

CRUISER POOL 160KG FRAME 250KG
STRUCTURAL CAPACITY DESIGN ASSESSMENT

ASSET ID: _____

SERIAL NUMBER: _____

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

Notes:

Rev	Date	Notes
O	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: Cruiser Pool 160kg Frame 250kg Structure Design Capacity assessments.

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

DATE: 19/07/2023.

COMMENTS:

Polyworld requested a Structural Capacity Design Assessment for a Cruiser Pool 160kg Frame 250kg 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 Cruiser Pool 160kg Frame 250kg 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:

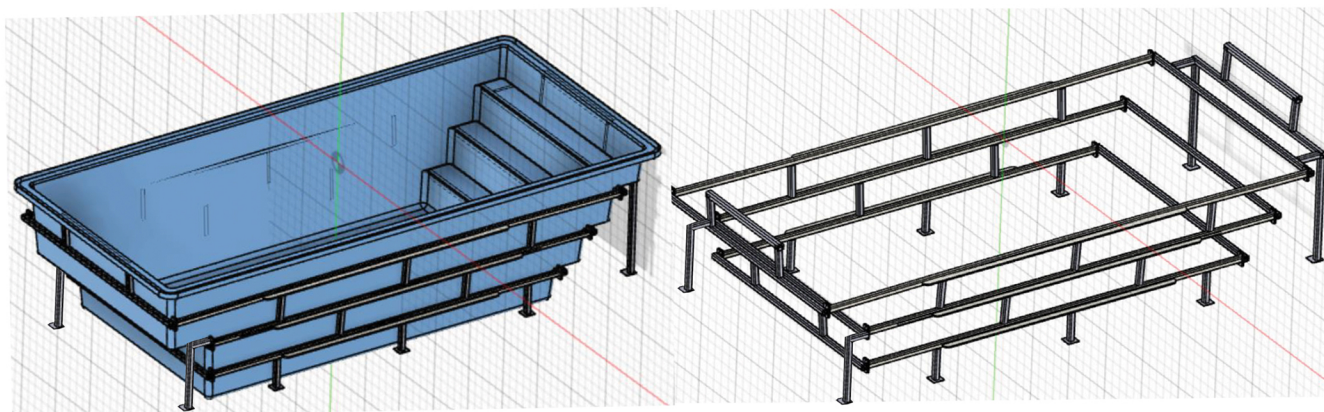


Name: Peter Kairu RPEQ 10198 MIEAust CPEng Chartered Professional Engineer 3473760 NER

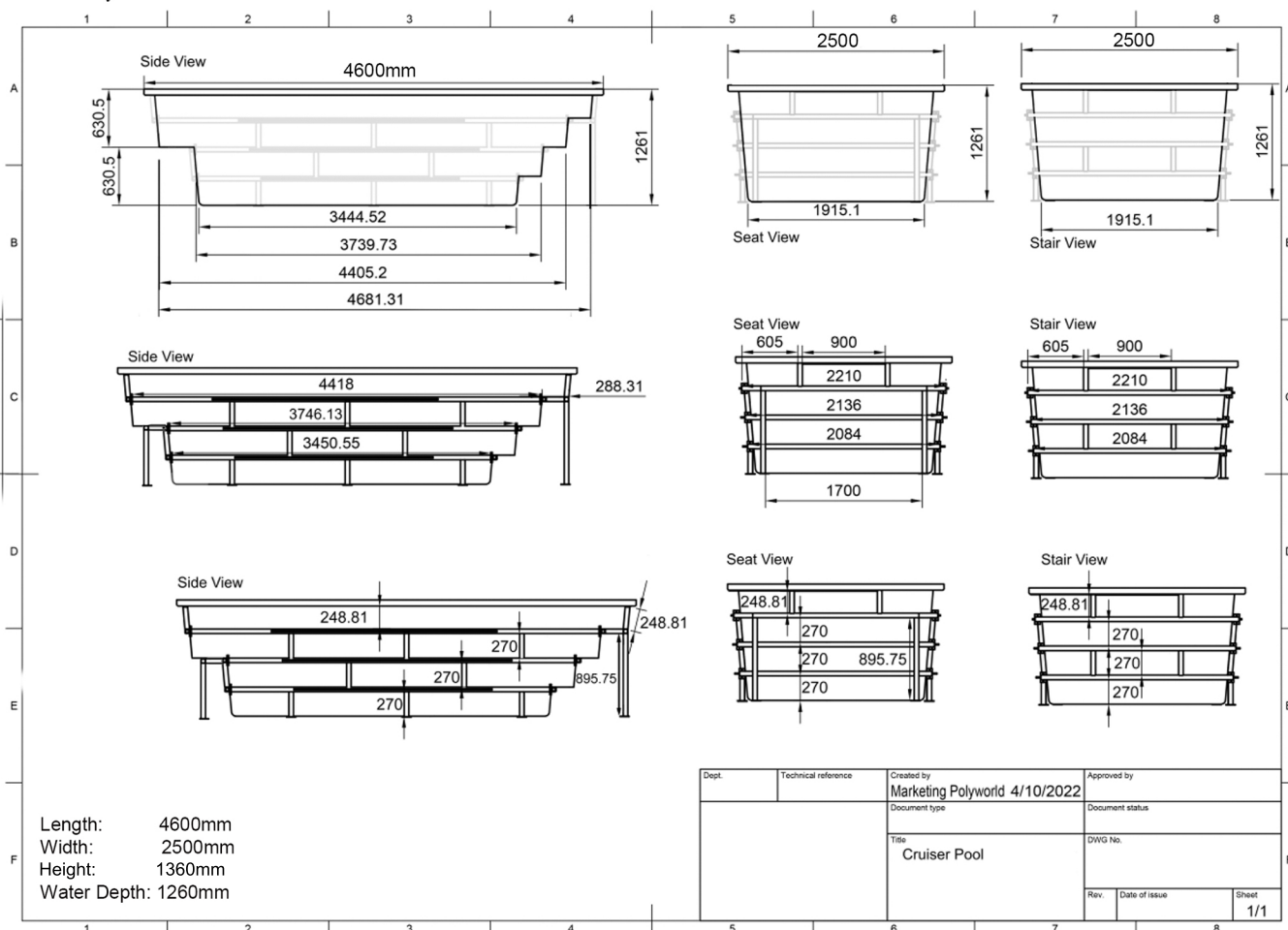
Att: Fabrication Drgs PDF

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

Cruiser Pool & frame Drawings



Geometry





CERTIFICATE OF CONFORMITY

SAI Global hereby grants:

Qenos Pty Ltd

62 054 196 771

471 Kororoit Creek Road, Altona, VIC, 3018, Australia

Product Safety Type Test Licence

Evaluated to:

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

The Type Test Licensee the right to use the Type Test Certification Trade Mark, as shown below, to those goods manufactured identically to the sample examined conforming to the Standard to Specification above

Certificate No: PST21573

Issued: 08 February 2022

Originally Certified: 30 July 2008

Expires: 29 July 2025

Current Certification: 02 February 2022

Calin Moldovean
President, Business Assurance
SAI Global Assurance



Registered by:

SAI Global Certification Services Pty Ltd (ACN 108 716 669) 680 George Street Sydney NSW 2000 Australia with SAI Global Limited 680 George Street Sydney NSW 2000 Australia ("SAI Global") and subject to the SAI Global Terms and Conditions for Certification. While all due care and skill was exercised in carrying out this assessment, SAI Global accepts responsibility only for proven negligence. This certificate remains the property of SAI Global and must be returned to SAI Global upon its request. To verify that this certificate is current please refer to SAI Global On-Line Certification register at <http://register.saiglobal.com>





Alkatuff® LL711UV

Technical Data Sheet
Linear Low Density Polyethylene

DESCRIPTION

Alkatuff LL711UV is a hexene LLDPE material specifically designed for rotational moulding applications that require excellent ESCR, chemical resistance*, stiffness and toughness. Alkatuff LL711UV is UV stabilised to provide prolonged outdoor protection in Australian conditions.

APPLICATION

Alkatuff LL711UV is designed for chemical, diesel fuel and water tanks, as well as other applications where toughness, stiffness and UV protection is important. Alkatuff LL711UV complies with the base resin requirements of AS/NZS 4766 Rotationally moulded buried, partially buried and non-buried storage tanks for water and chemicals.

FOOD CONTACT / PRODUCT SAFETY

For food contact information please refer to the Regulatory Data Sheet at [genos.com](https://www.genos.com). For product safety information please refer to the Safety Data Sheet at [genos.com](https://www.genos.com).

Polymer Properties	Value ¹	Units	Test Method
Melt Index @ 190°C, 2.16 kg	3.0	g/10 min	ASTM D1238
Density	0.938	g/cm ³	ASTM D1505
Moulding Properties	Value ¹	Units	Test Method
Melting Point	128	°C	ASTM D3418
Thermal Stability	Pass	-	AS/NZS 4766
Tensile Strength at Yield ²	19.5	MPa	ASTM D638
Flexural Modulus (1% Secant) ³	800	MPa	ASTM D790B
ESCR F ₅₀ (Condition A, 100% Igepal)	>1000	hrs	ASTM D1693
Contact with Drinking Water	Pass	-	AS/NZS 4020
Hydrostatic Design Basis	8.62 ⁴	MPa	ASTM D2837
UV Resistance ⁵	UV20	-	AS/NZS 4766
Resistance to Diesel Fuel ⁶	Pass	-	ECE-R34

1. Typical values - not to be construed as specifications.

2. At 50 mm/min crosshead speed.

3. At 12.7 mm/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 20,000 hours of accelerated weathering in Qenos's Xenon-Arc weatherometer. Qenos is accredited by NATA to perform accelerated weathering in accordance with ASTM D2565. 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.

6. TÜV Rheinland Kraftfahrt GmbH has certified Alkatuff LL711UV for use in the production of rotationally moulded fuel tanks. The certification applies to petroleum based diesel fuel containing up to 5% biodiesel.

For up to date information, refer to [genos.com](https://www.genos.com)

* The level of chemical resistance is a function of product design and environmental conditions. Contact Qenos for further information



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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 Micro-Tuff Polymer swimming pool shell**

Reference: Polyworld Technical Data Sheet

Report by: AL
Checked by: EAB
Date: 21/10/2022

JOB NO: D-QU-1014



Civil Structural Engineering Design Services Pty. Ltd.

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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 $2.5\text{m} \times 5\text{m}$ Rectangular Shape Swimming Pool (1.26 m 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, SAP2000

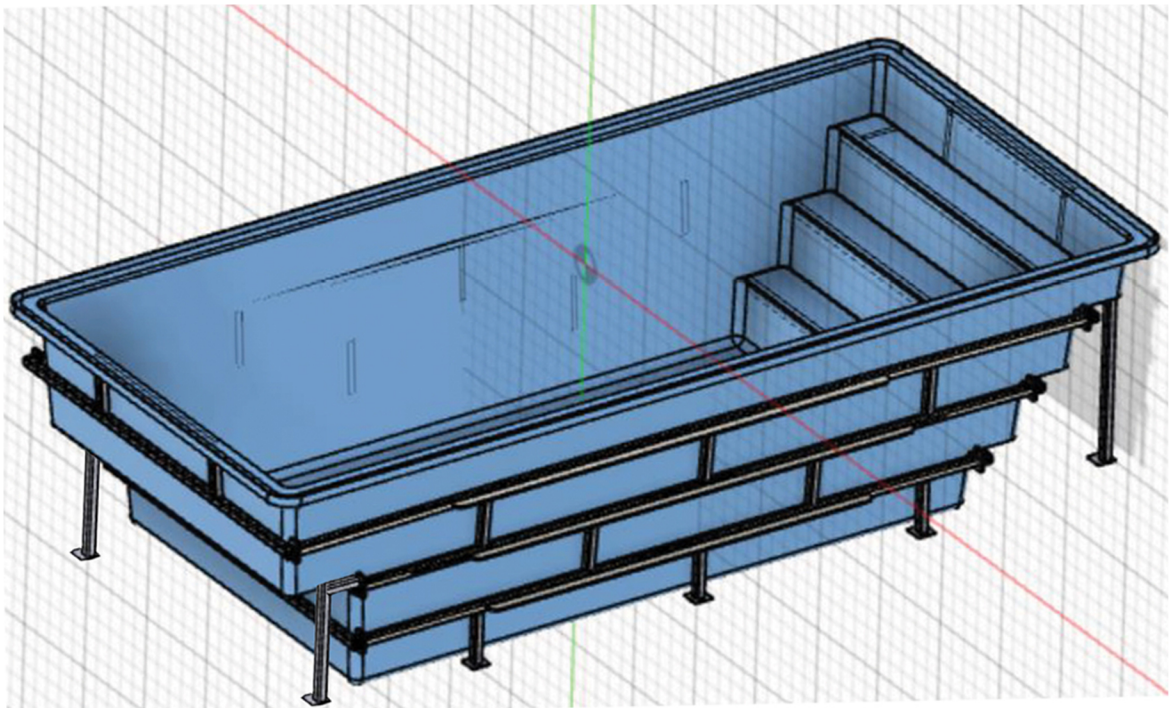
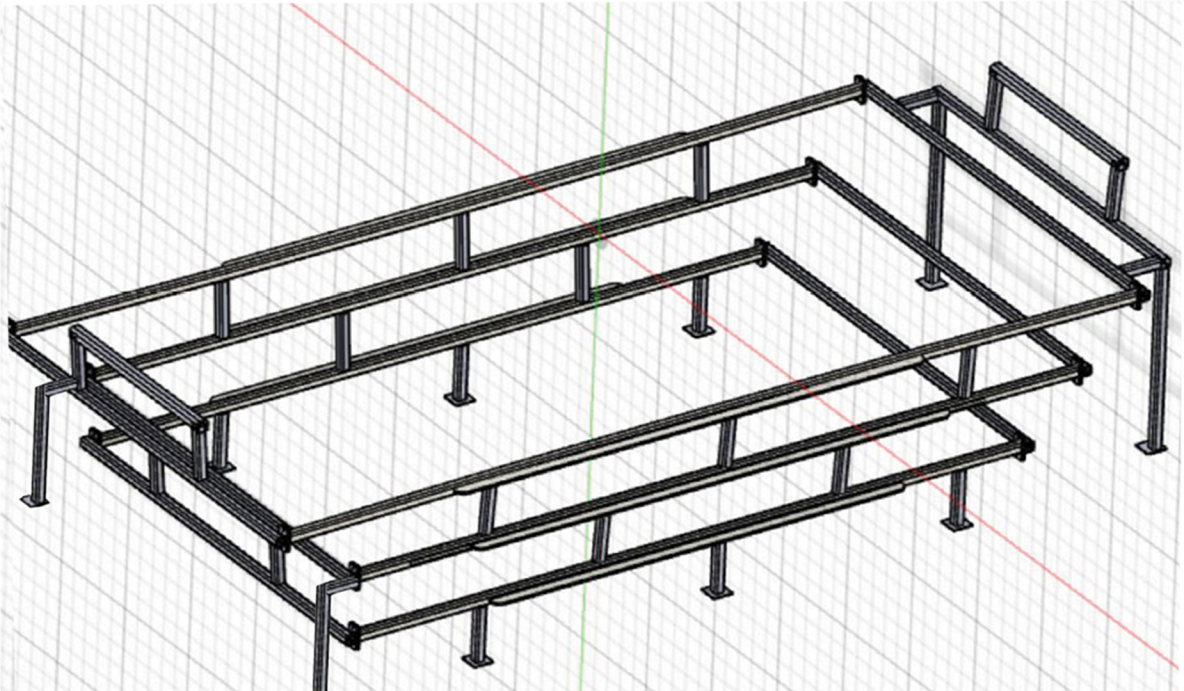
Calculations have been made to check the deflection on the pool shell consisting of 8mm thick Micro-Tuff Polymer sheeting.

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.



2.1 Geometry







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2.2 Material properties

Grade
LL711UV

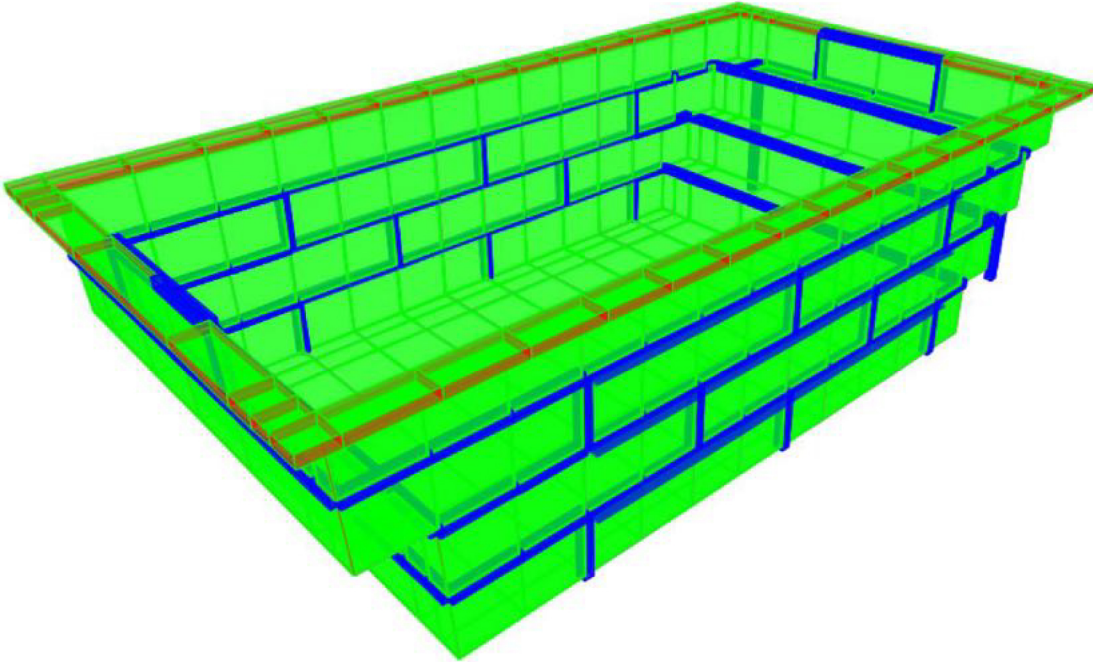
Physical Properties			
Property	Test Method ¹	Value ²	Units
Melt Index @190°C, 2.16kg	ASTM D1238	3.0	g/10 min
Density	ASTM D1505	0.938	g/cm ³
Melting Point	ASTM D3418	128	°C
Thermal Stability	AS/NZS 4766	Pass	-
Tensile Strength at Yield	ASTM D638 ³	19.5	MPa
Flexural Modulus (1% Secant)	ASTM D790	800	MPa
ESCR F _{sc} (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 12.61kPa 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

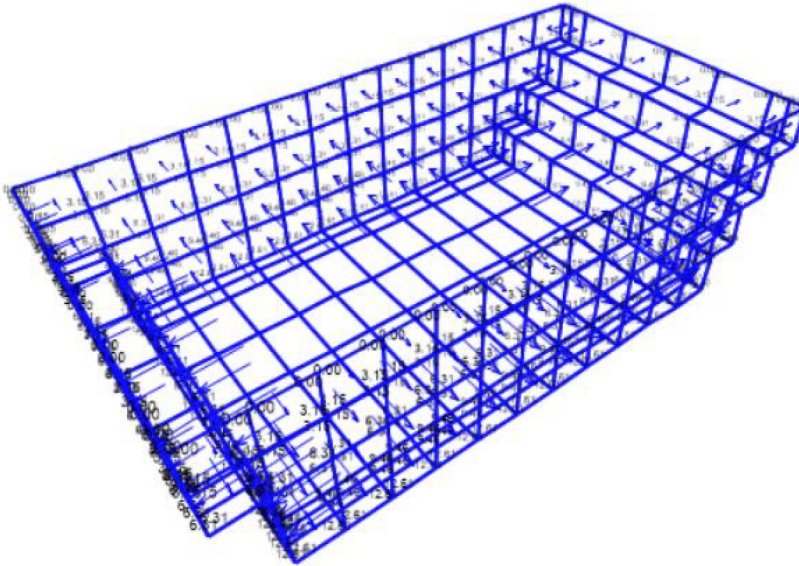
- Serviceability Limit States

F_{lp}

3.3 FE analysis

A 3-D model has been developed using SAP2000 software package. An 8mm Polymer Composite sheet has been used for the modelling.

3.4 Load Diagram

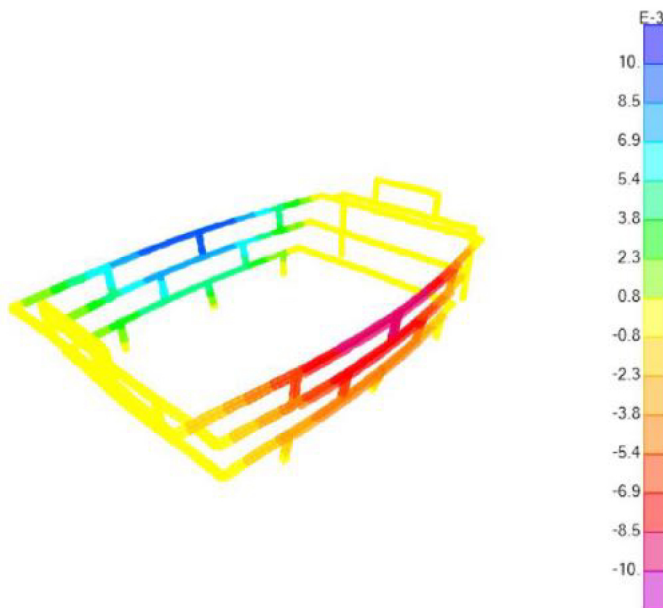


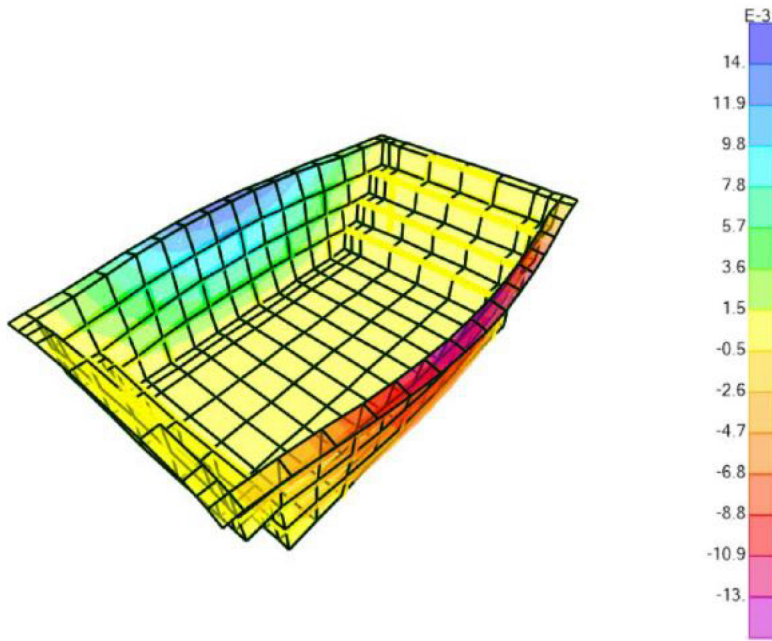
Liquid pressure

4 Analyse results

4.1 Deflection

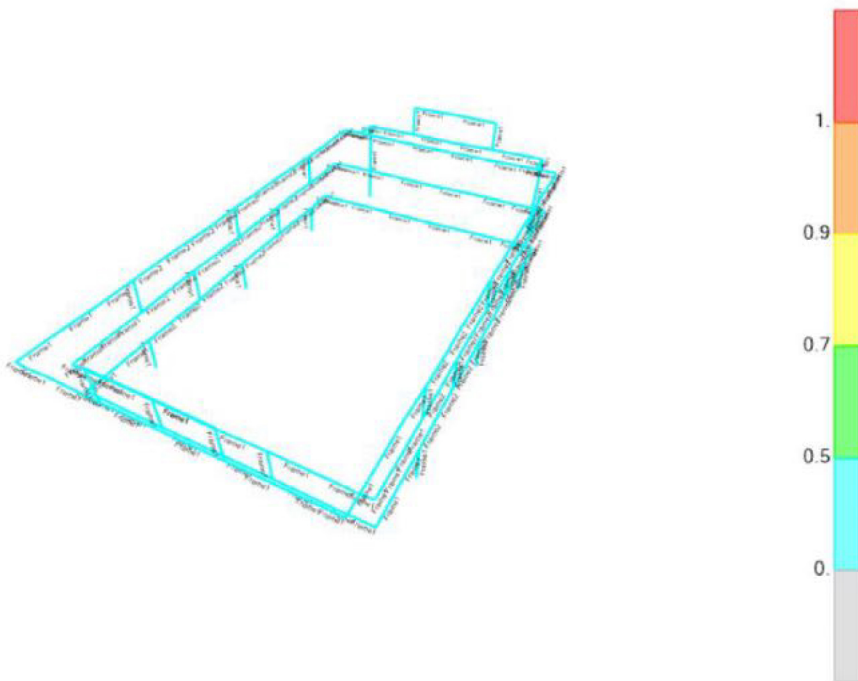
The maximum 10mm deflection occurs at the top of the frame with a depth of 0.95m and 14mm deflection occurs at the top of the Polymer Composite surface with a depth of 1.26m which are considered acceptably.





4.2 Steel frame

All steel frame elements pass the capacity.





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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 12.61kPa 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