

SCHOONER POOL 160KG FRAME 225KG
STRUCTURAL CAPACITY DESIGN ASSESSMENT

ASSET ID: _____

SERIAL NUMBER: _____

CLIENT: Polyworld, 14-20 Robson St, Clontarf QLD 4019

Notes:

Rev	Date	Notes
0	19/07/2023	APPROVED FOR ISSUE



Austica Pty Ltd

LEADERSHIP IN ENGINEERING

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CLIENT: Polyworld, 14-20 Robson St, Clontarf QLD 4019.

PROJECT: Various as determined by Polyworld.

LOCATION: Various as determined by Polyworld.

ITEM: Schooner Pool 160kg Frame 225kg Structure Design Capacity assessments.

ASSET ID: _____. **SERIAL NUMBER:** _____

DATE: 19/07/2023.

COMMENTS:

Polyworld requested a Structural Capacity Design Assessment for a Schooner Pool 160kg Frame 225kg Structure. The main fabrication materials consisted of Alkatuff LL711UV Linear Low Density Polyethylene Materials with AS 1163 SHS steel frame. Nominal wall thickness was 9 to 12mm. Polyworld provided the associated Structural Modelling and Analysis together with Fabrication Drawings as per the attached PDF.

Austica Pty Ltd then carried out review of Structural Modelling, Analysis and fabrication drawings to check Structural Capacity compliance with AS 1170, AS 1170.1, AS 1838, AS 1664.1, AS 4100 and AS 1554.1

The review indicates that the Schooner Pool 160kg Frame 225kg Structure design meets the requirements of the above noted Australian Standards, where installed as per the manufacturer recommendations.

Pool installation to be as per AS 1839 specifications. Where the structure is partially or wholly installed into the ground, relevant Engineers including Geotechnical, Structural and Hydraulic Engineers to be consulted to offer specific site pool installation and operation specifications. Site specific Engineering specifications to also consider pool emptying procedures including any necessary internal bracing. Periodic inspections to be carried out to the Structure and identify any damage. The Structure to be only used when in structurally sound state.

Polyworld to ensure the pool fabrication has been carried out to ISO 9000 QA procedures and that the materials indicated in the fabrication drawings have been utilised.

Sign:

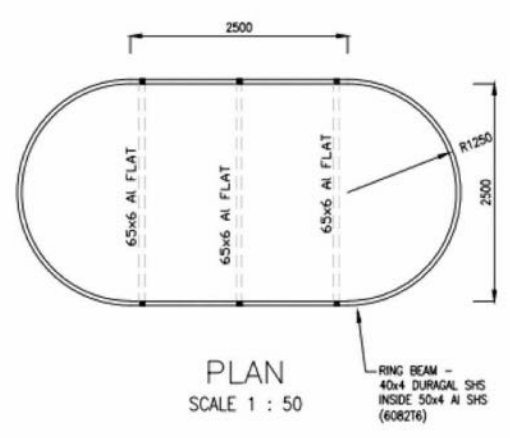
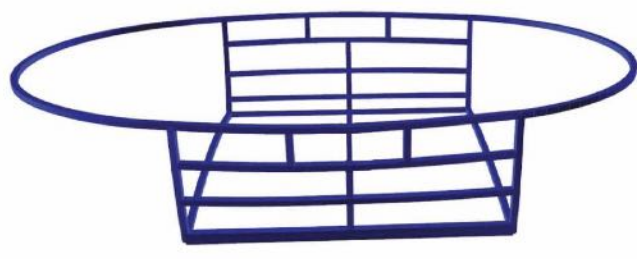
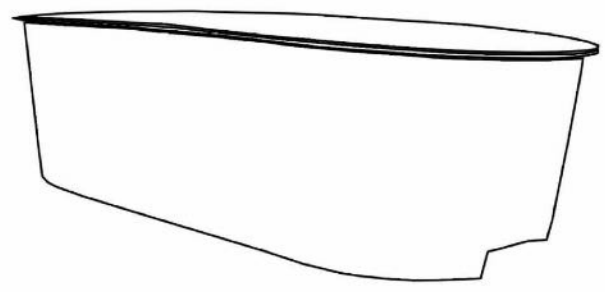


Name: Peter Kairu RPEQ 10198 MIEAust CPEng Chartered Professional Engineer 3473760 NER

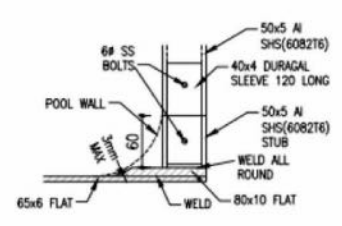
Att: Fabrication Drgs PDF

Base Reference: AS 1170, AS 1170.1, AS 1838, AS 1839, AS 1664.1, AS 4100, AS 1554.1

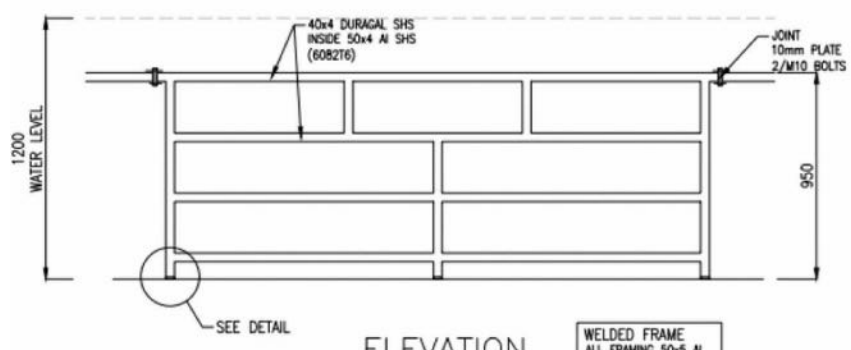
Schooner Pool & frame Drawings



PLAN
SCALE 1 : 50

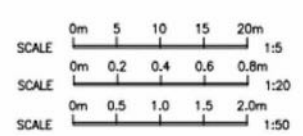


DETAIL FOR
POST BASE
SCALE 1 : 5



ELEVATION
SCALE 1 : 20

WELDED FRAME
ALL FRAMING 50x5 AL SHS (6082T6) UNO



Benchmark Certificate

This is to certify that:

Polymer Link Sdn. Bhd
Lot 99045, Jalan Tun Perak 1/KU16
Perdana Industrial Park
Port Klang
Selangor
42000
Malaysia

Holds Certificate Number:

BMP 694797

In respect of:

AS/NZS 4766:2020 Rotationally moulded buried, partially buried and non-buried storage tanks for water and chemicals.

Is authorised to use the BSI registered Benchmark Product Certification Trademark, on products identified in the Product Certification Schedule that is attached to this Product Certification certificate. Such products have been Type Tested and are manufactured under the Product Certification Requirements monitored by BSI to ensure that the manufacturing process has the capability to consistently produce products in compliance with and are certified to the above standard(s).

For and on behalf of BSI:

Charlene Loo, Managing Director, BSI Group Australia & New Zealand

First Issued: 2019-05-09

Latest Issue: 2024-06-12

Expiry Date: 2029-05-08

JAS-ANZ



Page: 1 of 5

Benchmark Certificate

No. BMP 694797

Schedule

This schedule supports the Product Certification Certificate for

Polymer Link Sdn. Bhd

ABN

Not Applicable

Head Office Address

Lot 99045, Jalan Tun Perak 1/KU16
Perdana Industrial Park
Port Klang
Selangor
42000
Malaysia

Holds Certificate Number

BMP 694797

Standard

AS/NZS 4766:2006 Polyethylene storage tanks for water and chemicals.
AS/NZS 4766:2020 Rotationally moulded buried, partially buried and non-buried storage tanks for water and chemicals.

The products certified to version 2006 of the standard comply to all the material test requirements of Clause 5 of the standard 4766:2006
The products certified to version 2020 of the standard comply to all the material test requirements of Clause 2 of the standard 4766:2020

Model	BSI Review Date	Description: AS/NZS 4766:2006
Rotational Moulding Powder	18/04/2019	PL6338 Rotational Moulding Powder in colours: Basalt Beige – 1 Black BM Beige BM Storm Blue UV BM Wheat CB Heritage Red CB Merino CB Rivergum Classic Cream Cove Desert Haze Earthtone Gully Jasper Light Grey Loft

First Issued: 2019-05-09

Latest Issue: 2024-06-12

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The use of this certificate and of the Benchmark Product Certification mark trademark is subject to the Client complying with the BSI Mark Requirements, and Terms and Conditions. BSI Group ANZ Pty Ltd, Suite 1, Level 1, 54 Waterloo Road, Macquarie Park, NSW 2113
The validity of this certificate can be checked at website: www.bsi-global.com/clientdirectory and the JASANZ website: www.jas-anz.org/register. This certificate remains the property of BSI and must be returned upon its request

Benchmark Certificate

No. BMP 694797

Schedule

Model	BSI Review Date	Description: AS/NZS 4766:2006
Rotational Moulding Powder	18/04/2019	PL6338 Rotational Moulding Powder in colours: Mangrove Metal Grey P TK Slate Grey Rivergum Shale Grey Smooth Cream Tank White Terrain Tuscan Red Wallaby Wheat UV Slip

First Issued: 2019-05-09

Latest Issue: 2024-06-12

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Benchmark Certificate

No. BMP 694797

Schedule

Model	BSI Review Date	Description: AS/NZS 4766:2020
Rotational Moulding Powder	14/12/2023	PL6338 Rotational Moulding Powder in colours: Tank Slate Grey Merino Beige CB Rivergum CB Slate Grey Mist Green Heritage Red Tank Beige Dark Grey Smooth Cream

First Issued: 2019-05-09

Latest Issue: 2024-06-12

Expiry Date: 2029-05-08

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Benchmark Certificate

No. BMP 694797

Certification Administration Details

Technical File Reference:

Certificate Amendment Record

Issue date	Comments	BSI Review No.
May 2019	First Issue	SMO 8992034
Dec 2023	Second Issue	SMO 30076677
June 2024	Recertification and renewal	SMO 3782023

First Issued: 2019-05-09

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Civil Structural Engineering Design Services Pty. Ltd.

Client: Polyworld
Project: **Structural analysis and calculation of steel framing to side wall of Elliptical Micro-Tuff Polymer swimming pool shell**

Reference: Polyworld Technical Data Sheet

Report by: JL, AL
Checked by: EAB
Date: 26/07/2022

JOB NO: D-21-0510



Civil Structural Engineering Design Services Pty. Ltd.

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Civil Structural Engineering Design Services Pty. Ltd.

1 Introduction

These 'Report' and 'Certification' are the sole property for copyright to Mr. Ted Bennett of Civil & Structural Engineering Design Services Pty. Ltd.

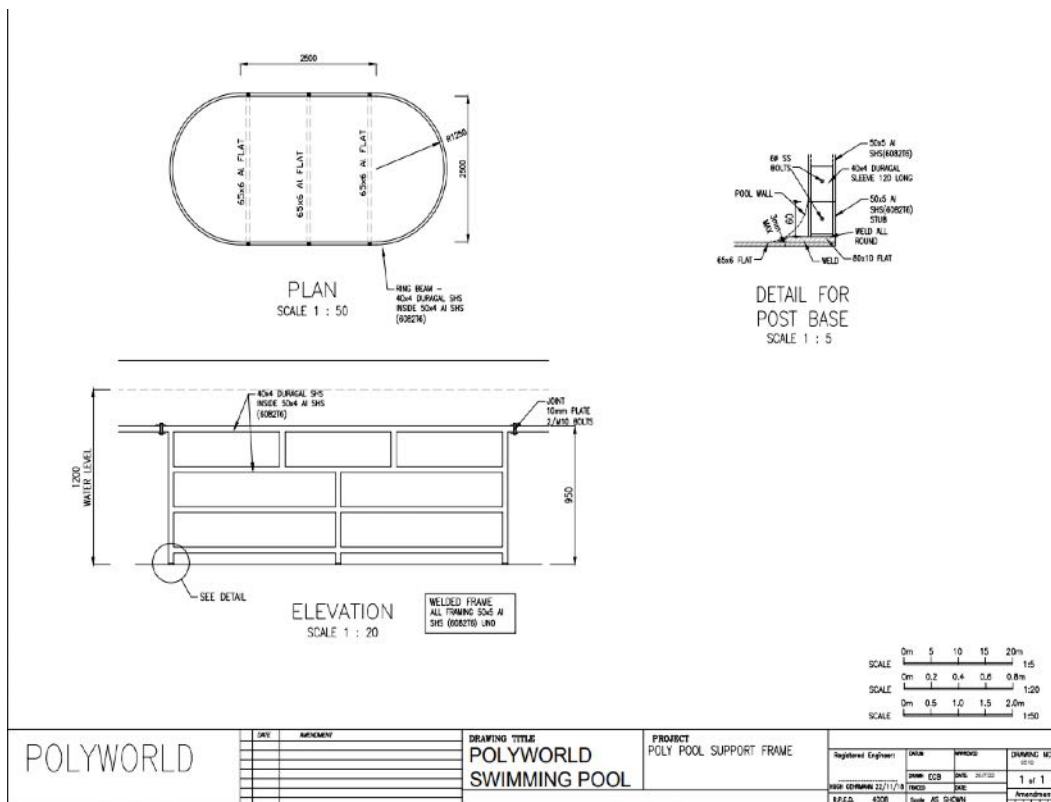
The following report contains an analysis of a 2.5m x 5m Elliptical Shape Swimming Pool (1.2m deep) with steel framing to side and end walls for stability of an out-of-ground, Micro-Tuff Polymer Swimming pool Shell, using finite element software, Space Gass.

Calculations have been made to check the deflection on the pool shell consisting of 8mm thick Micro-Tuff Polymer sheeting.

The relevant Australian Standards AS1170.0:2002 General principles, AS1170.1:2002 Permanent, imposed, and other actions are used. The design check is in accordance with AS 4100:2020 Steel Structures.

2 General

2.1 Geometry





2.2 Material properties

Grade
LL711UV

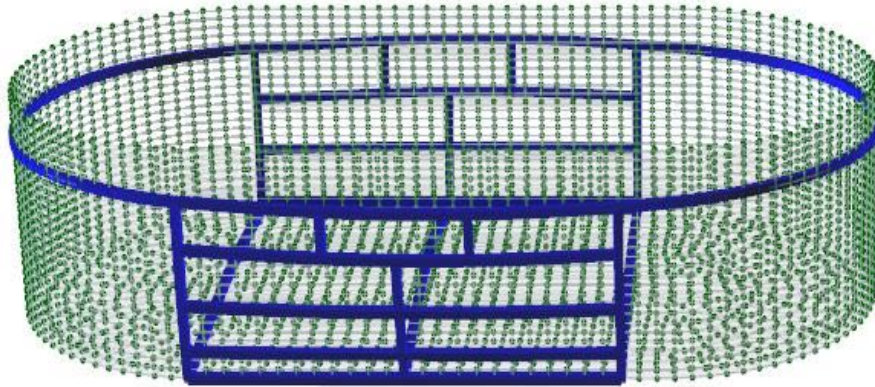
Physical Properties			
Property	Test Method ¹	Value ²	Units
Melt Index @190°C, 2.16kg	ASTM D1238	3.0	g/10 min
Density	ASTM D1505	0.938	g/cm ³
Melting Point	ASTM D3418	128	°C
Thermal Stability	AS/NZS 4766	Pass	-
Tensile Strength at Yield	ASTM D638 ³	19.5	MPa
Flexural Modulus (1% Secant)	ASTM D790	800	MPa
ESCR F _{as} (Condition A, 100% Igepal)	ASTM D1693	>1000	hrs
Contact with Drinking Water	AS/NZS 4020	Pass	-
Hydrostatic Design Basis	ASTM D2837	8.62 ⁴	MPa
UV Resistance	ASTM D2565	UV24 ⁵	-

1. Test procedures may be modified to accommodate operating conditions or facility limitations.
2. Typical values - not to be construed as specifications.
3. At 50mm/min crosshead speed
4. A service factor must be applied in accordance with AS/NZS 4766.
5. Samples of injection moulded non-pigmented LL711UV retained more than 50% tensile elongation after 24,000 hours of accelerated weathering in Qenos's Xenon-Arc weatherometer. Qenos is accredited by NATA to perform accelerated weathering in accordance with ASTM D 2565. UV performance determined via artificial weathering does not translate into a specific outdoor UV lifespan. Many factors can influence the overall UV performance of rotomoulded articles.



3 Model

3D View of Rectangular Swimming Pool



3.1 Assumptions

The structure was analyzed with the assumption that swimming pool is always full of water.

It is assumed that a liquid pressure varying load from 0 to 11.77kPa outward was applied simultaneously on the inner surface of the swimming pool.

As per technical data by Composite Engineers, the Polymer Composite must have minimum Young's Modulus of 0.8GPa. It is assumed the swimming pool was backfilled and filled with water with the same speed during construction.

3.2 Loading

3.2.1 Load case

Liquid pressure (F_{lp}) shall be calculated from the depth of the liquid and the unit weight of the liquid.

3.2.2 Load combination

- Ultimate Limit States **Refer to AS/NZS 1170.0, Section 4.2.3**

$S_u = 1.2 \times F_{lp}$ for static liquid pressure

- Serviceability Limit States

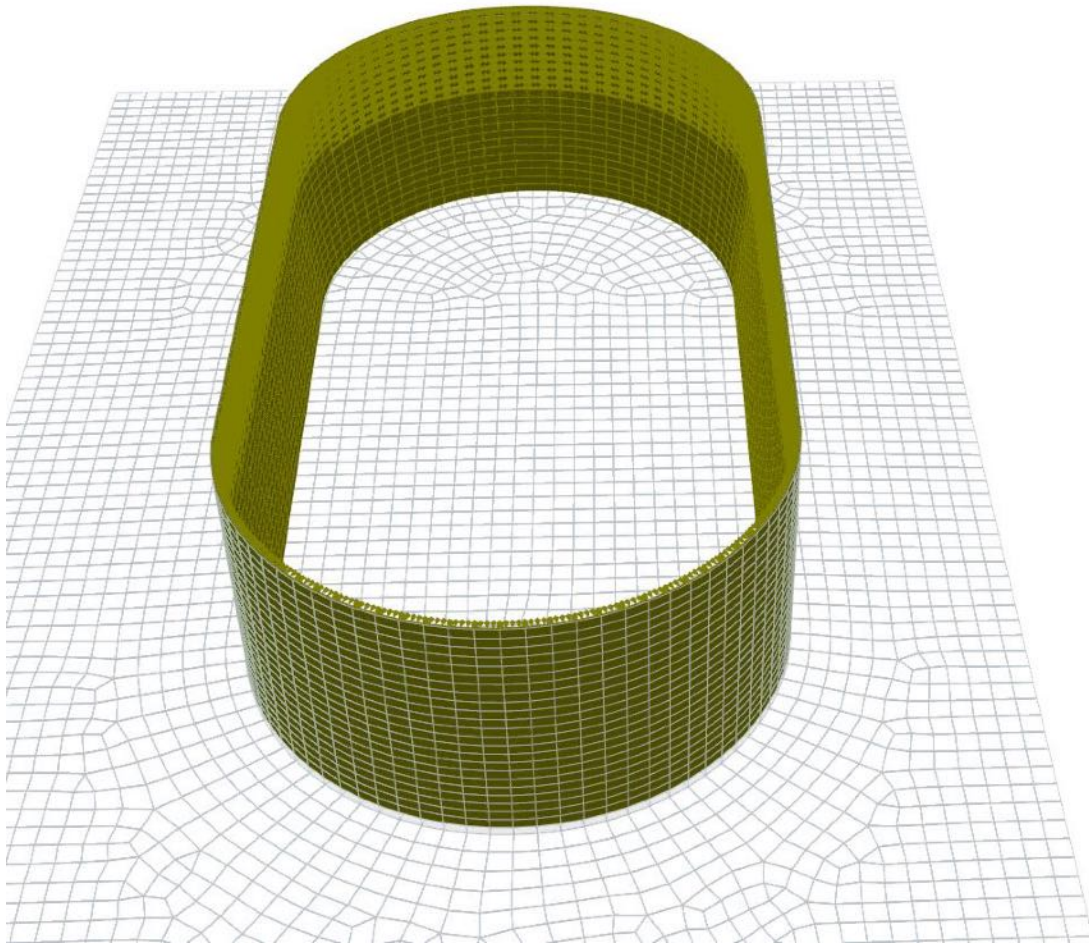
F_{lp}

3.3 FE analysis

A 3-D model has been developed using Space Gass software package. An 8mm Polymer Composite sheet has been used for the modelling.



3.4 Load Diagram



Liquid pressure

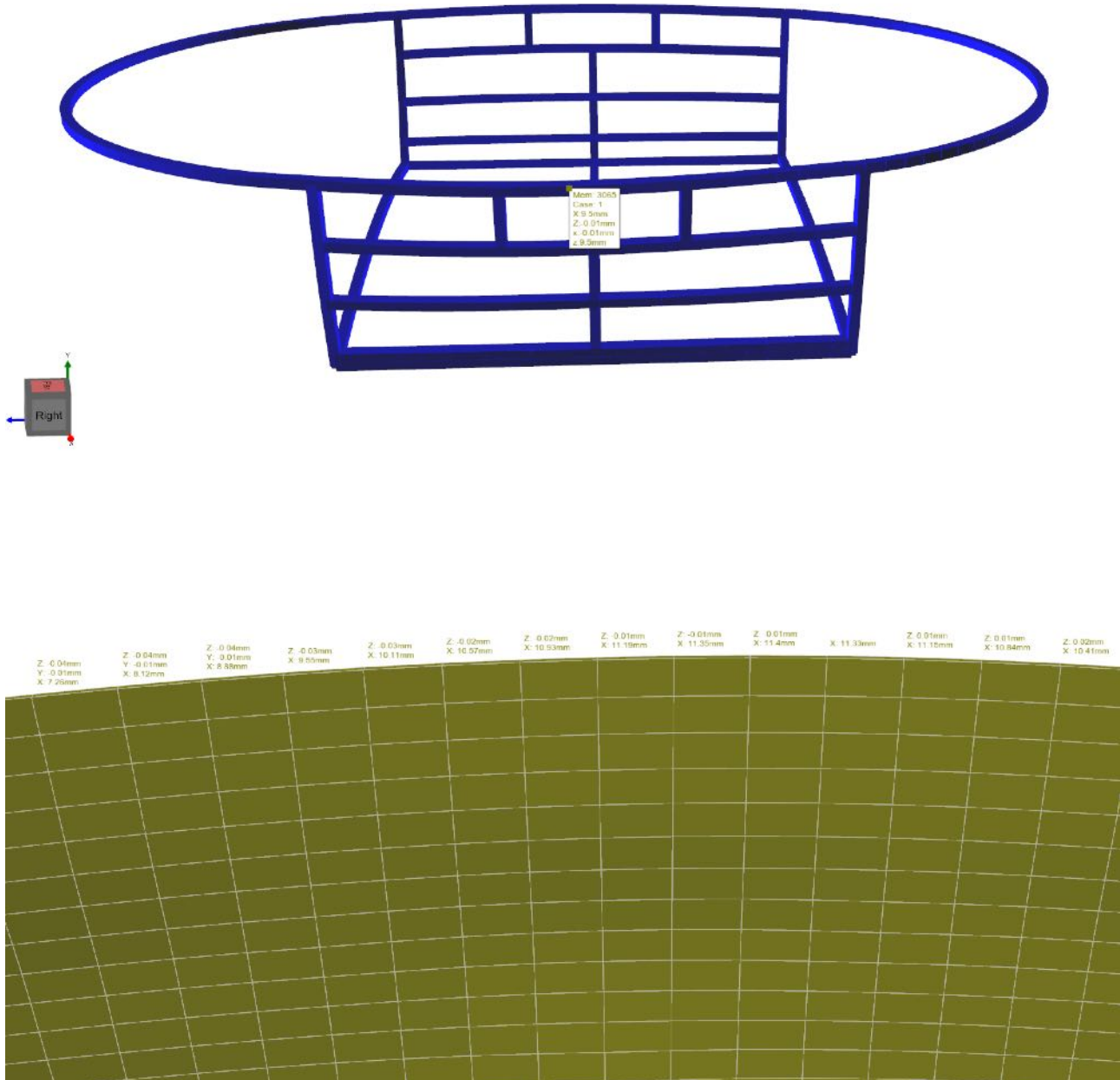


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4 Analyse results

4.1 Deflection

The maximum 9.5mm deflection occurs at the top of frame with a depth of 0.950m and 11.4mm deflection occurs at top of the Polymer Composite surface with a depth of 1.2m which are considered acceptable.





Civil Structural Engineering Design Services Pty. Ltd.

5 Summary and conclusions

- The swimming pool must stay full of water at all times and if required to be emptied; the shell should be temporarily propped to engineering specifications, if in the ground.
- It is assumed that a water pressure varying from 0 to 11.77kPa outward is applied simultaneously on the inner surface of the Polymer Composite
- As per technical data by Composite Engineers, the Polymer Composite sheet must have minimum Young's Modulus of 0.8GPa.
- The swimming pool must comply with Australian Standard AS1838 & AS1839.

Yours faithfully


E.A. Bennett M.I.E. Aust. NPER 198230