Certificate of Compliance - Design

To: The Senior Town Planner, Murray River Council
PO Box 906, Moama NSW 2731

From: Peter Bowman, Civil Engineer
13 Bath Lane
Kangaroo Flat Vic 3555

I prepared the design and I certify that the parts of the design described as:

Calculations for Mooring Pontoon & Walkway at Pericoota Station, Moama

comply with the following provisions of the Regulations:

AS 1170, AS 4100, AS 4600 & AS 5100

Design documents:

Calculations for Job No 4777, sheets 1 to 5 inclusive, plus printout, dated 22nd August 2022.

P.J. Bowman

Peter Bowman FIEAust CPEng NER

22ND. AUG. 2022

Date

BLA No. PE0000745 (Vic)

RPEQ 11685

Calculations for Mooring Pontoon & Walkway at Pericoota Station, Moama

Job No: 4777

For: Mr Barry Clark
c/- 445 High Street
Echuca Vic 3564

Date: 22nd August 2022

Refs: AS 1170
AS 4100
AS 4600
AustRoads Bridge Design Code

By: Peter Bowman FIE Aust CPEng NER

BLA No PE0000745 (Vic)

RPEQ 11685

ABN 27 791 389 359

13 Bath Lane
Kangaroo Flat Vic 3555

Ph: +61 438 087 101

PETER BOWMAN FIEAust CPEng

1.0 DATA

REFER TO MURRAY RIVER COUNCIL LETTER FROM THE SENIOR TOWN PLANNER DATED 24 JUNE 2022 FOR PAN-22/209, REQUESTING ADDITIONAL INFORMATION, IN PARTICULAR STRUCTURAL PLANS, CALCULATIONS AND CERTIFICATION OF THE PONTOON AND WALKWAY EXISTING ON SITE. ALSO REFER TO DRAWINGS BY EDG, DATED APRIL 2022, SHOWING THE PONTOON AND WALKWAY LAYOUT AND DIMENSIONS.

CHECK ADEQUACY OF PONTOON AND WALKWAY STRUCTURES.

NOTE: THE SITE IS NOT SUBJECT TO HIGH FLOW VELOCITIES, AND WATER LEVELS DO NOT RISE QUICKLY, AS FLOOD FLOWS TAKE WEEKS TO FLOW FROM UPSTREAM SOURCES, AND SPREADS WIDELY. IN THE EVENT OF A HIGH FLOW THE PONTOON CAN BE SEPARATED FROM THE WALKWAY AND AN Bra. CABLE MOORING RELEASED TO ALLOW THE PONTOON TO REST AGAINST THE RIVER BANK. THE WALKWAY CAN BE PULLED UP THE BANK BY A TRACTOR.

2.0 LOADS

WALKWAY
- SELF WT.
- FLOOR LOAD 4.0 KPa (AS 1170.1 - TABLE 3.1/C3 & AS 3962)
  BARRIERS 0.75 KN./m

PONTOON
- SELF WT.
  FLOATATION LOAD 3.0 KPa OVER WHOLE FLOOR
- STABILITY LOAD 2.0 KPa APPLIED TO MAXIMISE INSTABILITY.

3.0 CALCULATIONS

3.1 WALKWAY

DEAD LOAD (FLOOR PLATE) 0.1 KN./m.

LIVE LOAD 1.51 KN./m (PER SIDE)

REFER TO PRINTOUT NO. 4777B. C.S.R.'S FOR HORIZONTAL MEMBERS ARE:

TOP RAIL 1.22, MID RAIL 1.12, BOTTOM RAIL 1.37.

FOR OTHER MEMBERS C.S.A.'s (TYPICAL) ARE:

POSTS 1·57, DIAGONALS 1·31.

JUSTIFICATION FOR POSTS TO ACT AS LATERAL SUPPORTS FOR TOP RAILS:

$N_c^* = 47{\cdot}7$ kN., $0{\cdot}025 \times 47{\cdot}7 = 1{\cdot}19$ kN. REQUIRED LATERAL RESTRAINT.

AS 4100 CL. 5.4.3.2

FOR 76×38×2·5 RHS POST, ABOUT y–y AXIS,

$\phi M_{96} = 0{\cdot}9 \times \dfrac{350 \times 7810}{10^6} = 2{\cdot}46$ kN.m.

ϕ MOMENT IN POST ACTING AS RESTRAINT

$= 0{\cdot}87 \times 1{\cdot}19 = 1{\cdot}04$ kN.m.

$< 2{\cdot}46$ kN.m.

ADDING BARRIER LOAD TO POST, TOTAL MOMENT

$= 1{\cdot}04 + 1{\cdot}37 = 2{\cdot}41$ kN.m.

$< 2{\cdot}46$ kN.m.

$\therefore$ LATERAL RESTRAINT REQUIRED SATISFIED.

CHECK FLOOR PLATE:

CONSIDER PLATES 1340 m.m. LONG × 750 m.m. WIDE, FIXED ON SIDES & ONE END:

$\therefore \dfrac{a}{b} = \dfrac{1{\cdot}34}{0{\cdot}75} = 1{\cdot}79 \longrightarrow \alpha = 0{\cdot}037$, $\beta = 0{\cdot}084$

AISC MANUAL TABLE 3-23

$M_L^* = 0{\cdot}08 \times 1{\cdot}5 \times 4{\cdot}0 \times 0{\cdot}75^2 = 0{\cdot}28$ kN.m/m

$\phi \Delta = \dfrac{0{\cdot}037 \times 4{\cdot}0 \times 750^4}{2 \times 10^5 \times 3^3 \times 10^3} = 8{\cdot}7$ m.m.

$\left(\dfrac{SPAN}{86}\right)$

$\phi \phi M_L = 0{\cdot}9 \times 300 \times \dfrac{10^3 \times 3^2}{4 \times 10^6} = 0{\cdot}61$ kN.m/m.

$< M_L^*$

$\therefore$ 3 m.m. FLOOR PLATE O.K.

CONCLUSION: WALKWAY SUITABLE FOR 4·0 kPa. FLOOR LOAD & 0·75 kN/m BARRIER LOADS, WITH SUPPORTS AT ENDS ONLY.

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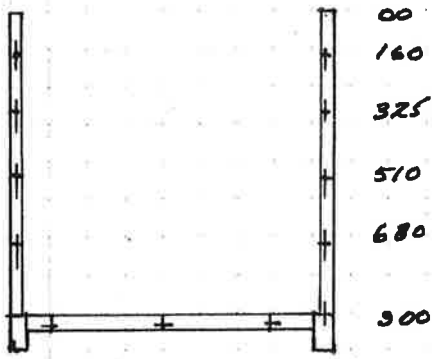
CHECK WALKWAY JOINTS:



DESIGN TENSION IN BOTTOM CHORDS = 74.8 KN. (EACH CHORD)

$N_{tf}^{x} = 2 \times 74.8 \times \frac{1}{(3 + 1.52 + 1.14 + 0.72 + 0.36)}$ = 22.8 KN.

∴ M12/4.6/S BOLTS O.K.

DESIGN MOMENT IN 45 x 45 x 6 EA = 0.075 x 22.8 = 1.71 KN.m.

CAPACITY = $\frac{0.9 \times 300 \times 6.88 \times 10^3}{10^6}$ = 1.86 KN.m.

> M^x ✓

3.2 PONTOON

DEAD LOAD (ESTIMATED) 1.5 TONNES (14.7 KN.)

LIVE LOAD 29.3 x 3.0 = 87.8 KN.

WALKWAY DEAD LOAD 5.1 KN.

TOTAL FLOTATION REQUIRED = 108 KN.

TANKS 1, 2 & 3 CAPACITY = 63.5 KN.

TANKS 4 & 5 CAPACITY = 44.5 KN.

$(3 \times 0.8 \times 0.74 \times 3.65 + 2 \times 0.8 \times 0.74 \times 3.85)$

FRAME STRUCTURE & CONNECTIONS TO BE CHECKED DURING PLANNED NON-USE PERIOD.

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BARRIER RAILINGS & POSTS

POST SPACING 1100 mm, HEIGHT O/A 930 mm.

$W_L^* = 1.5 \times 0.75 \times 1.1 = 1.24$ kN.

$W_S^* = 0.7 \times 0.75 \times 1.1 = 0.58$ kN.

$W_L^* < 9.6$ kN. & $W_S^* < 4.25$ kN.

∴ 50 x 25 x 2.0 RHS ON FLAT SUITABLE FOR RAILINGS.

FOR POSTS, $M^* = 1.1 \times 1.5 \times 0.75 \times 0.23$

$= 1.15$ kN.m.

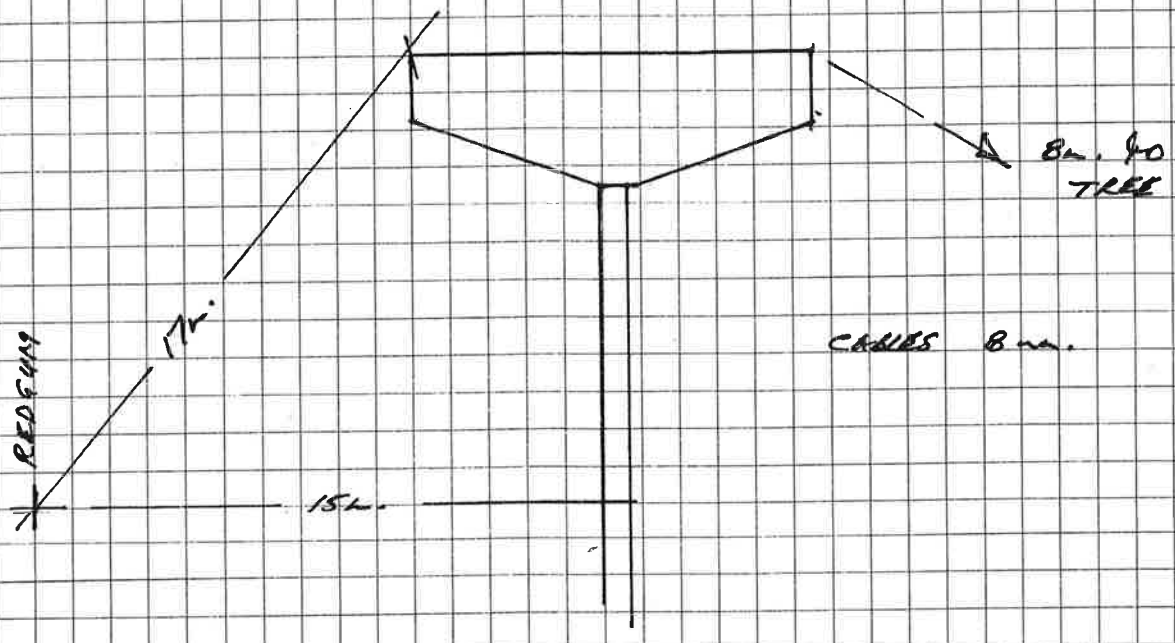
$\phi M_b = 0.90 \times 4.26 \times 10^3 \times \frac{350}{10^6} = 1.34$ kN.m.

∴ 50 x 25 x 2.0 RHS O.K. FOR STRENGTH FOR POSTS.

$\Delta_L = \frac{0.83 \times 10^3 \times 930^3}{3 \times 2 \times 10^5 \times 0.0828 \times 10^6} = 13.2$ mm. $\left(\frac{L}{70.5}\right)$ ✓

∴ 50 x 25 x 2.0 RHS O.K. FOR DEFLECTION.

3.3 POLYBOOM ANCHORAGE



FOR 3.0 KN/HR. VELOCITY & ROTATION HANGS FULLY SUBMERGED, TOTAL DRAG

Aust ROADS Cl. 2.10.3.1

$= 0.5 \times 1.4 \times 0.83^2 \times .5 \times 0.7 \times 0.80$

$= 1.43$ KN. (145 KG)

FOR 8 mm. CABLE, BREAKING FORCE = 3710 KG

TENSION IN CABLE ~ $\frac{145}{\sin 45^\circ} = 206$ KG.

< 3710 KG.

∴ ANCHORAGE CABLES O.K.

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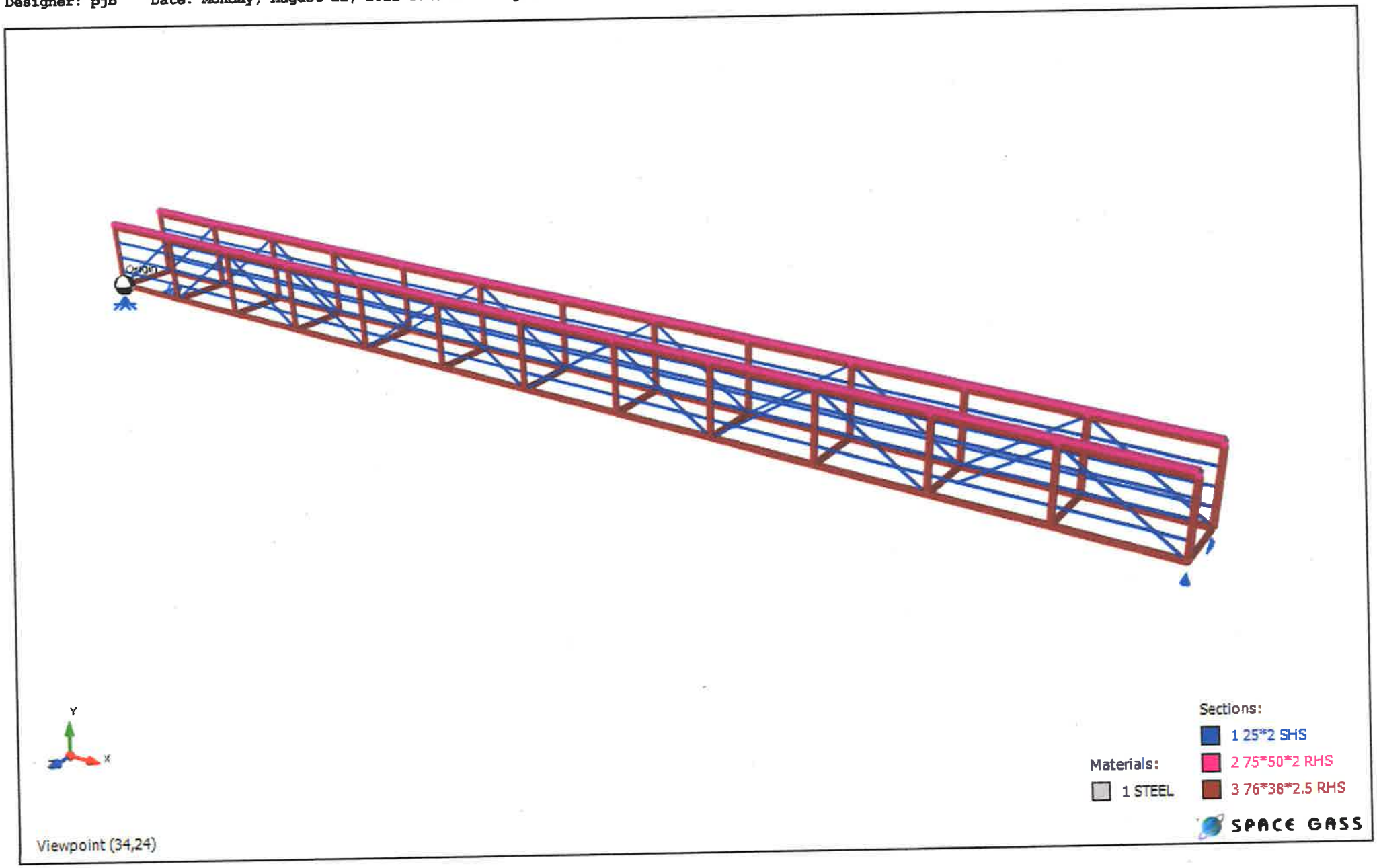
Y
X
Viewpoint (34,24)
Sections:
1 25*2 SHS
2 75*50*2 RHS
3 76*38*2.5 RHS
Materials:
1 STEEL
SPACE GASS

ANALYSIS STATUS REPORT

Job name 4777b
Location ..... C:\Users\Peter\Documents\SPACE GASS Data\Jobs

Length units	m
Section property units	mm
Material strength units	MPa
Mass density units	T/m^3
Temperature units	Celsius
Force units	kN
Moment units	kNm
Mass units	T
Acceleration units	g's
Translation units	mm
Stress units	MPa

Nodes	232	(32765)
Members	458	(32765)
Plates	0	(32765)
Restrained nodes	4	(32765)
Nodes with spring restraints	0	(32765)
Section properties	3	(5000)
Material properties	1	(999)
Constrained nodes	0	(32765)
Member offsets	0	(32765)
Node loads	0	(250000)
Prescribed node displacements	0	(250000)
Member concentrated loads	0	(250000)
Member distributed forces	76	(250000)
Member distributed torsions	0	(250000)
Thermal loads	0	(250000)
Member prestress loads	0	(250000)
Plate pressure loads	0	(250000)
Self weight load cases	1	(10000)
Combination load cases	2	(10000)
Load cases with titles	4	(10000)
Lumped masses	0	(250000)
Spectral load cases	0	(10000)
Static analysis	Y	
Dynamic analysis	N	
Response analysis	N	
Buckling analysis	N	
Ill-conditioned	N	
Non-linear convergence	Y	
Frontwidth	78	
Total degrees of freedom	1384	
Static load cases	2	(10000)
Mass load cases	1	(10000)

STEEL DESIGN STATUS REPORT

Members with design data	11	(32765)
Member design or check	C	AS4100
Connections with design data	0	(32765)
Connection design	N	

NODE COORDINATES (m)

Node	X Coord	Y Coord	Z Coord
3	0.000	0.000	0.000
4	15.660	0.000	0.000
5	0.000	0.933	0.000
18	7.660	0.000	0.000
35	15.660	0.000	-0.800
40	7.660	0.933	0.000

Node	X Coord	Y Coord	Z Coord
120	0.000	0.000	-0.800
122	0.000	0.933	-0.800

MEMBER DATA (deg,kNm/rad,m)
(F=Fixed, R=Released) (*=Cable length)

Memb	Dir Angle	Dir Node	Dir Axis	Memb Type	Node A	Node B	Sect	Mat	Node A Fixity	Node B Fixity	Length
18	0.00			Norm	16	18	3	1	FFFFFF	FFFFFF	1.340
241	0.00			Norm	134	137	3	1	FFFFFF	FFFFFF	1.340
298	0.00			Norm	173	181	2	1	FFFFFF	FFFFFF	1.340

NODE RESTRAINTS (kN/m,kNm/rad)
(F=Fixed, R=Released, S=Spring, *=General)

Node	Rest Code	X Axial Stiffness	Y Axial Stiffness	Z Axial Stiffness	X Rotation Stiffness	Y Rotation Stiffness	Z Rotation Stiffness
3	FFFRRR						
4	RFRRRR						
35	RFFRRR						
120	RFFRRR						

SECTION PROPERTIES (mm,mm^2,mm^4,deg)

Sect	Name	Mark	Shape	Source
1	25*2 SHS	S1	Square tube	Aust300
2	75*50*2 RHS	S2	Rect tube	Aust300
3	76*38*2.5 RHS	S3	Rect tube	Aust300

Sect	Area of Section	Torsion Constant	Y-Axis Mom of In	Z-Axis Mom of In	Y-Axis Shr Area	Z-Axis Shr Area	Princ Angle
1	1.7400E+02	2.5300E+04	1.4800E+04	1.4800E+04	Infinite	Infinite	0.00
2	4.7400E+02	4.1400E+05	3.7200E+05	1.9900E+05	Infinite	Infinite	0.00
3	5.2900E+02	3.2000E+05	1.2900E+05	3.8300E+05	Infinite	Infinite	0.00

Sect	Shape	Trans	Mir	Rotate	D	Bt/Bb	Btw/Bbw	Tt/Tb	Tw/Rr
1	Square tube	No	No	0.00	25.00	0.00	0.00	0.00	2.00
						0.00	0.00	0.00	2.00
2	Rect tube	Yes	No	0.00	75.00	50.00	0.00	0.00	2.00
						0.00	0.00	0.00	2.00
3	Rect tube	No	No	0.00	76.00	38.00	0.00	0.00	2.50
						0.00	0.00	0.00	2.50

MATERIAL PROPERTIES (MPa,T/m^3,strain/degC)

Matl	Material Name	Young's Modulus	Poisson's Ratio	Mass Density	Coeff of Expansion	Concrete Strength
1	STEEL	2.0000E+05	0.25	7.8500E+00	1.170E-05	

SELF WEIGHT (g's)

Load Case	X-Axis Accel'n	Y-Axis Accel'n	Z-Axis Accel'n
1	0.000	-1.000	0.000

COMBINATION LOAD CASES

Load case 3: 1.2G + 1.5Q

1.200 * Load case 1: Dead Loads
1.500 * Load case 2: Live Loads

Load case 4: G + Q

1.000 * Load case 1: Dead Loads
1.000 * Load case 2: Live Loads

LOAD CASE TITLES

Load Case	Title
1	Dead Loads
2	Live Loads
3	1.2G + 1.5Q
4	G + Q

NODE DISPLACEMENTS (mm,rad)

Load case 3 (Non-linear): 1.2G + 1.5Q
Non-linear (Small, Sec, Full): P-Δ, P-δ, 4 Itns, 99.992% Cnv (Def gov)

Node	X-Axis Transl'n	Y-Axis Transl'n	Z-Axis Transl'n	X-Axis Rotation	Y-Axis Rotation	Z-Axis Rotation
3	0.000	0.000	0.000	0.005	0.000	-0.009
4	7.905	0.000	0.003	0.005	0.001	0.008
5	7.009	-0.014	14.796	0.023	-0.003	-0.008
18	3.808	-45.852	2.497	0.012	0.000	-0.001
35	7.864	0.000	0.000	-0.005	0.000	0.009
40	4.537	-45.856	29.086	0.036	-0.001	-0.001
120	-0.023	0.000	0.000	-0.005	0.000	-0.009
122	6.549	-0.015	-14.161	-0.021	0.003	-0.008

Load case 4 (Non-linear): G + Q
Non-linear (Small, Sec, Full): P-Δ, P-δ, 3 Itns, 99.971% Cnv (Def gov)

Node	X-Axis Transl'n	Y-Axis Transl'n	Z-Axis Transl'n	X-Axis Rotation	Y-Axis Rotation	Z-Axis Rotation
3	0.000	0.000	0.000	0.003	0.000	-0.007
4	5.430	0.000	0.003	0.003	0.000	0.006
5	4.824	-0.010	9.920	0.015	-0.002	-0.006
18	2.620	-31.552	0.744	0.008	0.000	-0.001
35	5.432	0.000	0.000	-0.003	0.000	0.006
40	3.121	-31.555	18.147	0.024	-0.001	-0.001
120	-0.038	0.000	0.000	-0.003	0.000	-0.006
122	4.515	-0.010	-9.482	-0.014	0.002	-0.005

MEMBER FORCES AND MOMENTS (kN,kNm)

Load case 3 (Non-linear): 1.2G + 1.5Q
Non-linear (Small, Sec, Full): P-Δ, P-δ, 4 Itns, 99.992% Cnv (Def gov)

Memb	Node	Axial Force	Y-Axis Shear	Z-Axis Shear	X-Axis Torsion	Y-Axis Moment	Z-Axis Moment
18	16	-74.970	1.661	-0.053	-0.023	0.011	-0.161
	18	-74.970	-1.600	-0.053	-0.023	-0.018	-0.287
241	134	44.631	-0.012	0.037	-0.011	0.001	0.080
	137	44.631	-0.077	0.037	-0.011	0.001	0.091

Memb	Node	Axial Force	Y-Axis Shear	Z-Axis Shear	X-Axis Torsion	Y-Axis Moment	Z-Axis Moment
298	173	47.531	-0.020	0.795	-0.014	-0.170	0.030
	181	47.531	-0.078	-0.712	-0.014	-0.169	0.040

Load case 4 (Non-linear): G + Q
Non-linear (Small, Sec, Full): P-Δ, P-δ, 3 Itns, 99.971% Cnv (Def gov)

Memb	Node	Axial Force	Y-Axis Shear	Z-Axis Shear	X-Axis Torsion	Y-Axis Moment	Z-Axis Moment
18	16	-51.505	1.101	-0.013	-0.015	0.003	-0.113
	18	-51.505	-1.111	-0.013	-0.015	-0.005	-0.199
241	134	30.914	0.008	0.013	-0.006	0.000	0.056
	137	30.914	-0.046	0.013	-0.006	0.002	0.065
298	173	32.928	0.003	0.519	-0.007	-0.112	0.022
	181	32.928	-0.046	-0.486	-0.007	-0.108	0.029

NODE REACTIONS (kN,kNm)

Load case 3 (Non-linear): 1.2G + 1.5Q
Non-linear (Small, Sec, Full): P-Δ, P-δ, 4 Itns, 99.992% Cnv (Def gov)

Node	X-Axis Force	Y-Axis Force	Z-Axis Force	X-Axis Moment	Y-Axis Moment	Z-Axis Moment
3	0.000	20.738	-0.375	0.000	0.000	0.000
4	0.000	20.764	0.000	0.000	0.000	0.000
35	0.000	20.683	-0.012	0.000	0.000	0.000
120	0.000	20.740	0.387	0.000	0.000	0.000
Load	0.000	-82.926	0.000	0.000	0.000	0.000
Reac	0.000	82.926	0.000	0.000	0.000	0.000
Equil	-1.200E-11	0.000E+00	8.194E-12			
Resid	4.569E-12	2.685E-11	3.476E-11	9.317E-13	7.744E-15	1.527E-13

Load case 4 (Non-linear): G + Q
Non-linear (Small, Sec, Full): P-Δ, P-δ, 3 Itns, 99.971% Cnv (Def gov)

Node	X-Axis Force	Y-Axis Force	Z-Axis Force	X-Axis Moment	Y-Axis Moment	Z-Axis Moment
3	0.000	14.320	-0.312	0.000	0.000	0.000
4	0.000	14.307	0.000	0.000	0.000	0.000
35	0.000	14.321	-0.005	0.000	0.000	0.000
120	0.000	14.334	0.318	0.000	0.000	0.000
Load	0.000	-57.281	0.000	0.000	0.000	0.000
Reac	0.000	57.281	0.000	0.000	0.000	0.000
Equil	6.603E-12	0.000E+00	-3.173E-11			
Resid	4.384E-12	2.509E-11	2.022E-11	6.962E-13	3.608E-15	1.002E-13

STEEL MEMBER DESIGN DATA (m)

Restraint codes are:
F => Fixed restraint
P => Partial restraint
R => Fixed and rotational restraint
S => Partial and rotational restraint
L => Lateral restraint
U => Unrestrained
C => Continuous lateral restraint
I => Ignore segment

```
                Group: 1  HandrailL (top chord)
           Member list: 1,5,8,11,14,17,20,23,26,29,32,35,38
   Compr'n eff lengths: Major axis  => 0.090,       Minor axis  => 0.090
                                    (Unbraced)                   (Unbraced)
   Bending eff lengths: +ve bending => Calculate,  -ve bending => Calculate
Top flange restr pos'ns: 0.1,0.18,0.27,0.36,0.45,0.54,0.63,0.72,0.81,0.9
Bot flange restr pos'ns:
 Top flange restr types: FLLLLLLLLLLF
 Bot flange restr types: FF

                Group: 2  Bottom Chord
           Member list: 2,6,9,12,15,18,21,24,27,30,33
   Compr'n eff lengths: Major axis  => 0.090,       Minor axis  => 0.090
                                    (Unbraced)                   (Unbraced)
   Bending eff lengths: +ve bending => Calculate,  -ve bending => Calculate
Top flange restr pos'ns: 0.1,0.18,0.27,0.36,0.45,0.54,0.63,0.72,0.81,0.9
Bot flange restr pos'ns:
 Top flange restr types: FLLLLLLLLLLF
 Bot flange restr types: FF

                Group: 3  Top Chord
           Member list: 3,61,59,57,55,79,75,77,67,71,69,73
   Compr'n eff lengths: Major axis  => 0.090,       Minor axis  => 0.090
                                    (Unbraced)                   (Unbraced)
   Bending eff lengths: +ve bending => Calculate,  -ve bending => Calculate
Top flange restr pos'ns: 0.09,0.18,0.27,0.36,0.45,0.54,0.63,0.72,0.81,0.9
Bot flange restr pos'ns:
 Top flange restr types: FLLLLLLLLLLF
 Bot flange restr types: FF

                Group: 4  Post
           Member list: 4,131,82,180
   Compr'n eff lengths: Major axis  => 1.000,       Minor axis  => 0.250
                                    (Unbraced)                   (Unbraced)
   Bending eff lengths: +ve bending => Calculate,  -ve bending => Calculate
Top flange restr pos'ns: 0.25,0.5,0.75
Bot flange restr pos'ns: 0.25,0.5,0.75
 Top flange restr types: FLLLF
 Bot flange restr types: FLLLF

                Group: 7  Post
           Member list: 7,134,85,183
   Compr'n eff lengths: Major axis  => 1.000,       Minor axis  => 0.250
                                    (Unbraced)                   (Unbraced)
   Bending eff lengths: +ve bending => Calculate,  -ve bending => Calculate
Top flange restr pos'ns: 0.25,0.5,0.75
Bot flange restr pos'ns: 0.25,0.5,0.75
 Top flange restr types: FLLLF
 Bot flange restr types: FLLLF

                Group: 19  Post
           Member list: 19,150,101,199
   Compr'n eff lengths: Major axis  => 1.000,       Minor axis  => 0.250
                                    (Unbraced)                   (Unbraced)
   Bending eff lengths: +ve bending => Calculate,  -ve bending => Calculate
Top flange restr pos'ns: 0.25,0.5,0.75
Bot flange restr pos'ns: 0.25,0.5,0.75
 Top flange restr types: FLLLF
 Bot flange restr types: FLLLF

                Group: 22  Post
           Member list: 22,154,105,203
   Compr'n eff lengths: Major axis  => 1.000,       Minor axis  => 0.250
                                    (Unbraced)                   (Unbraced)
   Bending eff lengths: +ve bending => Calculate,  -ve bending => Calculate
Top flange restr pos'ns: 0.25,0.5,0.75
Bot flange restr pos'ns: 0.25,0.5,0.75
 Top flange restr types: FLLLF
 Bot flange restr types: FLLLF
```

```
                Group: 41  Diagonal
          Member list: 41,181,83,132
   Compr'n eff lengths: Major axis  => 0.250,       Minor axis  => 0.250
                                      (Unbraced)                  (Unbraced)
   Bending eff lengths: +ve bending => Calculate,  -ve bending => Calculate
Top flange restr pos'ns: 0.25,0.5,0.75
Bot flange restr pos'ns: 0.25,0.5,0.75
 Top flange restr types: FLLLF
 Bot flange restr types: FLLLF

                Group: 42  Diagonal
          Member list: 42,185,87,136
   Compr'n eff lengths: Major axis  => 0.250,       Minor axis  => 0.250
                                      (Unbraced)                  (Unbraced)
   Bending eff lengths: +ve bending => Calculate,  -ve bending => Calculate
Top flange restr pos'ns: 0.25,0.5,0.75
Bot flange restr pos'ns: 0.25,0.5,0.75
 Top flange restr types: FLLLF
 Bot flange restr types: FLLLF

                Group: 46  Diagonal
          Member list: 46,152,103,201
   Compr'n eff lengths: Major axis  => 0.250,       Minor axis  => 0.250
                                      (Unbraced)                  (Unbraced)
   Bending eff lengths: +ve bending => Calculate,  -ve bending => Calculate
Top flange restr pos'ns: 0.25,0.5,0.75
Bot flange restr pos'ns: 0.25,0.5,0.75
 Top flange restr types: FLLLF
 Bot flange restr types: FLLLF

                Group: 47  Diagonal
          Member list: 47,205,107,156
   Compr'n eff lengths: Major axis  => 0.250,       Minor axis  => 0.250
                                      (Unbraced)                  (Unbraced)
   Bending eff lengths: +ve bending => Calculate,  -ve bending => Calculate
Top flange restr pos'ns: 0.25,0.5,0.75
Bot flange restr pos'ns: 0.25,0.5,0.75
 Top flange restr types: FLLLF
 Bot flange restr types: FLLLF
```

Group	Str Grade	Units	Load Height Pos'n	Scan Code	Angle Type	End Conn	Ecc Eff	Design Crit	Bolts in Cross Section	NZS3404 Seismic Spec
1	Norm	Ratio	Top	AG		Con	Yes	Weight	None	N/A
2	Norm	Ratio	Top	AG		Con	Yes	Weight	None	N/A
3	Norm	Ratio	Top	AG		Con	Yes	Weight	None	N/A
4	Norm	Ratio	Centre	AG		Con	Yes	Weight	None	N/A
7	Norm	Ratio	Centre	AG		Con	Yes	Weight	None	N/A
19	Norm	Ratio	Centre	AG		Con	Yes	Weight	None	N/A
22	Norm	Ratio	Centre	AG		Con	Yes	Weight	None	N/A
41	Norm	Ratio	Centre	AG		Con	Yes	Weight	None	N/A
42	Norm	Ratio	Centre	AG		Con	Yes	Weight	None	N/A
46	Norm	Ratio	Centre	AG		Con	Yes	Weight	None	N/A
47	Norm	Ratio	Centre	AG		Con	Yes	Weight	None	N/A

AS4100 1998 STEEL MEMBER DESIGN NOTES

1. The sign convention used in this design report for cross section axes is shown below. Note that it is not the same as the sign convention used in the analysis.

   n - major geometric axis (or angle section short leg)
   p - minor geometric axis (or angle section long leg)
   x - major principal axis
   y - minor principal axis

2. Double angle sections are treated as solid Tee shapes.

3. Torsion moments are not considered.

4. Shear forces in the direction of the minor axis only are considered.

5. Items that affect the end connection of members such as block shear, bearing, tearing, bolts, welds, stiffeners and the like are considered to be part of the connection design rather than the member design and, as such, are not considered here.

6. Cantilevers cannot be automatically detected. ALWAYS check that the bending effective lengths calculated by the program for cantilevered members are correct.

7. Initial frame imperfections are not automatically allowed for. When applicable, you should apply notional horizontal forces or initial deformations to the analysis model in accordance with the requirements of the design code.

8. A component that provides full, partial or lateral restraint to a member is not automatically checked to see if it is capable of resisting the force required to provide such restraint. To check this, the restraint forces should be added to the applied loads.

AS4100 1998 STEEL MEMBER DESIGN SUMMARY (MPa,m) (*=Failure) (#=Warning)

Group	Section Name	Yield Str	Total Length	Seg Length	Failure Mode	Crit Case	Load Factor
1	76*38*2.5 RHS	350	15.660	2.975	Member	3	1.37
2	76*38*2.5 RHS	350	14.320	7.876	Member	3	1.12
3	75*50*2 RHS	350	15.660	15.660	Member	3	1.22
4	76*38*2.5 RHS	350	0.871	0.218	Section	3	2.15
7	76*38*2.5 RHS	350	0.871	0.218	Section	3	1.57
19	76*38*2.5 RHS	350	0.871	0.218	Section	3	1.62
22	76*38*2.5 RHS	350	0.871	0.218	Section	3	1.70
41	25*2 SHS	350	1.499	0.375	Member	3	1.31
42	25*2 SHS	350	1.499	0.375	Member	3	1.55
46	25*2 SHS	350	1.598	0.400	Member	3	5.43
47	25*2 SHS	350	1.632	0.408	Member	3	5.79

WEIGHTED AVERAGE LOAD FACTORS

Case	Mass	WALF
3	0.206	1.374