-0.00026	-0.00779	-0.00058	0.00000	0.00000
	5	0.00000	-0.00014	-0.00001	0.00000	0.00000	0.00000
	6	0.00000	0.00005	0.00051	0.00004	0.00000	0.00000
	7	0.00000	0.00015	0.00412	0.00031	0.00000	0.00000
	8	0.00000	0.00003	0.00088	0.00007	0.00000	0.00000
	9	0.00000	0.00005	0.00105	0.00008	0.00000	0.00000
	10	0.03872	0.00000	0.00000	0.00000	-0.00012	-0.00309
	11	0.01796	0.00000	0.00000	0.00000	0.00028	-0.00149
3	1	0.00000	-0.00100	0.00108	0.00004	0.00000	0.00000
	2	0.00000	-0.00022	0.00094	0.00003	0.00000	0.00000
	3	0.00000	-0.00167	-0.02831	-0.00104	0.00000	0.00000
	4	0.00000	-0.00053	-0.02769	-0.00101	0.00000	0.00000
	5	0.00000	-0.00028	-0.00007	0.00000	0.00000	0.00000
	6	0.00000	0.00010	0.00180	0.00006	0.00000	0.00000
	7	0.00000	0.00030	0.01470	0.00054	0.00000	0.00000
	8	0.00000	0.00007	0.00316	0.00012	0.00000	0.00000
	9	0.00000	0.00010	0.00373	0.00014	0.00000	0.00000
	10	0.14761	0.00000	0.00000	0.00000	-0.00024	-0.00585
	11	0.07140	0.00000	0.00000	0.00000	0.00055	-0.00296
4	1	0.00000	-0.00147	0.00215	0.00005	0.00000	0.00000
	2	0.00000	-0.00032	0.00185	0.00004	0.00000	0.00000
	3	0.00000	-0.00250	-0.05768	-0.00134	0.00000	0.00000
	4	0.00000	-0.00079	-0.05586	-0.00127	0.00000	0.00000
	5	0.00000	-0.00041	-0.00020	-0.00001	0.00000	0.00000
	6	0.00000	0.00014	0.00360	0.00008	0.00000	0.00000
	7	0.00000	0.00046	0.02979	0.00069	0.00000	0.00000
	8	0.00000	0.00010	0.00647	0.00015	0.00000	0.00000
	9	0.00000	0.00014	0.00752	0.00017	0.00000	0.00000
	10	0.31865	0.00000	0.00000	0.00000	-0.00035	-0.00827
	11	0.15984	0.00000	0.00000	0.00000	0.00083	-0.00441
5	1	0.00000	-0.00193	0.00337	0.00005	0.00000	0.00000
	2	0.00000	-0.00043	0.00286	0.00004	0.00000	0.00000
	3	0.00000	-0.00333	-0.09241	-0.00149	0.00000	0.00000
	4	0.00000	-0.00105	-0.08846	-0.00138	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	5	0.00000	-0.00055	-0.00040	-0.00001	0.00000	0.00000
	6	0.00000	0.00019	0.00562	0.00008	0.00000	0.00000
	7	0.00000	0.00061	0.04741	0.00075	0.00000	0.00000
	8	0.00000	0.00014	0.01042	0.00017	0.00000	0.00000
	9	0.00000	0.00019	0.01188	0.00018	0.00000	0.00000
	10	0.54380	0.00000	0.00000	0.00000	-0.00047	-0.01036
	11	0.28280	0.00000	0.00000	0.00000	0.00110	-0.00583
6	1	0.00000	-0.00237	0.00458	0.00005	0.00000	0.00000
	2	0.00000	-0.00054	0.00381	0.00004	0.00000	0.00000
	3	0.00000	-0.00416	-0.12890	-0.00149	0.00000	0.00000
	4	0.00000	-0.00132	-0.12165	-0.00132	0.00000	0.00000
	5	0.00000	-0.00069	-0.00069	-0.00001	0.00000	0.00000
	6	0.00000	0.00024	0.00760	0.00008	0.00000	0.00000
	7	0.00000	0.00076	0.06562	0.00073	0.00000	0.00000
	8	0.00000	0.00017	0.01464	0.00017	0.00000	0.00000
	9	0.00000	0.00024	0.01629	0.00018	0.00000	0.00000
	10	0.81502	0.00000	0.00000	0.00000	-0.00059	-0.01211
	11	0.43978	0.00000	0.00000	0.00000	0.00138	-0.00724
7	1	0.00000	-0.00280	0.00562	0.00004	0.00000	0.00000
	2	0.00000	-0.00065	0.00454	0.00002	0.00000	0.00000
	3	0.00000	-0.00500	-0.16358	-0.00134	0.00000	0.00000
	4	0.00000	-0.00158	-0.15159	-0.00111	0.00000	0.00000
	5	0.00000	-0.00083	-0.00110	-0.00002	0.00000	0.00000
	6	0.00000	0.00029	0.00927	0.00006	0.00000	0.00000
	7	0.00000	0.00091	0.08245	0.00064	0.00000	0.00000
	8	0.00000	0.00020	0.01874	0.00016	0.00000	0.00000
	9	0.00000	0.00029	0.02023	0.00014	0.00000	0.00000
	10	1.12427	0.00000	0.00000	0.00000	-0.00071	-0.01353
	11	0.63032	0.00000	0.00000	0.00000	0.00165	-0.00863
11	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	10	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	11	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	1	0.00000	-0.00054	-0.00009	0.00000	0.00000	0.00000
	2	0.00000	-0.00021	-0.00012	-0.00001	0.00000	0.00000
	3	0.00000	0.00030	-0.00937	-0.00070	0.00000	0.00000
	4	0.00000	-0.00027	-0.00858	-0.00064	0.00000	0.00000
	5	0.00000	-0.00005	-0.00006	0.00000	0.00000	0.00000
	6	0.00000	-0.00024	-0.00017	-0.00001	0.00000	0.00000
	7	0.00000	-0.00015	0.00447	0.00033	0.00000	0.00000
	8	0.00000	-0.00005	0.00116	0.00009	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	9	0.00000	-0.00007	0.00096	0.00007	0.00000	0.00000
	10	0.02657	0.00000	0.00000	0.00000	-0.00020	-0.00217
	11	0.04006	0.00000	0.00000	0.00000	0.00037	-0.00317
13	1	0.00000	-0.00107	-0.00021	0.00000	0.00000	0.00000
	2	0.00000	-0.00042	-0.00033	-0.00001	0.00000	0.00000
	3	0.00000	0.00060	-0.03322	-0.00121	0.00000	0.00000
	4	0.00000	-0.00054	-0.03029	-0.00109	0.00000	0.00000
	5	0.00000	-0.00011	-0.00023	-0.00001	0.00000	0.00000
	6	0.00000	-0.00048	-0.00045	-0.00001	0.00000	0.00000
	7	0.00000	-0.00030	0.01586	0.00058	0.00000	0.00000
	8	0.00000	-0.00011	0.00410	0.00015	0.00000	0.00000
	9	0.00000	-0.00013	0.00343	0.00013	0.00000	0.00000
	10	0.10379	0.00000	0.00000	0.00000	-0.00040	-0.00422
	11	0.15096	0.00000	0.00000	0.00000	0.00075	-0.00590
14	1	0.00000	-0.00158	-0.00020	0.00001	0.00000	0.00000
	2	0.00000	-0.00063	-0.00048	0.00000	0.00000	0.00000
	3	0.00000	0.00090	-0.06684	-0.00152	0.00000	0.00000
	4	0.00000	-0.00080	-0.06065	-0.00136	0.00000	0.00000
	5	0.00000	-0.00016	-0.00048	-0.00001	0.00000	0.00000
	6	0.00000	-0.00072	-0.00056	0.00000	0.00000	0.00000
	7	0.00000	-0.00046	0.03197	0.00073	0.00000	0.00000
	8	0.00000	-0.00016	0.00823	0.00019	0.00000	0.00000
	9	0.00000	-0.00020	0.00696	0.00016	0.00000	0.00000
	10	0.22894	0.00000	0.00000	0.00000	-0.00060	-0.00616
	11	0.32238	0.00000	0.00000	0.00000	0.00112	-0.00821
15	1	0.00000	-0.00208	0.00010	0.00002	0.00000	0.00000
	2	0.00000	-0.00084	-0.00041	0.00001	0.00000	0.00000
	3	0.00000	0.00121	-0.10550	-0.00163	0.00000	0.00000
	4	0.00000	-0.00107	-0.09521	-0.00144	0.00000	0.00000
	5	0.00000	-0.00022	-0.00081	-0.00001	0.00000	0.00000
	6	0.00000	-0.00096	-0.00022	0.00003	0.00000	0.00000
	7	0.00000	-0.00061	0.05057	0.00079	0.00000	0.00000
	8	0.00000	-0.00021	0.01294	0.00020	0.00000	0.00000
	9	0.00000	-0.00027	0.01109	0.00018	0.00000	0.00000
	10	0.39925	0.00000	0.00000	0.00000	-0.00080	-0.00799
	11	0.54404	0.00000	0.00000	0.00000	0.00150	-0.01009
16	1	0.00000	-0.00256	0.00085	0.00004	0.00000	0.00000
	2	0.00000	-0.00105	0.00001	0.00003	0.00000	0.00000
	3	0.00000	0.00151	-0.14448	-0.00154	0.00000	0.00000
	4	0.00000	-0.00134	-0.12949	-0.00134	0.00000	0.00000
	5	0.00000	-0.00027	-0.00119	-0.00002	0.00000	0.00000
	6	0.00000	-0.00120	0.00084	0.00006	0.00000	0.00000
	7	0.00000	-0.00076	0.06945	0.00075	0.00000	0.00000
	8	0.00000	-0.00027	0.01763	0.00018	0.00000	0.00000
	9	0.00000	-0.00034	0.01537	0.00017	0.00000	0.00000
	10	0.61198	0.00000	0.00000	0.00000	-0.00101	-0.00970
	11	0.80563	0.00000	0.00000	0.00000	0.00187	-0.01154
17	1	0.00000	-0.00302	0.00220	0.00007	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	2	0.00000	-0.00126	0.00096	0.00005	0.00000	0.00000
	3	0.00000	0.00181	-0.17907	-0.00126	0.00000	0.00000
	4	0.00000	-0.00161	-0.15903	-0.00105	0.00000	0.00000
	5	0.00000	-0.00033	-0.00161	-0.00002	0.00000	0.00000
	6	0.00000	-0.00144	0.00289	0.00011	0.00000	0.00000
	7	0.00000	-0.00091	0.08638	0.00062	0.00000	0.00000
	8	0.00000	-0.00032	0.02171	0.00015	0.00000	0.00000
	9	0.00000	-0.00040	0.01935	0.00015	0.00000	0.00000
	10	0.86440	0.00000	0.00000	0.00000	-0.00121	-0.01129
	11	1.09687	0.00000	0.00000	0.00000	0.00225	-0.01256
21	1	0.00000	-0.00578	0.00274	-0.00004	0.00000	0.00000
	2	0.00000	-0.00358	-0.00046	-0.00005	0.00000	0.00000
	3	0.00000	-0.04903	-0.30486	-0.00095	0.00000	0.00000
	4	0.00000	-0.00438	-0.19108	-0.00004	0.00000	0.00000
	5	0.00000	-0.00449	-0.00887	-0.00007	0.00000	0.00000
	6	0.00000	-0.00115	0.00772	-0.00003	0.00000	0.00000
	7	0.00000	0.01051	0.12393	0.00020	0.00000	0.00000
	8	0.00000	0.00696	0.03988	0.00016	0.00000	0.00000
	9	0.00000	0.00012	0.02415	0.00000	0.00000	0.00000
	10	3.64936	0.00000	0.00000	0.00000	-0.00082	-0.01646
	11	2.25611	0.00000	0.00000	0.00000	0.00227	-0.01168
22	1	0.00000	-0.00509	0.00473	-0.00004	0.00000	0.00000
	2	0.00000	-0.00261	0.00229	-0.00005	0.00000	0.00000
	3	0.00000	-0.03328	-0.25637	-0.00086	0.00000	0.00000
	4	0.00000	-0.00374	-0.18913	-0.00004	0.00000	0.00000
	5	0.00000	-0.00328	-0.00541	-0.00006	0.00000	0.00000
	6	0.00000	-0.00071	0.00909	-0.00003	0.00000	0.00000
	7	0.00000	0.00725	0.11382	0.00018	0.00000	0.00000
	8	0.00000	0.00440	0.03187	0.00014	0.00000	0.00000
	9	0.00000	0.00020	0.02439	0.00000	0.00000	0.00000
	10	2.78515	0.00000	0.00000	0.00000	-0.00093	-0.01623
	11	1.68917	0.00000	0.00000	0.00000	0.00227	-0.01168
23	1	0.00000	-0.00439	0.00649	-0.00003	0.00000	0.00000
	2	0.00000	-0.00178	0.00461	-0.00004	0.00000	0.00000
	3	0.00000	-0.02034	-0.21655	-0.00061	0.00000	0.00000
	4	0.00000	-0.00311	-0.18718	-0.00004	0.00000	0.00000
	5	0.00000	-0.00224	-0.00251	-0.00005	0.00000	0.00000
	6	0.00000	-0.00026	0.01045	-0.00003	0.00000	0.00000
	7	0.00000	0.00446	0.10515	0.00014	0.00000	0.00000
	8	0.00000	0.00240	0.02559	0.00010	0.00000	0.00000
	9	0.00000	0.00028	0.02464	0.00000	0.00000	0.00000
	10	1.94157	0.00000	0.00000	0.00000	-0.00092	-0.01564
	11	1.12237	0.00000	0.00000	0.00000	0.00227	-0.01168
24	1	0.00000	-0.00370	0.00649	-0.00001	0.00000	0.00000
	2	0.00000	-0.00089	0.00461	-0.00003	0.00000	0.00000
	3	0.00000	-0.00687	-0.21635	-0.00045	0.00000	0.00000
	4	0.00000	-0.00217	-0.18718	-0.00004	0.00000	0.00000
	5	0.00000	-0.00114	-0.00251	-0.00003	0.00000	0.00000

B-100

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	6	0.00000	0.00039	0.01045	-0.00003	0.00000	0.00000
	7	0.00000	0.00126	0.10511	0.00012	0.00000	0.00000
	8	0.00000	0.00028	0.02557	0.00007	0.00000	0.00000
	9	0.00000	0.00040	0.02464	0.00000	0.00000	0.00000
	10	1.91752	0.00000	0.00000	0.00000	-0.00097	-0.01549
	11	1.17918	0.00000	0.00000	0.00000	0.00227	-0.01168
25	1	0.00000	-0.00425	0.00651	0.00000	0.00000	0.00000
	2	0.00000	0.00029	0.00463	-0.00001	0.00000	0.00000
	3	0.00000	0.00603	-0.21599	0.00000	0.00000	0.00000
	4	0.00000	-0.00613	-0.18752	0.00008	0.00000	0.00000
	5	0.00000	-0.00025	-0.00251	0.00000	0.00000	0.00000
	6	0.00000	0.00291	0.01047	-0.00002	0.00000	0.00000
	7	0.00000	-0.00152	0.10516	-0.00002	0.00000	0.00000
	8	0.00000	-0.00254	0.02551	0.00000	0.00000	0.00000
	9	0.00000	0.00168	0.02469	-0.00002	0.00000	0.00000
	10	1.82286	0.00000	0.00000	0.00000	-0.00137	-0.01520
	11	1.38231	0.00000	0.00000	0.00000	0.00255	-0.01226
26	1	0.00000	-0.00278	0.00652	-0.00001	0.00000	0.00000
	2	0.00000	0.00028	0.00465	0.00001	0.00000	0.00000
	3	0.00000	-0.00095	-0.21544	0.00003	0.00000	0.00000
	4	0.00000	-0.00877	-0.18797	-0.00011	0.00000	0.00000
	5	0.00000	-0.00110	-0.00250	0.00000	0.00000	0.00000
	6	0.00000	0.00275	0.01051	0.00004	0.00000	0.00000
	7	0.00000	0.00178	0.10523	0.00000	0.00000	0.00000
	8	0.00000	-0.00084	0.02544	-0.00002	0.00000	0.00000
	9	0.00000	0.00168	0.02475	0.00003	0.00000	0.00000
	10	1.64367	0.00000	0.00000	0.00000	-0.00178	-0.01448
	11	1.67397	0.00000	0.00000	0.00000	0.00278	-0.01301
27	1	0.00000	-0.00262	0.00657	0.00000	0.00000	0.00000
	2	0.00000	0.00010	0.00457	0.00002	0.00000	0.00000
	3	0.00000	-0.00123	-0.21545	-0.00001	0.00000	0.00000
	4	0.00000	-0.00727	-0.18741	-0.00019	0.00000	0.00000
	5	0.00000	-0.00103	-0.00248	-0.00001	0.00000	0.00000
	6	0.00000	0.00221	0.01029	0.00006	0.00000	0.00000
	7	0.00000	0.00166	0.10515	0.00003	0.00000	0.00000
	8	0.00000	-0.00062	0.02551	-0.00002	0.00000	0.00000
	9	0.00000	0.00127	0.02459	0.00005	0.00000	0.00000
	10	1.56211	0.00000	0.00000	0.00000	-0.00173	-0.01435
	11	1.64815	0.00000	0.00000	0.00000	0.00275	-0.01314
28	1	0.00000	-0.00269	0.00651	0.00003	0.00000	0.00000
	2	0.00000	-0.00048	0.00433	0.00005	0.00000	0.00000
	3	0.00000	-0.00048	-0.21497	-0.00010	0.00000	0.00000
	4	0.00000	-0.00392	-0.18599	-0.00015	0.00000	0.00000
	5	0.00000	-0.00076	-0.00238	-0.00001	0.00000	0.00000
	6	0.00000	0.00066	0.00967	0.00011	0.00000	0.00000
	7	0.00000	0.00072	0.10471	0.00008	0.00000	0.00000
	8	0.00000	-0.00037	0.02559	-0.00001	0.00000	0.00000
	9	0.00000	0.00035	0.02421	0.00005	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	10	1.41940	0.00000	0.00000	0.00000	-0.00162	-0.01410
	11	1.60100	0.00000	0.00000	0.00000	0.00278	-0.01321
29	1	0.00000	-0.00380	0.00651	0.00014	0.00000	0.00000
	2	0.00000	-0.00163	0.00433	0.00011	0.00000	0.00000
	3	0.00000	0.00234	-0.21483	-0.00030	0.00000	0.00000
	4	0.00000	-0.00208	-0.18588	-0.00009	0.00000	0.00000
	5	0.00000	-0.00042	-0.00238	-0.00002	0.00000	0.00000
	6	0.00000	-0.00186	0.00968	0.00022	0.00000	0.00000
	7	0.00000	-0.00118	0.10467	0.00018	0.00000	0.00000
	8	0.00000	-0.00041	0.02557	0.00002	0.00000	0.00000
	9	0.00000	-0.00052	0.02420	0.00007	0.00000	0.00000
	10	1.39337	0.00000	0.00000	0.00000	-0.00156	-0.01381
	11	1.64689	0.00000	0.00000	0.00000	0.00291	-0.01331
30	1	0.00000	-0.03727	0.00651	0.00056	0.00000	0.00000
	2	0.00000	-0.02538	0.00433	0.00039	0.00000	0.00000
	3	0.00000	0.02715	-0.21483	-0.00030	0.00000	0.00000
	4	0.00000	-0.03396	-0.18599	0.00055	0.00000	0.00000
	5	0.00000	0.00113	-0.00238	-0.00002	0.00000	0.00000
	6	0.00000	-0.04674	0.00968	0.00077	0.00000	0.00000
	7	0.00000	-0.01829	0.10477	0.00023	0.00000	0.00000
	8	0.00000	-0.00203	0.02557	0.00002	0.00000	0.00000
	9	0.00000	-0.00608	0.02420	0.00007	0.00000	0.00000
	10	1.26242	0.00000	0.00000	0.00000	-0.00156	-0.01381
	11	1.93418	0.00000	0.00000	0.00000	0.00365	-0.01388
31	1	0.00000	-0.06392	0.00651	0.00061	0.00000	0.00000
	2	0.00000	-0.04391	0.00433	0.00043	0.00000	0.00000
	3	0.00000	0.04040	-0.21483	-0.00030	0.00000	0.00000
	4	0.00000	-0.05872	-0.18599	0.00055	0.00000	0.00000
	5	0.00000	0.00196	-0.00238	-0.00002	0.00000	0.00000
	6	0.00000	-0.08524	0.00968	0.00091	0.00000	0.00000
	7	0.00000	-0.02916	0.10483	0.00026	0.00000	0.00000
	8	0.00000	-0.00290	0.02557	0.00002	0.00000	0.00000
	9	0.00000	-0.00905	0.02420	0.00007	0.00000	0.00000
	10	1.19252	0.00000	0.00000	0.00000	-0.00156	-0.01381
	11	2.09778	0.00000	0.00000	0.00000	0.00365	-0.01388
32	1	0.00000	-0.08636	0.02279	0.00062	0.00000	0.00000
	2	0.00000	-0.05990	0.01592	0.00044	0.00000	0.00000
	3	0.00000	0.05111	-0.22262	-0.00030	0.00000	0.00000
	4	0.00000	-0.07875	-0.17144	0.00055	0.00000	0.00000
	5	0.00000	0.00263	-0.00287	-0.00002	0.00000	0.00000
	6	0.00000	-0.11966	0.03459	0.00096	0.00000	0.00000
	7	0.00000	-0.03880	0.11189	0.00027	0.00000	0.00000
	8	0.00000	-0.00360	0.02608	0.00002	0.00000	0.00000
	9	0.00000	-0.01146	0.02594	0.00007	0.00000	0.00000
	10	1.49992	0.00000	0.00000	0.00000	-0.00156	-0.01381
	11	2.59582	0.00000	0.00000	0.00000	0.00365	-0.01388
33	1	0.00000	-0.01204	0.00475	0.00014	0.00000	0.00000
	2	0.00000	-0.00018	-0.00157	-0.00005	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	3	0.00000	0.00725	-0.33120	-0.00093	0.00000	0.00000
	4	0.00000	-0.00202	-0.19185	-0.00004	0.00000	0.00000
	5	0.00000	-0.00023	-0.01025	-0.00007	0.00000	0.00000
	6	0.00000	0.00050	0.00719	-0.00003	0.00000	0.00000
	7	0.00000	-0.00185	0.12794	0.00020	0.00000	0.00000
	8	0.00000	-0.12281	0.08287	0.00300	0.00000	0.00000
	9	0.00000	0.00041	0.02405	0.00000	0.00000	0.00000
	10	5.03148	0.00000	0.00000	0.00000	0.02269	-0.02410
	11	2.63695	0.00000	0.00000	0.00000	0.00227	-0.01168
34	1	0.00000	-0.00431	0.00661	0.00000	0.00000	0.00000
	2	0.00000	0.00029	0.00411	-0.00001	0.00000	0.00000
	3	0.00000	-0.00027	-0.36956	-0.00346	0.00000	0.00000
	4	0.00000	-0.00613	-0.18252	0.00008	0.00000	0.00000
	5	0.00000	-0.00025	-0.00227	0.00000	0.00000	0.00000
	6	0.00000	0.00291	0.00894	-0.00002	0.00000	0.00000
	7	0.00000	-0.00152	0.10405	-0.00002	0.00000	0.00000
	8	0.00000	-0.00254	0.02580	0.00000	0.00000	0.00000
	9	0.00000	0.00168	0.02365	-0.00002	0.00000	0.00000
	10	3.92429	0.00000	0.00000	0.00000	-0.00137	-0.03992
	11	2.19118	0.00000	0.00000	0.00000	0.00255	-0.01226
35	1	0.00000	-0.02190	-0.01958	-0.00042	0.00000	0.00000
	2	0.00000	0.00117	0.00586	0.00001	0.00000	0.00000
	3	0.00000	0.00112	-0.21261	0.00003	0.00000	0.00000
	4	0.00000	-0.01526	-0.19690	-0.00011	0.00000	0.00000
	5	0.00000	-0.00115	-0.00257	0.00000	0.00000	0.00000
	6	0.00000	0.00519	0.01386	0.00004	0.00000	0.00000
	7	0.00000	0.00198	0.10551	0.00000	0.00000	0.00000
	8	0.00000	-0.00198	0.02388	-0.00002	0.00000	0.00000
	9	0.00000	0.00350	0.02726	0.00003	0.00000	0.00000
	10	2.93790	0.00000	0.00000	0.00000	-0.00178	-0.01448
	11	2.57506	0.00000	0.00000	0.00000	0.00278	-0.01301
36	1	0.00000	-0.00275	0.00711	0.00001	0.00000	0.00000
	2	0.00000	-0.00020	0.00666	0.00002	0.00000	0.00000
	3	0.00000	-0.00123	-0.21603	-0.00001	0.00000	0.00000
	4	0.00000	-0.00784	-0.40741	-0.00367	0.00000	0.00000
	5	0.00000	-0.00103	-0.00311	-0.00001	0.00000	0.00000
	6	0.00000	0.00183	0.01578	0.00006	0.00000	0.00000
	7	0.00000	0.00166	0.12567	0.00033	0.00000	0.00000
	8	0.00000	-0.00062	0.02416	-0.00002	0.00000	0.00000
	9	0.00000	0.00120	0.06630	0.00075	0.00000	0.00000
	10	2.81993	0.00000	0.00000	0.00000	-0.00173	-0.01435
	11	2.87331	0.00000	0.00000	0.00000	0.00275	-0.01435
37	1	0.00000	-0.00486	0.00798	0.00006	0.00000	0.00000
	2	0.00000	-0.00115	0.00706	0.00002	0.00000	0.00000
	3	0.00000	-0.00097	-0.21614	-0.00001	0.00000	0.00000
	4	0.00000	0.17188	-0.48759	-0.00493	0.00000	0.00000
	5	0.00000	-0.00074	-0.00323	-0.00001	0.00000	0.00000
	6	0.00000	-0.00068	0.01682	0.00006	0.00000	0.00000

6-103

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
	7	0.00000	-0.01155	0.13116	0.00033	0.00000	0.00000
	8	0.00000	-0.00001	0.02391	-0.00002	0.00000	0.00000
	9	0.00000	-0.06591	0.09474	0.00211	0.00000	0.00000
	10	2.98976	0.00000	0.00000	0.00000	-0.00173	-0.01435
	11	3.22305	0.00000	0.00000	0.00000	0.00275	-0.01435
38	1	0.00000	-0.03731	0.03654	0.00056	0.00000	0.00000
	2	0.00000	-0.02538	0.02527	0.00039	0.00000	0.00000
	3	0.00000	0.02715	-0.23079	-0.00030	0.00000	0.00000
	4	0.00000	-0.03911	-0.24067	-0.00176	0.00000	0.00000
	5	0.00000	0.00113	-0.00338	-0.00002	0.00000	0.00000
	6	0.00000	-0.04674	0.05144	0.00077	0.00000	0.00000
	7	0.00000	-0.01829	0.11714	0.00023	0.00000	0.00000
	8	0.00000	-0.00203	0.02661	0.00002	0.00000	0.00000
	9	0.00000	-0.00608	0.02777	0.00007	0.00000	0.00000
	10	2.00821	0.00000	0.00000	0.00000	-0.00156	-0.01381
	11	3.28776	0.00000	0.00000	0.00000	0.00365	-0.03042
39	1	0.00000	-0.06825	0.04777	0.00056	0.00000	0.00000
	2	0.00000	-0.04583	0.03528	0.00044	0.00000	0.00000
	3	0.00000	0.04174	-0.23552	-0.00030	0.00000	0.00000
	4	0.00000	-0.06122	-0.14731	0.00055	0.00000	0.00000
	5	0.00000	0.00204	-0.00368	-0.00002	0.00000	0.00000
	6	0.00000	-0.08927	0.07642	0.00096	0.00000	0.00000
	7	0.00000	-0.03024	0.12366	0.00027	0.00000	0.00000
	8	0.00000	-0.00299	0.02692	0.00002	0.00000	0.00000
	9	0.00000	-0.00935	0.02883	0.00007	0.00000	0.00000
	10	2.15265	0.00000	0.00000	0.00000	-0.00156	-0.01381
	11	3.08618	0.00000	0.00000	0.00000	0.00365	-0.01388

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

205. PRINT MEMBER FORCES

B-109

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1	1	57.73	0.00	-1.06	0.00	8.29	0.00
		2	-55.95	0.00	1.06	0.00	-6.17	0.00
	2	1	12.11	0.00	-1.02	0.00	7.33	0.00
		2	-12.11	0.00	1.02	0.00	-5.30	0.00
	3	1	93.46	0.00	23.80	0.00	-213.88	0.00
		2	-93.46	0.00	-23.80	0.00	166.28	0.00
	4	1	29.53	0.00	25.47	0.00	-211.60	0.00
		2	-29.53	0.00	-25.47	0.00	160.65	0.00
	5	1	15.46	0.00	-0.11	0.00	-0.37	0.00
		2	-15.46	0.00	0.11	0.00	0.60	0.00
	6	1	-5.36	0.00	-1.81	0.00	13.94	0.00
		2	5.36	0.00	1.81	0.00	-10.31	0.00
	7	1	-17.08	0.00	-13.01	0.00	111.76	0.00
		2	17.08	0.00	13.01	0.00	-85.75	0.00
	8	1	-3.79	0.00	-2.53	0.00	23.73	0.00
		2	3.79	0.00	2.53	0.00	-18.67	0.00
	9	1	-5.38	0.00	-3.49	0.00	28.58	0.00
		2	5.38	0.00	3.49	0.00	-21.61	0.00
	10	1	0.00	53.30	0.00	37.47	0.00	1037.51
		2	0.00	-53.30	0.00	-37.47	0.00	-930.91
	11	1	0.00	3.21	0.00	-87.76	0.00	477.08
		2	0.00	-3.21	0.00	87.76	0.00	-470.66
2	1	2	55.95	0.00	-1.06	0.00	6.17	0.00
		3	-54.17	0.00	1.06	0.00	-4.06	0.00
	2	2	12.11	0.00	-1.02	0.00	5.30	0.00
		3	-12.11	0.00	1.02	0.00	-3.27	0.00
	3	2	93.46	0.00	23.80	0.00	-166.28	0.00
		3	-93.46	0.00	-23.80	0.00	118.67	0.00
	4	2	29.53	0.00	25.47	0.00	-160.65	0.00
		3	-29.53	0.00	-25.47	0.00	109.71	0.00
	5	2	15.46	0.00	-0.11	0.00	-0.60	0.00
		3	-15.46	0.00	0.11	0.00	0.82	0.00
	6	2	-5.36	0.00	-1.81	0.00	10.31	0.00
		3	5.36	0.00	1.81	0.00	-6.69	0.00
	7	2	-17.08	0.00	-13.01	0.00	85.75	0.00
		3	17.08	0.00	13.01	0.00	-59.74	0.00
	8	2	-3.79	0.00	-2.53	0.00	18.67	0.00
		3	3.79	0.00	2.53	0.00	-13.61	0.00
	9	2	-5.38	0.00	-3.49	0.00	21.61	0.00
		3	5.38	0.00	3.49	0.00	-14.64	0.00
	10	2	0.00	53.30	0.00	37.47	0.00	930.91
		3	0.00	-53.30	0.00	-37.47	0.00	-824.31
	11	2	0.00	3.21	0.00	-87.76	0.00	470.66
		3	0.00	-3.21	0.00	87.76	0.00	-464.25
3	1	3	54.17	0.00	-1.06	0.00	4.06	0.00
		4	-52.39	0.00	1.06	0.00	-1.94	0.00

B-105

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	2	3	12.11	0.00	-1.02	0.00	3.27	0.00
		4	-12.11	0.00	1.02	0.00	-1.23	0.00
	3	3	93.46	0.00	23.80	0.00	-118.67	0.00
		4	-93.46	0.00	-23.80	0.00	71.06	0.00
	4	3	29.53	0.00	25.47	0.00	-109.71	0.00
		4	-29.53	0.00	-25.47	0.00	58.76	0.00
	5	3	15.46	0.00	-0.11	0.00	-0.82	0.00
		4	-15.46	0.00	0.11	0.00	1.04	0.00
	6	3	-5.36	0.00	-1.81	0.00	6.69	0.00
		4	5.36	0.00	1.81	0.00	-3.06	0.00
	7	3	-17.08	0.00	-13.01	0.00	59.74	0.00
		4	17.08	0.00	13.01	0.00	-33.72	0.00
	8	3	-3.79	0.00	-2.53	0.00	13.61	0.00
		4	3.79	0.00	2.53	0.00	-8.56	0.00
	9	3	-5.38	0.00	-3.49	0.00	14.64	0.00
		4	5.38	0.00	3.49	0.00	-7.66	0.00
	10	3	0.00	53.30	0.00	37.47	0.00	824.31
		4	0.00	-53.30	0.00	-37.47	0.00	-717.71
	11	3	0.00	3.21	0.00	-87.76	0.00	464.25
		4	0.00	-3.21	0.00	87.76	0.00	-457.84
4	1	4	52.39	0.00	-1.06	0.00	1.94	0.00
		5	-50.61	0.00	1.06	0.00	0.18	0.00
	2	4	12.11	0.00	-1.02	0.00	1.23	0.00
		5	-12.11	0.00	1.02	0.00	0.80	0.00
	3	4	93.46	0.00	23.80	0.00	-71.06	0.00
		5	-93.46	0.00	-23.80	0.00	23.46	0.00
	4	4	29.53	0.00	25.47	0.00	-58.76	0.00
		5	-29.53	0.00	-25.47	0.00	7.82	0.00
	5	4	15.46	0.00	-0.11	0.00	-1.04	0.00
		5	-15.46	0.00	0.11	0.00	1.26	0.00
	6	4	-5.36	0.00	-1.81	0.00	3.06	0.00
		5	5.36	0.00	1.81	0.00	0.56	0.00
	7	4	-17.08	0.00	-13.01	0.00	33.72	0.00
		5	17.08	0.00	13.01	0.00	-7.71	0.00
	8	4	-3.79	0.00	-2.53	0.00	8.56	0.00
		5	3.79	0.00	2.53	0.00	-3.50	0.00
	9	4	-5.38	0.00	-3.49	0.00	7.66	0.00
		5	5.38	0.00	3.49	0.00	-0.69	0.00
	10	4	0.00	53.30	0.00	37.47	0.00	717.71
		5	0.00	-53.30	0.00	-37.47	0.00	-611.11
	11	4	0.00	3.21	0.00	-87.76	0.00	457.84
		5	0.00	-3.21	0.00	87.76	0.00	-451.43
5	1	5	50.61	0.00	-1.06	0.00	-0.18	0.00
		6	-48.82	0.00	1.06	0.00	2.29	0.00
	2	5	12.11	0.00	-1.02	0.00	-0.80	0.00
		6	-12.11	0.00	1.02	0.00	2.84	0.00
	3	5	93.46	0.00	23.80	0.00	-23.46	0.00
		6	-93.46	0.00	-23.80	0.00	-24.15	0.00

B-106

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	4	5	29.53	0.00	25.47	0.00	-7.82	0.00
		6	-29.53	0.00	-25.47	0.00	-43.12	0.00
	5	5	15.46	0.00	-0.11	0.00	-1.26	0.00
		6	-15.46	0.00	0.11	0.00	1.48	0.00
	6	5	-5.36	0.00	-1.81	0.00	-0.56	0.00
		6	5.36	0.00	1.81	0.00	4.19	0.00
	7	5	-17.08	0.00	-13.01	0.00	7.71	0.00
		6	17.08	0.00	13.01	0.00	18.31	0.00
	8	5	-3.79	0.00	-2.53	0.00	3.50	0.00
		6	3.79	0.00	2.53	0.00	1.56	0.00
	9	5	-5.38	0.00	-3.49	0.00	0.69	0.00
		6	5.38	0.00	3.49	0.00	6.29	0.00
	10	5	0.00	53.30	0.00	37.47	0.00	611.12
		6	0.00	-53.30	0.00	-37.47	0.00	-504.51
	11	5	0.00	3.21	0.00	-87.76	0.00	451.43
		6	0.00	-3.21	0.00	87.76	0.00	-445.02
6	1	6	48.82	0.00	-1.06	0.00	-2.29	0.00
		7	-47.04	0.00	1.06	0.00	4.41	0.00
	2	6	12.11	0.00	-1.02	0.00	-2.84	0.00
		7	-12.11	0.00	1.02	0.00	4.87	0.00
	3	6	93.46	0.00	23.80	0.00	24.15	0.00
		7	-93.46	0.00	-23.80	0.00	-71.76	0.00
	4	6	29.53	0.00	25.47	0.00	43.12	0.00
		7	-29.53	0.00	-25.47	0.00	-94.07	0.00
	5	6	15.46	0.00	-0.11	0.00	-1.48	0.00
		7	-15.46	0.00	0.11	0.00	1.71	0.00
	6	6	-5.36	0.00	-1.81	0.00	-4.19	0.00
		7	5.36	0.00	1.81	0.00	7.81	0.00
	7	6	-17.08	0.00	-13.01	0.00	-18.31	0.00
		7	17.08	0.00	13.01	0.00	44.32	0.00
	8	6	-3.79	0.00	-2.53	0.00	-1.56	0.00
		7	3.79	0.00	2.53	0.00	6.62	0.00
	9	6	-5.38	0.00	-3.49	0.00	-6.29	0.00
		7	5.38	0.00	3.49	0.00	13.26	0.00
	10	6	0.00	53.30	0.00	37.47	0.00	504.51
		7	0.00	-53.30	0.00	-37.47	0.00	-397.92
	11	6	0.00	3.21	0.00	-87.76	0.00	445.01
		7	0.00	-3.21	0.00	87.76	0.00	-438.60
7	1	7	47.04	0.00	-1.06	0.00	-4.41	0.00
		24	-43.03	0.00	1.06	0.00	9.17	0.00
	2	7	12.11	0.00	-1.02	0.00	-4.87	0.00
		24	-12.11	0.00	1.02	0.00	9.45	0.00
	3	7	93.46	0.00	23.80	0.00	71.76	0.00
		24	-93.46	0.00	-23.80	0.00	-178.87	0.00
	4	7	29.53	0.00	25.47	0.00	94.07	0.00
		24	-29.53	0.00	-25.47	0.00	-208.69	0.00
	5	7	15.46	0.00	-0.11	0.00	-1.71	0.00
		24	-15.46	0.00	0.11	0.00	2.20	0.00

B-107

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	6	7	-5.36	0.00	-1.81	0.00	-7.81	0.00
		24	5.36	0.00	1.81	0.00	15.97	0.00
	7	7	-17.08	0.00	-13.01	0.00	-44.32	0.00
		24	17.08	0.00	13.01	0.00	102.85	0.00
	8	7	-3.79	0.00	-2.53	0.00	-6.62	0.00
		24	3.79	0.00	2.53	0.00	18.00	0.00
	9	7	-5.38	0.00	-3.49	0.00	-13.26	0.00
		24	5.38	0.00	3.49	0.00	28.95	0.00
	10	7	0.00	53.30	0.00	37.47	0.00	397.92
		24	0.00	-53.30	0.00	-37.47	0.00	-158.07
	11	7	0.00	3.21	0.00	-87.76	0.00	438.60
		24	0.00	-3.21	0.00	87.76	0.00	-424.17
11	1	11	61.93	0.00	1.06	0.00	-2.53	0.00
		12	-60.15	0.00	-1.06	0.00	0.41	0.00
	2	11	23.59	0.00	1.02	0.00	-3.28	0.00
		12	-23.59	0.00	-1.02	0.00	1.25	0.00
	3	11	-33.86	0.00	31.30	0.00	-254.68	0.00
		12	33.86	0.00	-31.30	0.00	192.09	0.00
	4	11	30.07	0.00	29.63	0.00	-233.37	0.00
		12	-30.07	0.00	-29.63	0.00	174.12	0.00
	5	11	6.14	0.00	0.11	0.00	-1.62	0.00
		12	-6.14	0.00	-0.11	0.00	1.40	0.00
	6	11	26.96	0.00	1.81	0.00	-4.98	0.00
		12	-26.96	0.00	-1.81	0.00	1.35	0.00
	7	11	17.08	0.00	-14.71	0.00	121.35	0.00
		12	-17.08	0.00	14.71	0.00	-91.93	0.00
	8	11	5.99	0.00	-3.97	0.00	31.57	0.00
		12	-5.99	0.00	3.97	0.00	-23.63	0.00
	9	11	7.58	0.00	-3.01	0.00	26.07	0.00
		12	-7.58	0.00	3.01	0.00	-20.04	0.00
	10	11	0.00	18.20	0.00	64.04	0.00	708.38
		12	0.00	-18.20	0.00	-64.04	0.00	-671.98
	11	11	0.00	68.29	0.00	-119.37	0.00	1076.12
		12	0.00	-68.29	0.00	119.37	0.00	-939.53
12	1	12	60.15	0.00	1.06	0.00	-0.41	0.00
		13	-58.36	0.00	-1.06	0.00	-1.71	0.00
	2	12	23.59	0.00	1.02	0.00	-1.25	0.00
		13	-23.59	0.00	-1.02	0.00	-0.79	0.00
	3	12	-33.86	0.00	31.30	0.00	-192.09	0.00
		13	33.86	0.00	-31.30	0.00	129.50	0.00
	4	12	30.07	0.00	29.63	0.00	-174.12	0.00
		13	-30.07	0.00	-29.63	0.00	114.86	0.00
	5	12	6.14	0.00	0.11	0.00	-1.40	0.00
		13	-6.14	0.00	-0.11	0.00	1.18	0.00
	6	12	26.96	0.00	1.81	0.00	-1.35	0.00
		13	-26.96	0.00	-1.81	0.00	-2.27	0.00
	7	12	17.08	0.00	-14.71	0.00	91.93	0.00
		13	-17.08	0.00	14.71	0.00	-62.50	0.00

B-108

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	8	12	5.99	0.00	-3.97	0.00	23.63	0.00
		13	-5.99	0.00	3.97	0.00	-15.68	0.00
	9	12	7.58	0.00	-3.01	0.00	20.04	0.00
		13	-7.58	0.00	3.01	0.00	-14.02	0.00
	10	12	0.00	18.20	0.00	64.04	0.00	671.98
		13	0.00	-18.20	0.00	-64.04	0.00	-635.57
	11	12	0.00	68.29	0.00	-119.37	0.00	939.53
		13	0.00	-68.29	0.00	119.37	0.00	-802.94
13	1	13	58.36	0.00	1.06	0.00	1.71	0.00
		14	-56.58	0.00	-1.06	0.00	-3.82	0.00
	2	13	23.59	0.00	1.02	0.00	0.79	0.00
		14	-23.59	0.00	-1.02	0.00	-2.82	0.00
	3	13	-33.86	0.00	31.30	0.00	-129.50	0.00
		14	33.86	0.00	-31.30	0.00	66.90	0.00
	4	13	30.07	0.00	29.63	0.00	-114.86	0.00
		14	-30.07	0.00	-29.63	0.00	55.61	0.00
	5	13	6.14	0.00	0.11	0.00	-1.18	0.00
		14	-6.14	0.00	-0.11	0.00	0.95	0.00
	6	13	26.96	0.00	1.81	0.00	2.27	0.00
		14	-26.96	0.00	-1.81	0.00	-5.90	0.00
	7	13	17.08	0.00	-14.71	0.00	62.50	0.00
		14	-17.08	0.00	14.71	0.00	-33.07	0.00
	8	13	5.99	0.00	-3.97	0.00	15.68	0.00
		14	-5.99	0.00	3.97	0.00	-7.74	0.00
	9	13	7.58	0.00	-3.01	0.00	14.02	0.00
		14	-7.58	0.00	3.01	0.00	-7.99	0.00
	10	13	0.00	18.20	0.00	64.04	0.00	635.57
		14	0.00	-18.20	0.00	-64.04	0.00	-599.17
	11	13	0.00	68.29	0.00	-119.37	0.00	802.94
		14	0.00	-68.29	0.00	119.37	0.00	-666.35
14	1	14	56.58	0.00	1.06	0.00	3.82	0.00
		15	-54.80	0.00	-1.06	0.00	-5.94	0.00
	2	14	23.59	0.00	1.02	0.00	2.82	0.00
		15	-23.59	0.00	-1.02	0.00	-4.86	0.00
	3	14	-33.86	0.00	31.30	0.00	-66.90	0.00
		15	33.86	0.00	-31.30	0.00	4.31	0.00
	4	14	30.07	0.00	29.63	0.00	-55.61	0.00
		15	-30.07	0.00	-29.63	0.00	-3.65	0.00
	5	14	6.14	0.00	0.11	0.00	-0.95	0.00
		15	-6.14	0.00	-0.11	0.00	0.73	0.00
	6	14	26.96	0.00	1.81	0.00	5.90	0.00
		15	-26.96	0.00	-1.81	0.00	-9.52	0.00
	7	14	17.08	0.00	-14.71	0.00	33.07	0.00
		15	-17.08	0.00	14.71	0.00	-3.65	0.00
	8	14	5.99	0.00	-3.97	0.00	7.74	0.00
		15	-5.99	0.00	3.97	0.00	0.20	0.00
	9	14	7.58	0.00	-3.01	0.00	7.99	0.00
		15	-7.58	0.00	3.01	0.00	-1.97	0.00

B-109

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	10	14	0.00	18.20	0.00	64.04	0.00	599.17
		15	0.00	-18.20	0.00	-64.04	0.00	-562.77
	11	14	0.00	68.29	0.00	-119.37	0.00	666.36
		15	0.00	-68.29	0.00	119.37	0.00	-529.76
15	1	15	54.80	0.00	1.06	0.00	5.94	0.00
		16	-53.02	0.00	-1.06	0.00	-8.06	0.00
	2	15	23.59	0.00	1.02	0.00	4.86	0.00
		16	-23.59	0.00	-1.02	0.00	-6.89	0.00
	3	15	-33.86	0.00	31.30	0.00	-4.31	0.00
		16	33.86	0.00	-31.30	0.00	-58.28	0.00
	4	15	30.07	0.00	29.63	0.00	3.65	0.00
		16	-30.07	0.00	-29.63	0.00	-62.91	0.00
	5	15	6.14	0.00	0.11	0.00	-0.73	0.00
		16	-6.14	0.00	-0.11	0.00	0.51	0.00
	6	15	26.96	0.00	1.81	0.00	9.52	0.00
		16	-26.96	0.00	-1.81	0.00	-13.15	0.00
	7	15	17.08	0.00	-14.71	0.00	3.65	0.00
		16	-17.08	0.00	14.71	0.00	25.78	0.00
	8	15	5.99	0.00	-3.97	0.00	-0.20	0.00
		16	-5.99	0.00	3.97	0.00	8.14	0.00
	9	15	7.58	0.00	-3.01	0.00	1.97	0.00
		16	-7.58	0.00	3.01	0.00	4.06	0.00
	10	15	0.00	18.20	0.00	64.04	0.00	562.77
		16	0.00	-18.20	0.00	-64.04	0.00	-526.37
	11	15	0.00	68.29	0.00	-119.37	0.00	529.77
		16	0.00	-68.29	0.00	119.37	0.00	-393.18
16	1	16	53.02	0.00	1.06	0.00	8.06	0.00
		17	-51.24	0.00	-1.06	0.00	-10.17	0.00
	2	16	23.59	0.00	1.02	0.00	6.89	0.00
		17	-23.59	0.00	-1.02	0.00	-8.93	0.00
	3	16	-33.86	0.00	31.30	0.00	58.28	0.00
		17	33.86	0.00	-31.30	0.00	-120.88	0.00
	4	16	30.07	0.00	29.63	0.00	62.91	0.00
		17	-30.07	0.00	-29.63	0.00	-122.16	0.00
	5	16	6.14	0.00	0.11	0.00	-0.51	0.00
		17	-6.14	0.00	-0.11	0.00	0.29	0.00
	6	16	26.96	0.00	1.81	0.00	13.15	0.00
		17	-26.96	0.00	-1.81	0.00	-16.77	0.00
	7	16	17.08	0.00	-14.71	0.00	-25.78	0.00
		17	-17.08	0.00	14.71	0.00	55.20	0.00
	8	16	5.99	0.00	-3.97	0.00	-8.14	0.00
		17	-5.99	0.00	3.97	0.00	16.09	0.00
	9	16	7.58	0.00	-3.01	0.00	-4.06	0.00
		17	-7.58	0.00	3.01	0.00	10.09	0.00
	10	16	0.00	18.20	0.00	64.04	0.00	526.37
		17	0.00	-18.20	0.00	-64.04	0.00	-489.97
	11	16	0.00	68.29	0.00	-119.37	0.00	393.18
		17	0.00	-68.29	0.00	119.37	0.00	-256.59

B7/0

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
17	1	17	51.24	0.00	1.06	0.00	10.17	0.00
		29	-48.12	0.00	-1.06	0.00	-13.88	0.00
	2	17	23.59	0.00	1.02	0.00	8.93	0.00
		29	-23.59	0.00	-1.02	0.00	-12.49	0.00
	3	17	-33.86	0.00	31.30	0.00	120.88	0.00
		29	33.86	0.00	-31.30	0.00	-230.41	0.00
	4	17	30.07	0.00	29.63	0.00	122.16	0.00
		29	-30.07	0.00	-29.63	0.00	-225.86	0.00
	5	17	6.14	0.00	0.11	0.00	-0.29	0.00
		29	-6.14	0.00	-0.11	0.00	-0.10	0.00
	6	17	26.96	0.00	1.81	0.00	16.77	0.00
		29	-26.96	0.00	-1.81	0.00	-23.12	0.00
	7	17	17.08	0.00	-14.71	0.00	-55.20	0.00
		29	-17.08	0.00	14.71	0.00	106.70	0.00
	8	17	5.99	0.00	-3.97	0.00	-16.09	0.00
		29	-5.99	0.00	3.97	0.00	29.98	0.00
	9	17	7.58	0.00	-3.01	0.00	-10.09	0.00
		29	-7.58	0.00	3.01	0.00	20.63	0.00
	10	17	0.00	18.20	0.00	64.04	0.00	489.97
		29	0.00	-18.20	0.00	-64.04	0.00	-426.27
	11	17	0.00	68.29	0.00	-119.37	0.00	256.59
		29	0.00	-68.29	0.00	119.37	0.00	-17.56
21	1	21	0.78	-0.25	0.00	0.00	0.00	-2.16
		22	-9.69	3.15	0.00	0.00	0.00	-5.57
	2	21	7.93	-2.58	0.00	0.00	0.00	0.00
		22	-7.93	2.58	0.00	0.00	0.00	-11.70
	3	21	0.02	-52.68	0.00	0.00	0.00	-0.14
		22	-0.02	52.68	0.00	0.00	0.00	-239.11
	4	21	0.00	0.00	0.00	0.00	0.00	0.00
		22	0.00	0.00	0.00	0.00	0.00	0.00
	5	21	10.27	-3.34	0.00	0.00	0.00	0.00
		22	-10.27	3.34	0.00	0.00	0.00	-15.15
	6	21	0.00	0.00	0.00	0.00	0.00	0.00
		22	0.00	0.00	0.00	0.00	0.00	0.00
	7	21	2.86	8.79	0.00	0.00	0.00	0.00
		22	-2.86	-8.79	0.00	0.00	0.00	39.91
	8	21	4.10	5.50	0.00	0.00	0.00	-22.55
		22	-4.10	-5.50	0.00	0.00	0.00	47.54
	9	21	0.00	0.00	0.00	0.00	0.00	0.00
		22	0.00	0.00	0.00	0.00	0.00	0.00
	10	21	0.00	0.00	-35.75	-196.62	0.00	0.00
		22	0.00	0.00	35.75	196.62	162.32	0.00
	11	21	0.00	0.00	0.00	0.00	0.00	0.00
		22	0.00	0.00	0.00	0.00	0.00	0.00
22	1	22	9.69	-3.15	0.00	0.00	0.00	5.57
		23	-18.60	6.04	0.00	0.00	0.00	-26.44
	2	22	7.93	-2.58	0.00	0.00	0.00	11.70
		23	-7.93	2.58	0.00	0.00	0.00	-23.41

B-111

MEMBER END FORCES   STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	22	0.02	-52.69	0.00	0.00	0.00	239.11
		23	-0.02	52.69	0.00	0.00	0.00	-478.31
	4	22	0.00	0.00	0.00	0.00	0.00	0.00
		23	0.00	0.00	0.00	0.00	0.00	0.00
	5	22	10.27	-3.34	0.00	0.00	0.00	15.15
		23	-10.27	3.34	0.00	0.00	0.00	-30.31
	6	22	0.00	0.00	0.00	0.00	0.00	0.00
		23	0.00	0.00	0.00	0.00	0.00	0.00
	7	22	2.86	8.79	0.00	0.00	0.00	-39.91
		23	-2.86	-8.79	0.00	0.00	0.00	79.81
	8	22	4.10	5.50	0.00	0.00	0.00	-47.54
		23	-4.10	-5.50	0.00	0.00	0.00	72.52
	9	22	0.00	0.00	0.00	0.00	0.00	0.00
		23	0.00	0.00	0.00	0.00	0.00	0.00
	10	22	0.00	0.00	-35.75	-196.63	-162.31	0.00
		23	0.00	0.00	35.75	196.63	324.64	0.00
	11	22	0.00	0.00	0.00	0.00	0.00	0.00
		23	0.00	0.00	0.00	0.00	0.00	0.00
23	1	23	0.00	-19.55	0.00	0.00	0.00	26.44
		24	0.00	23.85	0.00	0.00	0.00	-71.62
	2	23	0.00	-8.34	0.00	0.00	0.00	23.41
		24	0.00	8.34	0.00	0.00	0.00	-40.77
	3	23	-50.10	-16.30	0.00	0.00	0.00	478.31
		24	50.10	16.30	0.00	0.00	0.00	-512.25
	4	23	0.00	0.00	0.00	0.00	0.00	0.00
		24	0.00	0.00	0.00	0.00	0.00	0.00
	5	23	0.00	-10.80	0.00	0.00	0.00	30.31
		24	0.00	10.80	0.00	0.00	0.00	-52.79
	6	23	0.00	0.00	0.00	0.00	0.00	0.00
		24	0.00	0.00	0.00	0.00	0.00	0.00
	7	23	9.24	0.00	0.00	0.00	0.00	-79.81
		24	-9.24	0.00	0.00	0.00	0.00	79.81
	8	23	6.50	-2.20	0.00	0.00	0.00	-72.52
		24	-6.50	2.20	0.00	0.00	0.00	67.94
	9	23	0.00	0.00	0.00	0.00	0.00	0.00
		24	0.00	0.00	0.00	0.00	0.00	0.00
	10	23	0.00	0.00	-35.75	-369.51	86.67	0.00
		24	0.00	0.00	35.75	369.51	-12.25	0.00
	11	23	0.00	0.00	0.00	0.00	0.00	0.00
		24	0.00	0.00	0.00	0.00	0.00	0.00
24	1	24	-1.06	19.18	0.00	0.00	0.00	62.44
		25	1.06	-4.75	0.00	0.00	0.00	21.32
	2	24	-1.02	3.77	0.00	0.00	0.00	31.32
		25	1.02	-3.77	0.00	0.00	0.00	-4.95
	3	24	-26.29	77.16	0.00	0.00	0.00	691.12
		25	26.29	-77.16	0.00	0.00	0.00	-150.99
	4	24	25.47	29.53	0.00	0.00	0.00	208.69
		25	-25.47	-29.53	0.00	0.00	0.00	-1.97

B-112

MEMBER END FORCES   STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	24	-0.11	4.66	0.00	0.00	0.00	50.59
		25	0.11	-4.66	0.00	0.00	0.00	-18.00
	6	24	-1.81	-5.36	0.00	0.00	0.00	-15.97
		25	1.81	5.36	0.00	0.00	0.00	-21.57
	7	24	-3.77	-17.08	0.00	0.00	0.00	-182.66
		25	3.77	17.08	0.00	0.00	0.00	63.07
	8	24	3.97	-5.99	0.00	0.00	0.00	-85.93
		25	-3.97	5.99	0.00	0.00	0.00	43.97
	9	24	-3.49	-5.38	0.00	0.00	0.00	-28.95
		25	3.49	5.38	0.00	0.00	0.00	-8.69
	10	24	0.00	0.00	17.55	-211.44	49.72	0.00
		25	0.00	0.00	-17.55	211.44	-172.57	0.00
	11	24	0.00	0.00	3.21	424.18	-87.76	0.00
		25	0.00	0.00	-3.21	-424.18	65.31	0.00
25	1	25	-1.06	3.92	0.00	0.00	0.00	-21.32
		26	1.06	14.81	0.00	0.00	0.00	-28.10
	2	25	-1.02	-2.49	0.00	0.00	0.00	4.95
		26	1.02	2.49	0.00	0.00	0.00	-27.55
	3	25	-31.30	33.86	0.00	0.00	0.00	178.49
		26	31.30	-33.86	0.00	0.00	0.00	129.03
	4	25	25.47	29.53	0.00	0.00	0.00	1.97
		26	-25.47	-29.53	0.00	0.00	0.00	266.23
	5	25	-0.11	4.66	0.00	0.00	0.00	18.00
		26	0.11	-4.66	0.00	0.00	0.00	24.29
	6	25	-1.81	-5.36	0.00	0.00	0.00	21.57
		26	1.81	5.36	0.00	0.00	0.00	-70.26
	7	25	-3.77	-17.08	0.00	0.00	0.00	-63.07
		26	3.77	17.08	0.00	0.00	0.00	-92.09
	8	25	3.97	-5.99	0.00	0.00	0.00	-43.97
		26	-3.97	5.99	0.00	0.00	0.00	-10.47
	9	25	-3.49	-5.38	0.00	0.00	0.00	8.69
		26	3.49	5.38	0.00	0.00	0.00	-57.52
	10	25	0.00	0.00	-18.20	-408.07	172.57	0.00
		26	0.00	0.00	18.20	408.07	-7.28	0.00
	11	25	0.00	0.00	3.21	424.18	-65.31	0.00
		26	0.00	0.00	-3.21	-424.18	36.20	0.00
26	1	26	4.87	-15.36	0.00	0.00	0.00	31.24
		27	-5.46	16.87	0.00	0.00	0.00	-47.13
	2	26	1.14	-5.72	0.00	0.00	0.00	27.55
		27	-1.14	5.72	0.00	0.00	0.00	-33.19
	3	26	-41.48	20.14	0.00	0.00	0.00	-129.03
		27	41.48	-20.14	0.00	0.00	0.00	148.89
	4	26	12.96	36.78	0.00	0.00	0.00	-266.23
		27	-12.96	-36.78	0.00	0.00	0.00	302.49
	5	26	2.13	-5.76	0.00	0.00	0.00	-24.29
		27	-2.13	5.76	0.00	0.00	0.00	18.60
	6	26	0.26	-5.65	0.00	0.00	0.00	70.26
		27	-0.26	5.65	0.00	0.00	0.00	-75.84

B-113

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	26	11.32	-13.92	0.00	0.00	0.00	92.09
		27	-11.32	13.92	0.00	0.00	0.00	-105.81
	8	26	5.88	-4.14	0.00	0.00	0.00	10.47
		27	-5.88	4.14	0.00	0.00	0.00	-14.55
	9	26	-1.29	-6.28	0.00	0.00	0.00	57.52
		27	1.29	6.28	0.00	0.00	0.00	-63.70
	10	26	0.00	0.00	-18.25	-382.70	-141.79	0.00
		27	0.00	0.00	18.25	382.70	159.78	0.00
	11	26	0.00	0.00	3.21	408.24	120.73	0.00
		27	0.00	0.00	-3.21	-408.24	-123.93	0.00
27	1	27	7.83	-23.00	0.00	0.00	0.00	46.22
		28	-8.88	25.71	0.00	0.00	0.00	-89.22
	2	27	4.17	-13.49	0.00	0.00	0.00	33.19
		28	-4.17	13.49	0.00	0.00	0.00	-57.00
	3	27	-41.45	20.19	0.00	0.00	0.00	-148.89
		28	41.45	-20.19	0.00	0.00	0.00	184.52
	4	27	-27.75	3.39	0.00	0.00	0.00	78.65
		28	27.75	-3.39	0.00	0.00	0.00	-72.67
	5	27	2.13	-5.77	0.00	0.00	0.00	-18.60
		28	-2.13	5.77	0.00	0.00	0.00	8.43
	6	27	4.18	-15.72	0.00	0.00	0.00	75.84
		28	-4.18	15.72	0.00	0.00	0.00	-103.58
	7	27	15.61	-12.25	0.00	0.00	0.00	72.06
		28	-15.61	12.25	0.00	0.00	0.00	-93.69
	8	27	5.88	-4.14	0.00	0.00	0.00	14.55
		28	-5.88	4.14	0.00	0.00	0.00	-21.86
	9	27	5.56	-5.97	0.00	0.00	0.00	-0.17
		28	-5.56	5.97	0.00	0.00	0.00	-10.36
	10	27	0.00	0.00	-18.20	-382.88	-159.34	0.00
		28	0.00	0.00	18.20	382.88	191.47	0.00
	11	27	0.00	0.00	-32.56	165.04	28.64	0.00
		28	0.00	0.00	32.56	-165.04	28.84	0.00
28	1	28	-1.06	-27.18	0.00	0.00	0.00	89.22
		29	1.06	28.86	0.00	0.00	0.00	-127.19
	2	28	-1.02	-14.08	0.00	0.00	0.00	57.00
		29	1.02	14.08	0.00	0.00	0.00	-76.09
	3	28	-31.30	33.86	0.00	0.00	0.00	-184.52
		29	31.30	-33.86	0.00	0.00	0.00	230.41
	4	28	-24.63	13.23	0.00	0.00	0.00	72.67
		29	24.63	-13.23	0.00	0.00	0.00	-54.74
	5	28	-0.11	-6.14	0.00	0.00	0.00	-8.43
		29	0.11	6.14	0.00	0.00	0.00	0.10
	6	28	-1.81	-16.16	0.00	0.00	0.00	103.58
		29	1.81	16.16	0.00	0.00	0.00	-125.49
	7	28	10.09	-17.08	0.00	0.00	0.00	93.69
		29	-10.09	17.08	0.00	0.00	0.00	-116.84
	8	28	3.97	-5.99	0.00	0.00	0.00	21.86
		29	-3.97	5.99	0.00	0.00	0.00	-29.98

B-114

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	9	28	3.01	-7.58	0.00	0.00	0.00	10.36
		29	-3.01	7.58	0.00	0.00	0.00	-20.63
	10	28	0.00	0.00	-18.19	-426.27	-39.38	0.00
		29	0.00	0.00	18.19	426.27	64.03	0.00
	11	28	0.00	0.00	-32.54	143.31	-86.78	0.00
		29	0.00	0.00	32.54	-143.31	130.88	0.00
29	1	29	0.00	19.26	0.00	0.00	0.00	141.07
		30	0.00	-10.60	0.00	0.00	0.00	-36.57
	2	29	0.00	9.51	0.00	0.00	0.00	88.57
		30	0.00	-9.51	0.00	0.00	0.00	-22.00
	3	29	0.00	0.00	0.00	0.00	0.00	0.00
		30	0.00	0.00	0.00	0.00	0.00	0.00
	4	29	5.00	43.30	0.00	0.00	0.00	280.60
		30	-5.00	-43.30	0.00	0.00	0.00	22.50
	5	29	0.00	0.00	0.00	0.00	0.00	0.00
		30	0.00	0.00	0.00	0.00	0.00	0.00
	6	29	0.00	10.80	0.00	0.00	0.00	148.60
		30	0.00	-10.80	0.00	0.00	0.00	-73.00
	7	29	-4.62	0.00	0.00	0.00	0.00	10.15
		30	4.62	0.00	0.00	0.00	0.00	-10.15
	8	29	0.00	0.00	0.00	0.00	0.00	0.00
		30	0.00	0.00	0.00	0.00	0.00	0.00
	9	29	0.00	0.00	0.00	0.00	0.00	0.00
		30	0.00	0.00	0.00	0.00	0.00	0.00
	10	29	0.00	0.00	0.00	0.00	0.00	0.00
		30	0.00	0.00	0.00	0.00	0.00	0.00
	11	29	0.00	0.00	35.75	160.88	-250.25	0.00
		30	0.00	0.00	-35.75	-160.88	0.00	0.00
30	1	30	0.00	9.92	0.00	0.00	0.00	36.57
		31	0.00	-5.30	0.00	0.00	0.00	-8.14
	2	30	0.00	3.26	0.00	0.00	0.00	22.00
		31	0.00	-3.26	0.00	0.00	0.00	-9.84
	3	30	0.00	0.00	0.00	0.00	0.00	0.00
		31	0.00	0.00	0.00	0.00	0.00	0.00
	4	30	0.00	0.00	0.00	0.00	0.00	0.00
		31	0.00	0.00	0.00	0.00	0.00	0.00
	5	30	0.00	0.00	0.00	0.00	0.00	0.00
		31	0.00	0.00	0.00	0.00	0.00	0.00
	6	30	0.00	10.80	0.00	0.00	0.00	73.00
		31	0.00	-10.80	0.00	0.00	0.00	-32.65
	7	30	-4.62	0.00	0.00	0.00	0.00	10.15
		31	4.62	0.00	0.00	0.00	0.00	-10.15
	8	30	0.00	0.00	0.00	0.00	0.00	0.00
		31	0.00	0.00	0.00	0.00	0.00	0.00
	9	30	0.00	0.00	0.00	0.00	0.00	0.00
		31	0.00	0.00	0.00	0.00	0.00	0.00
	10	30	0.00	0.00	0.00	0.00	0.00	0.00
		31	0.00	0.00	0.00	0.00	0.00	0.00

B-115

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	11	30	0.00	0.00	0.00	0.00	0.00	0.00
		31	0.00	0.00	0.00	0.00	0.00	0.00
31	1	31	3.11	4.29	0.00	0.00	0.00	8.14
		32	-0.40	-0.55	0.00	0.00	0.00	0.89
	2	31	1.91	2.63	0.00	0.00	0.00	9.84
		32	-1.91	-2.63	0.00	0.00	0.00	0.00
	3	31	0.00	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00	0.00
	4	31	0.00	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00	0.00
	5	31	0.00	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00	0.00
	6	31	6.35	8.74	0.00	0.00	0.00	32.65
		32	-6.35	-8.74	0.00	0.00	0.00	0.00
	7	31	-3.74	2.72	0.00	0.00	0.00	10.15
		32	3.74	-2.72	0.00	0.00	0.00	0.00
	8	31	0.00	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00	0.00
	9	31	0.00	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00	0.00
	10	31	0.00	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00	0.00
	11	31	0.00	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00	0.00
32	1	21	0.25	0.00	-0.78	0.00	2.16	0.00
		33	0.00	0.00	0.00	0.00	0.00	0.00
	2	21	0.00	0.00	0.00	0.00	0.00	0.00
		33	0.00	0.00	0.00	0.00	0.00	0.00
	3	21	52.68	0.00	-0.03	0.00	0.14	0.00
		33	-52.68	0.00	0.03	0.00	0.00	0.00
	4	21	0.00	0.00	0.00	0.00	0.00	0.00
		33	0.00	0.00	0.00	0.00	0.00	0.00
	5	21	0.00	0.00	0.00	0.00	0.00	0.00
		33	0.00	0.00	0.00	0.00	0.00	0.00
	6	21	0.00	0.00	0.00	0.00	0.00	0.00
		33	0.00	0.00	0.00	0.00	0.00	0.00
	7	21	0.00	0.00	0.00	0.00	0.00	0.00
		33	0.00	0.00	0.00	0.00	0.00	0.00
	8	21	-5.50	0.00	-4.10	0.00	22.55	0.00
		33	5.50	0.00	4.10	0.00	0.00	0.00
	9	21	0.00	0.00	0.00	0.00	0.00	0.00
		33	0.00	0.00	0.00	0.00	0.00	0.00
	10	21	0.00	35.75	0.00	0.00	0.00	196.62
		33	0.00	-35.75	0.00	0.00	0.00	0.00
	11	21	0.00	0.00	0.00	0.00	0.00	0.00
		33	0.00	0.00	0.00	0.00	0.00	0.00
33	1	25	0.82	0.00	0.00	0.00	0.00	0.00
		34	0.00	0.00	0.00	0.00	0.00	0.00

B-116

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	2	25	0.00	0.00	0.00	0.00	0.00	0.00
		34	0.00	0.00	0.00	0.00	0.00	0.00
	3	25	43.30	5.00	0.00	0.00	0.00	27.50
		34	-43.30	-5.00	0.00	0.00	0.00	0.00
	4	25	0.00	0.00	0.00	0.00	0.00	0.00
		34	0.00	0.00	0.00	0.00	0.00	0.00
	5	25	0.00	0.00	0.00	0.00	0.00	0.00
		34	0.00	0.00	0.00	0.00	0.00	0.00
	6	25	0.00	0.00	0.00	0.00	0.00	0.00
		34	0.00	0.00	0.00	0.00	0.00	0.00
	7	25	0.00	0.00	0.00	0.00	0.00	0.00
		34	0.00	0.00	0.00	0.00	0.00	0.00
	8	25	0.00	0.00	0.00	0.00	0.00	0.00
		34	0.00	0.00	0.00	0.00	0.00	0.00
	9	25	0.00	0.00	0.00	0.00	0.00	0.00
		34	0.00	0.00	0.00	0.00	0.00	0.00
	10	25	0.00	0.00	-35.75	0.00	196.62	0.00
		34	0.00	0.00	35.75	0.00	0.00	0.00
	11	25	0.00	0.00	0.00	0.00	0.00	0.00
		34	0.00	0.00	0.00	0.00	0.00	0.00
34	1	26	1.03	0.00	-0.75	0.00	3.15	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00
	2	26	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00
	3	26	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00
	4	26	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00
	5	26	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00
	6	26	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00
	7	26	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00
	8	26	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00
	9	26	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00
	10	26	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00
	11	26	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00
35	1	27	6.57	0.00	0.00	0.00	0.00	-0.91
		36	-0.54	0.00	0.00	0.00	0.00	0.91
	2	27	8.34	0.00	0.00	0.00	0.00	0.00
		36	-8.34	0.00	0.00	0.00	0.00	0.00
	3	27	0.00	0.00	0.00	0.00	0.00	0.00
		36	0.00	0.00	0.00	0.00	0.00	0.00

36	1	36	0.21	0.00	-0.50	0.00	0.91	0.00
		37	0.00	0.00	0.00	0.00	0.00	0.00
	2	36	0.00	0.00	0.00	0.00	0.00	0.00
		37	0.00	0.00	0.00	0.00	0.00	0.00
	3	36	0.00	0.00	0.00	0.00	0.00	0.00
		37	0.00	0.00	0.00	0.00	0.00	0.00
	4	36	52.52	0.00	4.19	0.00	-15.15	0.00
		37	-52.52	0.00	-4.19	0.00	0.00	0.00
	5	36	0.00	0.00	0.00	0.00	0.00	0.00
		37	0.00	0.00	0.00	0.00	0.00	0.00
	6	36	0.00	0.00	0.00	0.00	0.00	0.00
		37	0.00	0.00	0.00	0.00	0.00	0.00
	7	36	0.00	0.00	0.00	0.00	0.00	0.00
		37	0.00	0.00	0.00	0.00	0.00	0.00
	8	36	0.00	0.00	0.00	0.00	0.00	0.00
		37	0.00	0.00	0.00	0.00	0.00	0.00
	9	36	-5.16	0.00	-4.53	0.00	16.39	0.00
		37	5.16	0.00	4.53	0.00	0.00	0.00
	10	36	0.00	0.00	0.00	0.00	0.00	0.00
		37	0.00	0.00	0.00	0.00	0.00	0.00
	11	36	0.00	0.00	0.00	0.00	0.00	0.00
		37	0.00	0.00	0.00	0.00	0.00	0.00
37	1	30	0.67	0.00	0.00	0.00	0.00	0.00
		38	0.00	0.00	0.00	0.00	0.00	0.00
	2	30	0.00	0.00	0.00	0.00	0.00	0.00
		38	0.00	0.00	0.00	0.00	0.00	0.00
	3	30	0.00	0.00	0.00	0.00	0.00	0.00
		38	0.00	0.00	0.00	0.00	0.00	0.00
	4	30	43.30	5.00	0.00	0.00	0.00	22.50
		38	-43.30	-5.00	0.00	0.00	0.00	0.00
	5	30	0.00	0.00	0.00	0.00	0.00	0.00
		38	0.00	0.00	0.00	0.00	0.00	0.00

B-117

MEMBER END FORCES   STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	4	27	16.30	50.10	0.00	0.00	0.00	381.14
		36	-16.30	-50.10	0.00	0.00	0.00	-15.15
	5	27	0.00	0.00	0.00	0.00	0.00	0.00
		36	0.00	0.00	0.00	0.00	0.00	0.00
	6	27	10.80	0.00	0.00	0.00	0.00	0.00
		36	-10.80	0.00	0.00	0.00	0.00	0.00
	7	27	0.00	-4.62	0.00	0.00	0.00	-33.75
		36	0.00	4.62	0.00	0.00	0.00	0.00
	8	27	0.00	0.00	0.00	0.00	0.00	0.00
		36	0.00	0.00	0.00	0.00	0.00	0.00
	9	27	2.20	-6.50	0.00	0.00	0.00	-63.87
		36	-2.20	6.50	0.00	0.00	0.00	16.39
	10	27	0.00	0.00	0.00	0.00	0.00	0.00
		36	0.00	0.00	0.00	0.00	0.00	0.00
	11	27	0.00	0.00	-35.75	0.00	261.15	0.00
		36	0.00	0.00	35.75	0.00	0.00	0.00

B-118

MEMBER END FORCES   STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	6	30	0.00	0.00	0.00	0.00	0.00	0.00
		38	0.00	0.00	0.00	0.00	0.00	0.00
	7	30	0.00	0.00	0.00	0.00	0.00	0.00
		38	0.00	0.00	0.00	0.00	0.00	0.00
	8	30	0.00	0.00	0.00	0.00	0.00	0.00
		38	0.00	0.00	0.00	0.00	0.00	0.00
	9	30	0.00	0.00	0.00	0.00	0.00	0.00
		38	0.00	0.00	0.00	0.00	0.00	0.00
	10	30	0.00	0.00	0.00	0.00	0.00	0.00
		38	0.00	0.00	0.00	0.00	0.00	0.00
	11	30	0.00	0.00	-35.75	0.00	160.87	0.00
		38	0.00	0.00	35.75	0.00	0.00	0.00
38	1	32	0.55	0.00	-0.40	0.00	0.89	0.00
		39	0.00	0.00	0.00	0.00	0.00	0.00
	2	32	0.00	0.00	0.00	0.00	0.00	0.00
		39	0.00	0.00	0.00	0.00	0.00	0.00
	3	32	0.00	0.00	0.00	0.00	0.00	0.00
		39	0.00	0.00	0.00	0.00	0.00	0.00
	4	32	0.00	0.00	0.00	0.00	0.00	0.00
		39	0.00	0.00	0.00	0.00	0.00	0.00
	5	32	0.00	0.00	0.00	0.00	0.00	0.00
		39	0.00	0.00	0.00	0.00	0.00	0.00
	6	32	0.00	0.00	0.00	0.00	0.00	0.00
		39	0.00	0.00	0.00	0.00	0.00	0.00
	7	32	0.00	0.00	0.00	0.00	0.00	0.00
		39	0.00	0.00	0.00	0.00	0.00	0.00
	8	32	0.00	0.00	0.00	0.00	0.00	0.00
		39	0.00	0.00	0.00	0.00	0.00	0.00
	9	32	0.00	0.00	0.00	0.00	0.00	0.00
		39	0.00	0.00	0.00	0.00	0.00	0.00
	10	32	0.00	0.00	0.00	0.00	0.00	0.00
		39	0.00	0.00	0.00	0.00	0.00	0.00
	11	32	0.00	0.00	0.00	0.00	0.00	0.00
		39	0.00	0.00	0.00	0.00	0.00	0.00

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

```
206. *        PLOT DISPLACEMENT FILE
207. *        PLOT SECTION FILE
208. *        PLOT BENDING FILE
209. FINISH
```

*************** END OF STAAD-III ***************

****** DATE= JUL 22,1992   TIME= 9:25:54 ******

```
****************************************************************
*        FOR QUESTIONS ON STAAD-III/ISDS, CONTACT:             *
*        RESEARCH ENGINEERS, INC AT (714) 974-2500             *
```

JUL 24 '92 15:08 TO 3038432208 FROM BROMWELL AND CARRIER T-870 P.01

B-119

BCI

BROMWELL & CARRIER, INC.

P.O. Box 5467
Lakeland, FL 33807-5467
(813) 646-8591
FAX: (813) 644-8920

ENGINEERS • DESIGNERS • SCIENTISTS

FACSIMILE TRANSMITTAL

To: Don Parker Date: 7/24/92

Fax No.: (303) 843-2208

From: Mark E. Plaskett Project No.: 7901
BCI

Subject: Footing Design - 30° Curve - Al. Box Beam

Please find attached 2 page(s), including the cover sheet. If you have any problems receiving, contact Mark at (813) 646-8591. BCI Fax is a Toshiba Model TF-331.

A hard copy of transmitted document(s) [ ] will [X] will not follow in the mail.

Message:
Call If You Have Any Questions.
Mark

Confirmed fax sent by: ____________ Date/time: ____________

BCI BROMWELL & CARRIER, INC.	SUBJECT Maglev Found Design		
	JOB NO 7901 REF.	MADE BY MEP CHECKED REVIEWED	DATE 7/24/92 SHEET OF

Aluminum Box Beam Double Guideway
30° Curve Loads

Footer Size: $L = 48$ Ft (Along Z Axis)
$B = 20$ Ft (Along X Axis)

Approximate Quantities:

Form & Pour - 89 Yd^3
Excavation - 142 Yd^3
Backfill (compacted) - 53 Yd^3

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE) United Engineers & Constructors

A Raytheon Company

NAME OF COMPANY MI / MIT UNIT/S

SUBJECT MAGNEPLANE

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER	
FINAL			DATE 9-30-92	DATE
VOID				
SHEET	OF		DATE	DATE
J.O 6869002				

MAGNEPLANE INTERNATIONAL - SYSTEM CONCEPT DEFINITION REPORT

SUPPLEMENT C
BACKUP MATERIALS-MAGWAY STRUCTURE

MECHANICAL SWITCH (Report reference 3.2.2.d & 5.3.2.22)

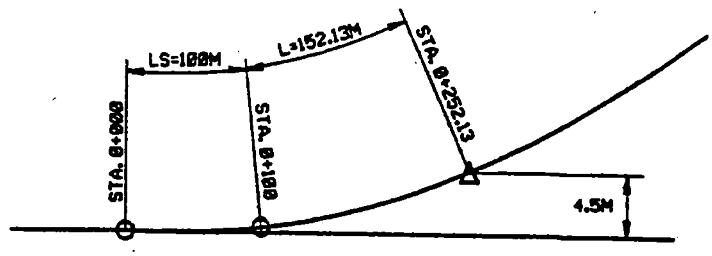
The following pages offer additional preliminary design information for the design of the mechanical switch. The mechanical switch system is the alternate switching system. The baseline switching system is the MAGSWITCH as discussed in section 3.2.2.d of the report.

As shown on the layout on page M-1, the total length of switch to satisfy ride quality requirements at 100 m/s is 252 meters. this is made up of a spiral length ot 100 m and a horizontal curve with a 4632 m radius. The crossover can simply be made up of two switches as shown on page M-3. This is possible if the guideways are spaced at 9 meters c to c at this location. If it is desired to hold a 5.5 m guideway c to c spacing, an arrangement as shown on pages M-5 and M-6 is possible. Note that two guideway sections are required to move in tandem due to clearances, but that the total length of crossover is shorter. We have elected to baseline crossover A at this time. M-7 shows crossover C & D which shows possible arrangements for transitioning from a 5.5 m spacing to a 9 m spacing at the crossover area.

CONTENTS:

M-1 thru M-7	Layouts
M-8	Switch segments
M-9	Switch joint clearances
M-10 thru M-13	Switch hydraulics
M-14 & 15	Carriage loading
M-16 & 17	Switch Drawings
M-18 & 19	Switch Description

M-1



SWITCH-A

SCALE: HORIZ. 1:5000
VERT. 1:500

Curve Set Type: SPIRAL CIRCULAR SPIRAL

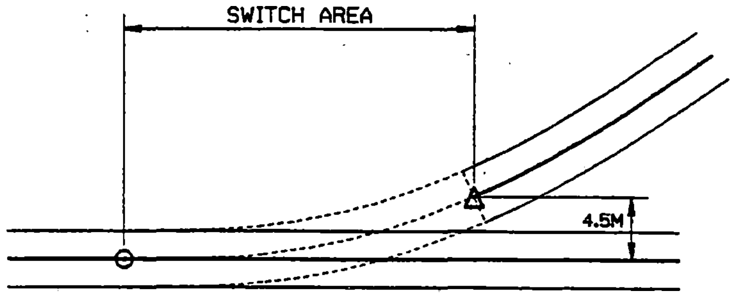
	STATION	EASTING	NORTHING
TS	0+000.00	431577.64	32838.34
SC	0+100.00	431677.64	32838.70
CC		431627.64	37470.43

Length:	100.00	100.00
Angle:	0°37'06.52"L	0°37'06.52"L
Constant:	680.59	680.59
Offset:	0.00	0.00
Long Tangent:	66.67	66.67
Short Tangent:	33.33	33.33
Long Chord:	100.00	100.00
X:	100.00	100.00
Y:	0.36	0.36
Radius:	4632.00	

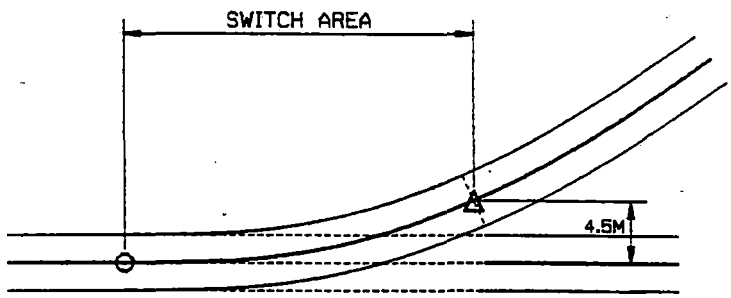
M-2

SWITCH-A

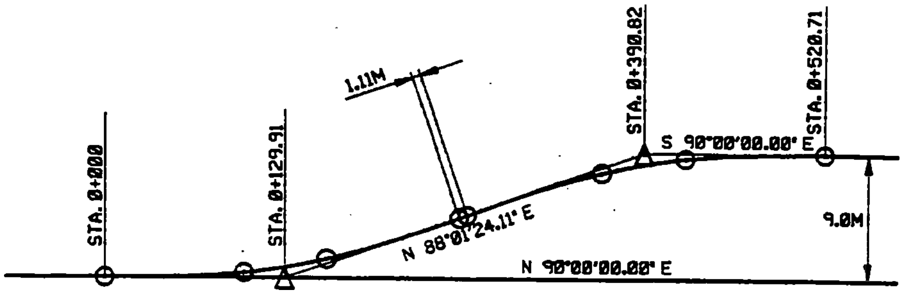
SCALE: HORIZ. 1:5000
VERT. 1:500



NORMAL POSITION



SWITCHED POSITION



CROSS-OVER A

SCALE: HORIZ. 1:5000
VERT. 1:500

Curve Set Type: SPIRAL CIRCULAR SPIRAL

	STATION	EASTING	NORTHING
PI	0+129.91	438919.32	32283.40
TS	0+000.00	438789.41	32283.40
SC	0+100.00	438889.41	32283.76
CC		438839.41	36915.49
CS	0+159.80	438949.19	32284.79
ST	0+259.80	439049.15	32287.88

Length:	100.00	100.00
Angle:	0°37'06.52"L	0°37'06.52"L
Constant:	680.59	680.59
Offset:	0.00	0.00
Long Tangent:	66.67	66.67
Short Tangent:	33.33	33.33
Long Chord:	100.00	100.00
X:	100.00	100.00
Y:	0.36	0.36

Radius:	4632.00
Delta:	0°44'22.85"L
Length:	59.80
Tangent:	29.90
Degree of Curve:	1°14'13.04"

Curve Set Type: SPIRAL CIRCULAR SPIRAL

	STATION	EASTING	NORTHING
PI	0+390.82	439180.09	32292.40
TS	0+260.91	439050.26	32287.92
SC	0+360.91	439150.21	32291.01
CC		439260.00	27660.31
CS	0+420.71	439210.00	32292.04
ST	0+520.71	439310.00	32292.40

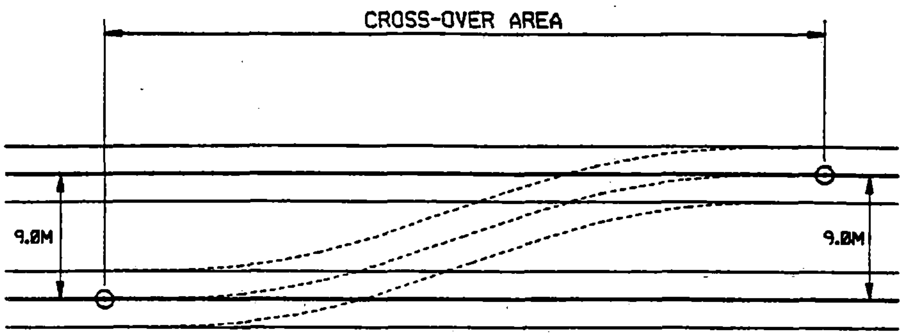
Length:	100.00	100.00
Angle:	0°37'06.52"R	0°37'06.52"R
Constant:	680.59	680.59
Offset:	0.00	0.00
Long Tangent:	66.67	66.67
Short Tangent:	33.33	33.33
Long Chord:	100.00	100.00
X:	100.00	100.00
Y:	0.36	0.36

Radius:	4632.00
Delta:	0°44'22.85"R
Length:	59.80
Tangent:	29.90
Degree of Curve:	1°14'13.04"

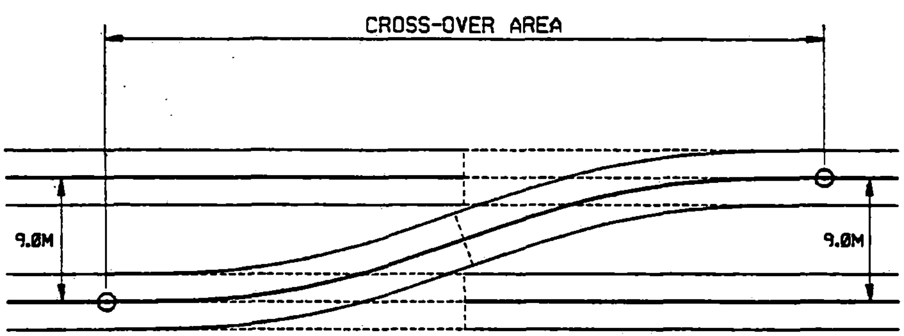
M-4

CROSS-OVER A

SCALE: HORIZ. 1:5000
VERT. 1:500

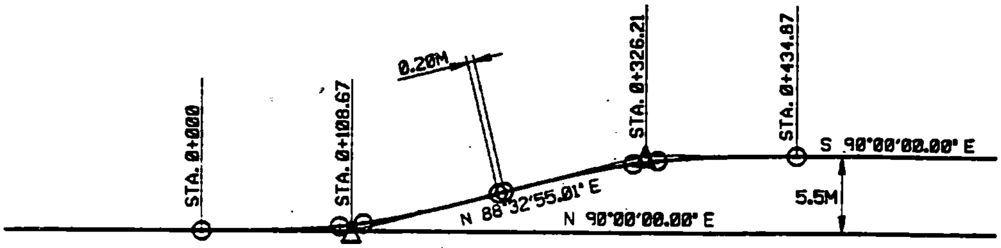


NORMAL POSITION



CROSS-OVER POSITION

M-5



CROSS-OVER B

SCALE: HORIZ. 1:5000
VERT. 1:500

Curve Set Type: SPIRAL CIRCULAR SPIRAL

	STATION	EASTING	NORTHING
PI	0+108.67	438778.09	31056.71
TS	0+000.00	438669.42	31056.71
SC	0+100.00	438769.42	31057.06
CC		438719.42	35688.79
CS	0+117.34	438786.75	31057.28
ST	0+217.34	438886.73	31059.46

Length:	100.00	100.00
Angle:	0°37'06.52"L	0°37'06.52"L
Constant:	680.59	680.59
Offset:	0.00	0.00
Long Tangent:	66.67	66.67
Short Tangent:	33.33	33.33
Long Chord:	100.00	100.00
X:	100.00	100.00
Y:	0.36	0.36

Radius:	4632.00
Delta:	0°12'51.95"L
Length:	17.34
Tangent:	8.67
Degree of Curve:	1°14'13.04"

Curve Set Type: SPIRAL CIRCULAR SPIRAL

	STATION	EASTING	NORTHING
PI	0+326.21	438995.17	31062.21
TS	0+217.53	438886.53	31059.45
SC	0+317.53	438986.51	31061.63
CC		439053.84	26430.12
CS	0+334.87	439003.84	31061.85
ST	0+434.87	439103.84	31062.21

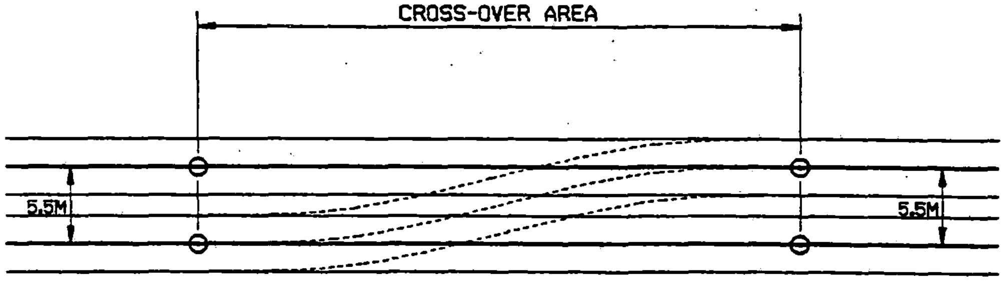
Length:	100.00	100.00
Angle:	0°37'06.52"R	0°37'06.52"R
Constant:	680.59	680.59
Offset:	0.00	0.00
Long Tangent:	66.67	66.67
Short Tangent:	33.33	33.33
Long Chord:	100.00	100.00
X:	100.00	100.00
Y:	0.36	0.36

Radius:	4632.00
Delta:	0°12'51.95"R
Length:	17.34
Tangent:	8.67
Degree of Curve:	1°14'13.04"

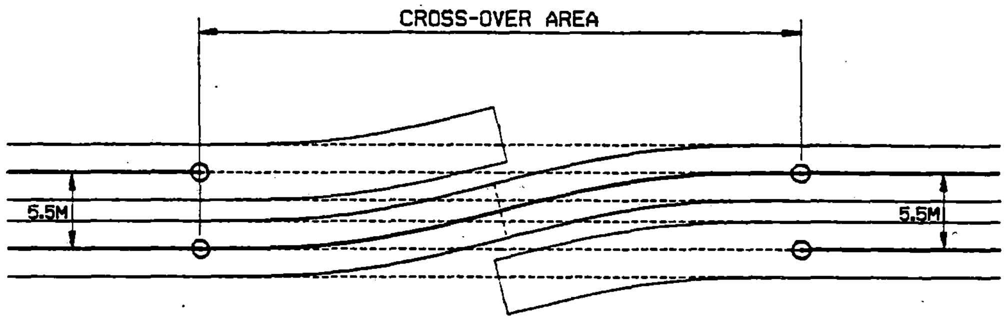
M-6

CROSS-OVER B

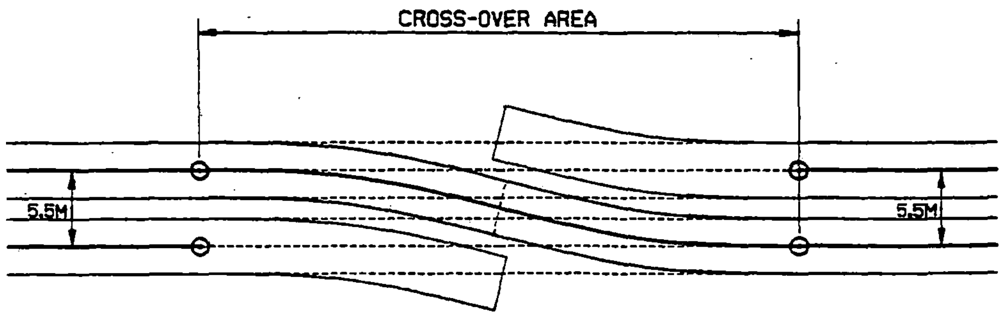
SCALE: HORIZ. 1:5000
VERT. 1:500



NORMAL POSITION

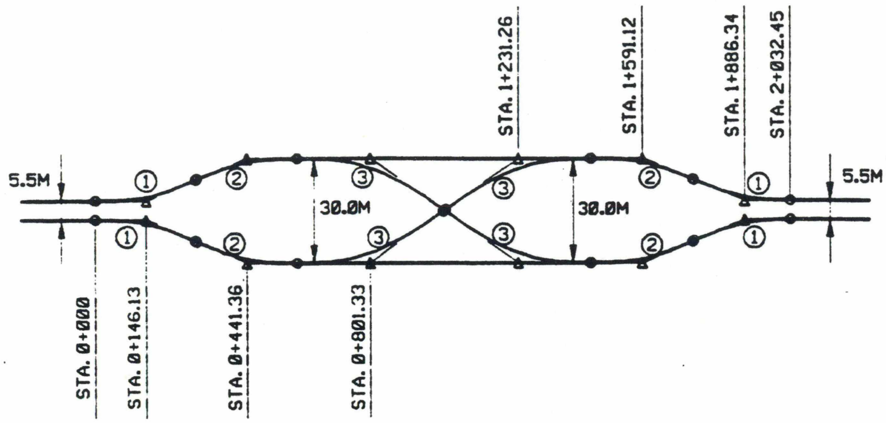


CROSS-OVER POSITION 1



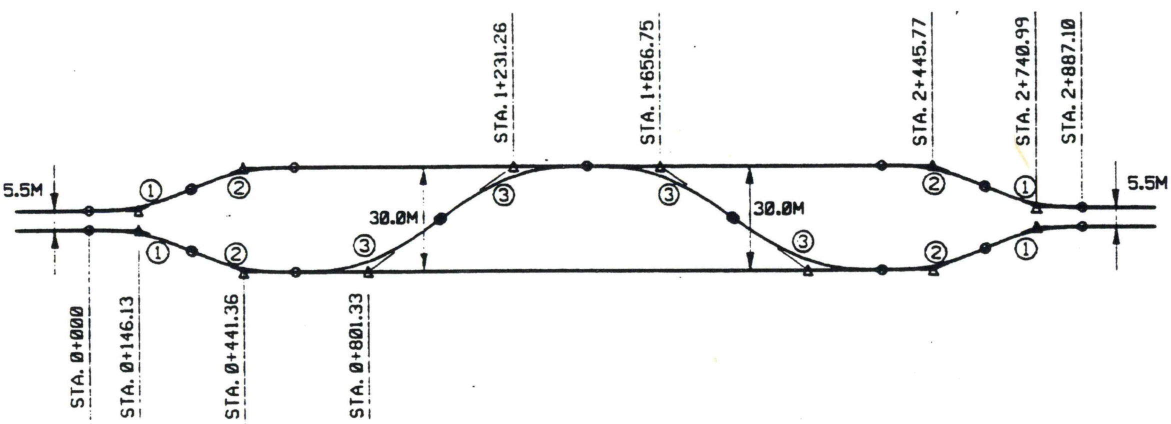
CROSS-OVER POSITION 2

M-7



CROSS-OVER C

SCALE: HORIZ. 1:20000
VERT. 1:2000



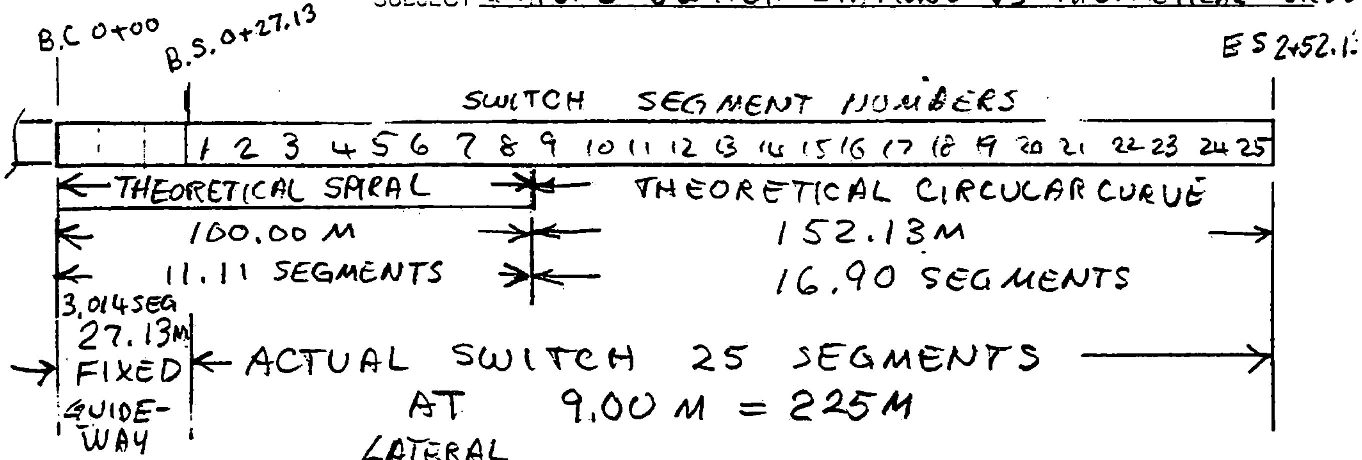
CROSS-OVER D

SCALE: HORIZ. 1:20000
VERT. 1:2000

	1	2	3
Length:	100.00	100.00	100.00
Angle:	0°37'06.52"	0°37'06.52"	0°37'06.52"
Constant:	680.59	680.59	680.59
Offset:	0.00	0.00	0.00
Long Tangent:	66.67	66.67	66.67
Short Tangent:	33.33	33.33	33.33
Long Chord:	100.00	100.00	100.00
X:	100.00	100.00	100.00
Y:	0.36	0.36	0.36
Radius:	4632.00	4632.00	4632.00
Delta:	1°08'27.28"	1°08'27.28"	2°45'46.89"
Length:	92.24	92.24	223.37
Tangent:	46.12	46.12	111.71
Degree of Curve:	1°14'13.04"	1°14'13.04"	1°14'13.04"

United Engineers & Constructors
Raytheon
Stearns-Roger Division

PAGE 1 OF 1 M-8
JOB NO. 6869002 DATE 4-23-92 BY KEJ CH'K
CUSTOMER MI/MIT PROJECT MAGLEV
SUBJECT ACTUAL SWITCH STATIONS VS THEORETICAL CURVE



SEGMENT NO.	LATERAL TRAVEL (INCHES)
1	0.24
2	0.59
3	1.22
4	2.25
5	3.83
6	6.14
7	9.35
8	13.68
9	17.91
10	22.07
11	27.55
12	33.72
13	40.57
14	48.12
15	56.35
16	65.27
17	74.88
18	85.18
19	96.16
20	107.84
21	120.20
22	133.25
23	146.99
24	161.41
25	176.53

FORM 62-114/A0388175

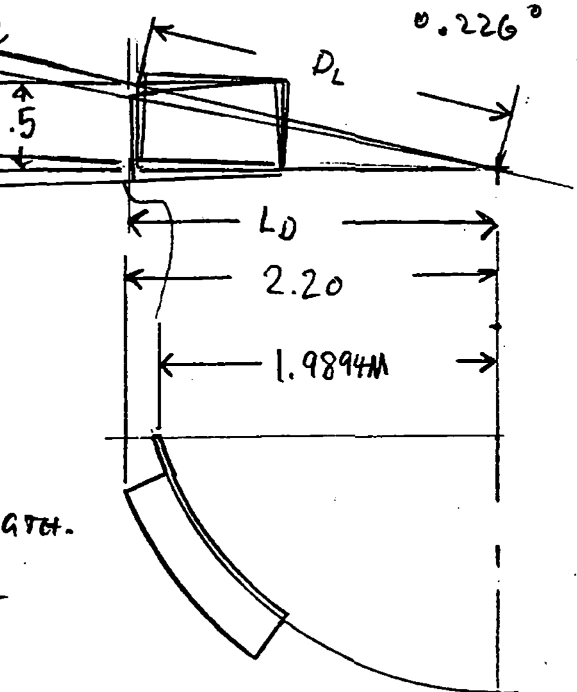
M-9

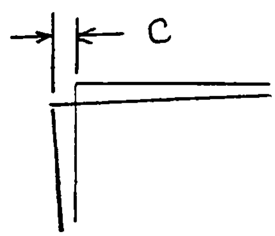
4-06-92 KEJ

SWITCH JOINT OVERLAP CLEARANCE

CHECK INTERFERENCE WHEN OVERLAPPED PART OF LEVITATION BEAM JOINT ROTATES DURING SWITCH OPERATION. OVERLAP IS 0.5M

α = ANGLE OF ROTATION OF JOINT 0.1132° (30' SECTION)
0.226° (60' SECTION)





DIAGONAL LENGTH.

$D_L = \sqrt{1.9894^2 + 0.5^2}$

$D_L = 2.051$ M

ANGLE OF OVERLAP CORNER

$\tan^{-1} \frac{0.5}{1.989} = 14.111°$

JOINT MOTION (ANGLE) $\pm 0.1132°$ (30' SECTION)

(+) 14.2242°

(−) 13.9978°

DEFLECTED WIDTH TO CORNER

$L_{D_1} = (\cos 13.9978°) \times 2.051$

$L_{D_1} = 1.9901$

$C = 1.9901 - 1.9894 = 0.00070\text{ M} = \boxed{.027\text{IN}}$

14.111
.226 (60' SECTION)

− 13.885

$L_{D_2} = 1.99107$

C = .00097M = .0381IN

United Engineers & Constructors
- Raytheon ...
Stearns-Roger Division

PAGE 1 OF 4 M-10

JOB NO. 6869002 DATE 4-30-92 BY KEJ CH'K

CUSTOMER MI/MIT PROJECT MAGLEV SWITCH

SUBJECT SWITCH ACTUATORS SIZES AND QUANTITIES

SWITCH SEGMENT#	CYLIN. DIA (IN)	ROD DIA (IN)	STROKE (IN)	DISPL. GAL/IN CYL	DISPL. GAL/IN ROD	EXTEND GAL +	RETR. GAL =	CYCLE GAL	SUM GAL
1	7	4	176.53	.1666	.0544	29.41	19.81	49.22	49.22
2	6	4	161.41	.1224		14.76	10.98	30.74	79.96
3	6	4	146.99		.0544	17.99	10.00	27.99	107.95
4	6	3 1/2	133.25		.0416	16.31	10.77	27.08	135.03
5	6	3 1/2	120.20			14.71	8.17	22.88	157.91
6	6	3 1/2	107.84	.1224	.0416	13.2	8.71	21.91	179.82
7	5	3	96.16	.0850	.0306	8.17	5.23	13.40	193.22
8	5	3	85.18			7.24	4.63	11.87	205.09
9	5	3	74.88		.0306	6.36	4.07	10.43	215.52
10	5	2 1/2	65.27		.0213	5.55	4.16	9.71	225.23
11	5	2 1/2	56.35		.0213	4.79	3.59	8.38	233.61
12	5	2	48.12		.0136	4.09	3.44	7.53	241.14
13	5	2	40.57		.0136	3.45	2.90	6.35	247.49
14	5	2	33.72	.0850	.0136	2.87	2.41	5.28	252.77
15	4	1 3/4	27.55	.0544	.0104	1.50	1.21	2.71	255.48
16	4	1 3/4	22.07		.0104	1.20	0.97	2.17	257.65
17	4	1 3/8	17.91		.0065	0.97	0.86	1.83	259.48
18	4	1 3/8	13.68		.0065	0.74	0.66	1.40	260.88
19	4	1	9.35		.0034	0.51	0.48	0.99	261.87
20	4	1	6.14			0.33	0.31	0.64	262.51
21	4	1	3.83			0.21	0.20	0.41	262.92
22	4	1	2.25			0.12	0.11	0.23	263.15
23	4	1	1.22			0.07	0.06	0.13	263.28
24	4	1	0.59			0.03	0.03	0.06	263.34
25	4	1	0.24	.0544	.0034	0.01	0.00	0.01	263.35
TOTALS GAL.						159.59	103.76		263.35

MAXIMUM FLOW RATE

EXTEND 159.59 GAL IN 12 SECOND.

$$159.59 \times \frac{60}{12} = 797.95 \text{ GAL/MIN MAX RATE}$$

RETURN $103.76 \times \frac{60}{12} = 518.8$ GAL/MIN

FORM 62-114/AC388175

United Engineers
& Constructors
Raytheon
Stearns-Roger Division

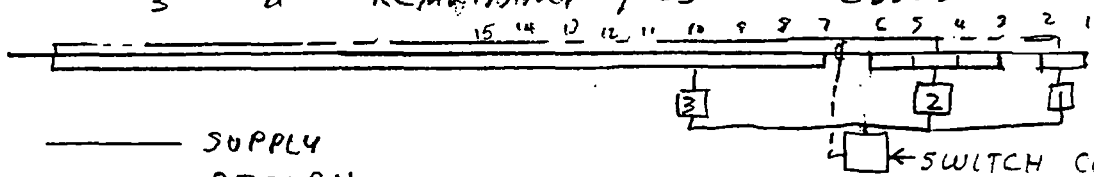
JOB NO. 6869002 DATE 4-30-92 BY KEJ CH'K ______

CUSTOMER MI/MIT PROJECT MAGLEV SWITCH

SUBJECT HYDRAULIC PIPING SIZES & QUANTITIES

(3) 104 GAL ACCUMULATORS = 3X104 = 312 GAL CAPACITY.

ACCUM NO 1	SERVES	CYLINDER	1, 2, ,	79.96 GAL
2	"	"	3, 4, 5, 6,	99.86
3	"	REMAINING	7-25	83.53



———— SUPPLY

— - - — RETURN

← SWITCH CONTROL & HYDRAULIC SUPPLY BUILDING

PIPING SIZES. USE 15 FT/SEC
MAXIMUM FLOW VELOCITY PER PARKER CATALOG.

1. SUPPLY TO ACCUMULATORS

ACCUMULATORS MUST BE RECHARGED IN 5 MINUTES.

ACCM. NO.	CAPACITY	USE	STORE	RECHARGE	TIME	GPM
1	104	80	24	80	5MIN	16
2	104	100	04	100	5MIN	20
3	104	84	20	84	5MIN	16.8

	GPM		IN³/SEC	PIPE DIA	AREA	VEL.	
1	16	×231÷60=	61.60	3" SCH160	5.42 IN²	11.3	FT/SEC OK
2	20		77.00	"	"	14.2	
3	16.8		64.68	"	"	11.9	

2. FLOW RATE TO CYLINDERS FROM ACCUMULATORS

ACCUM #1 FLOW $\frac{80\,GAL}{12/60} = 400$ GPM

#2 " $\frac{100\times 60}{12}$ 500 GPM

#3 " $\frac{84\times 60}{12}$ 417 GPM

ACCUM #2

$500 \times \frac{231}{60} = 1925$ IN³/SEC (WORST CASE)

$Q = AV$

$A = \frac{Q}{V} = \frac{1925}{15} = 128.3$ IN² REQ 16" SCH160 PIPE
A = 129 IN² NO GOOD.

United Engineers & Constructors
Raytheon
Stearns-Roger Division

JOB NO. 6864002 DATE 4-30-92 BY KEJ CHK
CUSTOMER MI / MIT PROJECT MAGLEV SWITCH
SUBJECT HYDRAULIC PIPING

TRY 4 PIPES, ONE TO EACH CYLINDER IN GROUP.

$128.3 \div 4 = 32.08$ 8" SCH 160 AREA = 36.5 IN^2
OK

ACCUM NO 1

$\frac{400 \times 231}{60} \times \frac{1}{15} = 102.7\ IN^2 \div 2$ $51.3\ IN^2$, USE 10", $56.7\ IN^2$
TWO REQUIRED

ACCUM NO 3

$\frac{417 \times 231}{60} \times \frac{1}{15} = 107.03$ THIS DISTRIBUTES TO
19 CYLINDERS
HALF IN EACH DIRECTION FROM
ACCUMULATIO
USE 10" HEADER TO CYLINDERS 7-15 (1/2 CAPACITY)
USE 5" " " 16-25

PIPE QUANTITY:

CYLINDER	ACCUM SUPPLY	CYLIN. SUPPLY	RETURN.
1 & 2	45M 3" PIPE	9M 10"	225M 3"
3-6	14.5M 3" "	27M 8"	
7-25	36 M 3" "	72M 10", 90 M 5"	

RETURN QUANTITY GREATEST WHEN ALL CYLINDERS RETRACTING

$\frac{160\ GAL}{12} \times 60 = 800$ GPM TOTAL. IN 12 SECONDS.
160 GAL. USE RETURN PIPE AS RECEIVER

160 GAL $\times 231 = 36960\ IN^3$ USE SCH 80
3" PIPE $6.6\ IN^2 \times 225 \times 39.37 = 58464\ IN^3$

THESE ARE ESTIMATES FOR PIPE QUANTITIES
IF VELOCITY OF 15 FT/SEC CAN BE INCREASED,
THE SIZES CAN BE REDUCED FOR SUPPLY PIPING.

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tearns-Roger Division

JOB NO. 6869002 DATE 4-30-92 BY KEJ CHK
CUSTOMER MI/MIT PROJECT MAGLEV SWITCH
SUBJECT OIL QUANTITY IN SYSTEM

CYLINDERS RETRACTED	104 GAL			104
ACCUMULATORS	312 GAL			416
ACCUMULATOR SUPPLY PIPE :	96' M 3" PIPE			
		$\frac{96 \times 39.37 \times 5.42}{231}$	89	505
CYLINDER SUPPLY	81 M 10"	$\frac{81 \times 39.37 \times 56.7}{231}$	782	1287
	27 M 8"	27 36.5	167	1454
RETURN	225, 3"	$\frac{225 \times 39.37 \times 5.42}{231}$	208	1662
				TOT GAL.

$\frac{1662}{55} =$ 30.2 BARRELS @ 55 GAL/BARREL.

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Raytheon
Stearns-Roger Division

M-14

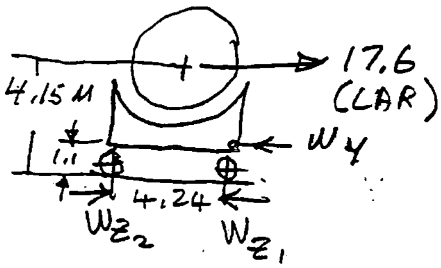
PAGE 1
JOB NO. 6869002 DATE 4-16-92 BY KEJ CH'K
CUSTOMER MI / MIT PROJECT MAG LEV SWITCH
SUBJECT CARRIAGE LOADS

CORNERING LOADS

$110{,}000 \times .16\,G = 17{,}600$ LB

$W_y = \frac{17.6}{2} = 8.8$

$\Sigma M_{W_{Z_2}} = 0$



$4.15 \times \frac{17.6}{2} - 4.24 W_{Z_1} - 1.1 \times 8.8$

$W_{Z_1} = 6.3$ K.

$W_{Z_2} = -W_{Z_1} = -6.3$

$W_Y = -\frac{17.6}{2} = 8.8$

LOADS FROM STRUCTURAL CALC 4/9/92:

	F_Z	F_X	F_Y
	50.5	22.3	21.7
CORNERING	± 6.3	0	± 8.8
TOTAL	56.8 K	22.3 K	30.5 K

WHEELS ACCEPT F_Z ONLY.

SIDE ROLLERS ACCEPT F_X

HOOKS ACCEPT F_Y

M-15

FORM 5007/ BC192016 REV 17/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE) STRUCTURAL

UNITED ENGINEERS & CONSTRUCTORS

CALC SET NO		REV	COMP BY	CHK'D BY
PRELIM	✓	0	MKJ	
FINAL			DATE 04/09/92	DATE
VOID				
SHEET	OF			
JO 6869.002			DATE	DATE

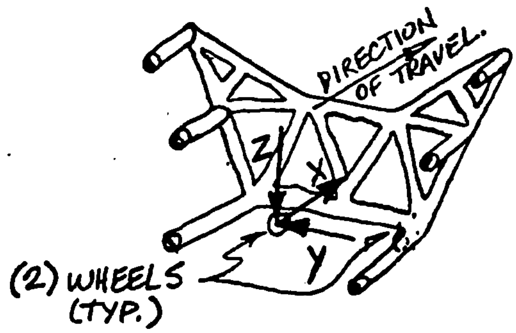
NAME OF COMPANY MAGNEPLANE INT'L UNITS______

SUBJECT SINGLE GUIDEWAY SUPPORT STRUCT.

TO: MIKE McDONALD
FROM: MARK JOHNSON

PRELIMINARY

HERE ARE THE WORST CASE SUPPORT REACTIONS FOR YOUR SWITCH DESIGN. PLEASE NOTE THESE RESULTS ARE FOR 30 FT (9.15 m) SPANS, AND ARE FOR STRAIGHT RUNS OF GUIDEWAY. ADDITIONAL LOADS DUE TO BANKING OF THE VEHICLE ARE NOT INCLUDED.



DEAD LOAD*	F_Z = 28.3 kN (6.4 KIPS)	$F_X \approx \phi$	F_Y = ±6.8 kN (1.5 KIPS)
LIVE LOAD* (VEHICLE)	F_Z = 126.0 kN (28.3 KIPS)	$F_X \approx \phi$	F_Y = ±18.0 kN (4.1 KIPS)
WIND LOAD* ON GUIDEWAY (TRANSVERSE)	F_Z = ±37.0 kN (8.3 KIPS)	F_X = ±6.4 kN (1.4 KIPS)	F_Y = ±57.7 kN (13.0 KIPS)
WIND LOAD* ON VEHICLE	F_Z = ±15 kN (3.4 KIPS)	$F_X \approx \phi$	F_Y = ±9 kN (2.0 KIPS)
BRAKING LOAD*	F_Z = 18 kN (4.1 KIPS) ✓	F_X = 81.8 kN ✓ (18.4 KIPS)	F_Y = ±5 kN (1.1 KIPS)
THERMAL LOAD* (ASSUME 0.4 DEAD)	$F_Z = \phi$	F_X = 11.3 kN (2.5 KIPS)	$F_Y = \phi$
	50.5 ✓	22.3 Kips ✓	21.7 ~~8.7~~ Kip =
			braking + 8.8
			30.5 K

* ALL VALUES ARE PER WHEEL.

17.6 ÷ 2 = 8.8 / wheel

... LLI VERT STATIC WHEEL LOAD = 66.5 KIPS

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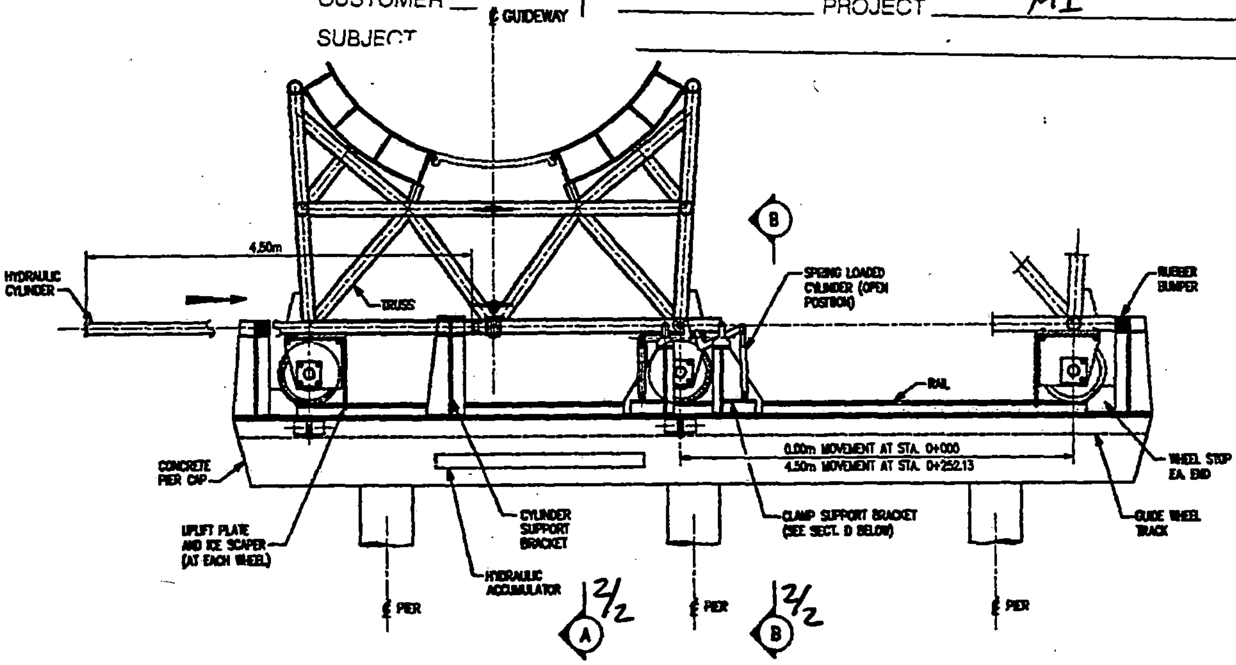
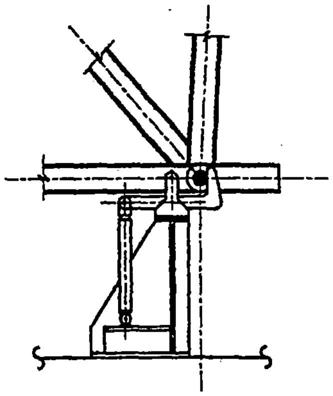
A Raytheon Company

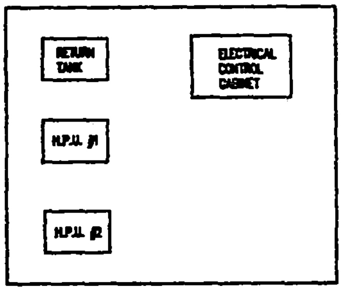
		PAGE	M-16
JOB NO.	DATE	BY	CH'K
CUSTOMER		PROJECT	MI
SUBJECT			



SECTION AT SWITCH JOINT
(AT CENTERLINE OF PIER)
SECTION C

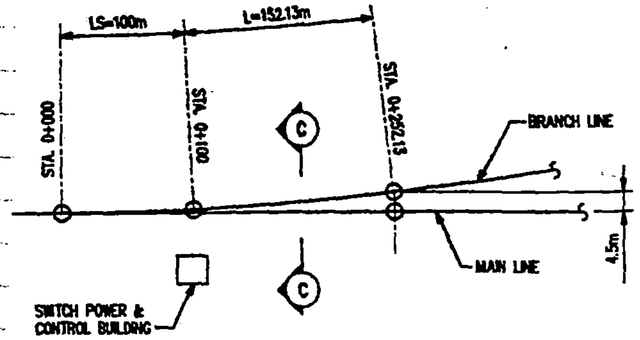


CLAMP SUPPORT BRACKET
SECTION D



SWITCH POWER
& CONTROL BUILDING
PLAN

NOTE:
THIS MECHANICAL SWITCHING SYSTEM SYSTEM IS AN ALTERNATE SYSTEM. THE BASELINE SWITCHING SYSTEM IS THE MAGSWITCH SHOWN ON DRAWINGS S-10, S-10A AND S-10C.



1/2

FORM 62

PLAN SWITCH-A

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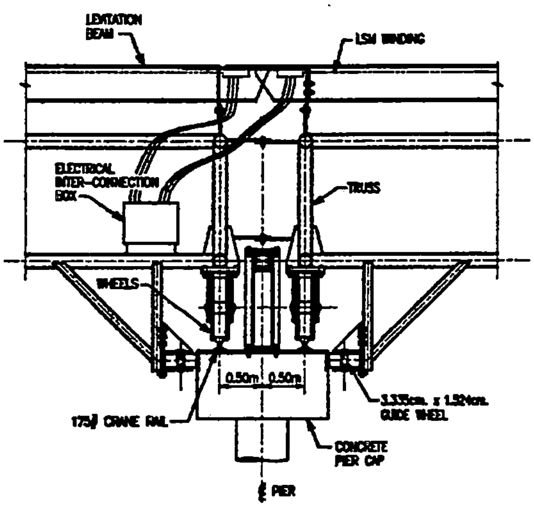
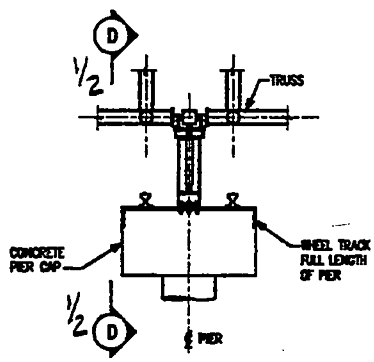
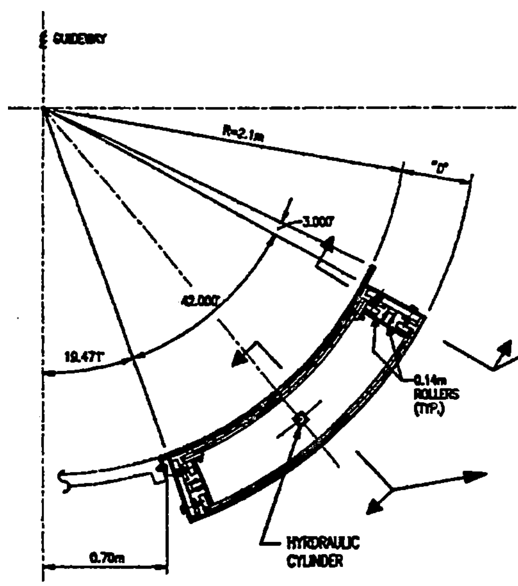
PAGE M-17
JOB NO. ______ DATE ______ BY ______ CH'K ______
CUSTOMER ______ PROJECT MI
SUBJECT ______

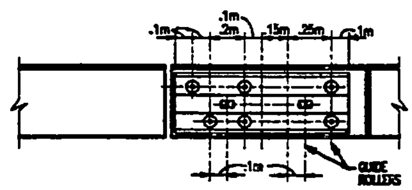


SECTION AT SWITCH JOINT
SECTION A

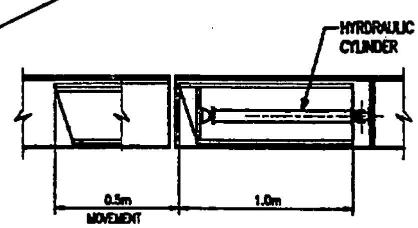


SECTION AT CLAMP SUPPORT
AT CENTERLINE PIER CAP
SECTION B





SECTION



SECTION

MECHANICAL SWITCH EXTENDABLE TONGUE
(AT STA. 0+252.13)

2/2

NOTE:
TYPICAL 4 PLACES
2 MAINLINE, 2 BRANCHLINE

FORM 62-114/A0388175I

MECHANICAL SWITCH DESCRIPTION

Design Parameters

- Magneplane speed through undeflected switch 134 m/s
- Magneplane speed through deflected switch 100 m/s
- Maximum lateral acceleration 0.16 gee

Description of Mechanical Switch System

Magneplane guideways will be provided with two types of mechanical switches. An exit switch and a crossover switch. See Sheets M-1 through M-7. Both switches are designed for a vehicle speed of 100 meters per second. The switches consist of nine meter long guideway trough sections pinned together and mounted on carriages. The joints between the guideway trough sections are similar to the typical trough expansion joint except that each end of the section is supported directly from the steel truss. These joints allow the nine meter long sections to conform to either the undeflected or deflected configuration. Each carriage travels on rails on concrete beams. The length of travel varies up to a maximum travel of 4.5m at the last cylinder. A hydraulic cylinder located on the concrete beam moves the guideway sections between switch positions. The carriages are supported by four 27" diameter crane track wheels on 175 Lb/Yd rails and have four (4) side thrust rollers and four (4) hook-type latches. An extendable tounge connector in the stationary levitation sheet beam is provided for each switch position to connect the last moveable switch section to either fixed guideway at the switch outlet. Stops are provided for the carriages in each switch position. Switches are designed for minimum length by transitioning to fixed guideway as soon as centerline spacing between outlets provides sufficient clearance for side-by-side guideway sections. The first fixed guideway sections at the switch exit are narrower than the standard fixed guideway sections to provide clearance to minimize switch length.

Switches installed in cold climate locations will have a cold weather kit to maintain switch hydraulic system at minimum operating temperature and prevent ice formation on critical parts. Ice scrapers will be provided at each carriage wheel and the hydraulic system will be sized to operate the switch with ice on the carriage tracks.

Mechanical Switch Power System

Each switch section with its carriage weighs approximately 10,000 kilograms. Power to move each section is provided by a hydraulic cylinder. All the cylinders in a switch system are connected to a 1000 psi hydraulic oil supply system consisting of two (2) 50 gpm hydraulic pumping units, four (4) 50 gallon and four (4) 15 gallon accumulators and a 250 gallon return oil tank. Power to operate hydraulic pumping units will be obtained from the guideway 480 VAC power system.

The accumulators provide sufficient capacity to actuate all switch sections within 12 seconds and then return the switch to its initial (mainline) position within 20 seconds after the vehicle passes through the switch. Electric power for solenoid controls will be obtained from transformers reducing 480 volt guideway power to 240 VAC. The hydraulic pumping units will recharge all accumulators within 5 minutes to allow the switch to recycle.

All hydraulic cylinders will be controlled by electric solenoid operated hydraulic flow control valves. Deceleration control valves will be provided on the larger cylinders which operate the switch sections with longest travel.

Sequence of Operation

Guideway control system will initiate a switching operation in the following sequence:

1. Initial switch operation requirement signal
2. Confirm exit of preceding vehicle from switch
3. Confirm correct vehicle is approaching switch
4. Confirm switch is ready to operate
    - 4.1 Confirm hydraulic pressure in accumulators
    - 4.2 Confirm power to hydraulic controls
5. Initiate switch operation
    - 5.1 Retract end switch section connector tounge
    - 5.2 Disengage carriage hold-down hooks
    - 5.3 Initiate motion of last switch section
    - 5.4 Initiate motion of remaining switch sections in sequence
    - 5.5 Decelerate motion of switch sections approaching end of travel
    - 5.6 Stop switch sections in correct positions
    - 5.7 Latch switch sections in correct positions
    - 5.8 Extend connector tounge
    - 5.9 Begin recharge of hydraulic accumulators
    - 5.10 Send signal to control system to indicate switch correctly actuated

Switch Operation Monitoring Requirements

1. Hydraulic pressure
2. Position of switch
3. Switch in motion
4. Switch locked in position
5. Time to complete switch operation
6. Vehicle entering and leaving switch
7. Ambient temperature
8. Status of cold weather switch heater when installed (on/off indicator)
9. Temperature of hydraulic oil
10. Velocity of travel for final (longest travel) switch segment actuator cylinder

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY MI /MIT UNIT/S

SUBJECT MAGNEPLANE

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER	
FINAL			DATE 9-30-92	DATE
VOID				
SHEET OF			DATE	DATE
J.O 6869002				

MAGNEPLANE INTERNATIONAL - SYSTEM CONCEPT DEFINITION REPORT

SUPPLEMENT C
BACKUP MATERIAL-MAGWAY STRUCTURE

TUNNELS (Report reference section 3.2.2.k)

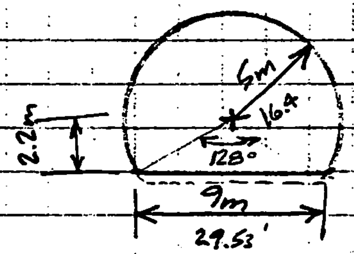
The following pages provide backup calculations on the material quantities that were used in the report to determine the costs of the various tunnel sizes.

Contents:

T-1 thru 4 Mined/Bored Tunnel
T-5 thru 10 Cut/Fill Tunnel

TUNNEL 1233 - MINED / BORED SINGLE 10 m DIA

INSIDE AREA = 60.4 m²
(650 SF)



CIRCUMFERENCE OF 4" GUNITE

$\pi d \quad 2\pi(16.7)\left(1-\frac{128}{360}\right) = 67.6$ — 68 SF/LF

Floor slab 12" concr (per COE)

9m × 12" — 1.1 CY/LF

QTY. OF ROCK REMOVED
FREE AREA + gunite + slab

650 + .33(68) + 29.53 = 702 SF — 26 CY/LF

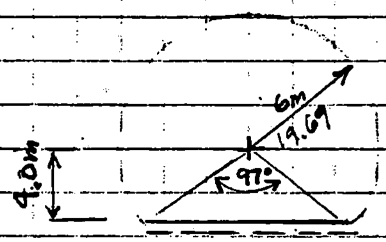
ALSO ADD VENTILATION
LIGHTING
DRAINAGE
WALKWAY
ROCKBOLTS
ASSUME 20' LONG
4 PER LF — 4 EA/LF

United Engineers & Constructors
A Raytheon Company

PAGE T-2
JOB NO. 6869002 DATE 4/10/92 BY PARKER CH'K
CUSTOMER MI PROJECT MAGLEV
SUBJECT NMD

TUNNEL 1233 - MINED / BORED SINGLE 12 m DIA

INSIDE AREA = 100.6 m^2
(1083 SF)



CIRCUMFERENCE OF 4" GUNITE

$2\pi(19.69)\left(1-\frac{97}{360}\right) = 90.4$ 91 SF/LF

FLOOR SLAB 12" CONCR (PER CO.E)
9m x 12" 1.1 CY/LF

QTY OF ROCK REMOVED

FREE AREA + gunite + slab

$1083 + .33(91) + 29.5 = 1143$ SF 43 CY/LF

ALSO ADD VENTILATION

LIGHTING

DRAINAGE

WALKWAY

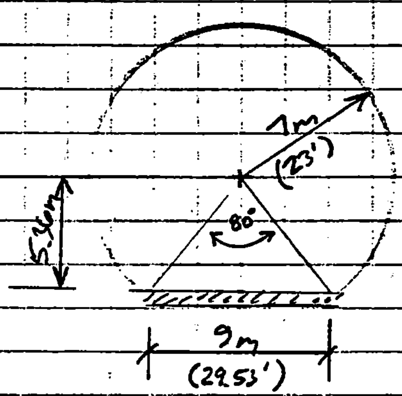
ROCKBOLTS
assume 20' LONG
5 PER LF 5 EA/LF

United Engineers & Constructors
A Raytheon Company

PAGE T-3
JOB NO. 6869002 DATE 9/10/92 BY PARKER CH'K
CUSTOMER MI PROJECT MAGLEV
SUBJECT MTO

TUNNEL 1233 MINED/BORED SINGLE 14 m DIA

INSIDE AREA = 144 m^2
(1550 SF)



CIRCUMFERENCE OF 4" GUNITE

$2\pi(23)\left(1-\frac{80}{360}\right) = 112$ SF 113 SF/LF

FLOOR SLAB 12" CONCR (PER C.O.E.)
9m x 12" 1.1 CY/LF

QTY OF ROCK REMOVED

FREE AREA + GUNITE + SLAB

1550 + .33(113) + 29.53 = 1617 SF 60 CY/LF

ALSO ADD VENTILATION

LIGHTING

DRAINAGE

WALKWAY

ROCKBOLTS
ASSUME 20' LONG 6 EA/LF
6 PER LF

FORM 62-114/A0388175I

T-4

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY: MI

UNIT/S:

SUBJECT: Tunnel Summary

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O				

MINED/BORED TUNNEL COST SUMMARY

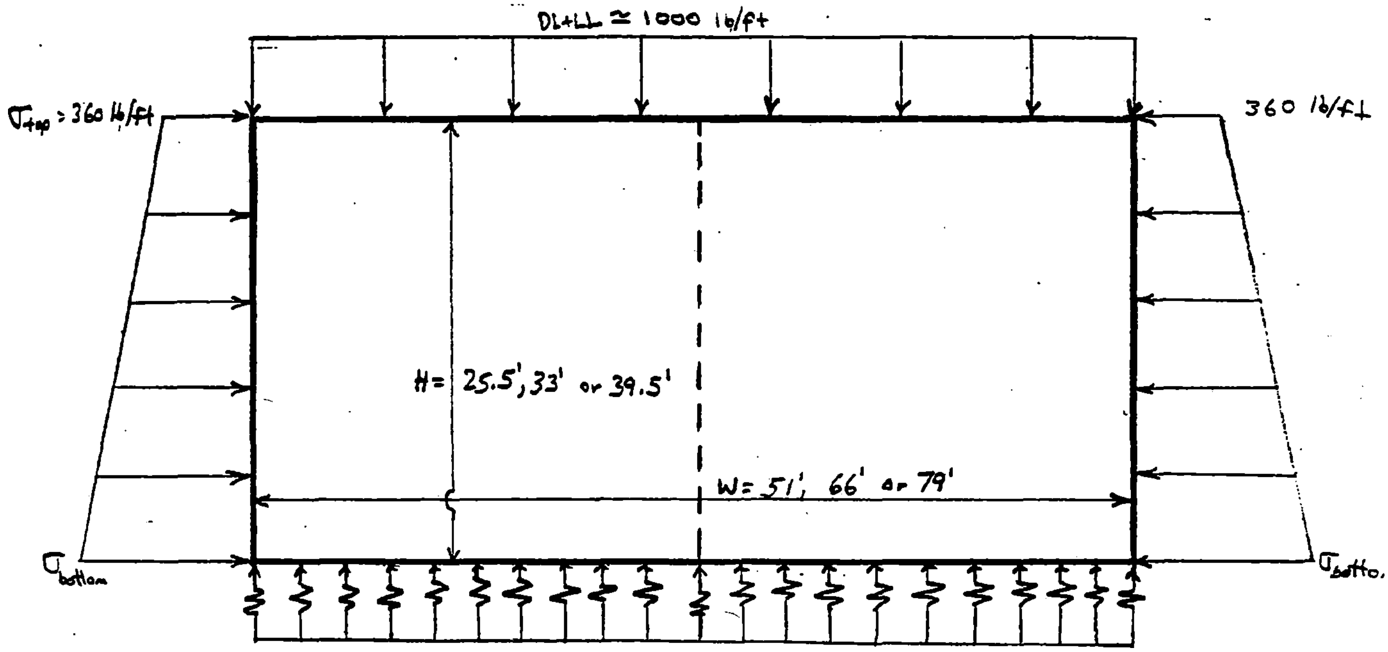
TUNNEL CAPITOL COST

DOUBLE MINED/BORED

COST ELEMENT	UNIT	UNIT COST	DIAMETER= 10 M QTY/ MILE	COST/ MILE	DIAMETER= 12 M QTY/ MILE	COST/ MILE	DIAMETER= 14 M QTY/ MILE	COST/ MILE
EXCAVATION	CY	$66.02	288,000	19,014,912	454,080	29,980,178	633,600	41,832,806
LINER	SF	$8.40	718,080	6,030,468	960,960	8,070,185	1,193,280	10,021,219
ROCK BOLTS	EA	$178.76	42,240	7,550,928	52,800	9,438,660	63,360	11,326,392
HAUL ROCK	CY	$8.95	288,000	2,576,448	454,080	4,062,200	633,600	5,668,186
WATERPROOFING	LOT	-	-	1,387,512	-	1,617,848	-	1,887,481
DRAINAGE	LF	$22.68	10,560	239,501	10,560	239,501	10,560	239,501
SURVEY	LOT	-	-	47,880	-	50,401	-	52,921
FOOTING	CY	$118.23	11,616	1,373,311	11,616	1,373,311	11,616	1,373,311
CATWALK	LF	$52.32	10,560	552,515	10,560	552,515	10,560	552,515
LIGHTING	LOT	-	-	496,565	-	526,904	-	557,239
VENTILATION	LOT	-	-	1,487,566	-	1,574,725	-	1,661,869
STEEL CRADLE	TON	$2,104.65	704	1,481,673	704	1,481,673	704	1,481,673
ALUM FAB	TON	$8,279.46	1,128	9,339,231	1,128	9,339,231	1,128	9,339,231
ALUM DEL/ERCT	TON	$240.55	1,128	271,346	1,128	271,346	1,128	271,346
ALIGNMENT	LF	$1.50	10,560	15,800	10,560	15,800	10,560	15,800
MOB/DEMOB	LS	5%		2,593,283		3,429,724		4,314,074
TOTAL				54,458,939		72,024,202		90,595,564
			$/METER	33,839	$/METER	44,754	$/METER	56,293

United Engineers & Constructors
A Raytheon Company

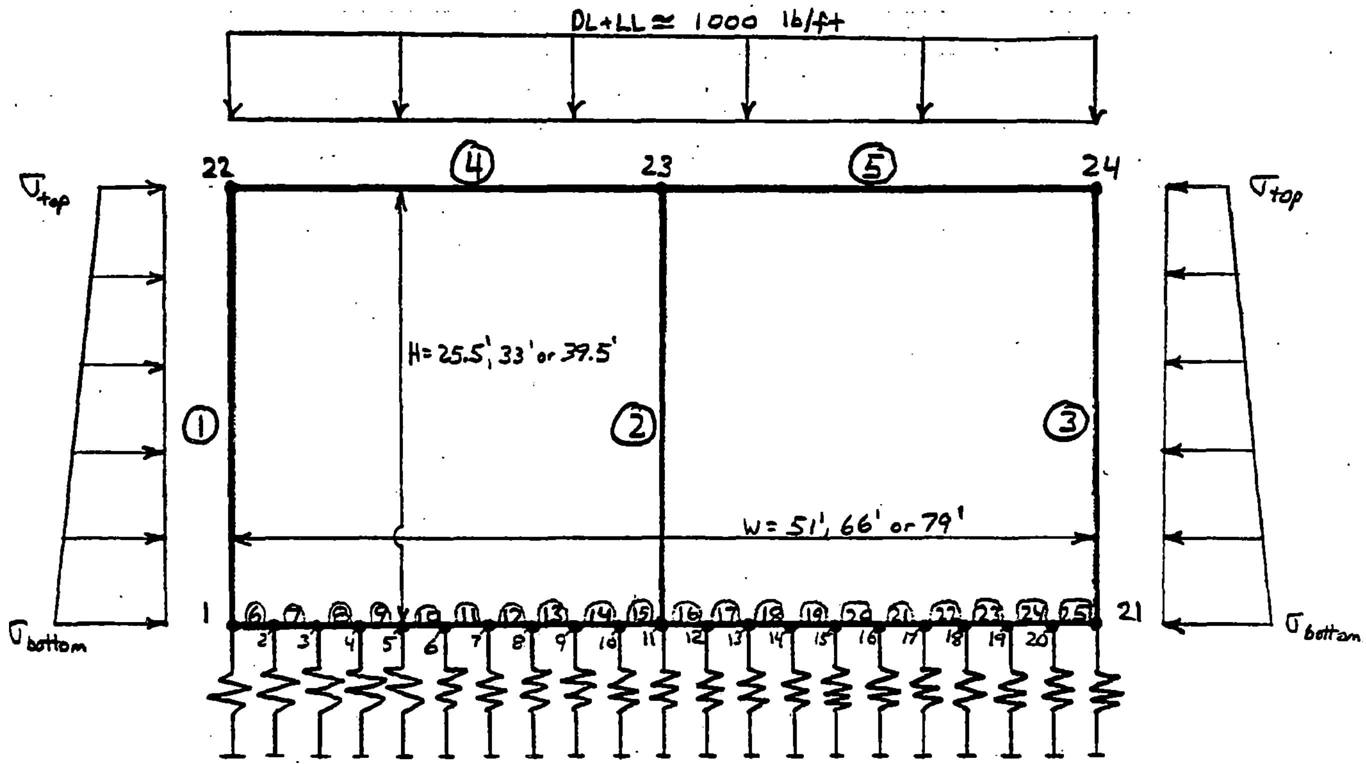
				PAGE	T-5
JOB NO.	6869002	DATE	4/15/92	BY	AJP
CH'K					
CUSTOMER	MI/MIT			PROJECT	MAGLEV
SUBJECT	MTO TUNNEL				



Assume: γ = 120 pcf
3' cover + H20 highway load (Handbook of Steel Drainage & Highway Construction Products p. 86)
= 1000 psf
soil subgrade reaction = 250 kcf
wt of train negligible

σ_{bottom} = 3420 lb/ft for H = 25.5'
4320 lb/ft for H = 33'
5100 lb/ft for H = 39.5'

σ_{top} = 360 lb/ft



For $\gamma = 120$ pcf

$\sigma_{top} = 360$ lb/ft

$\sigma_{bottom} =$ 3420 lb/ft for H = 25.5'
4320 lb/ft for H = 33'
5100 lb/ft for H = 39.5'

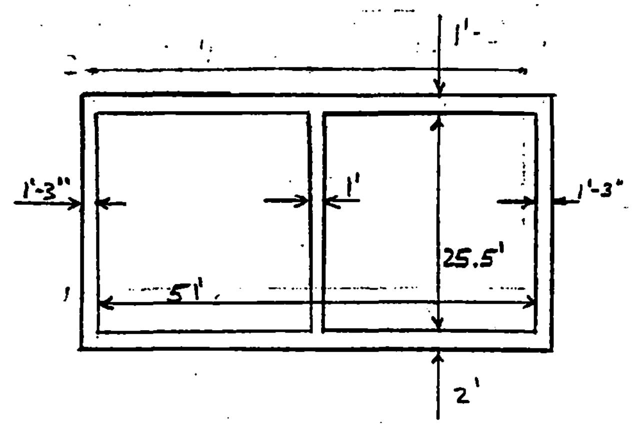
use 250 kcf for soil subgrade reaction

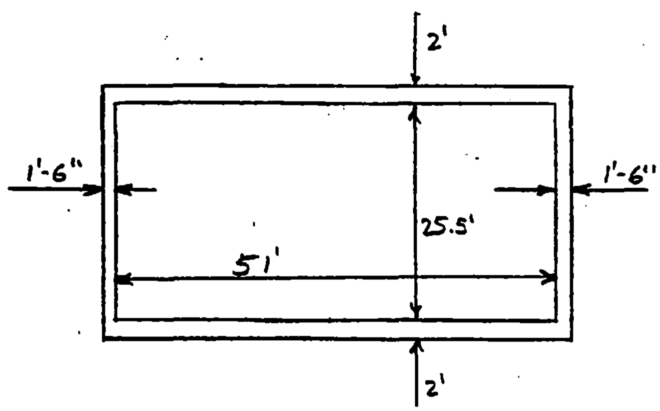
e.g. (H=25.5) $KFY_2 = (1)(2.55)(250) = 637.5$

$KFY_1 = (1)\left(\frac{2.55}{2}\right)(250) = 318.75$

United Engineers & Constructors
A Raytheon Company

PAGE	T-7
JOB NO.	6869 002
DATE	4-16-92
BY	AJP
CH'K	
CUSTOMER	MI / MIT
PROJECT	MAGLEV
SUBJECT	MTO TUNNEL





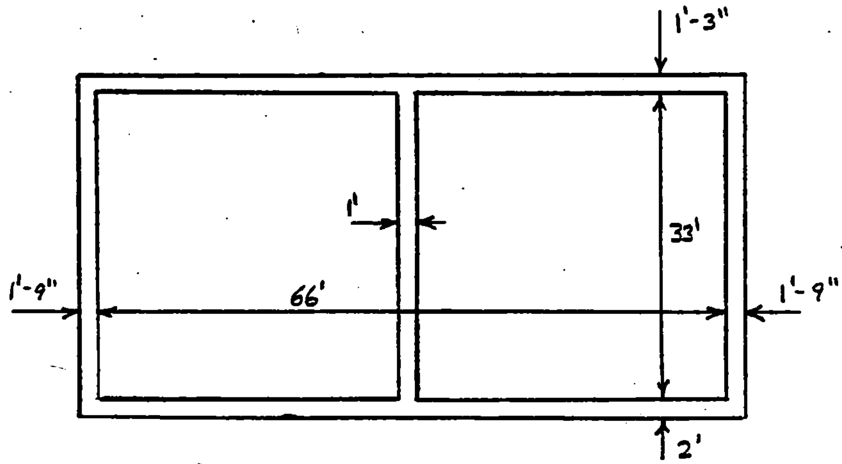
United Engineers
& Constructors
A Raytheon Company

PAGE T-8

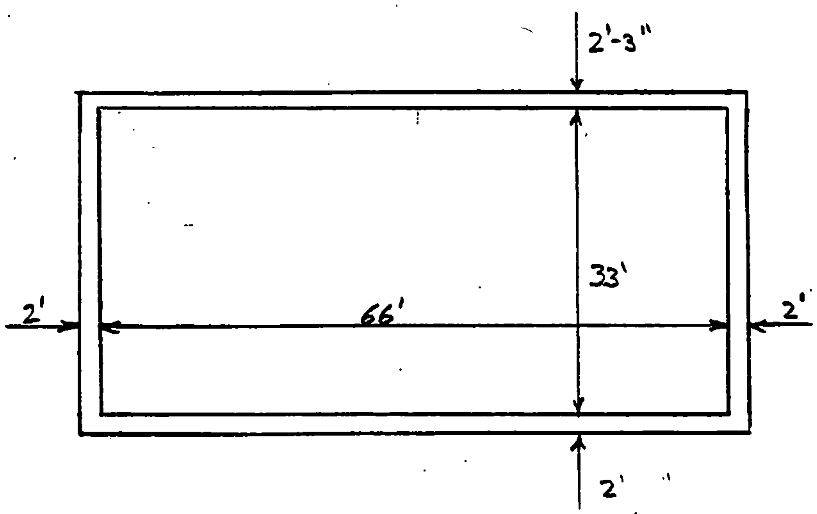
JOB NO. 6869002 DATE 4-16-92 BY AJP CH'K

CUSTOMER MI/MIT PROJECT MAGLEV

SUBJECT MTO TUNNEL

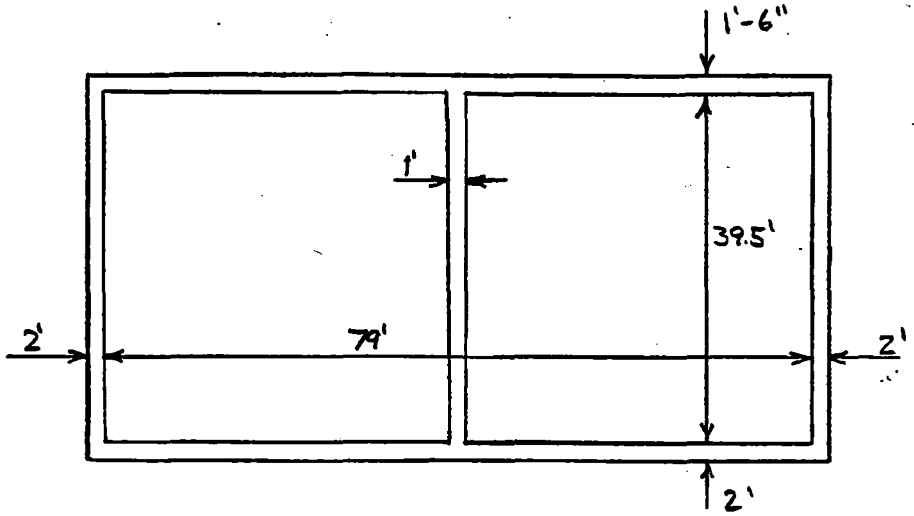


69.5



United Engineers & Constructors
A Raytheon Company

PAGE T-9
JOB NO. 6869002 DATE 4-16-92 BY AJP CH'K
CUSTOMER MI/MIT PROJECT MAGLEV
SUBJECT MTO TUNNEL



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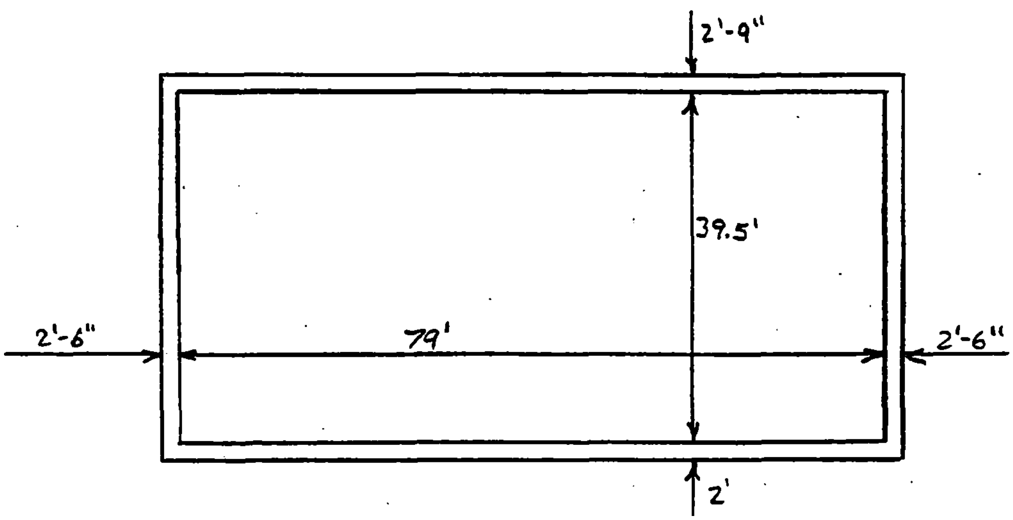

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FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O				

NAME OF COMPANY MI UNIT/S

SUBJECT Tunnel Summary

CUT/FILL TUNNEL COST SUMMARY

TUNNEL CAPITOL COST DOUBLE CUT/FILL

EQUIVALENT DIAMETER			DIAMETER= 10 M		DIAMETER= 12 M		DIAMETER= 14 M	
SIZE-METERS			(2) 7.8x7.8		(2) 10x10		(2) 12x12	
CROSS AREA-SF			(2) 650		(2) 1083		(2) 1550	
COST ELEMENT	UNIT	UNIT COST	QTY/ MILE	COST/ MILE	QTY/ MILE	COST/ MILE	QTY/ MILE	COST/ MILE
EXCAVATION	CY	$4.06	343,200	1,392,243	549,100	2,227,508	776,200	3,148,773
HAUL	CY	$5.61	310,900	1,745,408	508,100	2,852,499	726,900	4,080,853
BACKFILL	CY	$6.94	32,300	224,244	41,000	284,644	49,300	342,267
SHEETPILING	SF	$7.56	343,200	2,594,592	425,000	3,213,000	500,000	3,780,000
WATERPROOFING	LOT	-	-	561,632	-	780,730	-	933,671
SURVEY	LOT	-	-	28,980	-	31,500	-	34,020
BOTTOM SLAB	CY	$195.46	20,900	4,085,062	27,200	5,316,444	32,500	6,352,369
WALLS	CY	$316.17	17,500	5,532,951	29,000	9,168,890	38,600	12,204,109
TOP SLAB	CY	$324.83	10,700	3,475,727	17,000	5,522,183	24,400	7,925,957
CATWALK	LF	$52.32	10,560	552,515	10,560	552,515	10,560	552,515
LIGHTING	LOT	-	-	797,159	-	981,176	-	1,138,316
VENTILATION	LOT	-	-	2,757,997	-	3,397,252	-	3,956,419
STEEL CRADLE	TON	$2,104.65	704	1,481,673	704	1,481,673	704	1,481,673
ALUM FAB	TON	$8,279.46	1,128	9,339,231	1,128	9,339,231	1,128	9,339,231
ALUM DEL/ERCT	TON	$240.55	1,128	271,346	1,128	271,346	1,128	271,346
ALIGNMENT	LF	$1.50	10,560	15,800	10,560	15,800	10,560	15,800
MOB/DEMOB	LS	5%		1,742,828		2,271,819		2,777,866
TOTAL				36,599,388		47,708,209		58,335,186
			$/METER	22,742	$/METER	29,645	$/METER	36,248

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY MI / MIT UNIT/S

SUBJECT MAGNEPLANE

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER	
FINAL			DATE 9-30-92	DATE
VOID				
SHEET	OF		DATE	DATE
J.O 6869002				

MAGNEPLANE INTERNATIONAL - SYSTEM CONCEPT DEFINITION REPORT

SUPPLEMENT C
BACKUP MATERIAL-MAGWAY STRUCTURE

LIFE CYCLE COSTS (Report reference 5.3.11)

The following pages provide backup for the capital cost estimates used in the structural trade off study described and summarized in section 5.3.2.23 (Magway Structural System) and section 3.2.2.k (tunnels) of the report.

CONTENTS:

E-1 THRU E-5 Estimate basis

E-6 Summary of Magway costs
E-7 THRU E-12 Foundation MTO from BCI
E-13 THRU E-33 Est backup for Aluminum box beam magway
E-34 THRU E-44 Est backup for Concrete beam magway
E-45 THRU E-55 Est backup for Steel truss magway
E-56 THRU E-65 Est backup for a banked curve
E-66 THRU E-68 Est backup for a switch
E-69 THRU E-72 Est backup for tunnels
E-73 THRU E-76 Est backup for emergency exits

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UNITED ENGINEERS & CONSTRUCTORS, INC.
WESTERN OPERATIONS

ESTIMATE BASIS

CLIENT: Magneplane International
(who is contracted to the Corps. of Engineers)

PROJECT MANAGER: P. Lindquist - Boston

LOCATION: USA

JOB NO.: 6869.002

ESTIMATED DATE : April 24, 1992, Rev July, 1992

1. **PURPOSE**

Provide conceptual Rough-Order-of-Magnitude estimates for the MAGLEV Guideway Systems. The estimate is a deliverable with the concept report.

The estimates will be used for comparison purposes to the other schemes proposed by our competitors. The other competing schemes are not anticipated to be Magnetic Levitation concepts.

The estimates provided are for cost comparisons between the schemes (Concrete vs. Steel, bored tunnel vs. excavated tunnel, etc.).

The range of accuracy of the estimates is estimated at 30% plus, 20% minus due to the preliminary nature of the engineering.

2. **SCOPE**

Provide to the client a Conceptual Design Report consisting of a Safety plan, Maintenance plan, Life Cycle Costing Report, Design Concept Study, Preliminary Environmental Analysis and a Preliminary Concept Cost Estimate.

Architectural, structural work for guideway system including switching system, passenger stations and guide system. United Engineers & Constructors, Inc. (Denver) is a team member with United Engineers & Constructors, Inc. (Boston), Beechcraft, Magneplane International, M.I.T., Bromwell & Carrier Inc., and Raytheon Equipment Division.

There are 100 estimates options on the project. There are some basic configurations such as a single elevated steel, concrete schemes and also double guideways of concrete and steel. The other options are mostly different heights and spans of the basic material schemes.

Tunnel options include a bored or excavated type and both in single or double configuration.

E-2

5) elevated steel guideway (single)

6) elevated steel guideway (double)

The remaining options are comprised of the same basic structures with different column height and span length configurations.

3. COMPETITIVE ANALYSIS

The Magneplane team is competing with three other groups for proof of concept studies.

4. CONSTRUCTION APPROACH

Assume a General Contractor

1991 R.S. Means Construction Cost Data wage rates are union.

5. QUANTITY BASIS

A) Earthwork — Earthwork account consists of footing excavation and tunnel excavation. Quantities were preliminary engineered by the Engineering group.

B) Concrete — Concrete account consists of footings columns C.I.P. box beam and an alternate Precast box beam. Engineering group provided sketches and quantities.

C) Structures — This account includes the aluminum guideway and structural steel truss. Engineering has provided concept sketches and quantities for this account.

K) Buildings — Tunnel ventilation will be costed on a square foot basis. No quantities are available.

A - Account =

Footing excavation quantities vary by size	cy
Tunnel	

B - Account =

Footings quantities vary by size	cy
Columns quantities vary by size	
C.I.P. box girder quantities vary by size	cy
P.C. box girder quantities vary by size	cy

C - Account =

Aluminum guideway
Aluminum guideway
structural steel truss
structural steel truss

6. PRICING BASIS

Aluminum and Carbon steel structural shape material and fabrication costs were obtained from vendors. Quotes are Rough-Order-of-Magnitude and rough quotes were also obtained for precast concrete work to be used as a cost comparison for cast in place concrete.

A Account - Footings and excavation by B.C.I.

B Tunnel Boring - Subcontractor phone quote.

B Account - Footings - by B.C.I.
Columns and support beams and pricing from R.S. Means

C Account - Aluminum material phone quoted by supplier/fabricator.
Structural Steel - Pricing from R.S. Means.

7. **LABOR**

Wage Rate

Wage rates for craft were obtained from R. S. Means Construction Cost Data Mid-1991 and are averages for 30 cities. This approach is dictated by the RFP requirements.

Productivity Units / Installation Rates

Unit Labor Rates were obtained from R. S. Means. Some unit rates were adjusted for height and complexity of work and estimators judgement.

8. **SCHEDULE**

C.O.E. has requested pricing to be consistent with material and labor rates available in Mid-1991. It is therefore assumed that schedule is not a factor in this cost estimate.

9. **ESCALATION**

Not Applicable - costs are 1991 2nd Quarter.

10. **OVERHEADS AND PROFITS**

Generally used overhead and profits at 26%. MOB/DEMOB = 5%

11. **EXCLUSIONS**

- Per the C.O.E. land costs, demolition and civil reconstruction costs are not to be included.
- Rock excavation and ripping for footings and tunnel blasting not included.
- All civil work, except for foundation excavation and backfill.
- Demolition or relocation of any facilities or structures.
- Land, land rights or land acquisitions.
- All permits.
- Land restoration or landscaping.
- State sales and use taxes.

- Escalation.
- Caissons, drilled piers or pilings.
- Cost of money (no project financing).
- Overtime and/or subsistence is not included for craft.

12. **ASSUMPTIONS & QUALIFICATIONS**

- UE&C (Denver) is only costing aluminum guideway and structural support, and tunneling. Remainder of costing is by others: Electrical system costs by UE&C (Boston), control system costs by Raytheon Equipment Division and vehicle costs by Beech Aircraft.
- All spoil from the excavations can be disposed of within the plant boundary line.
- Civil work is based on soil conditions of 3000 psf.
- It was assumed that all excavated material is suitable for backfill without reworking.
- It there is not enough backfill material available from excavations, it was assumed that usable material is onsite at no cost to the Contractor.
- The site does not contain any hazardous or toxic wastes.
- No subsurface structures/facilities or archaeological finds exist that would delay or impede construction.
- No dewatering is required.
- All foundations are on spread footings.
- Overtime and/or subsistence is not included for craft.
- Performance Bond costs are not included.
- Engineering costs are not included.

13. **OTHER**

Cost estimate format and breakdown has been dictated by the C.O.E. to match "Maglev Cost Estimation" by Parsons, Brinkershoff, Quade and Douglas.

Contengency to be established by UE&C Boston as stated in section 5.3.11 of the System Concept Definition Report.

E-5

MAGLEV

Estimating Methodology

The estimate is a generic cost for the systems and options.

The baseline as imposed by the C.O.E. is to provide estimates using R.S. Means Construction Cost Data 1991. The R.S. Means manuals were used when applicable, however the manuals are not totally comprehensive of work and estimators' judgement was used for adjustments in labor and material costs.

The costs are for one mile of each option. The costs are again generic and as dictated by the C.O.E., contain no specific factors for terrain, remoteness, labor and material availability or major prefab and or modularization.

The length of the MAGLEV System chosen will have great impact on the costs and the volume of materials required may drive the costs down significantly. Mobile modular plants along the routes could reduce costs. Remote work areas could require mancamps and work incentives to attract an adequate work force. These conditions are apparent but are not included in the estimate.

Terrain is a major factor and no consideration has been given to any terrain or environmental obstacles.

In summary the estimate could increase or decrease dramatically when further definition of the concept is realized.

SUMMARY MAGNEPLANE GUIDEWAY COSTS

SINGLE GUIDEWAY

COST PER METER

GUIDEWAY HEIGHT FEET	METERS	SPAN–FT / – METERS	15 / 4.57	30 / 9.14	45 / 13.72	75 / 22.86	120 / 36.58
2	0.61	ALUM	3,849	4,089	4,872		
		CONC		5,354		5,756	7,805
		STEEL		4,761		4,857	6,102
3	0.91	ALUM	3,906	4,118	4,891		
		CONC		5,397		5,779	7,815
		STEEL		4,809		4,882	6,114
17	5.18	ALUM	4,847	4,617	5,237		
		CONC		6,177		6,224	8,115
		STEEL		5,639		5,217	6,383
25	7.62	ALUM	5,448	4,889	5,432		
		CONC		6,523		6,403	8,361
		STEEL		6,002		5,355	6,499
30	9.14	ALUM	5,694	5,019	5,519		
		CONC		6,725		6,515	8,478
		STEEL		6,206		5,443	6,570
65.61	20.00	ALUM	10,347	7,355	7,086		
		CONC		12,305		9,175	10,974
		STEEL		11,652		7,604	8,226

DOUBLE GUIDEWAY

COST PER METER

GUIDEWAY HEIGHT FEET	METERS	SPAN–FT / – METERS	15 / 5	30 / 9	45 / 14	75 / 23	120 / 37
2	0.61	ALUM	7,699	8,179	9,745		
		CONC		10,708		11,511	15,609
		STEEL		9,522		9,713	12,205
3	0.91	ALUM	7,813	8,236	9,783		
		CONC		10,794		11,559	15,631
		STEEL		9,617		9,764	12,228
17	5.18	ALUM	9,695	9,235	10,473		
		CONC		13,457		13,104	16,687
		STEEL		12,057		11,395	14,058
25	7.62	ALUM	10,896	9,778	10,863		
		CONC		14,704		13,683	16,860
		STEEL		12,717		11,679	14,302
30	9.14	ALUM	11,387	10,039	11,037		
		CONC		15,218		13,958	17,039
		STEEL		13,139		11,840	14,450
65.61	20.00	ALUM	20,694	14,709	14,173		
		CONC		24,775		17,436	20,367
		STEEL		19,219		14,252	16,235

E-7

TO: Don Parker UEC FAX #: 303 843 2208	FROM: Mark Plaskett BCI FAX #: 813 644-5926 PHONE #: 813 646-8591	DATE: 8/11/92 PAGES INCLUDING THIS PAGE: 6

MEMORANDUM

DATE: August 11, 1992

TO: Don Parker

FROM: Mark Plaskett, E.I and Larry Madrid, P.E.

RE: Maglev Footer Design

The following tables summarize our analyses for the design of footers for the Magneplane project.

The pier configurations and loading conditions used for the analyses are those outlined in your fax dated July 30, 1992. An allowable bearing capacity of 3.0 KSF was used for all analyses. All loadings were considered in the analyses and the resultant force fell within the middle 1/3 of the base (kern) except for transient loadings such as earthquakes, wind, and braking.

More detailed information along with sample calculations will be included in our final report. If you have any questions or need additional information, please contact us.

MAGLEV PROJECT
BCI Project No. 7901
Summary of Quantities
Concrete Single Pier

Gudieway Span (ft.)	Guideway Height (ft.)	Foundation Base (ft.)	Foundation Length (ft.)	Exca-vation (yd^3)	Form & Pour (yd^3)	Backfill (yd^3)
120	65	36.5	36.5	192	123	69
120	30	29.5	29.5	129	81	48
120	25	28.5	28.5	121	75	45
120	17	27	27	109	68	42
120	3	26	24	94	58	37
120	2	26	24	94	58	37
75	65	24	24	88	53	34
75	30	18	18	52	30	22
75	25	17.5	17.5	49	28	21
75	17	16.5	16.5	44	25	19
75	3	14	13.5	32	18	15
75	2	14	13	31	17	14
30	65	20	20	63	37	26
30	30	14	14	33	18	15
30	25	13.5	13.5	31	17	14
30	17	12.5	12.5	27	14	13
30	3	11.5	8.5	18	9	9
30	2	10	10	19	9	9

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MAGLEV PROJECT
BCI Project No. 7901
Summary of Quantities
Concrete Double Pier

Gudieway Span (ft.)	Guideway Height (ft.)	Foundation Base (ft.)	Foundation Length (ft.)	Exca-vation (yd^3)	Form & Pour (yd^3)	Backfill (yd^3)
120	65	48	46.5	314	207	108
120	30	40	38.5	221	143	78
120	25	40	37	212	137	75
120	17	38	35.5	194	125	70
75	65	34	30.5	152	96	56
75	30	26	25	98	60	38
75	25	25	24	91	56	35
75	17	24	22	81	49	32
30	65	28	24	101	62	39
30	30	20	17	54	31	23
30	25	20	16	51	30	22
30	17	18	15	44	25	19

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MAGLEV PROJECT
BCI Project No. 7901
Summary of Quantities
Steel Truss Single

Gudieway Span (ft.)	Guideway Height (ft.)	Foundation Base (ft.)	Foundation Length (ft.)	Excavation (yd^3)	Form & Pour (yd^3)	Backfill (yd^3)
120	65	41	12	78	46	32
120	30	30	10.5	52	29	23
120	25	28	10.5	49	27	21
120	17	24	10.5	42	23	19
120	3	20	8	29	15	14
120	2	18	9	29	15	14
75	65	24	14	54	31	23
75	30	18	11.5	35	19	16
75	25	16	11.5	32	17	14
75	17	16	9.5	27	14	13
75	3	12	6	15	7	8
75	2	11	6	13	6	7
30	65	18	16.5	48	28	20
30	30	15	12.5	32	17	15
30	25	14	12	29	16	13
30	17	12.5	10.5	23	12	11
30	3	10	5.5	12	5	7
30	2	10	5	11	5	6

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MAGLEV PROJECT
BCI Project No. 7901
Summary of Quantities
Steel Truss - Double

Gudieway Span (ft.)	Guideway Height (ft.)	Foundation Base (ft.)	Foundation Length (ft.)	Exca-vation (yd^3)	Form & Pour (yd^3)	Backfill (yd^3)
120	65	35	33	168	107	61
120	30	28	26	109	67	41
120	25	26.5	25	100	61	38
120	17	25	21.5	82	50	32
75	65	28	25	105	65	40
75	30	23.5	20.5	74	45	30
75	25	22	21	72	43	29
75	17	21.5	18	61	36	25
75	3	24	20	74	44	30
75	2	23	20.5	73	44	29
30	65	22	22	75	45	30
30	30	17.5	17.5	49	28	21
30	25	16.5	16.5	44	25	19
30	17	15	15	37	21	17
30	3	16	8	23	12	11
30	2	15	8.5	23	12	11

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MAGLEV PROJECT
BCI Project No. 7901
Summary of Quantities
Aluminum Box Beam Double

Guideway Span (ft.)	Guideway Height (ft.)	Foundation Base (ft.)	Foundation Length (ft.)	Excavation (yd^3)	Form & Pour (yd^3)	Backfill (yd^3)
45	65	21	22.5	73	44	29
45	30	17	16	44	25	19
45	25	16	16	42	24	18
45	17	15.5	15.5	40	22	17
45	3	10	30	50	28	22
45	2	10	30	50	28	22
30	65	22.5	20	70	42	28
30	30	16.5	16.5	44	25	19
30	25	16	16	42	24	18
30	17	13.5	18.5	41	23	18
30	3	10	30	50	28	22
30	2	10	30	50	28	22
15	65	21.5	20	67	40	27
15	30	16.5	16	43	24	19
15	25	15	17	42	24	18
15	17	14	16.5	38	21	17
15	3	10	30	50	28	22
15	2	10	30	50	28	22
30	35° Bank	20	48	143	89	54

ALUMINUM BOX BEAM AT GRADE – SINGLE

ALUMINUM
SINGLE

SPAN			15			15		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	25	8,800	17,195	25	8,800	17,195
CONCRETE	CY	134.73	14	4,928	663,949	14	4,928	663,949
BACKFILL	CY	8.904	11	3,872	34,476	11	3,872	34,476
PEDESTAL	CY	309.46	3.4	1,197	370,362	4.2	1,478	457,506
ALUM FAB	TON	8279.46	1.6025	564	4,670,278	1.6025	564	4,670,278
AL DEL&ER	TON	240.55	1.6025	564	135,689	1.6025	564	135,689
ALIGNMT	LF	1.5	15	5,280	7,920	15	5,280	7,920
MOB&DEMOB		5%			294,993			299,351
TOTAL					6,194,863			6,286,365
				$/METER	3,849		$/METER	3,906

ALUMINUM
SINGLE

SPAN			30			30		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	25	4,400	8,598	25	4,400	8,598
CONCRETE	CY	134.73	14	2,464	331,975	14	2,464	331,975
BACKFILL	CY	8.904	11	1,936	17,238	11	1,936	17,238
PEDESTAL	CY	309.46	3.4	598	185,181	4.2	739	228,753
ALUM FAB	TON	8279.46	3.8125	671	5,555,518	3.8125	671	5,555,518
AL DEL&ER	TON	240.55	3.8125	671	161,409	3.8125	671	161,409
ALIGNMT	LF	1.5	30	5,280	7,920	30	5,280	7,920
MOB&DEMOB		5%			313,392			315,571
TOTAL					6,581,230			6,626,981
				$/METER	4,089		$/METER	4,118

ALUMINUM
SINGLE

SPAN			45			45		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	25	2,933	5,732	25	2,933	5,732
CONCRETE	CY	134.73	14	1,643	221,316	14	1,643	221,316
BACKFILL	CY	8.904	11	1,291	11,492	11	1,291	11,492
PEDESTAL	CY	309.46	3.4	399	123,454	4.2	493	152,502
ALUM FAB	TON	8279.46	7.1	833	6,897,342	7.1	833	6,897,342
AL DEL&ER	TON	240.55	7.1	833	200,394	7.1	833	200,394
ALIGNMT	LF	1.5	45	5,280	7,920	45	5,280	7,920
MOB&DEMOB		5%			373,383			374,835
TOTAL					7,841,033			7,871,533
				$/METER	4,872		$/METER	4,891

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ALUMINUM BOX BEAM AT GRADE – DOUBLE

ALUMINUM
DOUBLE

SPAN			15			15		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	50	17,600	34,390	50	17,600	34,390
CONCRETE	CY	134.73	28	9,856	1,327,899	28	9,856	1,327,899
BACKFILL	CY	8.904	22	7,744	68,953	22	7,744	68,953
PEDESTAL	CY	309.46	6.8	2,394	740,723	8.4	2,957	915,011
ALUM FAB	TON	8279.46	3.205	1,128	9,340,556	3.205	1,128	9,340,556
AL DEL&ER	TON	240.55	3.205	1,128	271,379	3.205	1,128	271,379
ALIGNMT	LF	1.5	30	10,560	15,840	30	10,560	15,840
MOB&DEMOB		5%			589,987			598,701
TOTAL					12,389,727			12,572,729
				$/METER	7,699		$/METER	7,813

ALUMINUM
DOUBLE

SPAN			30			30		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	50	8,800	17,195	50	8,800	17,195
CONCRETE	CY	134.73	28	4,928	663,949	28	4,928	663,949
BACKFILL	CY	8.904	22	3,872	34,476	22	3,872	34,476
PEDESTAL	CY	309.46	6.8	1,197	370,362	8.4	1,478	457,506
ALUM FAB	TON	8279.46	7.625	1,342	11,111,035	7.625	1,342	11,111,035
AL DEL&ER	TON	240.55	7.625	1,342	322,818	7.625	1,342	322,818
ALIGNMT	LF	1.5	60	10,560	15,840	60	10,560	15,840
MOB&DEMOB		5%			626,784			631,141
TOTAL					13,162,460			13,253,961
				$/METER	8,179		$/METER	8,236

ALUMINUM
DOUBLE

SPAN			45			45		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	50	5,867	11,463	50	5,867	11,463
CONCRETE	CY	134.73	28	3,285	442,633	28	3,285	442,633
BACKFILL	CY	8.904	22	2,581	22,984	22	2,581	22,984
PEDESTAL	CY	309.46	6.8	798	246,908	8.4	986	305,004
ALUM FAB	TON	8279.46	14.2	1,666	13,794,684	14.2	1,666	13,794,684
AL DEL&ER	TON	240.55	14.2	1,666	400,788	14.2	1,666	400,788
ALIGNMT	LF	1.5	90	10,560	15,840	90	10,560	15,840
MOB&DEMOB		5%			746,765			749,670
TOTAL					15,682,066			15,743,067
				$/METER	9,745		$/METER	9,783

ALUMINUM BOX BEAM – ELEVATED – SINGLE

ALUMINUM								
SINGLE								
SPAN			15.00			15.00		
HEIGHT			17.00			25.00		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.95	19.00	6,688	13,059	21	7,392	14,434
CONCRETE	CY	134.72	10.50	3,696	497,925	12	4,224	569,057
BACKFILL	CY	8.90	8.50	2,992	26,617	9	3,168	28,183
COLUMN	CY	728.81	3.00	1,056	769,623	6.3	2,218	1,616,209
CROSSBM	CY	530.96	7.00	2,464	1,308,285	7	2,464	1,308,285
ALUM FAB	TON	8279.46	1.60	564	4,670,278	1.6025	564	4,670,278
AL DEL&ER	TON	240.56	1.60	564	135,695	1.6025	564	135,695
ALIGNMT	LF	1.50	15.00	5,280	7,899	15	5,280	7,899
MOB&DEMOB	5%				371,469			417,502
TOTAL					7,800,851			8,767,542
				$/METER	4,847		$/METER	5,448

ALUMINUM								
SINGLE								
SPAN			30.00			30		
HEIGHT			17.00			25		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.95	20.50	3,608	7,045	21	3,696	7,217
CONCRETE	CY	134.72	11.50	2,024	272,673	12	2,112	284,529
BACKFILL	CY	8.90	9.00	1,584	14,091	9	1,584	14,091
COLUMNS	CY	728.81	3.15	554	404,052	6.3	1,109	808,105
CROSSBM	CY	530.96	7.00	1,232	654,143	7	1,232	654,143
ALUM FAB	TON	8279.46	3.81	671	5,555,518	3.8125	671	5,555,518
AL DEL&ER	TON	240.56	3.81	671	161,416	3.8125	671	161,416
ALIGNMT	LF	1.50	30.00	5,280	7,899	30	5,280	7,899
MOB&DEMOB	5%				353,842			374,646
TOTAL					7,430,679			7,867,562
				$/METER	4,617		$/METER	4,889

ALUMINUM								
SINGLE								
SPAN			45.00			45		
HEIGHT			17.00			25		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.95	20.00	2,347	4,582	21	2,464	4,811
CONCRETE	CY	134.72	11.00	1,291	173,879	12	1,408	189,686
BACKFILL	CY	8.90	8.50	997	8,872	9	1,056	9,394
COLUMNS	CY	728.81	3.00	352	256,541	6.3	739	538,736
CROSSBM	CY	530.96	7.65	898	476,590	7.65	898	476,590
ALUM FAB	TON	8279.46	7.10	833	6,897,342	7.1	833	6,897,342
AL DEL&ER	TON	240.56	7.10	833	200,403	7.1	833	200,403
ALIGNMT	LF	1.50	45.00	5,280	7,899	45	5,280	7,899
MOB&DEMOB	5%				401,305			416,243
TOTAL					8,427,413			8,741,104
				$/METER	5,237		$/METER	5,432

15.00			15.00		
30.00			65.00		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
21.5	7,568	14,777	33.5	11,792	23,025
12	4,224	569,057	20	7,040	948,429
9.5	3,344	29,748	13.5	4,752	42,274
7.76	2,732	1,990,759	34	11,968	8,722,398
7	2,464	1,308,285	7	2,464	1,308,285
1.6025	564	4,670,278	1.6025	564	4,670,278
1.6025	564	135,695	1.6025	564	135,695
15	5,280	7,899	15	5,280	7,899
		436,325			792,914
		9,162,824			16,651,197
	$/METER	5,694		$/METER	10,347

30			30		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
22	3,872	7,560	35	6,160	12,028
12.5	2,200	296,384	21	3,696	497,925
9.5	1,672	14,874	14	2,464	21,920
7.76	1,366	995,380	34	5,984	4,361,199
7	1,232	654,143	7	1,232	654,143
3.8125	671	5,555,518	3.8125	671	5,555,518
3.8125	671	161,416	3.8125	671	161,416
30	5,280	7,899	30	5,280	7,899
		384,659			563,602
		8,077,832			11,835,649
	$/METER	5,019		$/METER	7,355

45			45		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
22	2,581	5,040	36.5	4,283	8,362
12.5	1,467	197,589	22	2,581	347,757
9.5	1,115	9,916	14.5	1,701	15,135
7.76	911	663,586	34	3,989	2,907,466
7.65	898	476,590	7.65	898	476,590
7.1	833	6,897,342	7.1	833	6,897,342
7.1	833	200,403	7.1	833	200,403
45	5,280	7,899	45	5,280	7,899
		422,916			543,048
		8,881,284			11,404,002
	$/METER	5,519		$/METER	7,086

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17-Aug-92

ALUMINUM BOX BEAM – ELEVATED – DOUBLE

ALUMINUM								
DOUBLE								
SPAN			15.00			15		
HEIGHT			17.00			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.95	38.00	13,376	26,118	42	14,784	28,867
CONCRETE	CY	134.72	21.00	7,392	995,850	24	8,448	1,138,115
BACKFILL	CY	8.90	17.00	5,984	53,234	18	6,336	56,365
COLUMNS	CY	728.81	6.00	2,112	1,539,247	12.6	4,435	3,232,418
CROSSBM	CY	530.96	14.00	4,928	2,616,571	14	4,928	2,616,571
ALUM FAB	TON	8279.46	3.21	1,128	9,340,556	3.205	1,128	9,340,556
AL DEL&ER	TON	240.56	3.21	1,128	271,390	3.205	1,128	271,390
ALIGNMT	LF	1.50	30.00	10,560	15,798	30	10,560	15,798
MOB&DEMOB	5%				742,938			835,004
TOTAL					15,601,701			17,535,083
				$/METER	9,695		$/METER	10,896

ALUMINUM		WBS						
DOUBLE								
SPAN			30.00			30		
HEIGHT			17.00			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.95	41.00	7,216	14,090	42	7,392	14,434
CONCRETE	CY	134.72	23.00	4,048	545,347	24	4,224	569,057
BACKFILL	CY	8.90	18.00	3,168	28,183	18	3,168	28,183
COLUMNS	CY	728.81	6.30	1,109	808,105	12.6	2,218	1,616,209
CROSSBM	CY	530.96	14.00	2,464	1,308,285	14	2,464	1,308,285
ALUM FAB	TON	8279.46	7.63	1,342	11,111,035	7.625	1,342	11,111,035
AL DEL&ER	TON	240.56	7.63	1,342	322,832	7.625	1,342	322,832
ALIGNMT	LF	1.50	60.00	10,560	15,798	60	10,560	15,798
MOB&DEMOB	5%				707,684			749,292
TOTAL					14,861,357			15,735,124
				$/METER	9,235		$/METER	9,778

ALUMINUM								
DOUBLE								
SPAN			45.00			45		
HEIGHT			17.00			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.95	40.00	4,693	9,164	42	4,928	9,622
CONCRETE	CY	134.72	22.00	2,581	347,757	24	2,816	379,372
BACKFILL	CY	8.90	17.00	1,995	17,745	18	2,112	18,788
COLUMNS	CY	728.81	6.00	704	513,082	12.6	1,478	1,077,473
CROSSBM	CY	530.96	15.30	1,795	953,179	15.3	1,795	953,179
ALUM FAB	TON	8279.46	14.20	1,666	13,794,684	14.2	1,666	13,794,684
AL DEL&ER	TON	240.56	14.20	1,666	400,805	14.2	1,666	400,805
ALIGNMT	LF	1.50	90.00	10,560	15,798	90	10,560	15,798
MOB&DEMOB	5%				802,611			832,486
TOTAL					16,854,825			17,482,208
				$/METER	10,473		$/METER	10,863

15			15		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
43	15,136	29,555	67	23,584	46,050
24	8,448	1,138,115	40	14,080	1,896,858
19	6,688	59,496	27	9,504	84,548
15.52	5,463	3,981,518	68	23,936	17,444,796
14	4,928	2,616,571	14	4,928	2,616,571
3.205	1,128	9,340,556	3.205	1,128	9,340,556
3.205	1,128	271,390	3.205	1,128	271,390
30	10,560	15,798	30	10,560	15,798
		872,650			1,585,828
		18,325,648			33,302,394
	$/METER	11,387		$/METER	20,694

30			30		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
44	7,744	15,121	70	12,320	24,056
25	4,400	592,768	42	7,392	995,850
19	3,344	29,748	28	4,928	43,839
15.52	2,732	1,990,759	68	11,968	8,722,398
14	2,464	1,308,285	14	2,464	1,308,285
7.625	1,342	11,111,035	7.625	1,342	11,111,035
7.625	1,342	322,832	7.625	1,342	322,832
60	10,560	15,798	60	10,560	15,798
		769,317			1,127,205
		16,155,664			23,671,299
	$/METER	10,039		$/METER	14,709

45			45		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
44	5,163	10,081	73	8,565	16,725
25	2,933	395,179	44	5,163	695,514
19	2,229	19,832	29	3,403	30,270
15.52	1,821	1,327,173	68	7,979	5,814,932
15.3	1,795	953,179	15.3	1,795	953,179
14.2	1,666	13,794,684	14.2	1,666	13,794,684
14.2	1,666	400,805	14.2	1,666	400,805
90	10,560	15,798	90	10,560	15,798
		845,837			1,086,095
		17,762,567			22,808,003
	$/METER	11,037		$/METER	14,173

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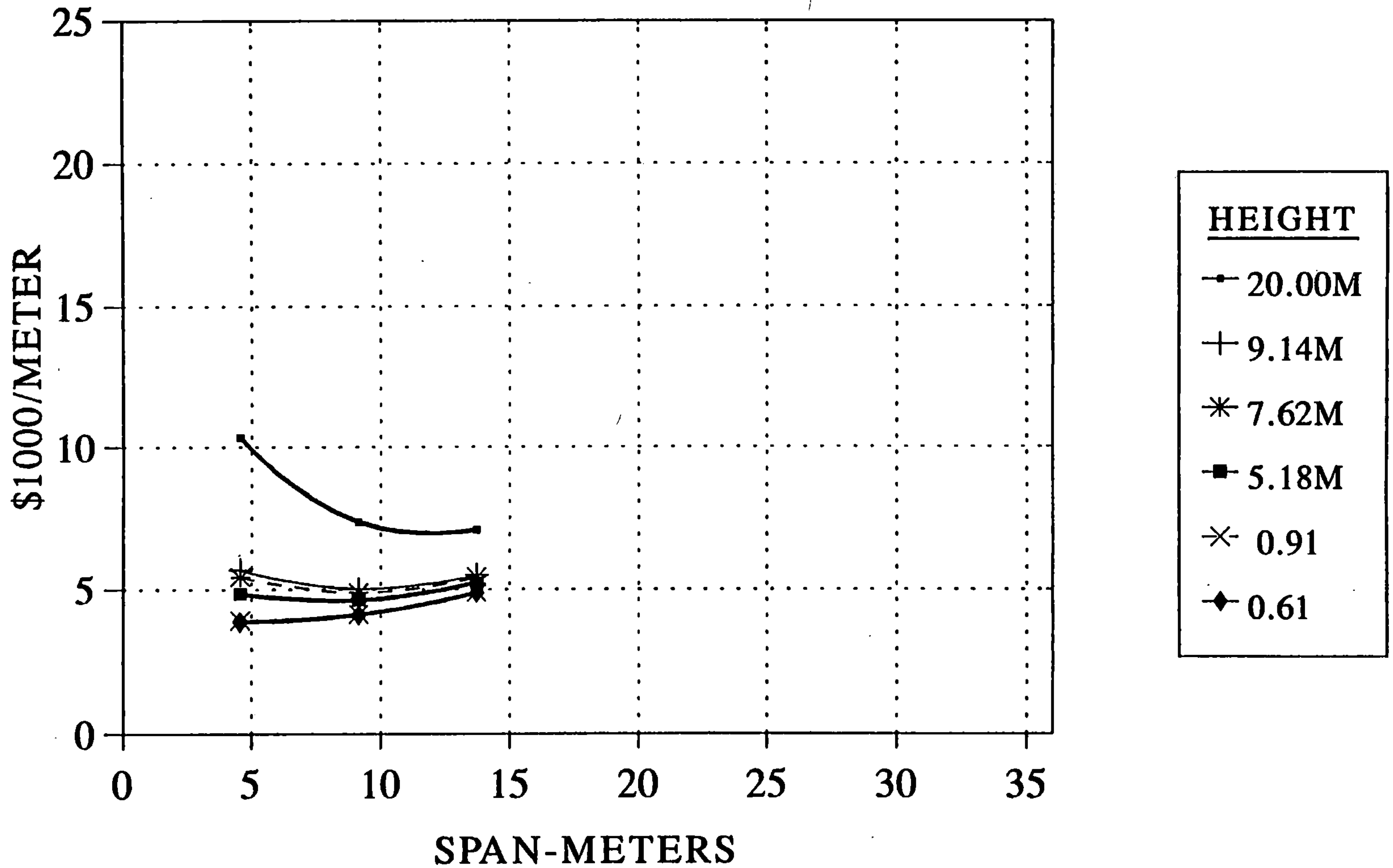
17-Aug-92

ALUMINUM BOX BEAM - SINGLE



ALUMS.CH3, 8/17/92

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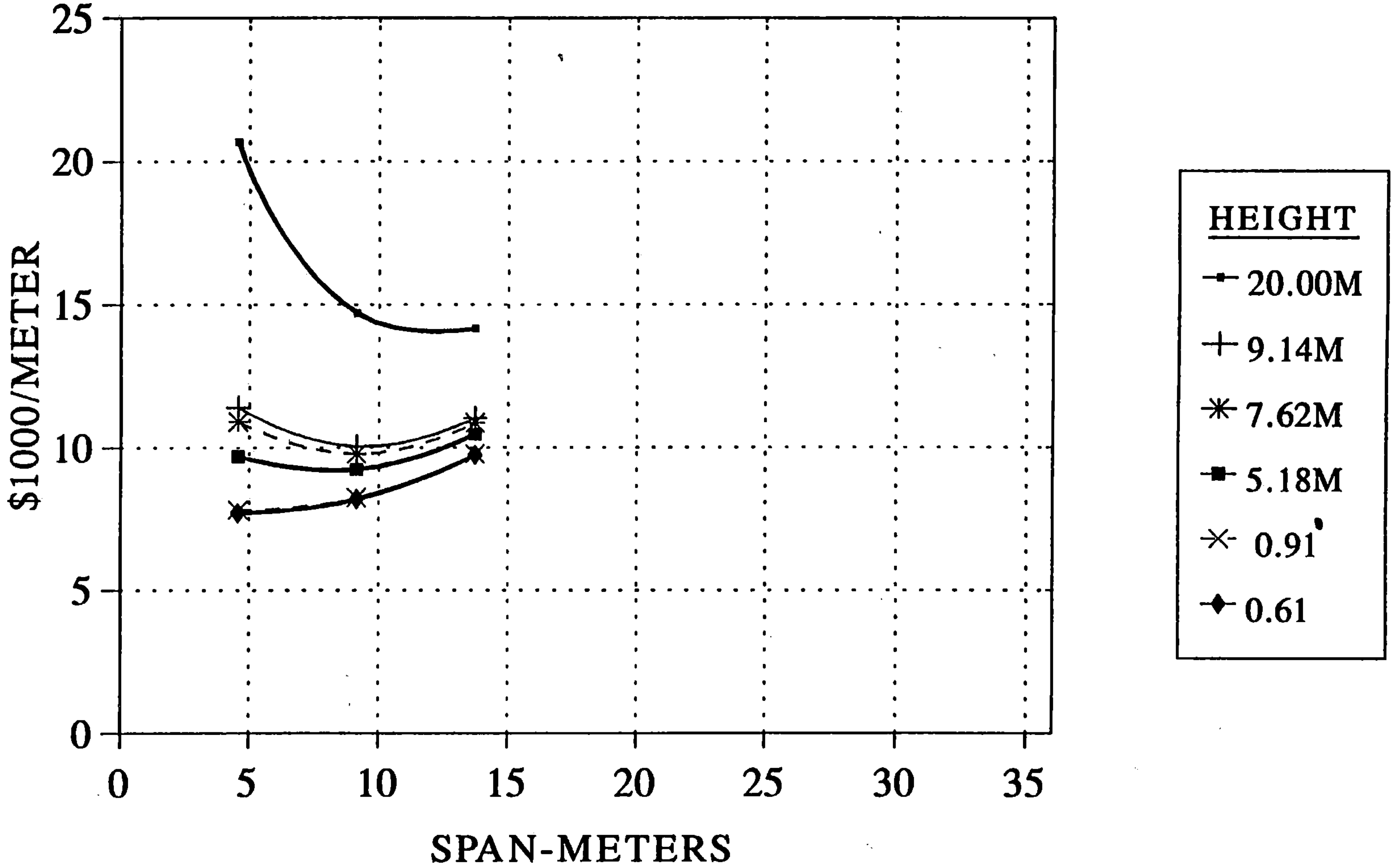
ALUMINUM BOX BEAM - DOUBLE



ALUMD.CH3, 8/17/92

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Client: MAGNEPLANE INTL
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS
Facility: ALUMINUM BOX BEAM
WBS DUAL AT GRADE

LF = N/A

United Engineers & Constructors

WESTERN OPERATIONS
Rev No.:
Job No.: 6869.002

Date: 14-Aug-92
Priced By: WWS

WBS	ACCT	Description	Quantity U/M	Manhours per unit	Manhours total	Manhours $/MH	MATL Unit	SUBS Unit	Compounded Mark-Ups 126.000%	Totals Labor	Totals Material	Totals Subs	Totals Total
	A	FOOTING EXCAVATION	17,600 CY	0.026	458	$23.75		0.93		$13,706		$20,624	$34,330
	A	FOOTING BACKFILL	7,744 CY	0.260	2,013	$23.75		0.89		$60,239		$8,684	$68,923
	B	FOOTING CONCRETE	9,856 CY	1.180	11,630	$23.75	73.00	5.9		$348,028	$906,555	$73,270	$1,327,853
	B	CONC PEDESTALS FORM/POUR	2,394 CY	4.100	9,815	$23.05	135.00	16		$285,057	$407,219	$48,263	$740,539
	C	ALUM. GUIDE RAIL MATL/FABR	1,128 TN				6571.00				$9,339,231		$9,339,231
	C	ALUM. GUIDE RAIL DELIVER/ERE	1,128 TN	6.656	7,508	$23.75		32.836		$224,677		$46,669	$271,346
	C	ALUM. GUIDE RAIL ALIGN	10,560 LF	0.050	528	$23.75				$15,800			$15,800
SUBTOTAL					31,952					$947,507	$10,653,005	$197,510	$11,798,022
	MOBILIZATION/DEMOBILIZATION		5%		1,598					$47,375	$532,650	$9,876	$589,901
		TOTAL ALUMINUM BOX BEAM			33,550	$29.65				$994,882	$11,185,655	$207,386	$12,387,923

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Client: MAGNEPLANE INTL
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS

United Engineers & Constructors
WESTERN OPERATIONS
Job No.: 6869.002
Date: 14-Aug-92
Priced By: WWS

WBS	DESCRIPTION	QTY	UofM	UNIT RATE	TOTAL
	FOOTING EXCAVATION	17,600	CY	$2	$34,330
	FOOTING BACKFILL	7,744	CY	$9	$68,923
	FOOTING CONCRETE	9,856	CY	$135	$1,327,853
	CONC PEDESTALS FORM/POUR	2,394	CY	$309	$740,539
	ALUM. GUIDE RAIL MATL/FABR	1,128	TN	$8,279	$9,339,231
	ALUM. GUIDE RAIL DELIVER/ERECT	1,128	TN	$241	$271,346
	ALUM. GUIDE RAIL ALIGN	10,560	LF	$1	$15,800
SUBTOTAL					$11,798,022
	MOBILIZATION/DEMOBILIZATION			5%	$589,901
TOTAL					$12,387,923

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5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

United Engineers & Constructors
A Raytheon Company

DISCIPLINE

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER	
FINAL			DATE 9-15-92	DATE
VOID			27	
SHEET	OF		DATE	DATE
J.O 6869002				

NAME OF COMPANY MAGNEPLANE UNIT/S

SUBJECT ESTIMATE

FORMAT FOR TYPICAL DUAL GUIDEWAY
(ALUMINUM BOX BEAM)

ALUM AT GRADE
DUAL,
HT = 2'
SPAN = 15'

	UNITS		QTY/MILE
FOOTING (BY BCI)			
STRUCT EXCAVATION	CY	50 x 5280/15	17600
FORM & POUR	CY	28	9856
COMPACTED BACKFILL	CY	22	7744
~~CONCRETE/COLUMNS/ FORM & POUR/~~	CY	~	~
CONCRETE ~~CROSS BEAMS~~ PEDESTALS FORM & POUR	CY	6.8 x 5280/15	2394
GUIDEWAY TROUGH			
FABRICATE ALUM BOX BEAMS	TN	3.205 x 5280/15	1128
DELIVER & ERECT BOX BEAMS	TN	Do.	1128
* ALIGNMENT	LF	5280 x 2	10560
SUBTOTAL			
MOBILIZATION/DEMOBILIZATION	%		
TOTAL			

[NOTE CONTINGENCY ADDED LATER]

* NOTE: LSM HAS NOT BEEN INCLUDED HERE AS PER THE PARSONS/VOLPE DOCUMENT, THE LONG STATOR WINDING WAS IN "GUIDEWAY ELECTRIFICATION SECTION UNDER WBS 1526.

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FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY ______ UNIT/S ______

SUBJECT ______

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O				

MTO FOR ALUM BOX BEAM ~ DOUBLE

FOOTINGS - SEE BCI FAX

COLUMNS PER G. CHARD

	15		30	45
17	3x2	6	3x2	3x2
25	6.3x2	12.6	6.3x2	6.3x2
30	7.76x2	15.52	7.76x2	7.76x2
65	34x2	68	34x2	34x2

SUPPORT BEAM	14.0	14.0	15.3

PEDSTAL

2	6.8	6.8	6.8
3	8.4	8.4	8.4

ALUM BOX BM

3.205	7.625	14.2

Client: MAGNEPLANE INTL.
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS LF = N/A
Facility: ALUM GUIDE RAIL DOUBLE, ELEV,30'SPAN X 17'H

United Engineers & Constructors
WESTERN OPERATIONS
Rev No.:
Job No.: 6869.002

Date: 17-Jul-92
Priced By: WWS

					Manhours				Compounded Mark-Ups	Totals			
WBS	ACCT	Description	Quantity	U/M	per unit	total	$/MH	MATL Unit	SUBS Unit 126.000%	Labor	Material	Subs	Total
1212CF75	A	FOOTING EXCAVATION	8,184	CY	0.026	213	$23.75		0.93	$6,374		$9,590	$15,964
1212CF75	A	FOOTING BACKFILL	4,682	CY	0.260	1,217	$23.75		0.89	$36,419		$5,250	$41,669
1212CF75	B	FOOTING CONCRETE	3,502	CY	1.180	4,133	$23.75	73.00	5.9	$123,680	$322,151	$26,037	$471,868
1212CF75	B	CONCRETE COLUMNS	1,109	CY	7.350	8,151	$23.05	383.00	26	$236,729	$535,181	$36,331	$808,241
1212CF75	B	CONCRETE CROSS BEAMS	2,464	CY	10.950	26,981	$23.05	149.00	20	$783,609	$462,591	$62,093	$1,308,293
AGRS	C	ALUM. GUIDE RAIL MATL/FABR	1,342	TN				6571.00			$11,111,035		$11,111,035
AGRS	C	ALUM. GUIDE RAIL DELIVER/ERE	1,342	TN	6.656	8,932	$23.75		32.836	$267,290		$55,523	$322,813
AGRS	C	ALUM. GUIDE RAIL ALIGN	10,560	LF	0.050	528	$23.75			$15,800			$15,800
SUBTOTAL						50,155				$1,469,901	$12,430,958	$194,824	$14,095,683
		MOBILIZATION/DEMOBILIZATION	5%			2,508				$73,495	$621,548	$9,741	$704,784

NOTE: COSTS PER MILE

TOTAL ALUM GUIDE RAIL DOUBLE, ELEV,30'SPA	52,663	$29.31		$1,543,396	$13,052,506	$204,565	$14,800,467

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2

E-24
3

Client: MAGNEPLANE INTL
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS

United Engineers & Constructors
WESTERN OPERATIONS
Job No.: 6869.002
Date: 17-Jul-92
Priced By: WWS

WBS	DESCRIPTION	QTY	UofM	UNIT RATE	TOTAL
~~1212CF75~~	FOOTING EXCAVATION	8,184	CY	$2	$15,964
~~1212CF75~~	FOOTING BACKFILL	4,682	CY	$9	$41,669
~~1212CF75~~	FOOTING CONCRETE	3,502	CY	$135	$471,868
~~1212CF75~~	CONCRETE COLUMNS	1,109	CY	$729	$808,241
~~1212CF75~~	CONCRETE CROSS BEAMS	2,464	CY	$531	$1,308,293
~~AGRS~~	ALUM. GUIDE RAIL MATL/FABR	1,342	TN	$8,279	$11,111,035
~~AGRS~~	ALUM. GUIDE RAIL DELIVER/ERECT	1,342	TN	$241	$322,813
~~AGRS~~	ALUM. GUIDE RAIL ALIGN	10,560	LF	$1	$15,800
SUBTOTAL					$14,095,683
	MOBILIZATION/DEMOBILIZATION			5%	$704,784

NOTE: COSTS PER MILE

TOTAL	$14,800,467

XC to B.S. 7/16/92 △1 7-17-92 .E-25 4

5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY: MAGNEPLANE UNIT/S

SUBJECT: ESTIMATE

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER DATE 7-13-92	DATE
FINAL				
VOID				
SHEET OF		1	PARKER DATE 7-17	DATE
J.O. 6869002				

FORMAT FOR TYPICAL DUAL GUIDEWAY (ALUMINUM BOX BEAM)

ALUM ELEVATED DUAL
HT = 17'
SPAN = 30'

	UNITS		QTY/MILE
FOOTING (BY BCI)			
STRUCT EXCAVATION	CY	46.5 * 5280/30	8184
FORM & POUR	CY	26.6 * "	4682
COMPACTED BACKFILL	CY	19.9 * "	3502
CONCRETE COLUMNS			
FORM & POUR	CY	6.30 * 5280/30	1109
CONCRETE CROSS BEAMS			
FORM & POUR	CY	14 * 5280/30	2464
GUIDEWAY TROUGH			
FABRICATE ALUM BOX BEAMS	TN	671 ~~564~~ * 2	1342 ~~1128~~ △1
DELIVER & ERECT BOX BEAMS	TN	671 ~~564~~ * 2	1342 ~~1128~~ △1
* ALIGNMENT	LF	2 * 5280	10560
SUBTOTAL			
MOBILIZATION/DEMOBILIZATION	%		
TOTAL			

[NOTE CONTINGENCY ADDED LATER]

* NOTE: LSM HAS NOT BEEN INCLUDED HERE AS PER THE PARSONS/VOLPE DOCUMENT, THE LONG STATOR WINDING WAS IN "GUIDEWAY ELECTRIFICATION" SECTION UNDER WBS 1526.

ALUMINUM BOX BEAM

ITEM	SPAN 15 FT (4.57M) VOLUME FT3	VOLUME M3	PERCENT	SPAN 30 FT (9.14M) VOLUME FT3	VOLUME M3	PERCENT	SPAN 45 FT (13.716 M) VOLUME FT3	VOLUME M3	PERCENT
	LENGTH OF SECTION 60 FT (18.29M)			LENGTH OF SECTION 60 FT (18.29M)			LENGTH OF SECTION 45 FT (13.7 16M)		
TOP SHEET	21.23	0.60	56.00	21.23	0.60	47.06	15.92	0.45	37.93
BOTTOM SHEET	5.63	0.16	14.85	6.54	0.19	14.50	5.76	0.16	13.73
STIFFENERS	6.26	0.18	16.51	12.97	0.37	28.75	16.00	0.45	38.12
TOTAL CROSS SECTION	33.12	0.94	87.36	40.74	1.15	90.30	37.68	1.07	89.78
DIAPHRAGM	1.76	0.05	4.63	1.96	0.06	4.35	2.18	0.06	5.20
BASE PLATE & STIFFEN	1.88	0.05	4.96	1.26	0.04	2.78	0.95	0.03	2.25
SPLICE PLATE	1.16	0.03	3.06	1.16	0.03	2.57	1.16	0.03	2.76
TOTALS FOR 1/2 TROUGH	37.91	1.07	100.00	45.12	1.28	100.00	41.97	1.19	100.00
TN/MILE FOR ONE TROUGH	563.86			670.98			832.32		
PERCENT OVER 15 FT SPAN	100.00			119.00			147.61		

FOR DOUBLE
3.205/SPAN

FOR DOUBLE:
7.625/SPAN

FOR DOUBLE
14.2 /SPAN

FOR SINGLE
1.6025/SPAN

FOR SINGLE
3.8125/SPAN

FOR SINGLE
7.1 /SPAN

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FORM 5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY ______ UNIT/S ______

SUBJECT ______

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O				

MTO FOR CONCRETE COLUMNS & CROSS BEAM

30' SPAN 45' SPAN

COLS $(2)\frac{33^2 \pi}{4(144)}(17+1-3.6)/27 = 6.3$ cy $(2)\frac{36^2 \pi}{4(144)}(17+1-3.6)/27 = 7.54$ cy

BEAM $137\text{ SF}\left(\frac{33}{12}\right)/27 = 14.0$ cy $14\left(\frac{36}{33}\right) = 15.3$ cy

 E-28-7

BCI
BROMWELL & CARRIER, INC.

P.O. Box 5467
Lakeland, FL 33807-5467
(813) 646-8591
FAX: (813) 644-5920

ENGINEERS • DESIGNERS • SCIENTISTS

FACSIMILE TRANSMITTAL

To: Don Parker **Date:** 7/16/92

Fax No.: (303) 843-2208

From: Mark Plaskett
BCI
Project No.: 7901

Subject: Footer Design - Aluminum Box Beam - Double Guideway

Please find attached 3 page(s), including the cover sheet. If you have any problems receiving, contact Mark Plaskett at (813) 646-8591. BCI Fax is a Toshiba Model TF-331.

A hard copy of transmitted document(s) [ ] will [✓] will not follow in the mail.

Message:

If You Have Any Questions Please Call.

Thanks

Mark

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MAGLEV
BCI Project No. 7901
Quanity Summary
Quanities based upon loading condition 3 as listed on the footer design summary
All quanities are listed in cubic yards.
All quanities based on depth of 3.5 feet to the bottom of the footer.
Thickness of footer used for quanities is 2.5 feet.
Excavation quanities based on 2 ft clearence on all sides.

Description	Quanities, CYS 30 Ft. Span	45 Ft. Span
Excavation	46.5	44.1
Form & Pour of footer	26.6	25.0
Backfill - Compacted	19.9	19.1

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MAGLEV **7/15/92**
BCI Project No. 7901
Footer Design Summary Sheet
Aluminum Box Beam - Double Guideway
Load and Load Cases per Don Parker at UEC
Maximum allowable soil bearing capacity = 3 KIPS/FT

	30 Ft Span		45 Ft Span	
Load Conditions and Notes	B (ft)	L (ft)	B (ft)	L (ft)
1 - All loads considered Resultant force falls within the kern.	45	36	44	35
2 - No emergency loads considered - (earthquake, wind, or braking) Resultant force falls within the kern.	8.5	18.5	9	16
3 - All loads considered. Resultant force allowed to fall outside of the kern for emergency cases.	15.5	18.5	15	18

Client: MAGNEPLANE INTL
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS LF = N/A
Facility: ALUM GUIDE RAIL DOUBLE, ELEV,45'SPAN X 17'H

United Engineers & Constructors

WESTERN OPERATIONS
Rev No.:
Job No.: 6869.002

Date: 17-Jul-92
Priced By: WWS

WBS	ACCT	Description	Quantity U/M	Manhours per unit	Manhours total	Manhours $/MH	MATL Unit	SUBS Unit (Compounded Mark-Ups 126.000%)	Totals Labor	Totals Material	Totals Subs	Totals Total
~~12122F75~~	A	FOOTING EXCAVATION	5,174 CY	0.026	135	$23.75		0.93	$4,040		$6,063	$10,103
~~12122F75~~	A	FOOTING BACKFILL	2,933 CY	0.260	762	$23.75		0.89	$22,803		$3,289	$26,092
~~12120F75~~	B	FOOTING CONCRETE	2,241 CY	1.180	2,644	$23.75	73.00	5.9	$79,122	$206,127	$16,660	$301,909
~~1212CP75~~	B	CONCRETE COLUMNS	885 CY	7.350	6,505	$23.05	383.00	26	$188,925	$427,083	$28,993	$645,001
~~1212CF75~~	B	CONCRETE CROSS BEAMS	1,795 CY	10.950	19,655	$23.05	149.00	20	$570,840	$336,993	$45,234	$953,067
~~AGRS~~	C	ALUM. GUIDE RAIL MATL/FABR	1,666 TN				6571.00			$13,793,580		$13,793,580
~~AGRS~~	C	ALUM. GUIDE RAIL DELIVER/ERE	1,666 TN	6.656	11,089	$23.75		32.836	$331,838		$68,928	$400,766
~~AGRS~~	C	ALUM. GUIDE RAIL ALIGN	10,560 LF	0.050	528	$23.75			$15,800			$15,800
SUBTOTAL					41,318				$1,213,368	$14,763,783	$169,167	$16,146,318
		MOBILIZATION/DEMOBILIZATION	5%		2,066				$60,668	$738,189	$8,458	$807,316

NOTE: COSTS PER MILE

TOTAL ALUM GUIDE RAIL DOUBLE, ELEV,45'SPA	43,384	$29.37		$1,274,036	$15,501,972	$177,625	$16,953,634

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0

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Client: MAGNEPLANE INTL
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS

United Engineers & Constructors
WESTERN OPERATIONS
Job No.: 6869.002
Date: 17-Jul-92
Priced By: WWS

~~WBS~~	DESCRIPTION	QTY	UofM	UNIT RATE	TOTAL
~~1212CR75~~	FOOTING EXCAVATION	5,174	CY	$2	$10,103
~~1212CR75~~	FOOTING BACKFILL	2,933	CY	$9	$26,092
~~1212CR75~~	FOOTING CONCRETE	2,241	CY	$135	$301,909
~~1212CR75~~	CONCRETE COLUMNS	885	CY	$729	$645,001
~~1212CR75~~	CONCRETE CROSS BEAMS	1,795	CY	$531	$953,067
~~AGRS~~	ALUM. GUIDE RAIL MATL/FABR	1,666	TN	$8,279	$13,793,580
~~AGRS~~	ALUM. GUIDE RAIL DELIVER/ERECT	1,666	TN	$241	$400,766
~~AGRS~~	ALUM. GUIDE RAIL ALIGN	10,560	LF	$1	$15,800

SUBTOTAL			$16,146,318
	MOBILIZATION/DEMOBILIZATION	5%	$807,316

NOTE: COSTS PER MILE

TOTAL	$16,953,634

to BS 7/17/92 E-33 12

5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER	
FINAL			DATE 7-13-92	DATE
VOID				
SHEET	OF		DATE	DATE
J.O	6869002			

NAME OF COMPANY MAGNEPLANE UNIT/S

SUBJECT ESTIMATE

FORMAT FOR TYPICAL DUAL GUIDEWAY
(ALUMINUM BOX BEAM)

ALUM ELEVATED
DUAL
HT = 17
SPAN = 45'

	UNITS		QTY/MILE
FOOTING } BY BCI			
STRUCT EXCAVATION	CY	44.1 × 5280/45	5174
FORM & POUR	CY	25.0 "	2933
COMPACTED BACKFILL	CY	19.1 "	2241
CONCRETE COLUMNS			
FORM & POUR	CY	7.54 × 5280/45	885
CONCRETE CROSS BEAMS			
FORM & POUR	CY	15.3 × 5280/45	1795
GUIDEWAY TROUGH			
FABRICATE ALUM BOX BEAMS	TN	833 × 2	1666
DELIVER & ERECT BOX BEAMS	TN	833 × 2	1666
ALIGNMENT	LF	5280 × 2	10560
*			
SUBTOTAL			
MOBILIZATION/DEMOBILIZATION	%		
TOTAL			

[NOTE CONTINGENCY ADDED LATER]

* NOTE: LSM HAS NOT BEEN INCLUDED HERE AS PER THE PARSONS/VOLPE DOCUMENT, THE LONG STATOR WINDING WAS IN " GUIDEWAY ELECTRIFICATION SECTION UNDER WBS 1526.

CONCRETE BEAM – AT GRADE – SINGLE

CONCRETE
SINGLE

SPAN			30			30		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	19	3,344	6,534	18	3,168	6,190
CONCRETE	CY	134.73	9	1,584	213,412	9	1,584	213,412
BACKFILL	CY	8.904	9	1,584	14,104	9	1,584	14,104
PEDESTAL	CY	309.46	4.81	847	261,976	6.02	1,060	327,879
CONBM FAI	CY	401.21	31	5,456	2,189,002	31	5,456	2,189,002
BM DEL&EF	CY	129.76	31	5,456	707,971	31	5,456	707,971
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	30	5,280	7,920	30	5,280	7,920
MOB&DEMOB		5%			410,310			413,588
TOTAL					8,616,515			8,685,352
				$/METER	5,354		$/METER	5,397

STEEL
SINGLE

SPAN			75			75		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	31	2,182	4,264	32	2,253	4,402
CONCRETE	CY	134.73	17	1,197	161,245	18	1,267	170,730
BACKFILL	CY	8.904	14	986	8,776	15	1,056	9,403
PEDESTAL	CY	309.46	4.81	339	104,791	6.02	424	131,152
CONBM FAI	CY	401.21	99.76	7,023	2,817,740	99.76	7,023	2,817,740
BM DEL&EF	CY	129.76	99.76	7,023	911,318	99.76	7,023	911,318
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	75	5,280	7,920	75	5,280	7,920
MOB&DEMOB		5%			441,067			442,897
TOTAL					9,262,406			9,300,847
				$/METER	5,756		$/METER	5,779

STEEL
SINGLE

SPAN			120			120		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	94	4,136	8,082	94	4,136	8,082
CONCRETE	CY	134.73	58	2,552	343,831	58	2,552	343,831
BACKFILL	CY	8.904	37	1,628	14,496	37	1,628	14,496
PEDESTAL	CY	309.46	4.81	212	65,494	6.02	265	81,970
CONBM FAI	CY	401.21	287.5	12,650	5,075,307	287.5	12,650	5,075,307
BM DEL&EF	CY	129.76	287.5	12,650	1,641,464	287.5	12,650	1,641,464
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	120	5,280	7,920	120	5,280	7,920
MOB&DEMOB		5%			598,094			598,918
TOTAL					12,559,973			12,577,272
				$/METER	7,805		$/METER	7,815

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CONCRETE BEAM – AT GRADE – DOUBLE

STEEL								
DOUBLE								
SPAN			30			30		
HEIGHT			2			3		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	38	6,688	13,068	36	6,336	12,381
CONCRETE	CY	134.73	18	3,168	426,825	18	3,168	426,825
BACKFILL	CY	8.904	18	3,168	28,208	18	3,168	28,208
PEDESTAL	CY	309.46	9.62	1,693	523,953	12.04	2,119	655,758
CONBM FAI	CY	401.21	62	10,912	4,378,004	62	10,912	4,378,004
BM DEL&EF	CY	129.76	62	10,912	1,415,941	62	10,912	1,415,941
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	60	10,560	15,840	60	10,560	15,840
MOB&DEMOB		5%			820,620			827,176
TOTAL					17,233,030			17,370,703
				$/METER	10,708		$/METER	10,794

STEEL								
DOUBLE								
SPAN			75			75		
HEIGHT			2			3		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	62	4,365	8,529	64	4,506	8,804
CONCRETE	CY	134.73	34	2,394	322,490	36	2,534	341,460
BACKFILL	CY	8.904	28	1,971	17,552	30	2,112	18,805
PEDESTAL	CY	309.46	9.62	677	209,581	12.04	848	262,303
CONBM FAI	CY	401.21	199.52	14,046	5,635,479	199.52	14,046	5,635,479
BM DEL&EF	CY	129.76	199.52	14,046	1,822,636	199.52	14,046	1,822,636
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	150	10,560	15,840	150	10,560	15,840
MOB&DEMOB		5%			882,134			885,795
TOTAL					18,524,812			18,601,693
				$/METER	11,511		$/METER	11,559

STEEL								
DOUBLE								
SPAN			120			120		
HEIGHT			2			3		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	188	8,272	16,163	188	8,272	16,163
CONCRETE	CY	134.73	116	5,104	687,662	116	5,104	687,662
BACKFILL	CY	8.904	74	3,256	28,991	74	3,256	28,991
PEDESTAL	CY	309.46	9.62	423	130,988	12.04	530	163,940
CONBM FAI	CY	401.21	575	25,300	10,150,613	575	25,300	10,150,613
BM DEL&EF	CY	129.76	575	25,300	3,282,928	575	25,300	3,282,928
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	240	10,560	15,840	240	10,560	15,840
MOB&DEMOB		5%			1,196,188			1,197,835
TOTAL					25,119,945			25,154,544
				$/METER	15,609		$/METER	15,631

CONCRETE BEAM – ELEVATED – SINGLE

CONCRETE								
SINGLE								
SPAN			30			30		
HEIGHT			17			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	27	4,752	9,285	31	5,456	10,661
CONCRETE	CY	134.73	14	2,464	331,975	17	2,992	403,112
BACKFILL	CY	8.904	13	2,288	20,372	14	2,464	21,939
COLUMNS	CY	728.8	6.67	1,174	855,553	10.22	1,799	1,310,907
CROSSBM	CY	530.94	5.78	1,017	540,115	5.78	1,017	540,115
CONBM FAI	CY	401.21	31	5,456	2,189,002	31	5,456	2,189,002
BM DEL&EF	CY	129.76	31	5,456	707,971	31	5,456	707,971
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	30	5,280	7,920	30	5,280	7,920
MOB&DEMOB		5%			473,374			499,846
TOTAL					9,940,852			10,496,758
				$/METER	6,177		$/METER	6,523

CONCRETE								
SINGLE								
SPAN			75			75		
HEIGHT			17			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	44	3,098	6,053	49	3,450	6,741
CONCRETE	CY	134.73	25	1,760	237,125	28	1,971	265,580
BACKFILL	CY	8.904	19	1,338	11,910	21	1,478	13,164
COLUMNS	CY	728.8	7.11	501	364,796	11.85	834	607,994
CROSSBM	CY	530.94	10.11	712	377,893	10.11	712	377,893
CONBM FAI	CY	401.21	99.76	7,023	2,817,740	99.76	7,023	2,817,740
BM DEL&EF	CY	129.76	99.76	7,023	911,318	99.76	7,023	911,318
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	75	5,280	7,920	75	5,280	7,920
MOB&DEMOB		5%			477,002			490,682
TOTAL					10,017,043			10,304,316
				$/METER	6,224		$/METER	6,403

CONCRETE								
SINGLE								
SPAN			120			120		
HEIGHT			17			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	109	4,796	9,371	121	5,324	10,403
CONCRETE	CY	134.73	68	2,992	403,112	75	3,300	444,609
BACKFILL	CY	8.904	42	1,848	16,455	45	1,980	17,630
COLUMNS	CY	728.8	6.51	286	208,757	16.89	743	541,615
CROSSBM	CY	530.94	11.56	509	270,057	11.56	509	270,057
CONBM FAI	CY	401.21	287.5	12,650	5,075,307	287.5	12,650	5,075,307
BM DEL&EF	CY	129.76	287.5	12,650	1,641,464	287.5	12,650	1,641,464
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	120	5,280	7,920	120	5,280	7,920
MOB&DEMOB		5%			621,886			640,715
TOTAL					13,059,616			13,455,005
				$/METER	8,115		$/METER	8,361

30			30		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
33	5,808	11,349	63	11,088	21,666
18	3,168	426,825	37	6,512	877,362
15	2,640	23,507	26	4,576	40,745
12.44	2,189	1,595,664	75.38	13,267	9,668,902
5.78	1,017	540,115	5.78	1,017	540,115
31	5,456	2,189,002	31	5,456	2,189,002
31	5,456	707,971	31	5,456	707,971
	564	4,669,615		564	4,669,615
	564	135,670		564	135,670
30	5,280	7,920	30	5,280	7,920
		515,382			942,948
		10,823,018			19,801,916
	$/METER	6,725		$/METER	12,305

75			75		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
52	3,661	7,153	88	6,195	12,105
30	2,112	284,550	53	3,731	502,705
22	1,549	13,791	34	2,394	21,313
14.81	1,043	759,864	89.78	6,321	4,606,389
10.11	712	377,893	10.11	712	377,893
99.76	7,023	2,817,740	99.76	7,023	2,817,740
99.76	7,023	911,318	99.76	7,023	911,318
	564	4,669,615		564	4,669,615
	564	135,670		564	135,670
75	5,280	7,920	75	5,280	7,920
		499,276			703,133
		10,484,790			14,765,802
	$/METER	6,515		$/METER	9,175

120			120		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
129	5,676	11,091	192	8,448	16,507
81	3,564	480,178	123	5,412	729,159
48	2,112	18,805	69	3,036	27,033
21.33	939	683,993	132.44	5,827	4,246,980
11.56	509	270,057	11.56	509	270,057
287.5	12,650	5,075,307	287.5	12,650	5,075,307
287.5	12,650	1,641,464	287.5	12,650	1,641,464
	564	4,669,615		564	4,669,615
	564	135,670		564	135,670
120	5,280	7,920	120	5,280	7,920
		649,705			840,986
		13,643,806			17,660,698
	$/METER	8,478		$/METER	10,974

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17-Aug-92

CONCRETE BEAM – ELEVATED – DOUBLE

CONCRETE								
DOUBLE								
SPAN			30			30		
HEIGHT			17			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	44	7,744	15,132	51	8,976	17,539
CONCRETE	CY	134.73	25	4,400	592,812	30	5,280	711,374
BACKFILL	CY	8.904	19	3,344	29,775	22	3,872	34,476
COLUMNS	CY	728.8	13.33	2,346	1,709,823	27.26	4,798	3,496,607
CROSSBM	CY	530.94	18.96	3,337	1,771,726	18.96	3,337	1,771,726
CONBM FAI	CY	401.21	73.61	12,955	5,197,820	73.61	12,955	5,197,820
BM DEL&EF	CY	129.76	73.61	12,955	1,681,088	73.61	12,955	1,681,088
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	60	10,560	15,840	60	10,560	15,840
MOB&DEMOB		5%			1,031,229			1,126,852
TOTAL					21,655,815			23,663,894
				$/METER	13,457		$/METER	14,704

CONCRETE								
DOUBLE								
SPAN			75			75		
HEIGHT			17			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	81	5,702	11,142	91	6,406	12,518
CONCRETE	CY	134.73	49	3,450	464,765	56	3,942	531,160
BACKFILL	CY	8.904	32	2,253	20,059	35	2,464	21,939
COLUMNS	CY	728.8	12.22	860	626,978	28.15	1,982	1,444,307
CROSSBM	CY	530.94	37.93	2,670	1,417,754	37.93	2,670	1,417,754
CONBM FAI	CY	401.21	211.8	14,911	5,982,330	211.8	14,911	5,982,330
BM DEL&EF	CY	129.76	211.8	14,911	1,934,815	211.8	14,911	1,934,815
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	150	10,560	15,840	150	10,560	15,840
MOB&DEMOB		5%			1,004,213			1,048,562
TOTAL					21,088,467			22,019,796
				$/METER	13,104		$/METER	13,683

CONCRETE								
DOUBLE								
SPAN			120			120		
HEIGHT			17			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	194	8,536	16,679	212	9,328	18,227
CONCRETE	CY	134.73	125	5,500	741,015	137	6,028	812,152
BACKFILL	CY	8.904	70	3,080	27,424	75	3,300	29,383
COLUMNS	CY	728.8	19.26	847	617,614	25.19	1,108	807,773
CROSSBM	CY	530.94	47.41	2,086	1,107,562	47.41	2,086	1,107,562
CONBM FAI	CY	401.21	575.24	25,311	10,154,850	575.24	25,311	10,154,850
BM DEL&EF	CY	129.76	575.24	25,311	3,284,298	575.24	25,311	3,284,298
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	240	10,560	15,840	240	10,560	15,840
MOB&DEMOB		5%			1,278,793			1,292,033
TOTAL					26,854,647			27,132,690
				$/METER	16,687		$/METER	16,860

30			30		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
54	9,504	18,571	101	17,776	34,734
31	5,456	735,087	62	10,912	1,470,174
23	4,048	36,043	39	6,864	61,117
33.19	5,841	4,257,241	141.33	24,874	18,128,230
18.96	3,337	1,771,726	18.96	3,337	1,771,726
73.61	12,955	5,197,820	73.61	12,955	5,197,820
73.61	12,955	1,681,088	73.61	12,955	1,681,088
	1,128	9,339,231		1,128	9,339,231
	1,128	271,340		1,128	271,340
60	10,560	15,840	60	10,560	15,840
		1,166,199			1,898,565
		24,490,186			39,869,864
	$/METER	15,218		$/METER	24,775

75			75		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
98	6,899	13,481	152	10,701	20,909
60	4,224	569,100	96	6,758	910,559
38	2,675	23,820	56	3,942	35,103
35.56	2,503	1,824,495	132.44	9,324	6,795,168
37.93	2,670	1,417,754	37.93	2,670	1,417,754
211.8	14,911	5,982,330	211.8	14,911	5,982,330
211.8	14,911	1,934,815	211.8	14,911	1,934,815
	1,128	9,339,231		1,128	9,339,231
	1,128	271,340		1,128	271,340
150	10,560	15,840	150	10,560	15,840
		1,069,610			1,336,153
		22,461,817			28,059,203
	$/METER	13,958		$/METER	17,436

120			120		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
221	9,724	19,001	314	13,816	26,996
143	6,292	847,721	207	9,108	1,227,121
78	3,432	30,559	108	4,752	42,312
32.59	1,434	1,045,070	179.2	7,885	5,746,442
47.41	2,086	1,107,562	47.41	2,086	1,107,562
575.24	25,311	10,154,850	575.24	25,311	10,154,850
575.24	25,311	3,284,298	575.24	25,311	3,284,298
	1,128	9,339,231		1,128	9,339,231
	1,128	271,340		1,128	271,340
240	10,560	15,840	240	10,560	15,840
		1,305,774			1,560,800
		27,421,245			32,776,792
	$/METER	17,039		$/METER	20,367

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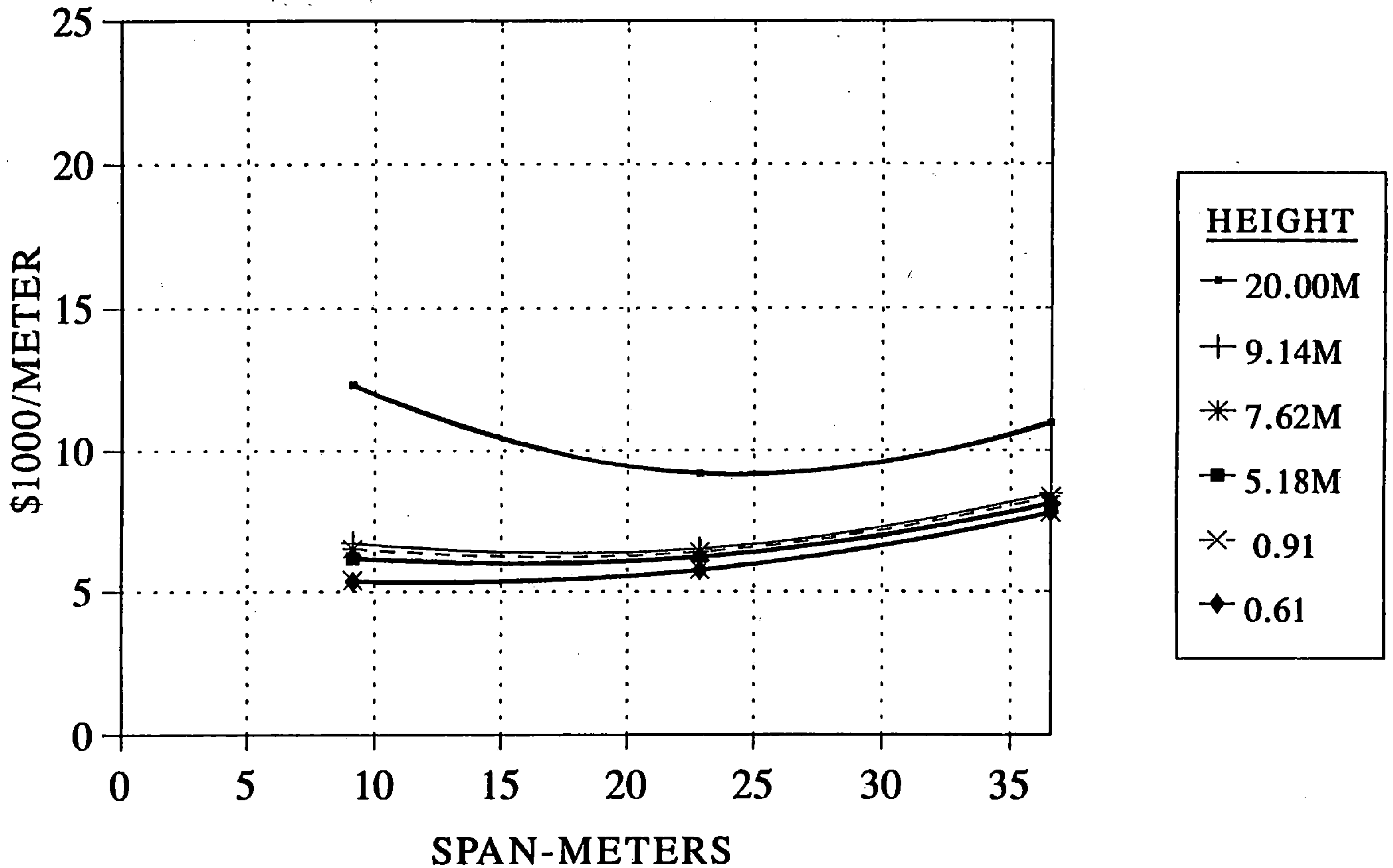
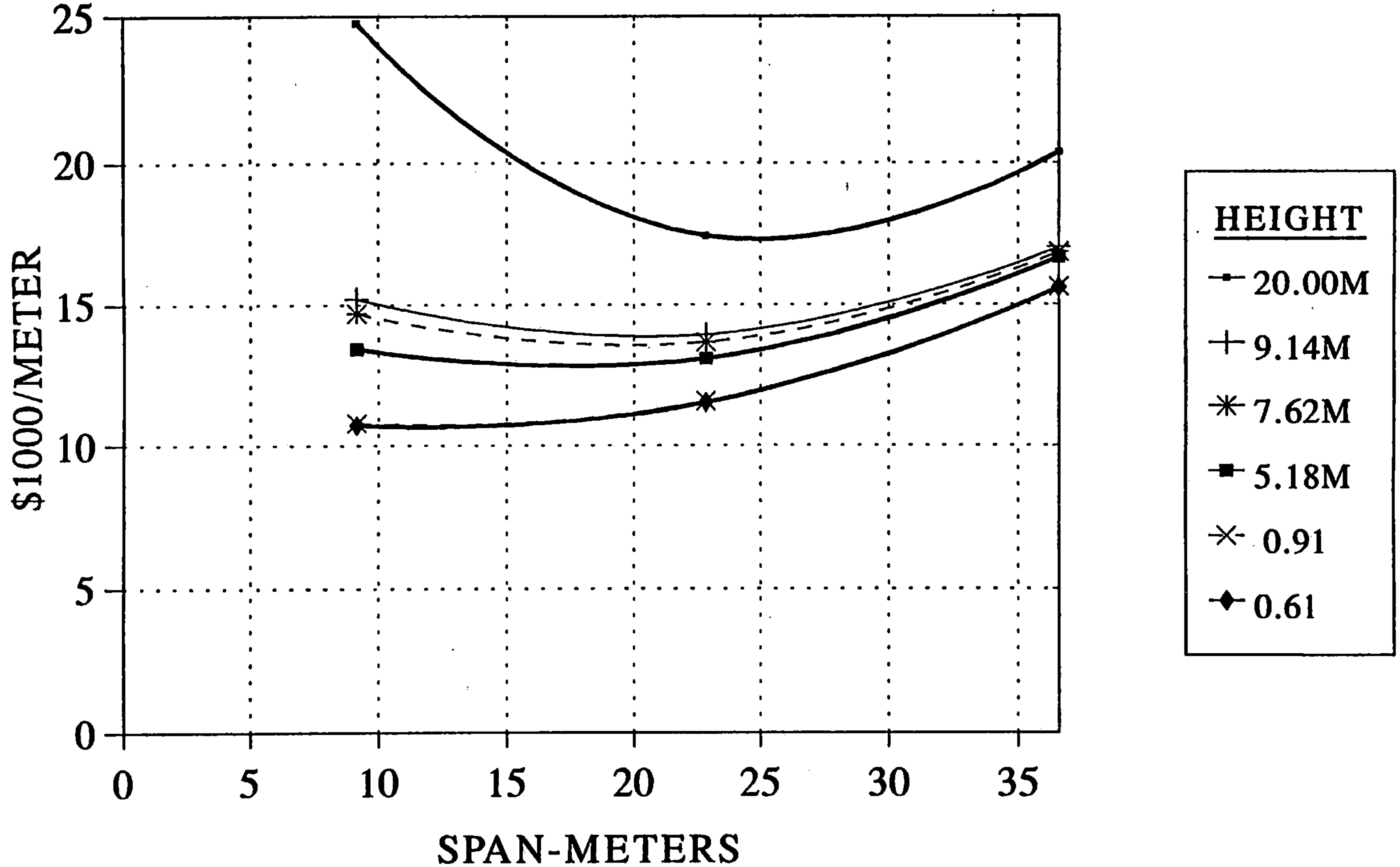
17-Aug-92

CONCRETE BEAM - SINGLE



CONCS.CH3, 8/17/92

CONCRETE BEAM - DOUBLE



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CONCD.CH3, 8/17/92

Client: MAGNEPLANE INTL
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS LF = N/A
Facility: CONCRETE SINGLE, ELEV,75' SPAN X 17'H
WBS 1212CF75

United Engineers & Constructors

WESTERN OPERATIONS
Rev No.:
Job No.: 6869.002

Date: 13-Aug-92
Priced By: WWS

				Manhours				Compounded Mark-Ups	Totals			
WBS	ACCT	Description	Quantity U/M	per unit	total	$/MH	MATL Unit	SUBS Unit 126.000%	Labor	Material	Subs	Total
1212CF75	A	FOOTING EXCAVATION	3,098 CY	0.026	81	$23.75		0.93	$2,424		$3,630	$6,054
1212CF75	A	FOOTING BACKFILL	1,338 CY	0.260	348	$23.75		0.89	$10,414		$1,500	$11,914
1212CF75	B	FOOTING CONCRETE	1,760 CY	1.180	2,077	$23.75	73.00	5.9	$62,154	$161,885	$13,084	$237,123
1212CF75	B	CONCRETE COLUMNS	501 CY	7.350	3,682	$23.05	383.00	26	$106,936	$241,773	$16,413	$365,122
1212CF75	B	CONCRETE CROSS BEAMS	712 CY	10.950	7,796	$23.05	149.00	20	$226,419	$133,671	$17,942	$378,032
1212CF75	B	CONCRETE BEAM FABRICATE	7,023 CY	7.350	51,619	$23.05	149.00		$1,499,171	$1,318,498		$2,817,669
1212CF75	B	CONCRETE BEAM DELIVER/EREC	7,023 CY	3.600	25,283	$23.05		20	$734,294		$176,980	$911,274
1212CF75	C	ALUM. GUIDE RAIL MATL/FABR	564 TN				6571.00			$4,669,615		$4,669,615
1212CF75	C	ALUM. GUIDE RAIL DELIVER/ERE	564 TN	6.656	3,754	$23.75		32.836	$112,338		$23,335	$135,673
1212CF75	C	ALUM. GUIDE RAIL ALIGN	5,280 LF	0.050	264	$23.75			$7,900			$7,900
SUBTOTAL					94,904				$2,762,050	$6,525,442	$252,884	$9,540,376
		MOBILIZATION/DEMOBILIZATION	5%		4,745				$138,103	$326,272	$12,644	$477,019

TOTAL CONCRETE SINGLE, ELEV,75' SPAN X 17'H	99,649	$29.10		$2,900,153	$6,851,714	$265,528	$10,017,395

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Client: MAGNEPLANE INTL.
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS

United Engineers & Constructors
WESTERN OPERATIONS
Job No.: 6869.002
Date: 13–Aug–92
Priced By: WWS

WBS	DESCRIPTION	QTY	UofM	UNIT RATE	TOTAL
1212CF75	FOOTING EXCAVATION	3,098	CY	$2	$6,054
1212CF75	FOOTING BACKFILL	1,338	CY	$9	$11,914
1212CF75	FOOTING CONCRETE	1,760	CY	$135	$237,123
1212CF75	CONCRETE COLUMNS	501	CY	$729	$365,122
1212CF75	CONCRETE CROSS BEAMS	712	CY	$531	$378,032
1212CF75	CONCRETE BEAM FABRICATE	7,023	CY	$401	$2,817,669
1212CF75	CONCRETE BEAM DELIVER/ERECT	7,023	CY	$130	$911,274
1212CF75	ALUM. GUIDE RAIL MATL/FABR	564	TN	$8,279	$4,669,615
1212CF75	ALUM. GUIDE RAIL DELIVER/ERECT	564	TN	$241	$135,673
1212CF75	ALUM. GUIDE RAIL ALIGN	5,280	LF	$1	$7,900
SUBTOTAL					$9,540,376
	MOBILIZATION/DEMOBILIZATION			5%	$477,019
TOTAL					$10,017,395

to BS 8/12/92 E-42

FORM 5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER	
FINAL			DATE 8-12-92	DATE
VOID				
SHEET	OF		DATE	DATE
J.O	6869002			

NAME OF COMPANY MAGNEPLANE UNIT/S

SUBJECT MTO

CONCRETE S/D SINGLE WBS 1212CF75

SPAN 75 HEIGHT 17

	UNITS		QTY/MILE
FOOTING			
EXCAVATION	CY	44 × 5280/75	3098
CONCRETE FORM & POUR	CY	25	1760
COMPACTED BACKFILL	CY	19	1338
CONCRETE COLUMNS			
FORM & POUR	CY	4 × 4 × 12/27 × 5280/75	501
CONCRETE CROSS BEAMS			
FORM & POUR	CY	13 × 3 × 7/27 × 5280/75	712
CONCRETE BEAMS			
FABRICATE	CY	32.71 × 5280/27 + 48/27 5280/75	7023
DELIVER & ERECT	CY	6397 + 626	
GUIDEWAY TROUGH			
FAB ALUM. BOX BMS	TN	564	564
DELIVER & ERECT "	TN	564	564
ALIGN TROUGH	LF	5280	5280

SUBTOTAL

MOB & DEMOB (5%)

TOTAL

(CONTINGENCY ADDED LATER BY OTHERS)

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FORM 5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY MAGNEPLANE UNIT/S

SUBJECT MAGLEV

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID			DATE	DATE
SHEET OF				
J.O				

MTO CONCRETE SINGLE

		30		75		120	
COLUMNS	17	4*3*15/27	6.67	4*4*12/27	7.11	4*4*11/27	6.51
	25	4*3*23/27	10.22	4*4*20/27	11.85	6*4*19/27	16.89
	30	4*3*28/27	12.44	4*4*25/27	14.81	6*4*24/27	21.33
	65	8*4*63.6/27	75.38	10*4*60.6/27	89.78	10*6*59.6/27	132.44
STRUCTURAL ~~CROSS BEAM~~		24.65*30/27 = 27.39		32.71 * 75/27 = 90.86		61.5*120/27 = 273.3	
		48/27 * 2 = 3.56	31 cy	48/27 * 75/15 = 8.88	99.76	48/27 * 120/15 = 14.2	287.5
CROSS BM ~~STRUCTURAL~~ BEAM		13*3*4/27 = 5.78 cy		13*3*7/27 = 10.11 cy		13*3*8/27 = 11.56 cy	

ALUM GUIDEWAY 564/MILE

AT GRADE PEDESTALS
- 2' 2.5*4*13/27 = 4.81
- 3' 2.5*5*13/27 = 6.02

E-44

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID			DATE	DATE
SHEET OF				
J.O				

NAME OF COMPANY MAGNEPLANE UNIT/S

SUBJECT MAGLEV

MTO CONCRETE DOUBLE

		30		75	120
COLUMNS	17	8x3x15/27	13.33	10x3x11/27 = 12.22	10x4 x 13/27 = 19.26
	25	8x4x23/27	27.26	10x4x 19/27 = 28.15	10x4x17/27 = 25.19
	30	8x4x28/27	33.19	10x4x 24/27 = 35.56	10x4x22/27 = 32.59
	65	10x6x63.6/27	141.33	10x6x 59.6/27 = 132.44	14x6x57.6/27 = 179.2
CROSS BEAM		32x4 x4/27 =	18.96	32x8x4/27 = 37.93	32x10x4/27 = 47.41
STRUCTURAL BEAM		59.85x30/27 =	66.5	69.85 x 75/27 = 194	123.03 x 120/27 = 546.8
		2x48/27 x 30/15 =	7.11	2x48/27 x 75/15 = 17.8	2x48/27 x 120/15 = 28.94
		Vx 62	73.61	Vx 2x	211.8	575.24
ALUM GUIDEWAY		1128			
AT GRADE PEDESTALS	2'	9.62			
	3'	12.04			
2X Single					

E-45

STEEL TRUSS – AT GRADE – SINGLE

STEEL								
SINGLE								
SPAN			30			30		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	11	1,936	3,783	12	2,112	4,127
CONCRETE	CY	134.73	5	880	118,562	5	880	118,562
BACKFILL	CY	8.904	6	1,056	9,403	7	1,232	10,970
PEDESTAL	CY	309.46	2.6	458	141,609	3.9	686	212,413
STEEL FAB	TON	2205	4.86	855	1,886,069	4.86	855	1,886,069
ST DEL&ER	TON	379.4	4.86	855	324,524	4.86	855	324,524
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	30	5,280	7,920	30	5,280	7,920
MOB&DEMOB		5%			364,858			368,494
TOTAL					7,662,013			7,738,364
				$/METER	4,761		$/METER	4,809

STEEL								
SINGLE								
SPAN			75			75		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	13	915	1,788	15	1,056	2,063
CONCRETE	CY	134.73	6	422	56,910	7	493	66,395
BACKFILL	CY	8.904	7	493	4,388	8	563	5,015
PEDESTAL	CY	309.46	2.6	183	56,644	3.9	275	84,965
STEEL FAB	TON	2205	13.8	972	2,142,202	13.8	972	2,142,202
ST DEL&ER	TON	379.4	13.8	972	368,595	13.8	972	368,595
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	75	5,280	7,920	75	5,280	7,920
MOB&DEMOB		5%			372,187			374,122
TOTAL					7,815,918			7,856,562
				$/METER	4,857		$/METER	4,882

STEEL								
SINGLE								
SPAN			120			120		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	29	1,276	2,493	29	1,276	2,493
CONCRETE	CY	134.73	15	660	88,922	15	660	88,922
BACKFILL	CY	8.904	14	616	5,485	14	616	5,485
PEDESTAL	CY	309.46	2.6	114	35,402	3.9	172	53,103
STEEL FAB	TON	2205	38.76	1,705	3,760,495	38.76	1,705	3,760,495
ST DEL&ER	TON	379.4	38.76	1,705	647,044	38.76	1,705	647,044
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	120	5,280	7,920	120	5,280	7,920
MOB&DEMOB		5%			467,652			468,537
TOTAL					9,820,699			9,839,285
				$/METER	6,102		$/METER	6,114

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STEEL TRUSS – AT GRADE – DOUBLE

STEEL
DOUBLE

SPAN			30			30		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	22	3,872	7,566	24	4,224	8,254
CONCRETE	CY	134.73	10	1,760	237,125	10	1,760	237,125
BACKFILL	CY	8.904	12	2,112	18,805	14	2,464	21,939
PEDESTAL	CY	309.46	5.2	915	283,218	7.8	1,373	424,827
STEEL FAB	TON	2205	9.72	1,711	3,772,138	9.72	1,711	3,772,138
ST DEL&ER	TON	379.4	9.72	1,711	649,047	9.72	1,711	649,047
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	60	10,560	15,840	60	10,560	15,840
MOB&DEMOB		5%			729,715			736,987
TOTAL					15,324,025			15,476,728
				$/METER	9,522		$/METER	9,617

STEEL
DOUBLE

SPAN			75			75		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	26	1,830	3,577	30	2,112	4,127
CONCRETE	CY	134.73	12	845	113,820	14	986	132,790
BACKFILL	CY	8.904	14	986	8,776	16	1,126	10,029
PEDESTAL	CY	309.46	5.2	366	113,287	7.8	549	169,931
STEEL FAB	TON	2205	27.6	1,943	4,284,403	27.6	1,943	4,284,403
ST DEL&ER	TON	379.4	27.6	1,943	737,189	27.6	1,943	737,189
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	150	10,560	15,840	150	10,560	15,840
MOB&DEMOB		5%			744,373			748,244
TOTAL					15,631,836			15,713,125
				$/METER	9,713		$/METER	9,764

STEEL
DOUBLE

SPAN			120			120		
HEIGHT			2			3		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	58	2,552	4,987	58	2,552	4,987
CONCRETE	CY	134.73	30	1,320	177,844	30	1,320	177,844
BACKFILL	CY	8.904	28	1,232	10,970	28	1,232	10,970
PEDESTAL	CY	309.46	5.2	229	70,804	7.8	343	106,207
STEEL FAB	TON	2205	77.52	3,411	7,520,990	77.52	3,411	7,520,990
ST DEL&ER	TON	379.4	77.52	3,411	1,294,088	77.52	3,411	1,294,088
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	240	10,560	15,840	240	10,560	15,840
MOB&DEMOB		5%			935,305			937,075
TOTAL					19,641,399			19,678,571
				$/METER	12,205		$/METER	12,228

STEEL TRUSS – ELEVATED – SINGLE

STEEL								
SINGLE								
SPAN			30			30		
HEIGHT			17			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	23	4,048	7,910	29	5,104	9,973
CONCRETE	CY	134.73	12	2,112	284,550	16	2,816	379,400
BACKFILL	CY	8.904	11	1,936	17,238	13	2,288	20,372
COLUMNS	CY	728.8	6.67	1,174	855,553	10.22	1,799	1,310,907
CROSSBM	CY	530.94	4.86	855	454,145	4.86	855	454,145
STEEL FAB	TON	2205	4.86	855	1,886,069	4.86	855	1,886,069
ST DEL&ER	TON	379.4	4.86	855	324,524	4.86	855	324,524
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	30	5,280	7,920	30	5,280	7,920
MOB&DEMOB		5%			432,160			459,930
TOTAL					9,075,353			9,658,525
				$/METER	5,639		$/METER	6,002

STEEL								
SINGLE								
SPAN			75			75		
HEIGHT			17			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	27	1,901	3,714	32	2,253	4,402
CONCRETE	CY	134.73	14	986	132,790	17	1,197	161,245
BACKFILL	CY	8.904	13	915	8,149	14	986	8,776
COLUMNS	CY	728.8	6.22	438	319,133	9.78	689	501,786
CROSSBM	CY	530.94	5.56	391	207,623	5.56	391	207,623
STEEL FAB	TON	2205	13.8	972	2,142,202	13.8	972	2,142,202
ST DEL&ER	TON	379.4	13.8	972	368,595	13.8	972	368,595
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	75	5,280	7,920	75	5,280	7,920
MOB&DEMOB		5%			399,781			410,402
TOTAL					8,395,391			8,618,436
				$/METER	5,217		$/METER	5,355

STEEL								
SINGLE								
SPAN			120			120		
HEIGHT			17			25		
		UNIT	QTY/	QTY/	COST/	QTY/	QTY/	COST/
ITEM	UNITS	PRICE	SPAN	MILE	MILE	SPAN	MILE	MILE
EXCAV	CY	1.954	42	1,848	3,611	49	2,156	4,213
CONCRETE	CY	134.73	23	1,012	136,347	27	1,188	160,059
BACKFILL	CY	8.904	19	836	7,444	21	924	8,227
COLUMNS	CY	728.8	7.7	339	246,917	12.44	547	398,916
CROSSBM	CY	530.94	7.22	318	168,669	7.22	318	168,669
STEEL FAB	TON	2205	38.76	1,705	3,760,495	38.76	1,705	3,760,495
ST DEL&ER	TON	379.4	38.76	1,705	647,044	38.76	1,705	647,044
ALUM FAB	TON	8279.46		564	4,669,615		564	4,669,615
AL DEL&ER	TON	240.55		564	135,670		564	135,670
ALIGNMT	LF	1.5	120	5,280	7,920	120	5,280	7,920
MOB&DEMOB		5%			489,187			498,041
TOTAL					10,272,919			10,458,871
				$/METER	6,383		$/METER	6,499

30			30		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
32	5,632	11,005	48	8,448	16,507
17	2,992	403,112	28	4,928	663,949
15	2,640	23,507	20	3,520	31,342
12.44	2,189	1,595,664	75.38	13,267	9,668,902
4.86	855	454,145	4.86	855	454,145
4.86	855	1,886,069	4.86	855	1,886,069
4.86	855	324,524	4.86	855	324,524
	564	4,669,615		564	4,669,615
	564	135,670		564	135,670
30	5,280	7,920	30	5,280	7,920
		475,562			892,932
		9,986,792			18,751,576
	$/METER	6,206		$/METER	11,652

75			75		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
35	2,464	4,815	54	3,802	7,428
19	1,338	180,215	31	2,182	294,035
16	1,126	10,029	23	1,619	14,417
12	845	615,690	74.19	5,223	3,806,505
5.56	391	207,823	5.56	391	207,823
13.8	972	2,142,202	13.8	972	2,142,202
13.8	972	368,595	13.8	972	368,595
	564	4,669,615		564	4,669,615
	564	135,670		564	135,670
75	5,280	7,920	75	5,280	7,920
		417,129			582,710
		8,759,702			12,236,920
	$/METER	5,443		$/METER	7,604

120			120		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
52	2,288	4,471	78	3,432	6,706
29	1,276	171,915	46	2,024	272,694
23	1,012	9,011	32	1,408	12,537
15.41	678	494,156	91.26	4,015	2,926,453
7.22	318	168,669	7.22	318	168,669
38.76	1,705	3,760,495	38.76	1,705	3,760,495
38.76	1,705	647,044	38.76	1,705	647,044
	564	4,669,615		564	4,669,615
	564	135,670		564	135,670
120	5,280	7,920	120	5,280	7,920
		503,448			630,390
		10,572,415			13,238,193
	$/METER	6,570		$/METER	8,226

E-47

17-Aug-92

STEEL TRUSS – ELEVATED – DOUBLE

STEEL								
DOUBLE								
SPAN			30			30		
HEIGHT			17			25		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	37	6,512	12,724	44	7,744	15,132
CONCRETE	CY	134.73	21	3,696	497,962	25	4,400	592,812
BACKFILL	CY	8.904	17	2,992	26,641	19	3,344	29,775
COLUMNS	CY	728.8	13.33	2,346	1,709,823	20.44	3,597	2,621,814
CROSSBM	CY	530.94	14.22	2,503	1,328,794	14.22	2,503	1,328,794
STEEL FAB	TON	2205	11.6	2,042	4,501,728	11.6	2,042	4,501,728
ST DEL&ER	TON	379.4	11.6	2,042	774,583	11.6	2,042	774,583
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	60	10,560	15,840	60	10,560	15,840
MOB&DEMOB		5%			923,933			974,552
TOTAL					19,402,600			20,465,602
				$/METER	12,057		$/METER	12,717

STEEL								
DOUBLE								
SPAN			75			75		
HEIGHT			17			25		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	61	4,294	8,391	72	5,069	9,904
CONCRETE	CY	134.73	36	2,534	341,460	43	3,027	407,855
BACKFILL	CY	8.904	25	1,760	15,671	29	2,042	18,178
COLUMNS	CY	728.8	11.56	814	593,115	18.67	1,314	957,911
CROSSBM	CY	530.94	23.7	1,668	885,863	23.7	1,668	885,863
STEEL FAB	TON	2205	32.94	2,319	5,113,342	32.94	2,319	5,113,342
ST DEL&ER	TON	379.4	32.94	2,319	879,819	32.94	2,319	879,819
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	150	10,560	15,840	150	10,560	15,840
MOB&DEMOB		5%			873,204			894,964
TOTAL					18,337,276			18,794,249
				$/METER	11,395		$/METER	11,679

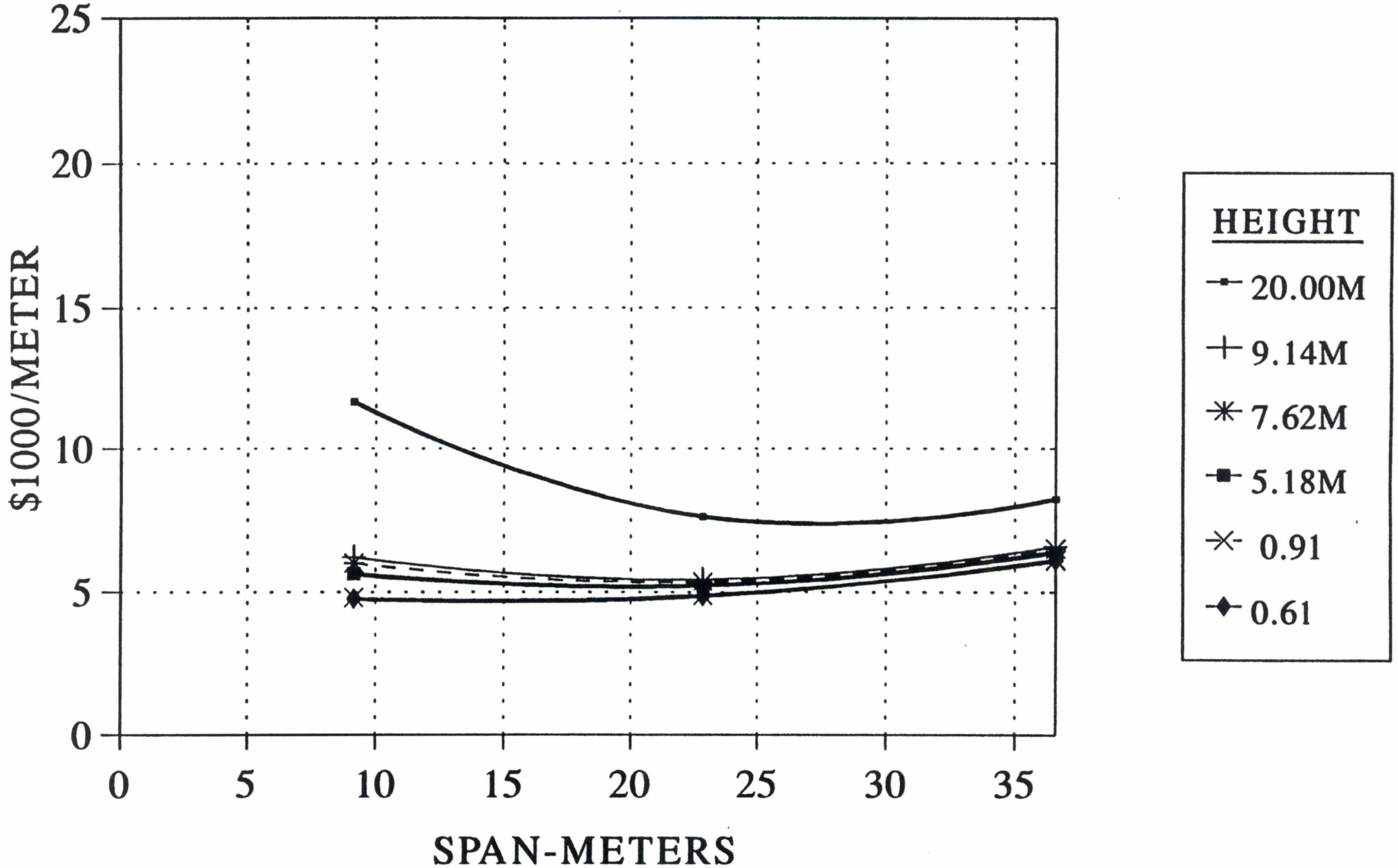
STEEL								
DOUBLE								
SPAN			120			120		
HEIGHT			17			25		
ITEM	UNITS	UNIT PRICE	QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
EXCAV	CY	1.954	82	3,608	7,050	100	4,400	8,598
CONCRETE	CY	134.73	50	2,200	296,406	61	2,684	361,615
BACKFILL	CY	8.904	32	1,408	12,537	38	1,672	14,887
COLUMNS	CY	728.8	13.04	574	418,156	22.52	991	722,153
CROSSBM	CY	530.94	28.44	1,251	664,397	28.44	1,251	664,397
STEEL FAB	TON	2205	92.53	4,071	8,977,261	92.53	4,071	8,977,261
ST DEL&ER	TON	379.4	92.53	4,071	1,544,659	92.53	4,071	1,544,659
ALUM FAB	TON	8279.46		1,128	9,339,231		1,128	9,339,231
AL DEL&ER	TON	240.55		1,128	271,340		1,128	271,340
ALIGNMT	LF	1.5	240	10,560	15,840	240	10,560	15,840
MOB&DEMOB		5%			1,077,344			1,095,999
TOTAL					22,624,221			23,015,981
				$/METER	14,058		$/METER	14,302

30			30		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
49	8,624	16,851	75	13,200	25,793
28	4,928	663,949	45	7,920	1,067,062
21	3,696	32,909	30	5,280	47,013
24.89	4,381	3,192,610	94.22	16,583	12,085,486
14.22	2,503	1,328,794	14.22	2,503	1,328,794
11.6	2,042	4,501,728	11.6	2,042	4,501,728
11.6	2,042	774,583	11.6	2,042	774,583
	1,128	9,339,231		1,128	9,339,231
	1,128	271,340		1,128	271,340
60	10,560	15,840	60	10,560	15,840
		1,006,892			1,472,844
		21,144,729			30,929,714
	$/METER	13,139		$/METER	19,219

75			75		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
74	5,210	10,180	105	7,392	14,444
45	3,168	426,825	65	4,576	616,524
30	2,112	18,805	40	2,816	25,074
23.11	1,627	1,185,717	91.26	6,425	4,682,324
23.7	1,668	885,863	23.7	1,668	885,863
32.94	2,319	5,113,342	32.94	2,319	5,113,342
32.94	2,319	879,819	32.94	2,319	879,819
	1,128	9,339,231		1,128	9,339,231
	1,128	271,340		1,128	271,340
150	10,560	15,840	150	10,560	15,840
		907,348			1,092,190
		19,054,310			22,935,992
	$/METER	11,840		$/METER	14,252

120			120		
30			65		
QTY/ SPAN	QTY/ MILE	COST/ MILE	QTY/ SPAN	QTY/ MILE	COST/ MILE
109	4,796	9,371	168	7,392	14,444
67	2,948	397,184	107	4,708	634,309
41	1,804	16,063	61	2,684	23,898
28.44	1,251	911,991	105.96	4,662	3,397,841
28.44	1,251	664,397	28.44	1,251	664,397
92.53	4,071	6,977,261	92.53	4,071	6,977,261
92.53	4,071	1,544,659	92.53	4,071	1,544,659
	1,128	9,339,231		1,128	9,339,231
	1,128	271,340		1,128	271,340
240	10,560	15,840	240	10,560	15,840
		1,107,367			1,244,161
		23,254,704			26,127,380
	$/METER	14,450		$/METER	16,235

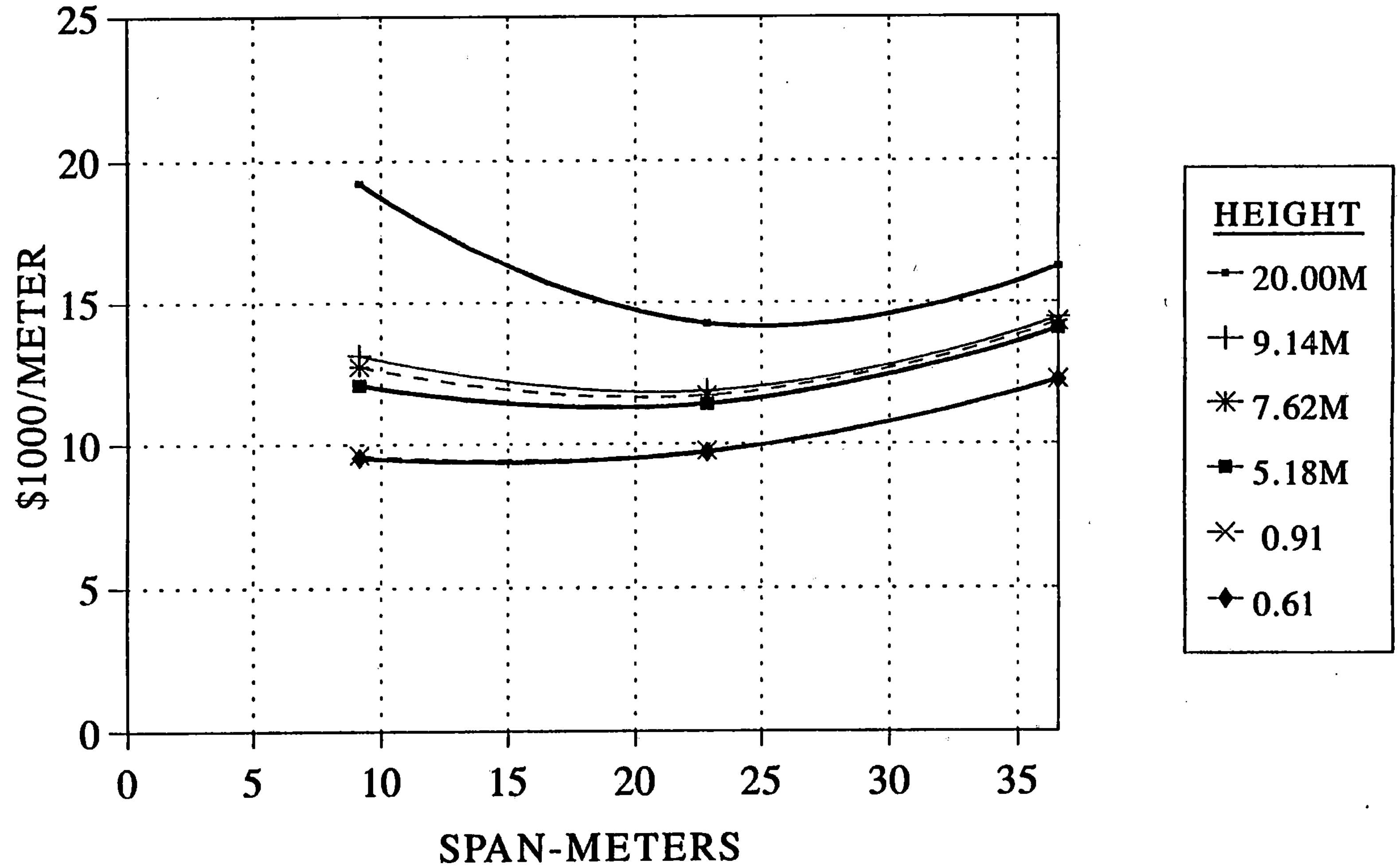
STEEL TRUSS - SINGLE



E-49

STEELS.CH3, 8/17/92

STEEL TRUSS - DOUBLE



STEELD.CH3, 8/17/92

E-52

Client: MAGNEPLANE INTL.
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS LF = N/A
Facility: STEEL SINGLE, ELEV,75'SPAN X 17'H
WBS 1212SF75

United Engineers & Constructors

WESTERN OPERATIONS
Rev No.:
Job No.: 6869.002

Date: 13-Aug-92
Priced By: WWS

WBS	ACCT	Description	Quantity U/M	Manhours per unit	Manhours total	Manhours $/MH	MATL Unit	SUBS Unit	Compounded Mark-Ups 126.000%	Totals Labor	Totals Material	Totals Subs	Totals Total
1212SF75	A	FOOTING EXCAVATION	1,197 CY	0.026	31	$23.75		0.93		$928		$1,403	$2,331
1212SF75	A	FOOTING BACKFILL	915 CY	0.260	238	$23.75		0.89		$7,122		$1,026	$8,148
1212SF75	B	FOOTING CONCRETE	986 CY	1.180	1,163	$23.75	73.00	5.9		$34,803	$90,692	$7,330	$132,825
1212SF75	B	CONCRETE COLUMNS	501 CY	7.350	3,682	$23.05	383.00	26		$106,936	$241,773	$16,413	$365,122
1212SF75	B	CONCRETE CROSS BEAMS	263 CY	10.950	2,880	$23.05	149.00	20		$83,644	$49,376	$6,628	$139,648
1212SF75	C	STEEL TRUSS FABRICATE	972 TN				1750.00				$2,143,260		$2,143,260
1212SF75	C	STEEL TRUSS DELIVER/ERECT	972 TN	7.900	7,679	$23.05		119		$223,021		$145,742	$368,763
1212SF75	C	ALUM. GUIDE RAIL MATL/FABR	564 TN				6571.00				$4,669,615		$4,669,615
1212SF75	C	ALUM. GUIDE RAIL DELIVER/ERE	564 TN	6.656	3,754	$23.75		32.836		$112,338		$23,335	$135,673
1212SF75	C	ALUM. GUIDE RAIL ALIGN	5,280 LF	0.050	264	$23.75				$7,900			$7,900
SUBTOTAL					19,691					$576,692	$7,194,716	$201,877	$7,973,285
		MOBILIZATION/DEMOBILIZATION	5%		985					$28,835	$359,736	$10,094	$398,664
TOTAL STEEL SINGLE, ELEV,75'SPAN X 17'H					20,676	$29.29				$605,527	$7,554,452	$211,971	$8,371,949

M-5

E-52

Client: MAGNEPLANE INTL
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS

United Engineers & Constructors
WESTERN OPERATIONS
Job No.: 6869.002

Date: 13-Aug-92
Priced By: WWS

WBS	DESCRIPTION	QTY	UofM	UNIT RATE	TOTAL
1212SF75	FOOTING EXCAVATION	1,197	CY	$2	$2,331
1212SF75	FOOTING BACKFILL	915	CY	$9	$8,148
1212SF75	FOOTING CONCRETE	986	CY	$135	$132,825
1212SF75	CONCRETE COLUMNS	501	CY	$729	$365,122
1212SF75	CONCRETE CROSS BEAMS	263	CY	$531	$139,648
1212SF75	STEEL TRUSS FABRICATE	972	TN	$2,205	$2,143,260
1212SF75	STEEL TRUSS DELIVER/ERECT	972	TN	$379	$368,763
1212SF75	ALUM. GUIDE RAIL MATL/FABR	564	TN	$8,279	$4,669,615
1212SF75	ALUM. GUIDE RAIL DELIVER/ERECT	564	TN	$241	$135,673
1212SF75	ALUM. GUIDE RAIL ALIGN	5,280	LF	$1	$7,900
SUBTOTAL					$7,973,285
	MOBILIZATION/DEMOBILIZATION			5%	$398,664
TOTAL					$8,371,949

TO DS 8/12/92 E-53

FORM 5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARKER	
FINAL			DATE 8-12-92	DATE
VOID				
SHEET	OF		DATE	DATE
J.O	6869002			

NAME OF COMPANY MAGNEPLANE UNIT/S

SUBJECT MTO

STEEL S/D SINGLE WBS T212SF75

SPAN 75' HEIGHT 17'

	UNITS		QTY/MILE
FOOTING			
EXCAVATION	CY	17 * 5280/75	1197
CONCRETE FORM & POUR	CY	14 *	986
COMPACTED BACKFILL	CY	13 *	915
CONCRETE COLUMNS			
FORM & POUR	CY	4*4*12/27 * 5280/75	501
CONCRETE CROSS BEAMS			
FORM & POUR	CY	263	263
STEEL TRUSS			
FABRICATE	TN	972	972
DELIVER & ERECT	TN	972	972
GUIDEWAY TROUGH			
FAB ALUM BOX BMS	TN	564	564
DELIVER & ERECT "	TN	564	564
ALIGN TROUGH	LF	5280	5280

SUBTOTAL

MOB & DEMOB (5%)

TOTAL

(CONTINGENCY ADDED LATER BY OTHERS)

E-54

FORM 5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
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FINAL				
VOID			DATE	DATE
SHEET OF				
J.O				

NAME OF COMPANY: MAGNEPLANE UNIT/S

SUBJECT: MAGLEV

MTO STEEL SINGLE

		30	75	120
COLUMNS	17	4x3x15/27 = 6.67	4x3x14/27 = 6.22	4x4x13/27 = 7.70
	25	4x3x23/27 = 10.22	4x3x22/27 = 9.78	4x4x21/27 = 12.44
	30	4x3x28/27 = 12.44	4x3x27/27 = 12.00	4x4x26/27 = 15.41
	65	8x4x63.6/27 = 75.38	8x4x62.6/27 = 74.19	10x4x61.6/27 = 91.26
CROSS BEAM		15x2.5x3.5/27 = 4.86	15x2.5x4/27 = 5.56	13x3x5/27 = 7.22
STRUCTURAL BEAM		for connections 9.26(1.05)/2 = 4.86	26.3(1.05)/2 = 13.8	Reduce 20% due to relaxation of f_n Regmt. 46.15(1.05).8 → 38.76
ALUM GUIDEWAY		564 TN/MILE →	→	→
AT GRADE PEDESTALS	2'	2.6 →	→	→
	3'	3.9 →	→	→

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FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY MAGNEPLANE UNIT/S

SUBJECT MAGLEV

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID			DATE	DATE
SHEET OF				
J.O				

MTO STEEL DOUBLE

		30	75	120
COLUMNS	17	$8*3*15/27 = 13.33$	$8*3*13/27 = 11.56$	$\cancel{8*4*11/27 = 13.04}$
	25	$8*3*23/27 = 20.44$	$8*3*21/27 = 18.67$	$8*4*19/27 = 22.52$
	30	$8*3*28/27 = 24.89$	$8*3*26/27 = 23.11$	$8*4*24/27 = 28.44$
	65	$10*4*63.6/27 = 94.22$	$10*4*61.6/27 = 91.26$	$12*4*59.6/27 = 105.96$
CROSS BEAM		$32*3*4/27 = 14.22$	$32*4*5/27 = 23.70$	$32*4*6/27 = 28.44$
STRUCTURAL BEAM		$11.05(1.05) = 11.6$ (2042 TN/MILE)	use same Ratio to bump single $13.8\left(\frac{11.6}{4.86}\right) =$ 32.94	$38.76\left(\frac{11.6}{4.86}\right) =$ 92.53
ALUM GUIDEWAY		1128 TN/MILE	→	→

AT GRADE PEDESTALS	2'	5.4	→	→
	3'	8.2	→	→

USE (2) SINGLES

E-56

BANKED GUIDEWAY COST ESTIMATE

Method used to establish pricing of banked guideway sections:

1) Determine the cost of a straight section

2) Design guideway and support for the maximum 35° bank

   - Loading from vehicle based on information from Mike Judd with semi gap of 1.0 m on inside of curved guideway
   - Foundation design by BCI based on loadings from UE&C.

3) For each of the guideway components, determine the quantities for the 35° bank and establish the ratios of 35° bank to straight section

   - Note that the inside and outside box beams have been calculated separately as the configuration of each changes differently in the banked curve

4) Establish "weighting" factors for each component as follows (based on straight section costs)

		Factors
Foundation	$15,964 + 41,669 + 471,868	0.037
Columns	$808,241	0.057
Cross Beams	$1,308,293	0.093
Box Beam Inside	$(11,111,035 + 322,813)/2	0.406
Box Beam Outside	" "	0.406
Alignment	$15,800	0.001
	$14,095,683	1.000

5) Determine variation of each component with bank angle from 0° to 24°. Graph this variation (plot ratio as a function of bank angle). [See p. 3]

6) Determine cost ratio of the banked sections to the straight section for each of the angles encountered in the SST. Do this by multiplying the ratio for each component by the weighting factor. The sum of these values will be the ratio of banked cost to the straight section cost. [See p. 4]

The results are as follows:

Bank °	Ratio	Multiplier (Ratio - 1.00)
5	1.050	0.050
10	1.099	0.099
14	1.176	0.176
15	1.194	0.194
16	1.214	0.214
18	1.254	0.254
19	1.274	0.274
20	1.293	0.293
21	1.315	0.315
23	1.359	0.359
24	1.380	0.380

7) On a spreadsheet, determine the extra cost of the banked sections as follows:
   a) For each curve are multiply arc length by the multiplier shown in step 6 [see p 6]
   b) Sum these figures for all the circular curve arcs: 4001.
   c) For each curve, multiply the taper (or spiral) length by the multiplier shown below. The multiplier takes into account that there are two tapers at each curve (one at each end of the circular arc). This multiplier is an average of the values from 0° to the bank angle under consideration [see p. 5]

Bank Angle	Multiplier for Taper
10	.110
14	.164
15	.179
16	.195
18	.227
19	.244
20	.261
21	.279
23	.315
24	.333

   d) Sum the figures obtained in step 7 c) = 5,015.

8) The extra cost of all the curves (including spirals) is then obtained by multiplying the sum of 7 b) and 7 d) by the per meter straight section cost. The sum of 7 b) and 7 d) = 9,016.

Note also that the Σ of all arcs = 10,529m therefore the average extra cost for an arc section = $\frac{4001}{10529}$ = 38% more than a straight section.
Similarly spiral sections cost $\frac{5015}{15,860}$ = 31.6% / 2 = 15.8% more.

3 E-58

FORM 5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	PARIKH	
FINAL			DATE 7-29-92	DATE
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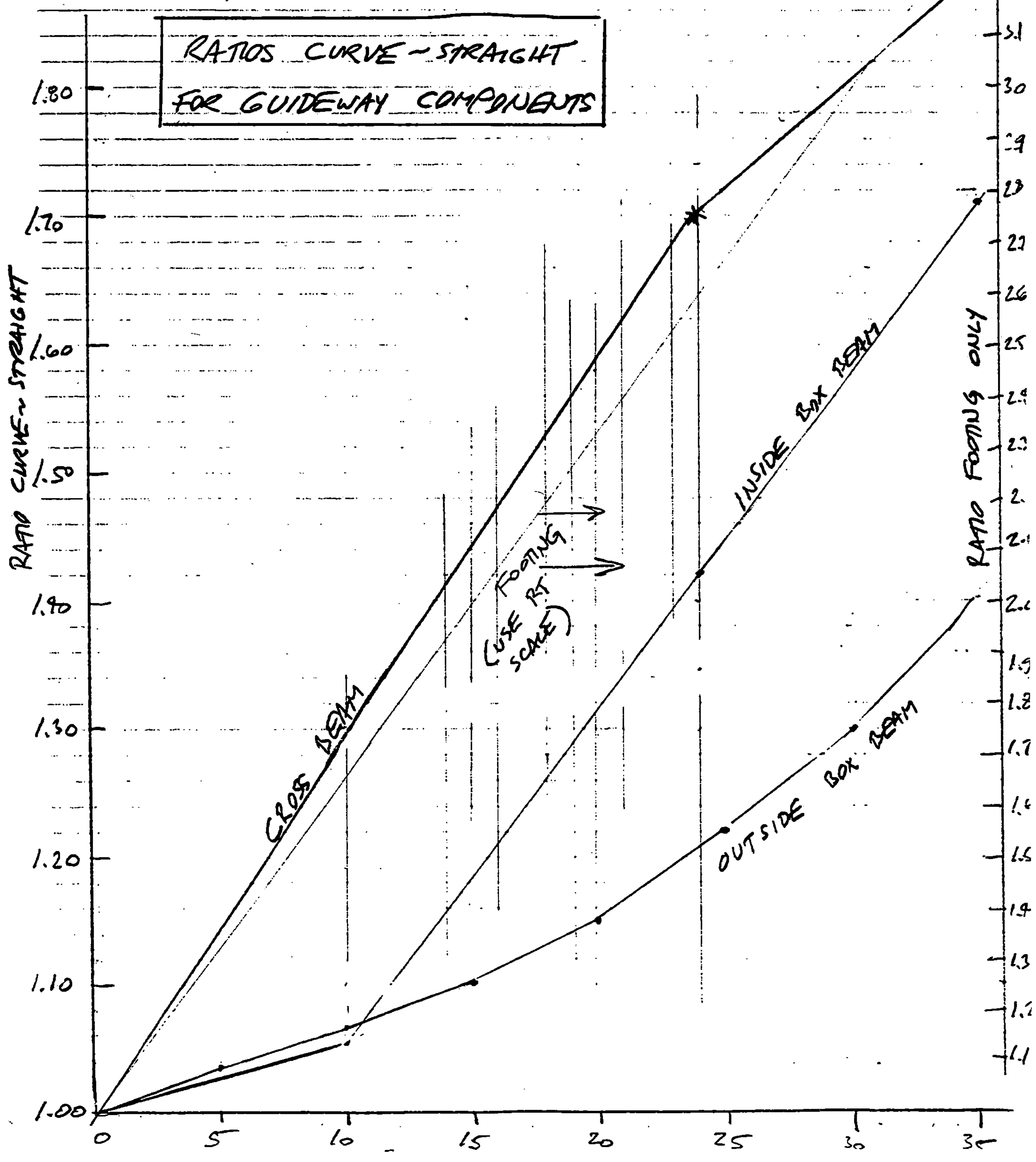
SHEET OF			DATE	DATE
J.O				

NAME OF COMPANY ____________ UNIT/S ________

SUBJECT MAGLEV



WEIGHTED FACTORS FOR CURVES

	WEIGHTING FACTOR	10 DEG RATIO	WTD FACTOR	14 DEG MULTP.	WTD FACTOR	15 DEG MULTP.	WTD FACTOR	16 DEG MULTP.	WTD FACTOR	18 DEG MULTP.	WTD FACTOR	19 DEG MULTP.	WTD FACTOR	20 DEG MULTP.	WTD FACTOR
FOUND	0.037	1.650	0.061	1.930	0.071	1.980	0.073	2.070	0.077	2.180	0.081	2.260	0.084	2.330	0.086
COLUMNS	0.057	1.000	0.057	1.000	0.057	1.000	0.057	1.000	0.057	1.000	0.057	1.000	0.057	1.000	0.057
CROSS BM	0.093	1.300	0.121	1.410	0.131	1.440	0.134	1.470	0.137	1.530	0.142	1.560	0.145	1.590	0.148
INS GUIDE	0.406	1.050	0.426	1.160	0.471	1.185	0.481	1.210	0.491	1.265	0.514	1.290	0.524	1.315	0.534
OS GUIDE	0.406	1.065	0.432	1.095	0.445	1.103	0.448	1.113	0.452	1.132	0.460	1.142	0.464	1.150	0.467
ALIGN	0.001	1.000	0.001	1.000	0.001	1.000	0.001	1.000	0.001	1.000	0.001	1.000	0.001	1.000	0.001
	1.000		1.099		1.176		1.194		1.214		1.254		1.274		1.293

	WEIGHTING FACTOR	30 DEG RATIO	WTD FACTOR	35 DEG MULTP.	WTD FACTOR	21 DEG MULTP.	WTD FACTOR	23 DEG MULTP.	WTD FACTOR	24 DEG MULTP.	WTD FACTOR	5 DEG MULTP.	WTD FACTOR
FOUND	0.037	3.000	0.111	3.400	0.126	2.380	0.088	2.530	0.094	2.600	0.096	1.330	0.049
COLUMNS	0.057	1.000	0.057	1.000	0.057	1.000	0.057	1.000	0.057	1.000	0.057	1.000	0.057
CROSS BM	0.093	1.810	0.168	1.920	0.179	1.620	0.151	1.680	0.156	1.700	0.158	1.140	0.106
INS GUIDE	0.406	1.580	0.641	1.710	0.694	1.340	0.544	1.393	0.566	1.421	0.577	1.025	0.416
OS GUIDE	0.406	1.300	0.528	1.410	0.572	1.168	0.474	1.195	0.485	1.210	0.491	1.035	0.420
ALIGN	0.001	1.000	0.001	1.000	0.001	1.000	0.001	1.000	0.001	1.000	0.001	1.000	0.001
	1.000		1.507		1.629		1.315		1.359		1.380		1.050

ML FACT 9/15/92

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5 E-60

FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

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FINAL			DATE 7-24-92	DATE
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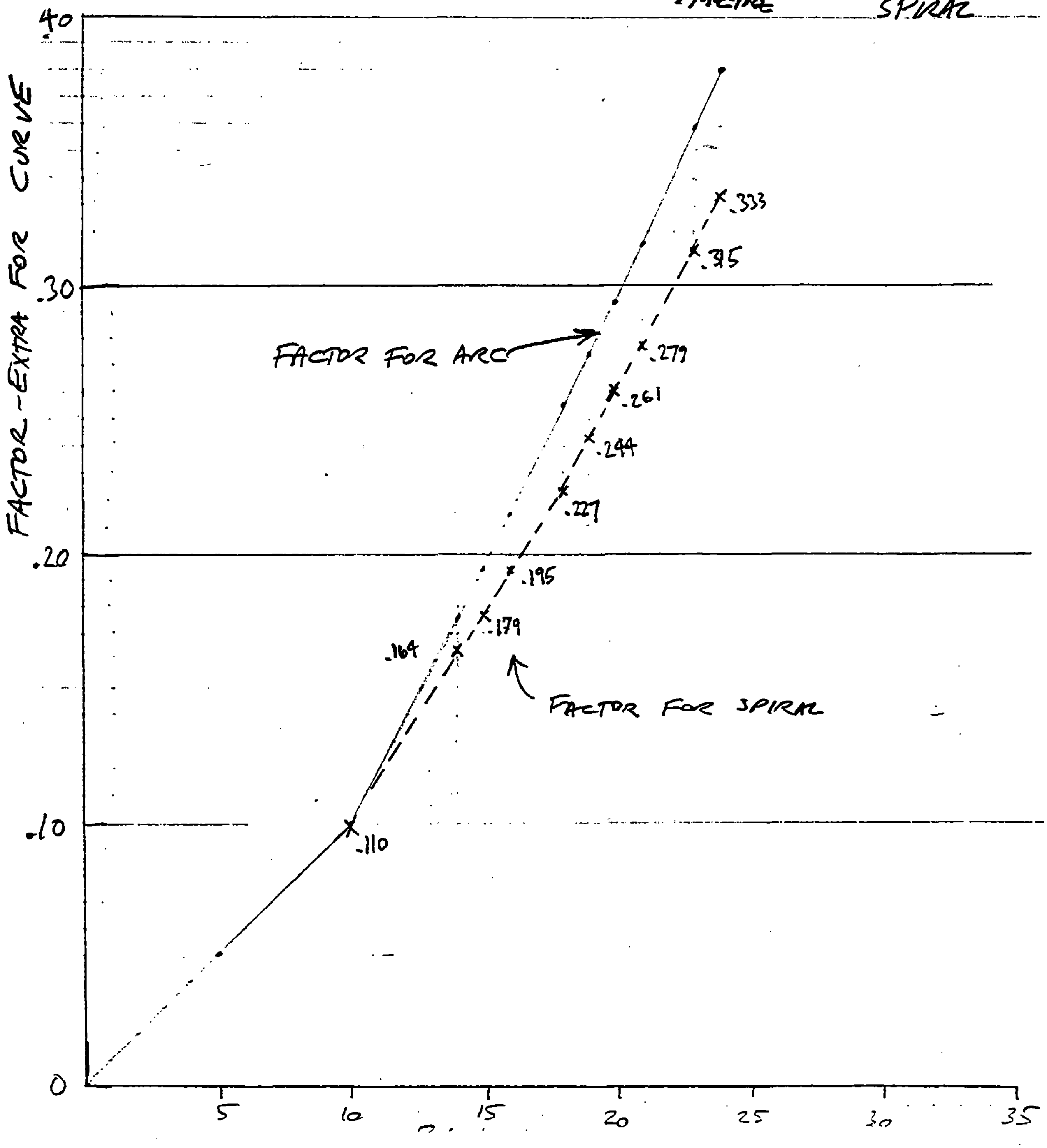
SHEET OF			DATE	DATE
J.O				

NAME OF COMPANY ______ UNIT/S ______

SUBJECT MAGLEV

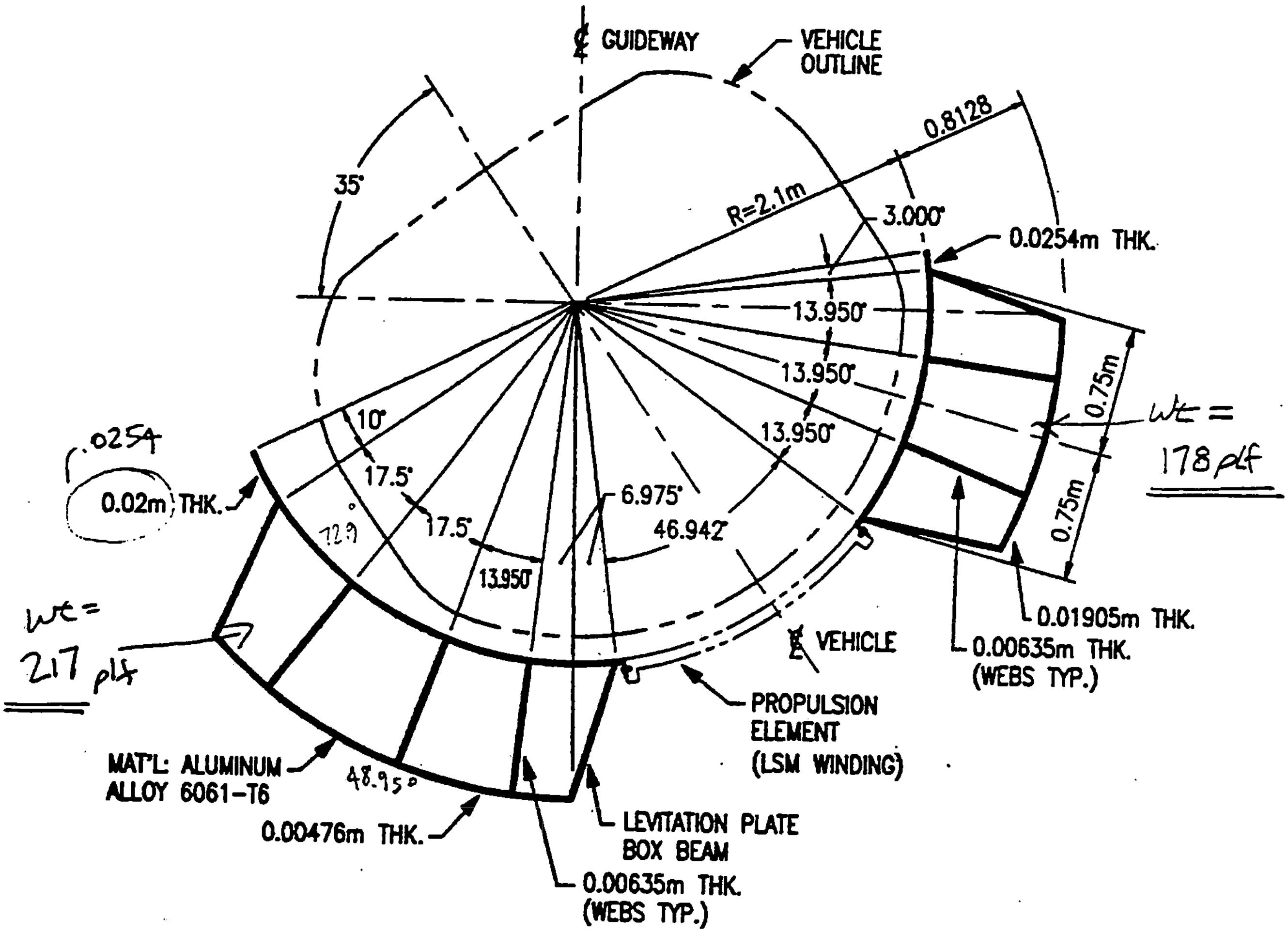
FACTOR - EXTRA COST FOR CURVE/METRE FOR ARC & SPIRAL



6 E-61

COMPILATION OF CURVE COSTS FOR THE HYPOTHETICAL ROUTE

POSITION (STATION)	PI #	L ea spiral	L ea arc	BANK AGL	FACTOR for spiral	FACTOR for arc	L SPIRAL* FACTOR	L ARC* FACTOR
9	1	213	66	24	0.333	0.380	70.929	25.080
16	2	175	0	20	0.261	0.293	45.675	0.000
22	3	282	337	24	0.333	0.380	93.906	128.060
33	4	337	536	24	0.333	0.380	112.221	203.680
40	5	261	681	24	0.333	0.380	86.913	258.780
54	6	301	257	24	0.333	0.380	100.233	97.660
62	7	105	0	14	0.164	0.176	17.220	0.000
72	8	320	466	24	0.333	0.380	106.560	177.080
81	9	337	361	24	0.333	0.380	112.221	137.180
96	10	209	0	21	0.279	0.315	58.311	0.000
101	11	238	198	24	0.333	0.380	79.254	75.240
107	12	261	629	24	0.333	0.380	86.913	239.020
117	13	279	0	23	0.315	0.359	87.885	0.000
124	14	282	207	24	0.333	0.380	93.906	78.660
132	15	282	573	24	0.333	0.380	93.906	217.740
144	16	337	361	24	0.333	0.380	112.221	137.180
154	17	175	0	16	0.227	0.214	39.725	0.000
166	18	209	0	19	0.244	0.274	50.996	0.000
173	19	261	53	24	0.333	0.380	86.913	20.140
182	20	337	187	24	0.333	0.380	112.221	71.060
188	21	157	0	15	0.179	0.194	28.103	0.000
198	22	337	12	24	0.333	0.380	112.221	4.560
206	23	238	67	24	0.333	0.380	79.254	25.460
212	24	183	0	18	0.227	0.254	41.541	0.000
217	25	105	0	14	0.164	0.176	17.220	0.000
221	26	337	12	24	0.333	0.380	112.221	4.560
231	27	261	472	24	0.333	0.380	86.913	179.360
238	28	320	701	24	0.333	0.380	106.560	266.380
243	29	261	53	24	0.333	0.380	86.913	20.140
256	30	337	187	24	0.333	0.380	112.221	71.060
262	31	279	0	23	0.315	0.359	87.885	0.000
273	32	282	85	24	0.333	0.380	93.906	32.300
278	33	282	207	24	0.333	0.380	93.906	78.660
285	34	261	158	24	0.333	0.380	86.913	60.040
294	35	301	187	24	0.333	0.380	100.233	71.060
304	36	262	0	21	0.279	0.315	73.098	0.000
313	37	337	12	24	0.333	0.380	112.221	4.560
324	38	262	0	21	0.279	0.315	73.098	0.000
333	39	157	0	15	0.179	0.194	28.103	0.000
340	40	320	73	24	0.333	0.380	106.560	27.740
350	41	175	0	16	0.195	0.214	34.125	0.000
356	42	70	0	10	0.110	0.099	7.700	0.000
365	43	314	0	24	0.333	0.380	104.562	0.000
373	44	337	710	24	0.333	0.380	112.221	269.800
380	45	282	268	24	0.333	0.380	93.906	101.840
388	46	301	117	24	0.333	0.380	100.233	44.460
398	47	175	0	16	0.195	0.214	34.125	0.000
405	48	369	154	24	0.333	0.380	122.877	58.520
420	49	584	202	24	0.333	0.380	194.472	76.760
434	50	754	119	24	0.333	0.380	251.082	45.220
449	51	953	1,141	24	0.333	0.380	317.349	433.580
469	52	1,066	680	24	0.333	0.380	354.978	258.400
SUMS		15,860.000	10,529.000				5,014.849	4,001.020



35° BANK CURVE

MTD FOR 35° BANK CURVE - DOUBLE GUIDEWAY

ALUM BOX BEAMS : $(178+217)2 * \frac{5280}{2000} = 2086$ TN/MILE

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FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID			DATE	DATE
SHEET OF				
J.O				

NAME OF COMPANY ______ UNIT/S ______

SUBJECT ______

for ½ gallery "inside" section:

Length	9.144 m	30'	VOLUME
Long Crossection Area :			
72.9° top sheet $.0254 * \frac{72.9}{360}\overbrace{(2\pi * 2.1)}^{2.67}$	0.06787	0.7305	21.92
48.95° Bott sheet $.00476 * \frac{48.95}{360}\overbrace{(2\pi * (2.1 + .8128))}^{2.49}$	0.01145	0.1232	3.70
stiffeners $.00635 * 5(.8128)$	0.0258	0.2778	8.33
	0.10512		33.95 ft³
	vol = .9612 m³		

diaphragm stiff

depth = .8128 − (.0254 + .00476) = .7826

$2 * .7826(.01)\left(\frac{2.67+2.49}{2}\right) = 0.04038$ m³ — 1.426 ft³

extension $1 * 2.49 * .01 * .18 = 0.00448$ m³ — 0.158 ft³

stiff + alignment pls

$.18(.33).01 * 10 = 0.00594$ — 0.210 ft³

Base ℓ $.0127(2.49).33 * 1 = .0104$ — 0.369 ft³

Splice ℓ $(1.00).0254(2.67) = .0678$ — 2.395 ft³

1.090 m³ — 38.51 ft³

½ guideway

$* 169 / 30 =$ 217 PCF

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FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE) United Engineers & Constructors A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O				

NAME OF COMPANY ______ UNIT/S ______

SUBJECT ______

% INCREASE IN DL FOR 35° BANKED CURVE

for 1/2 guideway "Outside" section

			Volume
Length of section	9.144 m	30'	

Longitudinal cross-section Area.

top sheet	$\overbrace{\frac{44.85}{360}(2(2.1)\pi)}^{1.644}.0254 =$	0.04175	0.4494	13.48 ft³
Bottom sheet	$\overbrace{\frac{27.9}{360}(2(2.1+.8128)\pi)}^{1.418}.01905 =$	0.02701	0.2907	8.72
stiffeners	(4) .8128 (.00635) =	0.02065	0.2223	6.67
		.089405 m² vol = .8175		28.87

diaphram stiffeners 20 spcg 9.144 m 30'

depth = 0.8128-(.0254+.01905) = 0.7684

$2 \times 0.7684(.01)\left(\frac{1.644+1.418}{2}\right) =$	0.0235 m³	.830
6" extension $1 \times 1.418 \times .01 \times .18$ =	0.00255 m³	.090
Stiff ℞ (& align ℞)		
$.18(.33).01 \times 8$ =	0.00475 m³	.168
Base ℞ $.0127(1.418).33 \times 1$ =	0.00594 m³	.210
splice ℞ $(1.00).0254)1.644$ =	0.04176 m³	1.475
	0.896 m³	31.643 ft³

ONE HALF GUIDEWAY

$\times .169 / 30$

178 plf

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United Engineers & Constructors
A Raytheon Company

PAGE ______

JOB NO. 6869002 DATE 7/20/92 BY RJC CH'K ______

CUSTOMER MIT MI PROJECT MAGLEV

SUBJECT GUIDEWAY SHEET SECTION IN CURVE

$R = 2.1\ m \quad (82.677")$

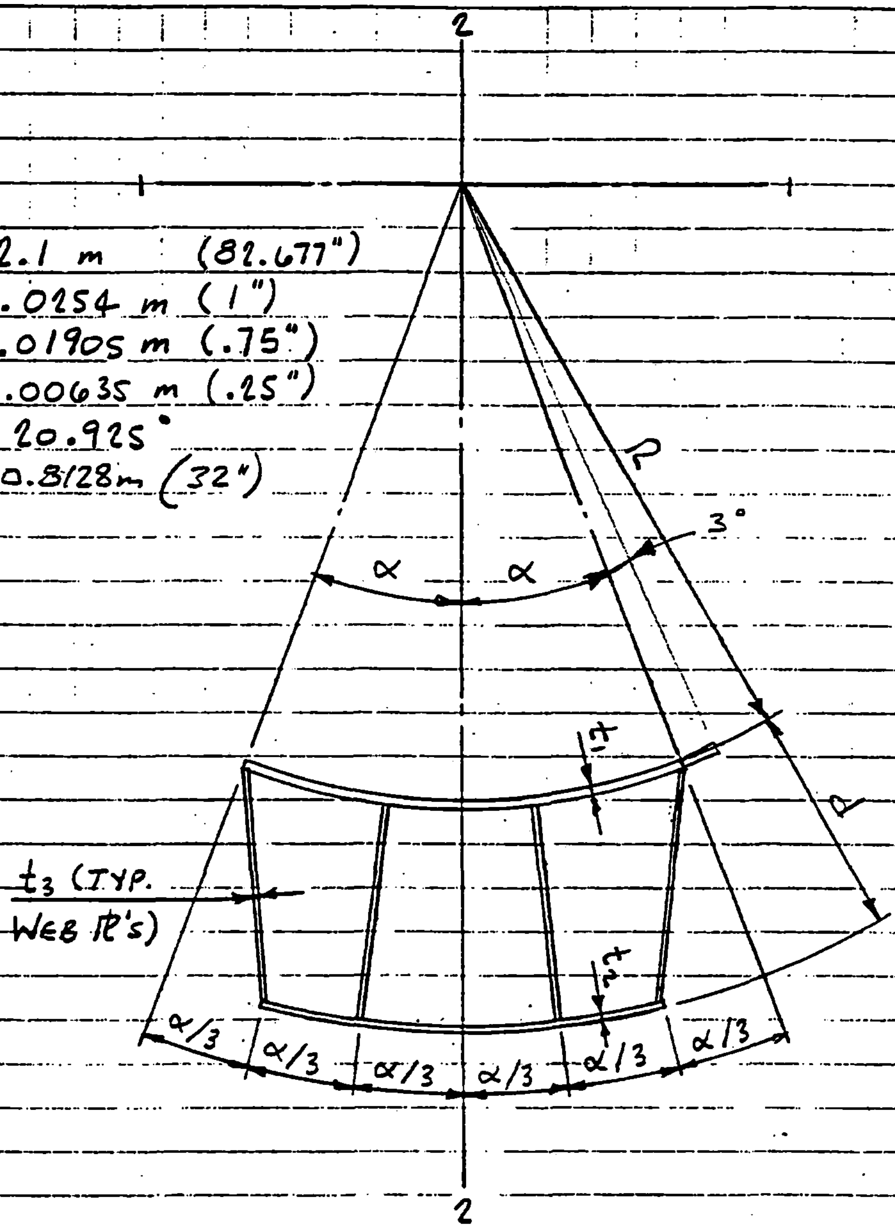
$t_1 = .0254\ m\ (1")$

$t_2 = .01905\ m\ (.75")$

$t_3 = .00635\ m\ (.25")$

$\alpha = 20.925°$

$d = 0.8128m\ (32")$



LEVITATION BOX BEAM

MAGNEPLANE COST OF SWITCH (GUIDEWAY COMPONENTS ONLY)

ALUMINUM
SWITCH HEIGHT - 17 FT (5.18M)
STRAIGHT LINE LENGTH - 1772 FT (540M)

ITEM	UNITS	UNIT PRICE	QTY/ SWITCH	COST/ SWITCH
EXCAV	CY	1.95	1.674	3,269
CONCRETE	CY	134.72	939	126,502
BACKFILL	CY	8.90	735	6,539
COLUMN	CY	728.81	257	187,304
CROSSBM	CY	530.96	1,339	710,955
ALUM FAB	TON	8279.46	486	4.023.818
AL DEL&ER	TON	240.56	486	116,912
ALIGNMT	LF	1.50	3,543	5,300
MOB&DEMOB		5%		259,030
TOTAL				5,439,629

NOTE THAT THIS IS TOTAL COST OF A SWITCH THAT "REPLACES" 540 m OF GUIDEWAY

THEREFORE, TO GET Δ COST OF A SWITCH, THE COST OF 540 m OF GUIDEWAY SHOULD BE SUBTRACTED.

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FORM 5007 REV. 7/79 **GENERAL COMPUTATION SHEET**

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID				
SHEET OF			DATE	DATE
J.O	68690			

NAME OF COMPANY ______ UNIT/S ______

SUBJECT ______

MTO FOR MAG SWITCH 1/2

ASSUME 17' ABOVE GRADE, BASE ON SINGLE GUIDEWAY

FOOTINGS — SAME PROPORTION INCREASE AS COLUMNS

COLUMNS : ea 33"ø x 14.4' = 3.17 cy

STRAIGHT RUN: 540/9.14 = 59 ea

BRANCH 340 → 540 = 200/9.14 = 22 ea

81 x 3.17 → 257 cy

CROSS BEAMS

0 137 SF x 33/12/27 = 14 cy

150 [3.3 + (1.4 − .85)] = 14.3 * 33/12 * 4/27 = 5.8 cy Δ.

250 [.36] → 15.48 * 33/12 * 4/27 = 6.3 cy Δ.

390 3.8 → (14.3 + 12.5) * 33/12 * 4/27 = 10.9 cy Δ.

460 Δ_{390} [.5] * 33/12 * 4/27 = 0.7 cy Δ_{390}

540 2* 14

Δft

0

492/30 [14 + 5.8/2] = 277.2

150

328/30 [14 + 5.8 + 1] = 227.4

250

459/30 [14 + 6.3 + 2.3] = 345.8

390

230/30 [14 + 10.9 + .35] = 193.6

460

262/30 2*(14 + 5.8/2) = 295.2

540

1339 cy → 1339 cy

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FORM 5007 REV. 7/79 GENERAL COMPUTATION SHEET

(DISCIPLINE)

United Engineers & Constructors
A Raytheon Company

NAME OF COMPANY ______ UNIT/S ______

SUBJECT MTO MAGSWITCH 2/2

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	DATE	DATE
FINAL				
VOID			DATE	DATE
SHEET	OF			
J.O	6869002			

ALUM BOX BEAMS [WORK in METERS] $2 * \frac{1.28}{18.29} = 0.14\ m^2$

$m^2/m = .14/3 = .047$

	m	m^2	m^3
0			
	150	.14 * 1.5	31.5
150			
	140	.28	39.2
290			
	100	.28 + .14/2	35.0
390			
	70	.14*3	29.4
460			
	80	.28 + .14/2	23.0
540			163.1

TONS/m^3 $\frac{671}{.14(1609.3)} = 2.978$

163.1 * 2.978 → 485.7 TONS

FOOTINGS Rate based on column cy based on 30' span Aluminum MH

ex 3608 $\frac{257}{554}$ → 1674 cy

concrete 2024 $\frac{257}{554}$ → 939 cy

backfill 1584 $\frac{257}{554}$ → 735 cy

ALIGNMENT USE 2*

[540] → 1772 * 2 → 3543 LF

Client: MAGNEPLANE INTL
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS
Facility: TUNNEL DOUBLE GUIDWAY EXCAVATED
WBS 1232-10 10M DIA.

LF = N/A

United Engineers & Constructors

WESTERN OPERATIONS
Rev No.:
Job No.: 6869.002

Date: 17-Jul-92
Priced By: WWS

				Manhours				Compounded Mark-Ups	Totals			
WBS	ACCT	Description	Quantity U/M	per unit	total	$/MH	MATL Unit	SUBS Unit 126.000%	Labor	Material	Subs	Total
1232-10	A	EXCAVATION	343,200 CY	0.037	12,698	$21.07		2.44	$337,109		$1,055,134	$1,392,243
1232-10	A	HAUL	310,900 CY	0.059	18,343	$18.40		3.37	$425,264		$1,320,144	$1,745,408
1232-10	A	BACKFILL	32,300 CY	0.067	2,164	$20.00		4.17	$54,533		$169,711	$224,244
1232-10	A	SHEET PILING	343,200 SF					6			$2,594,592	$2,594,592
1232-10	A	WATER PROOFING	646,000 SF					0.69			$561,632	$561,632
1232-10	A	SURVEY	1 LOT					23000			$28,980	$28,980
1232-10	B	BOTTOM SLAB	20,900 CY	3.500	73,150	$21.75	77.00	2	$2,004,676	$2,027,718	$52,668	$4,085,062
1232-10	B	WALLS	17500 CY	5.33	93,275	$21.75	127.00	8	$2,556,201	$2,800,350	$176,400	$5,532,951
1232-10	B	TOP SLAB	10700 CY	6.06	64,842	$21.75	120.00	6	$1,776,995	$1,617,840	$80,892	$3,475,727
1232-10	C	WALKWAY	10,560 LF	0.300	3,168	$21.75	35.00		$86,819	$465,696		$552,515
1232-10	F	LIGHTING	10,560 LF	1.520	16,051	$25.60	21.00		$517,741	$279,418		$797,159
1232-10	K	VENTILATION	10,560 LF	2.560	27,034	$25.50	142.00		$868,602	$1,889,395		$2,757,997
CRAD	C	STR STEEL CRADLE	704 TN	12.200	8,589	$21.75	1358.00	47	$235,382	$1,204,600	$41,691	$1,481,673
AGRS	C	ALUM. GUIDE RAIL	1,128 TN			$23.75	6571.00			$9,339,231		$9,339,231
AGRS	C	ALUM. GUIDE RAIL	1,128 TN	6.656	7,508	$23.75		32.836	$224,677		$46,669	$271,346
AGRS	C	ALUM. GUIDE RAIL	10,560 LF	0.050	528	$23.75			$15,800			$15,800
SUBTOTAL					327,350				$9,103,799	$19,624,248	$6,128,513	$34,856,560
		MOBILIZATION & DEMOBILIZATION	5%		16,368				$455,190	$981,212	$306,426	$1,742,828
TOTAL		TUNNEL DOUBLE GUIDWAY EXCAVATED			671,068	$27.81			$18,662,788	$40,229,708	$12,563,452	$36,599,388

NOTES:

(1) COSTS PER MILE
(2) EXCLUDES CONTINGENCY WHICH WILL BE ADDED ON GRAND TOTAL OF ESTIMATE (WITH OTHER COMPONENTS)

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Client: MAGNEPLANE INTL.
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS
Facility: TUNNEL DOUBLE GUIDWAY EXCAVATED
WBS 1232-10 10M DIA.

United Engineers & Constructors
WESTERN OPERATIONS
Job No.: 6869.002
Date: 17-Jul-92
Priced By: WWS

WBS	DESCRIPTION	QTY	UofM	UNIT RATE	TOTAL
1232-10	EXCAVATION	343,200	CY	$4	$1,392,243
1232-10	HAUL	310,900	CY	$6	$1,745,408
1232-10	BACKFILL	32,300	CY	$7	$224,244
1232-10	SHEET PILING	343,200	SF	$8	$2,594,592
1232-10	WATER PROOFING	646,000	SF	$1	$561,632
1232-10	SURVEY	1	LOT	$28,980	$28,980
1232-10	BOTTOM SLAB	20,900	CY	$195	$4,085,062
1232-10	WALLS	17,500	CY	$316	$5,532,951
1232-10	TOP SLAB	10,700	CY	$325	$3,475,727
1232-10	WALKWAY	10,560	LF	$52	$552,515
1232-10	LIGHTING	10,560	LF	$75	$797,159
1232-10	VENTILATION	10,560	LF	$261	$2,757,997
CRAD	STR STEEL CRADLE	704	TN	$2,105	$1,481,673
AGRS	ALUM. GUIDE RAIL	1,128	TN	$8,279	$9,339,231
AGRS	ALUM. GUIDE RAIL	1,128	TN	$241	$271,346
AGRS	ALUM. GUIDE RAIL	10,560	LF	$1	$15,800
SUBTOTAL					$34,856,560
MOBILIZATION & DEMOBILIZATION		0		5%	$1,742,828
TOTAL					$36,599,388

NOTES:
(1) COSTS PER MILE
(2) EXCLUDES CONTINGENCY WHICH WILL BE ADDED ON GRAND TOTAL OF ESTIMATE (WITH OTHER COMPONENTS)

Client: MAGNEPLANE INTL.
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS
Facility: TUNNEL BORED DOUBLE
WBS 1234-10 10M DIA.

LF = N/A

United Engineers & Constructors

WESTERN OPERATIONS
Rev No.:
Job No.: 6869.002

Date: 17-Jul-92
Priced By: WWS

WBS	ACCT	Description	Quantity U/M	Manhours per unit	Manhours total	Manhours $/MH	MATL Unit	SUBS Unit	Compounded Mark-Ups 126.000%	Totals Labor	Totals Material	Totals Subs	Totals Total
1233-10	A	EXCAVATION	288,000 CY					52.4				$19,014,912	$19,014,912
1233-10	A	LINER	718,080 SF	0.192	137,512	$21.75	2.50			$3,768,516	$2,261,952		$6,030,468
1233-10	A	ROCK BOLTS	42,240 EA	4.500	190,080	$21.75	44.00			$5,209,142	$2,341,786		$7,550,928
1233-10	A	HAUL ROCK	288,000 CY					7.1				$2,576,448	$2,576,448
1233-10	A	WATER PROOFING	2 LOT					550600				$1,387,512	$1,387,512
1233-10	A	DRAINAGE	10,560 LF	0.500	5,280	$26.00	5.00			$172,973	$66,528		$239,501
1233-10	A	SURVEY	2 LOT					19000				$47,880	$47,880
1233-10	B	FOOTING/WALKWAY	11,616 CY	1.000	11,616	$21.75	69.24	2.84		$318,336	$1,013,408	$41,567	$1,373,311
1233-10	C	CATWALK	10,560 LF	0.300	3,168	$21.75	35.00			$86,819	$465,696		$552,515
1233-10	F	LIGHTING	10,560 LF	0.950	10,032	$25.60	13.00			$323,592	$172,973		$496,565
1233-10	K	VENTILATION	10,560 LF	1.600	16,896	$25.50	71.00			$542,868	$944,698		$1,487,566
CRAD	C	STR STEEL CRADLE	704 TN	12.200	8,589	$21.75	1358.00	47		$235,382	$1,204,600	$41,691	$1,481,673
AGRS	C	ALUM. GUIDE RAIL	1,128 TN			$23.75	6571.00				$9,339,231		$9,339,231
AGRS	C	ALUM. GUIDE RAIL	1,128 TN	6.656	7,508	$23.75		32.836		$224,677		$46,669	$271,346
AGRS	C	ALUM. GUIDE RAIL	10,560 LF	0.050	528	$23.75				$15,800			$15,800
SUBTOTAL					391,209					$10,898,105	$17,810,872	$23,156,679	$51,865,656
		MOBILIZATION & DEMOBILIZATION	5%		19,560					$544,905	$890,544	$1,157,834	$2,593,283
		TOTAL TUNNEL BORED DOUBLE			410,769	$27.86				$11,443,010	$18,701,416	$24,314,513	$54,458,939

NOTES:

(1) COSTS PER MILE

(2) EXCLUDES CONTINGENCY WHICH WILL BE ADDED ON GRAND TOTAL OF ESTIMATE (WITH OTHER COMPONENTS)

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E-72
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Client: MAGNEPLANE INTL.
Project: MAGLEV
Location: U S A
Account: ALL ACCOUNTS
Facility: TUNNEL BORED DOUBLE
WBS 1234-10 10M DIA.

United Engineers & Constructors
WESTERN OPERATIONS
Job No.: 6869.002

Date: 17-Jul-92
Priced By: WWS

WBS	DESCRIPTION	QTY	UofM	UNIT RATE	TOTAL
1233-10	EXCAVATION	288,000	CY	$66	$19,014,912
1233-10	LINER	718,080	SF	$8	$6,030,468
1233-10	ROCK BOLTS	42,240	EA	$179	$7,550,928
1233-10	HAUL ROCK	288,000	CY	$9	$2,576,448
1233-10	WATER PROOFING	2	LOT	$693,756	$1,387,512
1233-10	DRAINAGE	10,560	LF	$23	$239,501
1233-10	SURVEY	2	LOT	$23,940	$47,880
1233-10	FOOTING/WALKWAY	11,616	CY	$118	$1,373,311
1233-10	CATWALK	10,560	LF	$52	$552,515
1233-10	LIGHTING	10,560	LF	$47	$496,565
1233-10	VENTILATION	10,560	LF	$141	$1,487,566
CRAD	STR STEEL CRADLE	704	TN	$2,105	$1,481,673
AGRS	ALUM. GUIDE RAIL	1,128	TN	$8,279	$9,339,231
AGRS	ALUM. GUIDE RAIL	1,128	TN	$241	$271,346
AGRS	ALUM. GUIDE RAIL	10,560	LF	$1	$15,800
SUBTOTAL					$51,865,656
	MOBILIZATION & DEMOBILIZATION			5%	$2,593,283
TOTAL					$54,458,939

NOTES:
(1) COSTS PER MILE
(2) EXCLUDES CONTINGENCY WHICH WILL BE ADDED ON GRAND TOTAL OF ESTIMATE (WITH OTHER COMPONENTS)

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ESTIMATE FOR EXIT

STAIRWAY TO GRADE

ITEM	UNITS	UNIT PRIC	QTY	COST
ALUM PLANK GRATING	SF	9.45	18	170
STAIR TREADS	EA	53.496	35	1,872
ALUM SUPPT FRAMING	TN	11173.05	2	22,346
HANDRAIL	LF	18.816	90	1,693
HINGE MECHANISM	EA	3594.78	1	3,595
MOB/DEMOB		5%		1,484
			TOTAL	31,161
	$/METER AT 762 M SPCG			41

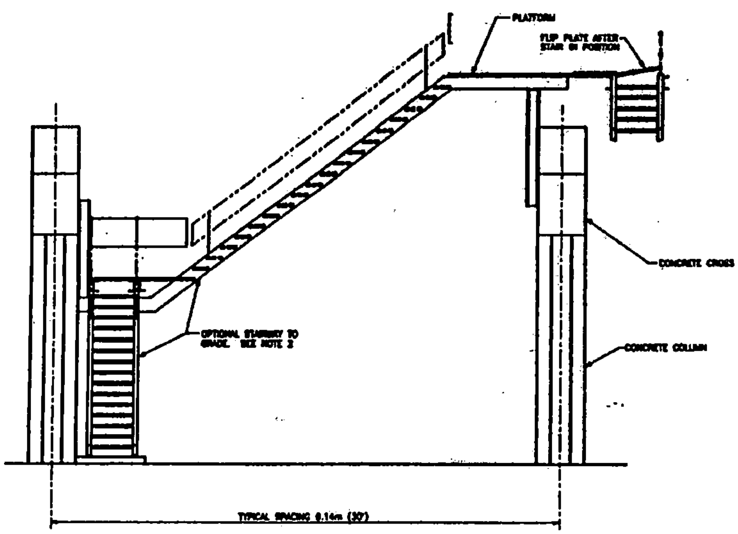
OPTIONAL; IE, NOT IN BASELINE

STAIR OUT OF GUIDEWAY TROUGH

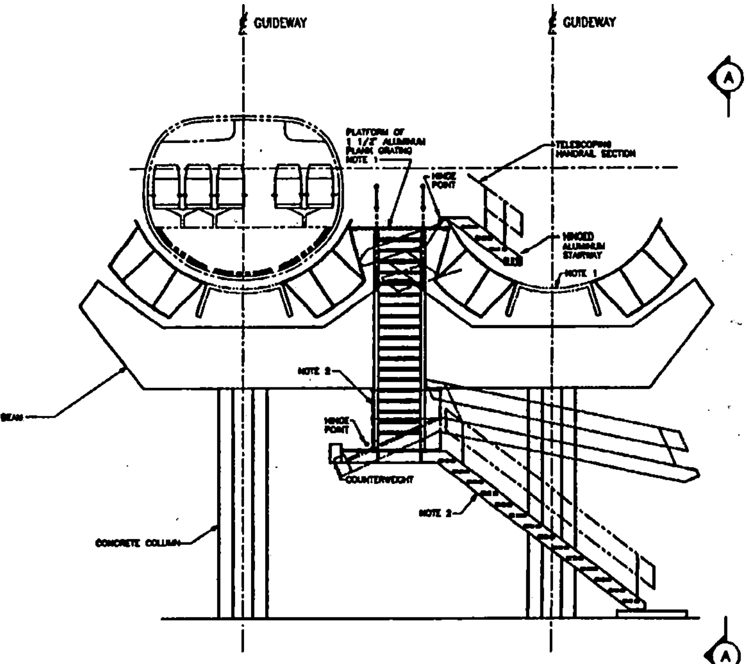
ITEM	UNITS	UNIT PRIC	QTY	COST
ALUM PLANK GRATING	SF	9.45	30	284
STAIR TREADS	EA	53.496	5	267
ALUM SUPPT FRAMING	TN	11173.05	0.065	726
HANDRAIL	LF	18.816	10	188
HINGE MECHANISM	EA	200	1	200
MOB/DEMOB		5%		83
			TOTAL	1,749
	$/METER AT 762 M SPCG			2

CATWALK BETWEEN GUIDEWAYS COST/METER

ALUM PLANK GRATING	SF	8.76	18	158
ALUM SUPPT FRAMING	TN	11173.05	0.0055	61
MOB/DEMOB		5%		11
		TOT $/METER (CONT)		230
$/METER FOR 40 METER PLATFORMS @ 762 M SPCG				12


PLATFORM
FLIP PLATE AFTER STAIR IN POSITION
CONCRETE CROSS
CONCRETE COLUMN
OPTIONAL STAIRWAY TO GRADE. SEE NOTE 2
TYPICAL SPACING 9.14m (30')

SECTION A-A



GUIDEWAY EMERGENCY EXIT TYPICAL

NOTES:

1. TYPICAL EMERGENCY EGRESS FROM VEHICLE IS FROM FORWARD / AFT DOORS TO GUIDEWAY TROUGH. THEN TO A PLATFORM VIA A HINGED ALUMINUM STAIRWAY. PLATFORMS SHALL BE LOCATED AT A MAXIMUM SPACING OF 762m (2500').

2. STAIRWAY SHOWN TO GRADE IS OPTIONAL. IF STAIRWAY TO GRADE IS NOT PROVIDED, THE PLATFORM LENGTH SHALL BE SUFFICIENT TO ACCOMODATE 142 PERSONS.

MAGNEPLANE INTERNATIONAL, INC.

National MAGLEV Initiative

U.S. Department of Transportation

Federal Railroad Administration | U.S. Army Corps of Engineers | U.S. Department of Energy

MAGLEV SYSTEM CONCEPT DEFINITION

EMERGENCY EXIT SECTIONS

COE – HUNTSVILLE CONTRACT No. DTFR 53-92-C-00006

DATE: 9/30/92 | SCALE: | DRAWING NO. S-11

E-76

System Concept Definition Report for the National Maglev Institute - Volume 7B:Supplement C: Backup Materials for Magway Structure-Part 2 of 2, Magneplane International, Inc, 1992 -