

A. Objectives of the testing

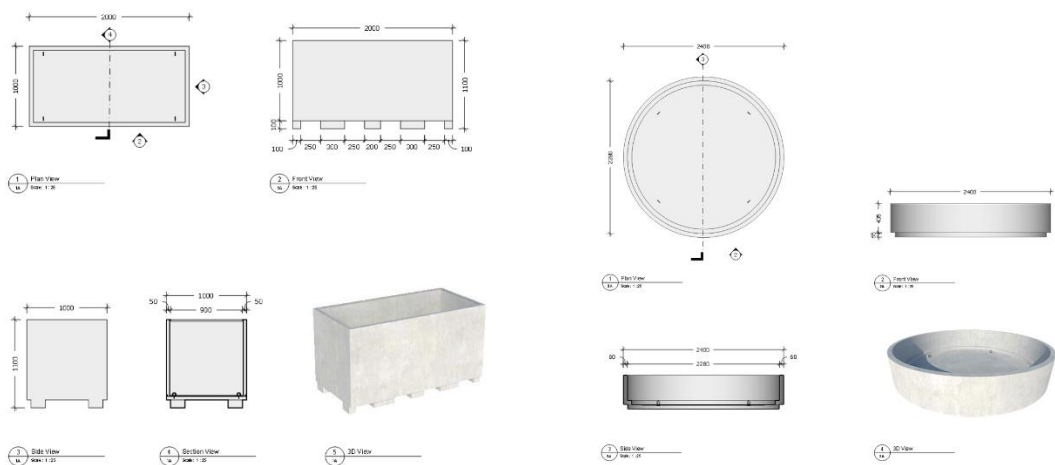
- To test the strength of Satu Bumi’s inbuilt lifting lug assemblies for both rectangle and cylindrical GRC planters to a minimum of 800 Kgs.
- To test the reliability of Satu Bumi’s manufacturing process to ensure it provides consistent results in relation to the installation of the lifting lug assemblies.

B. Testing approach

- Six GRC 800 kg planters were produced using Satu Bumi’s standard manufacturing and quality control systems and processes. Three rectangle planters and three cylindrical planters.
- Each planter was filled with 1,600 Kgs of water – making them 2,400 Kgs in total weight – in effect three times their empty weight.
- Each of the planters was lifted with a crane and a lifting rig to approximately one and a half to two meters: -
 - One of each of the rectangle and cylindrical planters was left hanging on the crane for twenty-four hours.
 - The other four planters were lifted for one hour each.
- Each planter was then reviewed to see if the lifting caused any structural damage to the planters.

C. Shop Drawings

Shop drawings for both the rectangle and the cylindrical test planters are included below.



D. Rectangle Planter Testing Statistics

- Planter dimensions 2000L x 1000W x 1000H
- Planter actual weight 802 kg

Theoretical weight estimate (just the rectangle planter) calculation: -

Length	Width	Height	Lip	Feet H	Wall T	Rectangle	
2000	1000	1000	50	100	40		
Part Name	Height	Wide	Thick	Sides	m3	Density	Kg
Front wall	0,96	2,00	0,04	2	0,154	2000	307,20
Side Wall	0,96	0,96	0,04	2	0,074	2000	147,46
Base	1,96	0,96	0,04	1	0,075	2000	150,53
Lip 1	0,05	2,00	0,02	2	0,004	2000	8,00
Lip 2	0,05	0,90	0,02	2	0,002	2000	3,60
Feet	0,10	1,90	0,25	2	0,095	2000	190,00
						Total	806,78

Actual unfilled rectangle planter weight: -



Infill water statistics for the rectangle planter: -

- When filled with water to a height of 910 mm the theoretical weight estimate of the water was 1608 kg.

Weight estimate (water) calculation: -

Water						
Length	Width	Thick	Rectangle Container			
1920	920	910				
	Length	Width	Height	m3	Density	Kg
	1,92	0,92	0,91	1,6074	1000	1607,42

- Total weight estimate for the rectangle planter filled with water was 2,410 kg (802Kgs + 1,608 Kgs)

E. Cylindrical Planter Testing Statistics

- Dimensions 2400D x 500H
- Product weight 802 kg

Theoretical weight estimate (just the cylinder planter) calculation: -

Diameter	Height	Lip	Inner Lip	Wall Thick	Base Thick			Cylinder
2400	500	60		60	82			
Part Name	Height	Radius 1	Radius 2	Thick	Phi	m3	Density	Kg
Cylinder Wall	0,50	1,20	1,20	0,06	3,14	0,113	2000	226,08
Cylinder Base		1,12	1,12	0,08	3,14	0,288	2000	575,73
							Total	801,81

Actual unfilled cylinder planter weight



Infill water statistics for the cylinder planter: -

- When filled with water to a height of 365 mm the theoretical weight estimate of the water was 1620 kg.

Weight estimate (water) calculation based on the diameters of the upper part of the planter plus the lower part of the planter: -

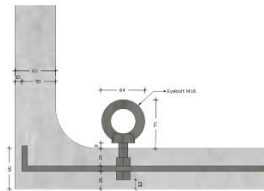
Water						
Diameter	Height	Cylinder Container (Lower Part)				
2270	65					
Phi	Radius 1	Radius 2	Height	m3	Density	Kg
3,14	1,135	1,135	0,065	0,2629	1000	262,93

Water						
Diameter	Height	Cylinder Container (Upper Part)				
2400	300					
Phi	Radius 1	Radius 2	Height	m3	Density	Kg
3,14	1,2	1,2	0,3	1,3565	1000	1356,48

Total weight estimate for the cylinder planter filled with water was = 802 + 263 + 1357 = 2422 kg

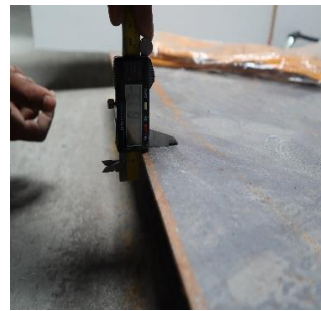
F. Drawings of the Placement of the Lifting Assemblies

LIFTING LUGS
Assembly Construction



G. Lifting lug assembly components

The lifting assembly is made up of M16 eye bolts and welded lengths of 8mm thick and 50 mm wide coated SS400 structural steel.



H. Manufacturing Process

The lug assemblies are imbedded into the planters during the manufacturing process.

- Picture 1: shows the placement of the lifting assembly during manufacture.
- Picture 2: shows the assembly after initial covering with GRC material.
- Picture 3: shows the assembly after all GRC material has been added.
- Picture 4: shows the finished planter cured and ready for lift testing.



I. Lift Testing

The lift testing was completed using a large crane and lifting jigs over a five-day period.

Cylindrical planter prior to, during and after lift testing.



Rectangle planter prior to and during lift testing



I. Test Results

After the lift testing, each of the planters was inspected and there was no indication of any significant structural damage caused to any of the planters because of the lift testing. All the planters were structurally sound and were considered to have passed the lift testing process by the factory manager who is a mechanical engineer.

Therefore: -

- The lifting lug assemblies for both the rectangle and cylindrical GRC planters are more than strong enough to lift an 800 Kg GRC planter with an additional load of 1,600 Kgs (2,400 Kgs in total).
- Satu Bumi's standard manufacturing and quality control processes provided a consistent result for all six planters.

J. Disclaimer

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