PROJECT :	Steel Pool Frame Engineering	**DATE :**	17-Jan-17
CLIENT :	Driclad Pool Technology Pty Ltd	**ENGINEER :**	SB
ADDRESS :	Varies	**PAGE :**	1 of 11
		JOB No. :	100653

REFERANCE CODES

AS 1170.0	General Principles
AS 1170.1	Structural Design Actions
AS 1170.2	Wind Actions
AS 1684	Residential timber framing code
AS 1720	Timber structures
AS 2870	Residential slabs & footings
AS 3600	Concrete Structures
AS 3633	Private Swimming Pools - Water Quality
AS 3700	Masonry structures
AS 3735	Concrete Structures for retaining liquids
AS 4100	Steel structures
AS 4600	Cold-formed Steel Structures
AS 4773	Masonry for small buildings

These computations have been prepared to indicate design intent. Where appropriate and necessary, shop drawings describing the detailed construction proposals shall be prepared and submitted to the Design Engineer for approval. These computations must be reproduced in full and not altered in any way.

ENGINEER :	Stuart Bridger	**CHECKER :**	Mario Aiezza
	B.Eng. (Civil)	**SUPERVISOR :**	

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Check Round Pool

Check largest diameter round pool, as that will result in the largest tensile force in the wall. Round Pools do not have any support frames

Design Data

Water Depth = 1.18m Pool Radius = 5.5m Pool Wall Thickness (t) = 0.4mm

Calculations

F= Circumferential Force P=Internal Pressure σ_θ= hoop stress r=radius

l = axial length of cylinder

$\sigma_\theta = F/(t \times l)$ $\sigma_\theta = (P \times r)/t$ $T=F/l$

$\sigma_\theta = F/(t \times l) = (P \times r)/t$ $\therefore$ $F/l = P \times r = T$

Water pressure = 9.81 x 1.18 = 11.58kN/m $\therefore$ average pressure = 9.81kN/m^2

Tension in Wall

T * = 9.81 x 5.5 = 54kN

Wall Capacity

Pool wall is grade 300 steel

$\Theta N_T = 0.9 \times 0.4 \times 1.18 \times 300 = 127.4$ kN $\therefore$ **Accept**

Check Join in Wall

Pool Wall Fixed by 62 M6 Bolts, 2 rows equally spaced down pool wall

$\Theta V_b = 0.6 \times C \times d_f \times t \times f_u$

$= 0.6 \times 3 \times 6 \times 0.4 \times 430 = 1.86$ kN

$\therefore$ Pool wall capacity = 1.86 x 62 = 115.17 kN $\therefore$ **Accept**

For Same reason either end of rain drop pool & oval pool do not need frames

Check Oval / Raindrop Pool Frames

Check Shallow End Frame

Check largest & smallest width tanks. All other widths of support frame will be considered acceptable. Pool Widths vary from 2.85m (min) to 5.5m (max)

Design Data

Water Depth = 1.18m Uprights - 75 x 3 SHS

Calculations

Hydrostatic Pressure = 0 kN/m (at the top of the wall)

= 9.81kN/m x 1.18m = 11.58 kN/m (at the base of the wall)

Load on Base Channel = 0.075 x 1.18 x 9.81 = 0.87kN/m

Import Frame into "Space Gass" software (See Next page for Results)

Results

Pool Deflection - 16.67mm x 1.18 = 19.67mm outwards (5.5m wide frame)

- 30.97mm x 1.18 = 36.54mm outwards (2.85 wide frame)

Although there is no deflection criteria for a structure of this type calculation have been done as a guide only. It should be noted that the post is weld at 88 degrees to the base as such after hydrostatic pressure the resultant lateral displacement is 4mm inwards (2.85 wide unit) or 22mm outwards (5.5m wide unit) . This is deemed acceptable

Bending moment on the uprights

M* = 2.69 kN.m/m x 1.18 = 3.17 kN.m

ΘM_b= 9.10 kN.m 75 x 3 SHS grade 450

Moment @ bolted connection = 2.18 kN.m/m x 1.18 = 2.57 kN.m

Leaver arm (spacing b/w bolts) = 250mm

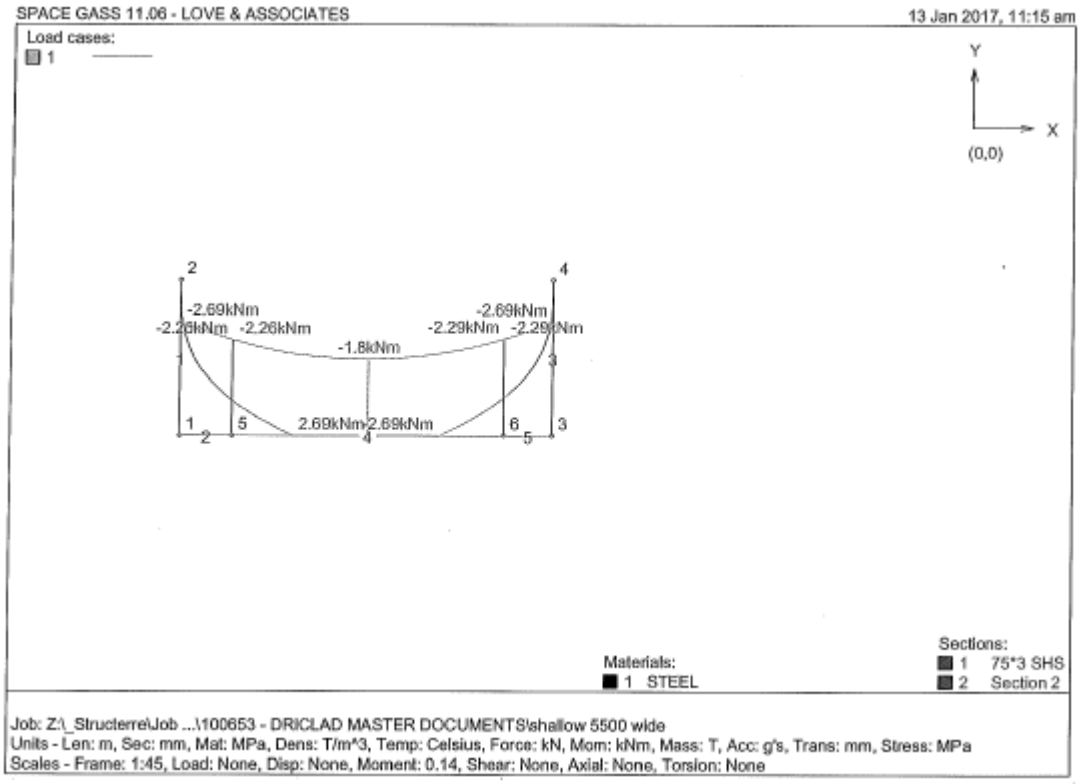
Bolt Shear capacity = 15.1 kN

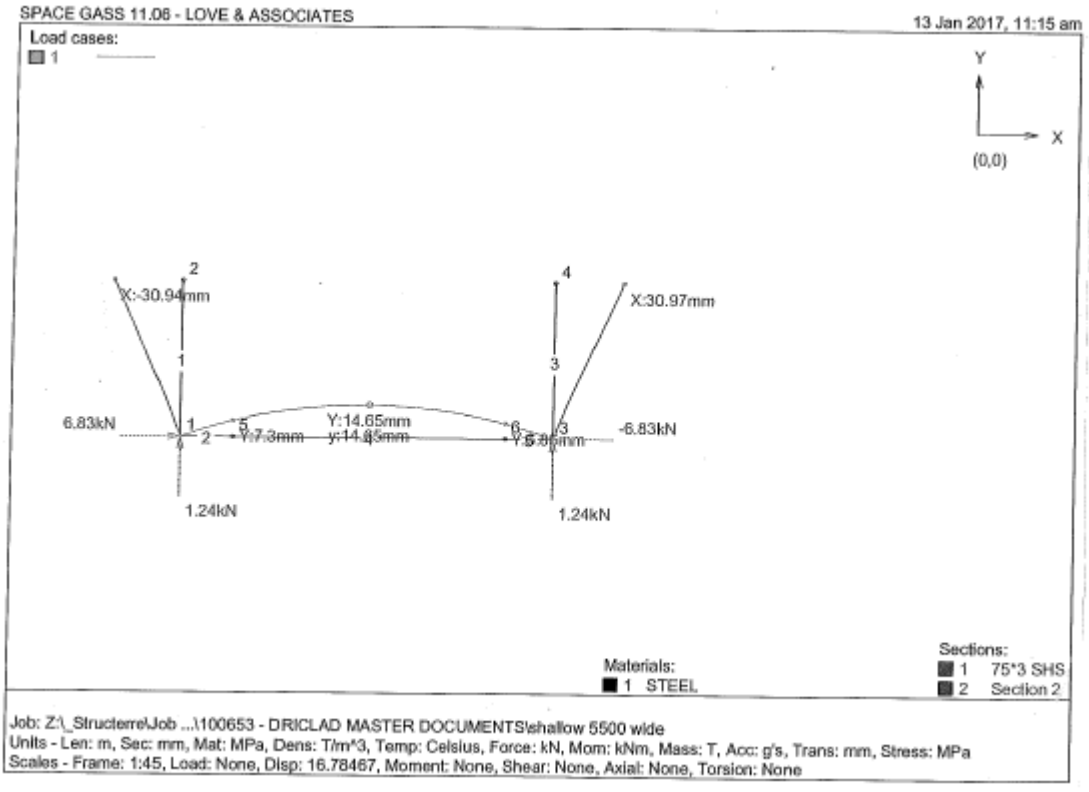
$\Theta V_b = 0.6 \times C \times d_f \times t \times f_u$

= 0.6 x 3 x 12 x 2.9 x 430 = 26.94 kN

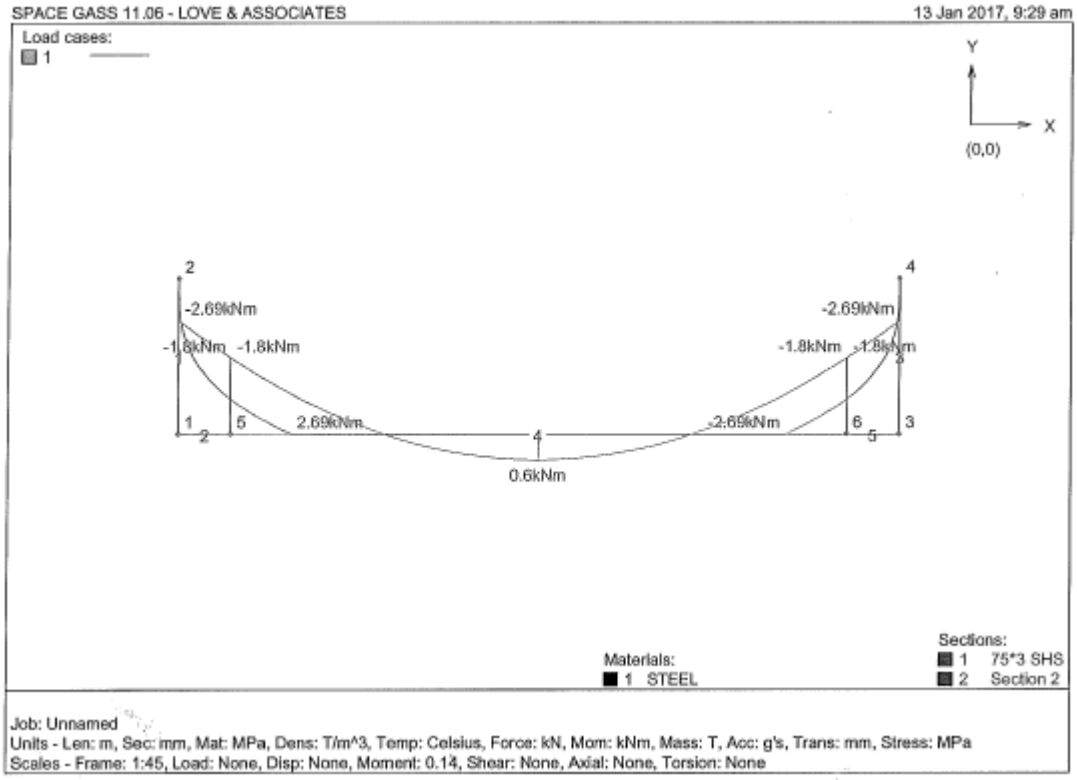
15.1 x 0.25 = 3.78 kN.m > 2.57 kN.m ∴ **Accept**

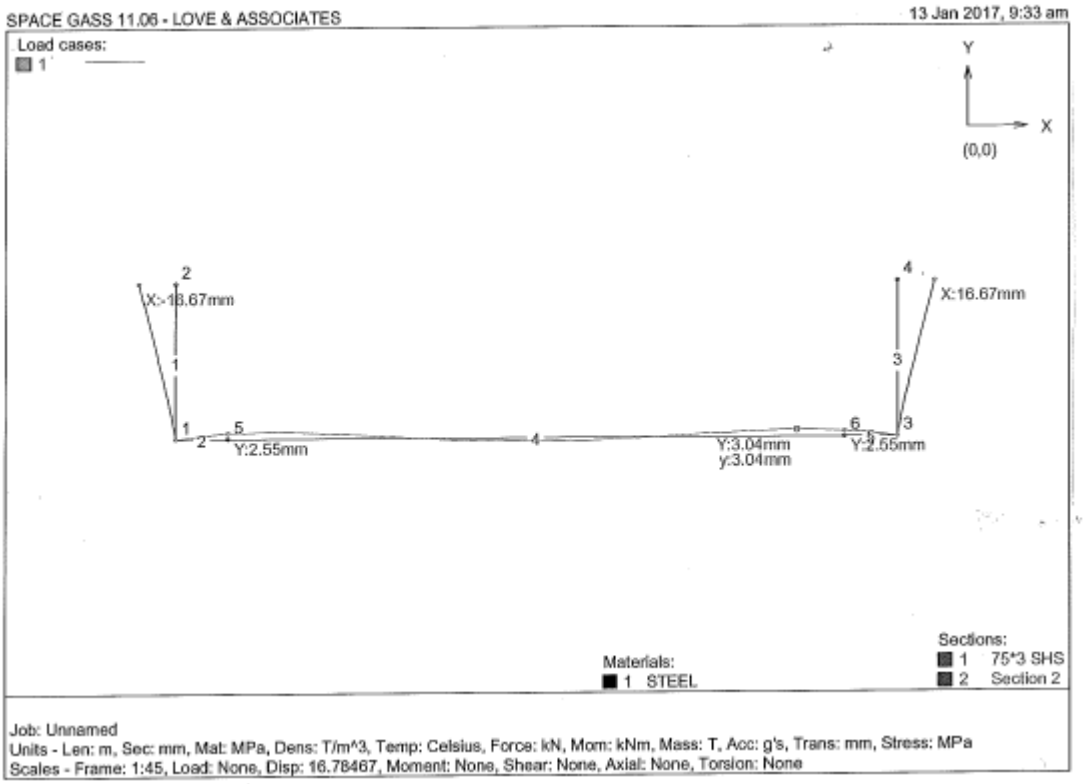
SPACE GASS RESULTS shallow frame 2.85m wide





SPACE GASS RESULTS shallow frame 5.50m wide





Check Oval / Raindrop Pool Frames

Check Deep End Frame

Check largest & smallest width tanks. All other widths of support frame will be considered acceptable. Pool Widths vary from 2.85m (min) to 4.66m (max)

Design Data

Water Depth = 1.78m Uprights - 75 x 3 SHS

Calculations

Hydrostatic Pressure = 0 kN/m (at the top of the wall)

= 9.81kN/m x 1.18m = 11.58 kN/m (at top of 45 degree bend in wall)

= 9.81kN/m x 1.78m = 17.46 kN/m (at base of 45 degree bend in wall)

Lateral Earth Pressure = 0.33 x 17.5 x 0.6 = 3.47 kN/m (at base of 45 degree bend in wall

Load on Base Channel = 0.075 x 1.18 x 9.81 = 0.87kN/m

Import Frame into "Space Gass" software (See Next page for Results)

Results

Pool Deflection - 10.11mm x 1.18 = 11.93mm outwards (4.66m wide frame)

- 9.49mm x 1.18 = 11.20mm outwards (2.85 wide frame)

This is deemed acceptable

Bending moment on the uprights

M* = 2.69 kN.m /m x 1.18 = 3.17 kN.m

ΘM_b= 9.10 kN.m 75 x 3 SHS grade 450

Moment @ bolted connection = 0.8 kN.m/m x 1.18 = 0.94kN.m

Leaver arm (spacing b/w bolts) = 250mm

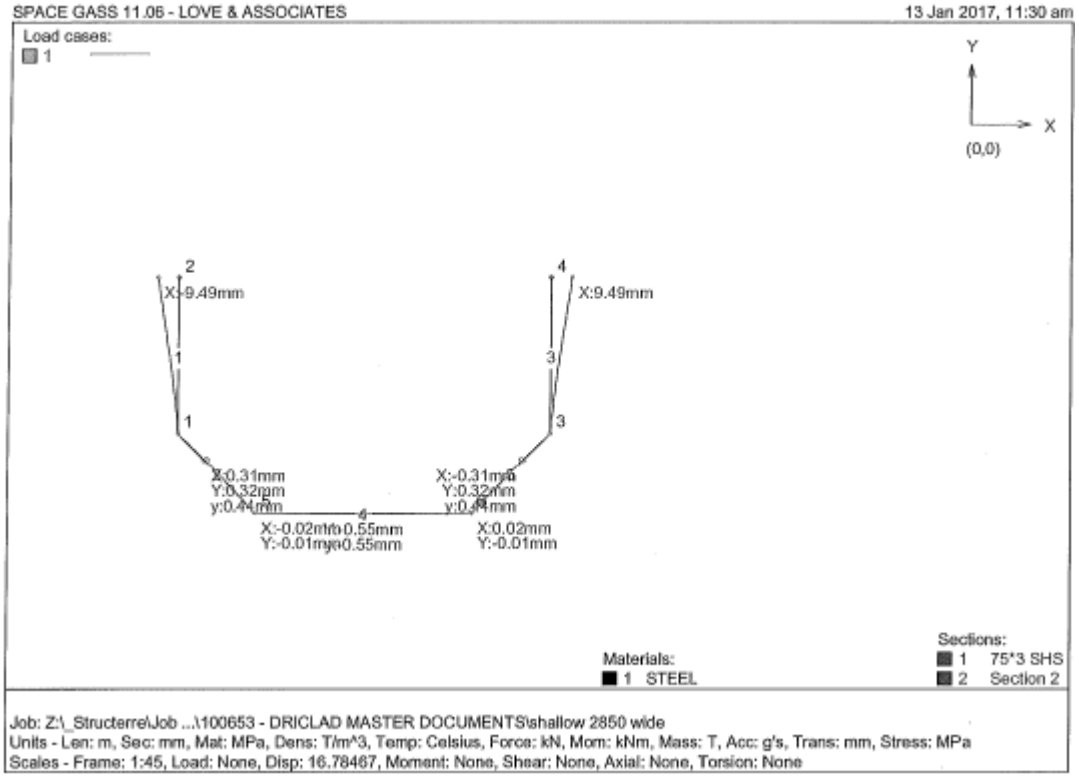
Bolt Shear capacity = 15.1 kN

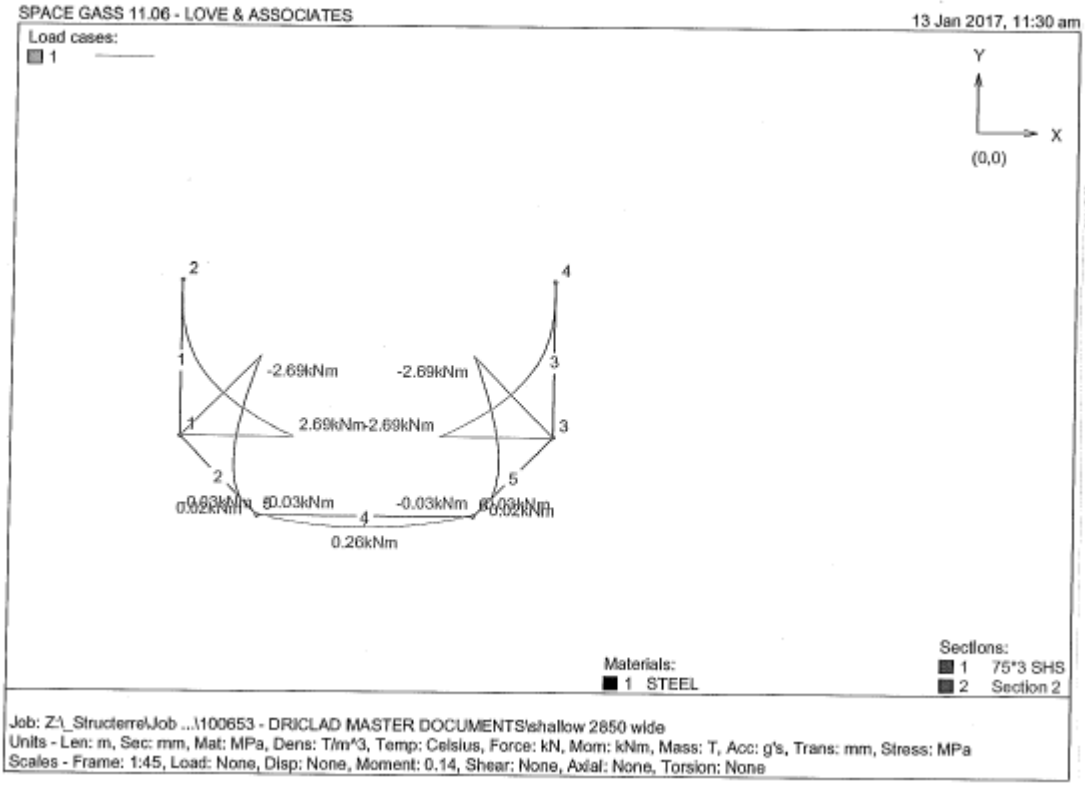
$\Theta V_b = 0.6 \times C \times d_f \times t \times f_u$

= 0.6 x 3 x 12 x 2.9 x 430 = 26.94 kN

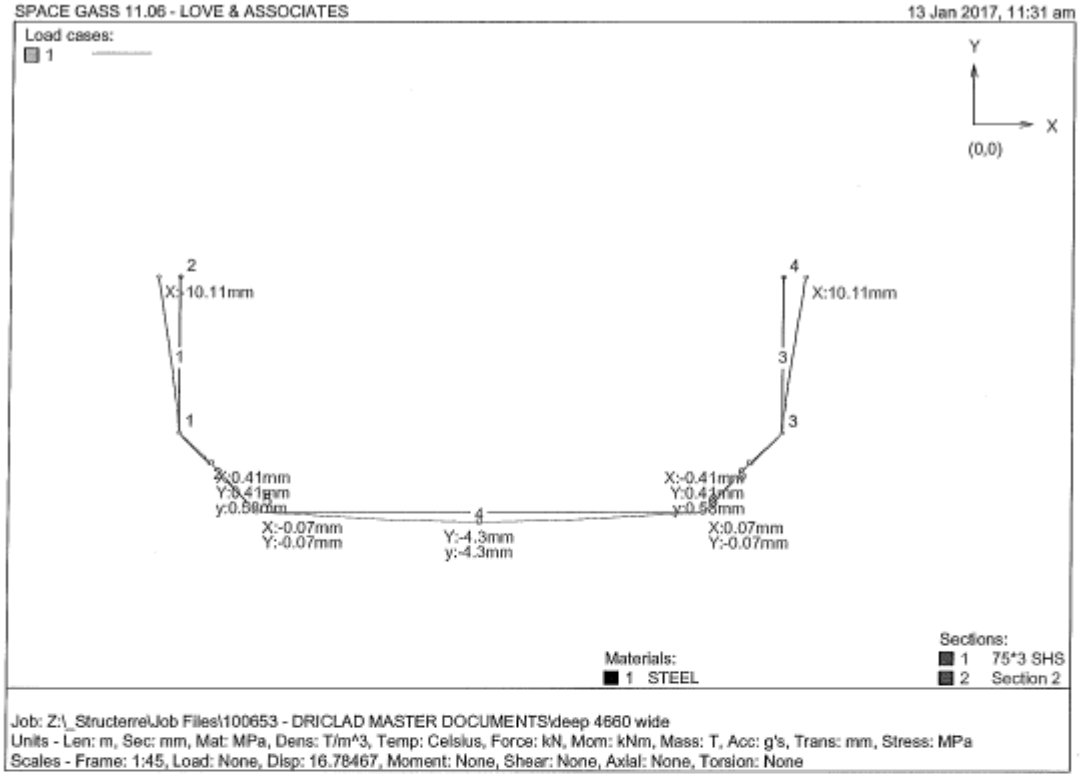
15.1 x 0.25 = 3.78 kN.m > 0.94 kN.m ∴ **Accept**

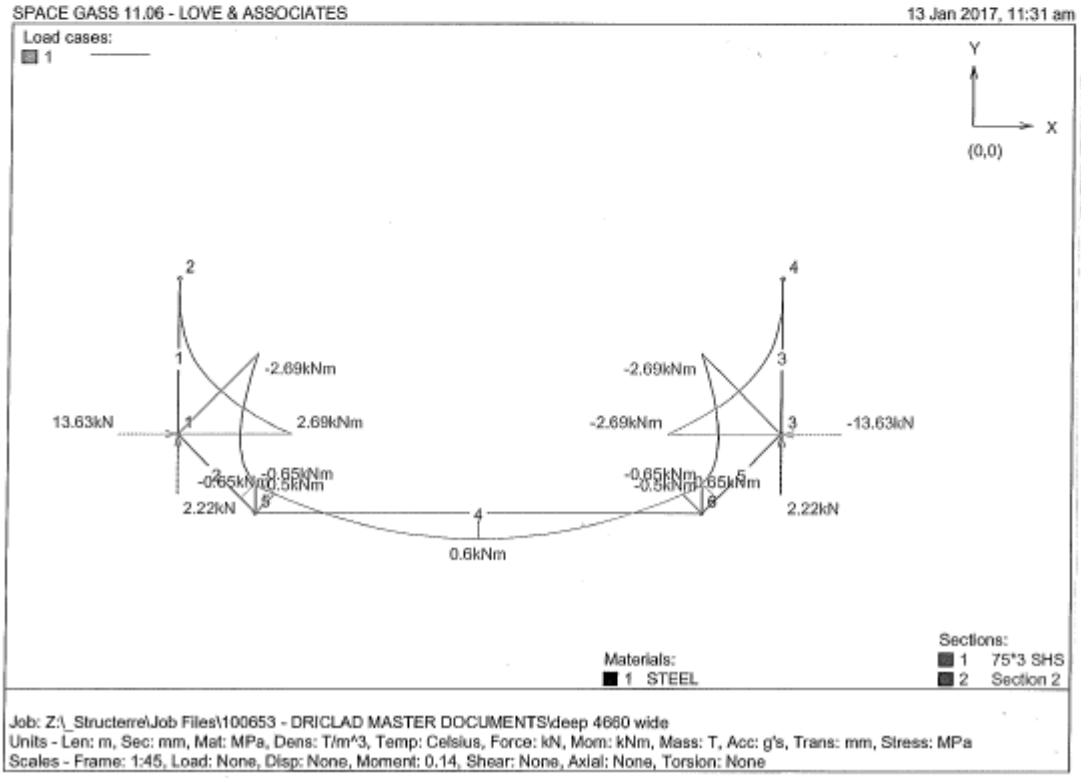
SPACE GASS RESULTS deep frame 2.85m wide





SPACE GASS RESULTS deep frame 4.57 wide





Check Footing

Largest Reaction from "Space Gass" = 2.22 kN

Footing Size = 250mm Squared

Footing capacity with 80kPa bearing = 5 kN ∴ **Accept**

Check in Ground Mass Retaining Wall

Design Data

Retaining Wall Height – 1320mm

Assumed Soil Conditions

Ka - 0.42, γ = 18.5 kN/m^2, No pour water pressure, No surcharge load

Calculations

Overturning Moment due to Lateral Earth Pressure

$M_{overturning}$ = 1/6 x 0.42 x 18.5 x 1.32^3 = 2.98 kN.m

M_{resist} = 20 x 0.45 x 1.32 x 0.45/2 = 2.71 kN.m

Steel Frame will provide some resistance to overturning moment. As the difference between the overturning moment and the resisting moment are minor it is assumed that the capacity of the frame will be enough to account for the minor difference.

Check Square End Frame

Design Data

Water Depth = 1.18m Uprights - 75 x 3 SHS

Calculations

Hydrostatic Pressure = 0 kN/m (at the top of the wall)

= 9.81kN/m x 1.18m = 11.58 kN/m (at the base of the wall)

Load on Base Channel = 0.075 x 1.18 x 9.81 = 0.87kN/m

Import into "SpacGass"

Check Pressure Pad

Resistance to up lift = 0.6 x 0.3 x 1.180 x 10 = 2.12 kN < 2.95 kN ∴ remaining load exerts onto Channel sections

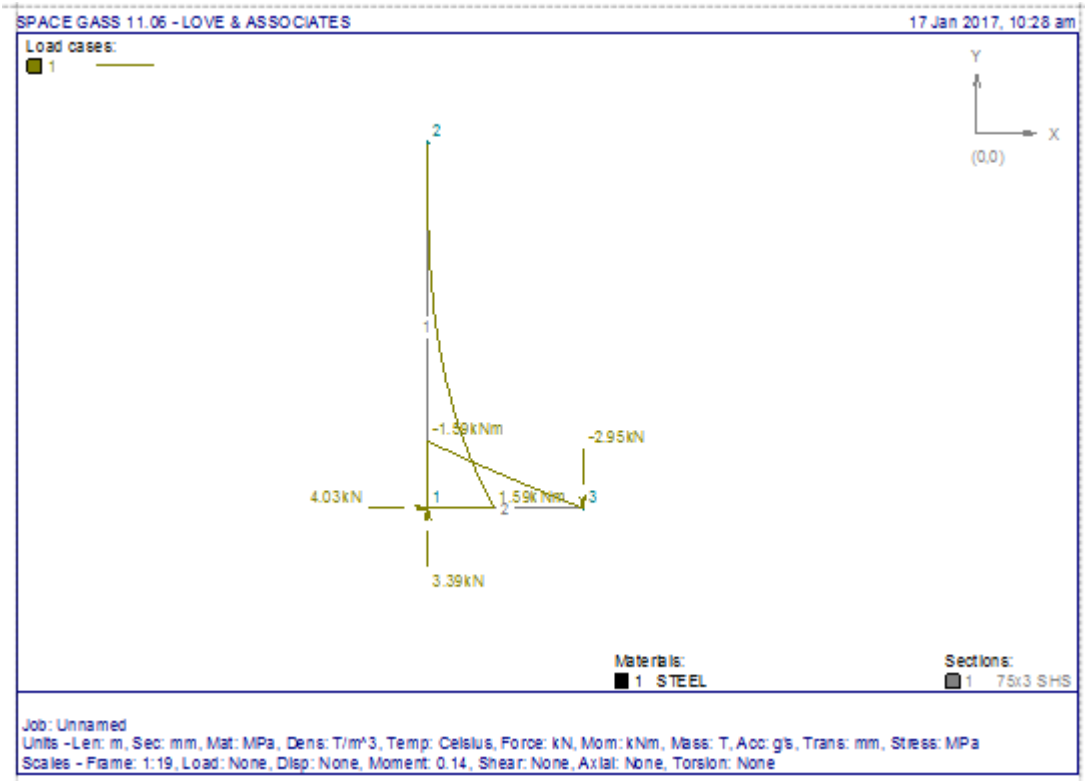
2.95 - 2.12 = 0.83 kN @ 590 spacing = 1.41 kN/m – 0.87 kN/m = 0.54 kN/m

Bending moment on 3.66m wide pool

$M^* = 0.54 \times 3.66^2 / 8 = 0.90$ kN.m

Capacity of 90x48x2.9 Channel, grade 300

$\Theta M_b = 14.9 \times 300 \times 0.9 = 4.023$ kN.m 0.9kN.m ∴ **Accept**


SPACE GASS 11.06 - LOVE & ASSOCIATES
17 Jan 2017, 10:28 am
Load cases:
1
Y
X
(0,0)
2
1
-1.58kNm
-2.95kN
4.03kN
1
1.59kNm
2
3
3.39kN
Materials:
1 STEEL
Sections:
1 75x3 SHS
Job: Unnamed
Units - Len: m, Sec: mm, Mat: MPa, Dens: T/m^3, Temp: Celsius, Force: kN, Mom: kNm, Mass: T, Acc: g's, Trans: mm, Stress: MPa
Scales - Frame: 1:19, Load: None, Disp: None, Moment: 0.14, Shear: None, Axial: None, Torsion: None