Technical Bulletin

ACO EzyBrixx® Certified Test Results

– BASED ON LLOYDS BRITISH INDEPENDENT TESTS

A single cable route can pass through a number of different environments with varying factors e.g. anticipated design loads, traffic frequency, soil conditions etc. Therefore, individual pits will need specific consideration.

The purpose of this document is to contrast a typical design load against the capability of the EzyBrixx® pit. This document refers to Lloyds British test report no.s 5550/2741, 5550/2744, PRJ-043197. (EzyBrixx® is the Australian trademark and Easystack is the UK trademark for this product – test reports are available on request).

Soils apply lateral pressure on structures from their own weight and surface live loads, typically vehicles. The resulting lateral earth pressure is exerted on the pit wall in the horizontal direction and its magnitude is a function of the shear strength parameter of the soil.

The following is a derivation of a typical design lateral load on a sidewall of a pit (backfilled with granular material) based on a hypothetical vertical live load of 8 tonnes (half an axle). This is the recommended wheel load for Class D240kN (AS 3996).

To convert a vertical live load to a horizontal design load, a theoretical test model is created and a number of assumptions are made namely,

1. The live load is assumed static and resting adjacent to the pit through a 400mm x 500mm wheel footprint.
2. The dissipation of the load offered by the road surface is ignored.
3. There are 2 pit size specimens to be analysed
   - 900mm x 900mm x 750mm
   - 600mm x 600mm x 750mm
4. The density of the ground is 2000kg/m^3 with an effective angle of internal friction of the soil of 45º.
5. A lateral pressure is calculated from the accumulation of 150mm height increments from the surface level with the top of the pit. For each pit, this is then converted to a design load. See calculation in Table 1.

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							Granular	600	mm	Equivalent		900	mm	Equivalent	
					Upper	Lower	Average	Force		to a		Force		to a	
			Depth	Depth	Vertical	Vertical	Lateral	Lateral		central		Lateral		central	
			From	To	Pressure	Pressure	Pressure			load				load	
Lateral Earth Pressure Calculations			m	m	n/m2	n/m2	n/m2	n	kg	kg		n	kg	kg	
Depth of Fill [m]	0.15	m	0.15	0.30	78727	52956	19285	1735.6	173.6	86.8		2603.4	260.3	130.2	
Depth of access chamber [m]	1.20	m	0.30	0.45	52956	41412	13820	1243.8	124.4	62.2		1865.7	186.6	93.3	
Unit weight of saturated soil [Nm^-3]	20000	N/m^3	0.45	0.60	41412	36053	11344	1021.0	102.1	51.0		1531.5	153.1	76.6	
Superimposed live load [N]	80000	N	0.60	0.75	36053	33810	10231	920.8	92.1	46.0		1381.2	138.1	69.1	
Breadth of live load area	0.40	m	0.75	0.90	33810	33308	9829	884.6	88.5	44.2		1326.9	132.7	66.3	
Width of live load area	0.50	m	0.90		33308				Total=	290.3	kg		Total=	435.4	kg
Effective angle of internal friction of earth [degrees]	45	1.00													
Poisson's ratio of earth	0.45														
At-rest Earth Pressure Coefficient (granular)	0.29														
At-rest Earth Pressure Coefficient (cohesive)	0.82														

Table 1 – Sidewall design loads calculation

6. From Table 1 above
   - An 8 tonne vertical load plus a fill density of 2 tonnes/sq.m of soil will result in a maximum expected load of 870kg on the 900mm x 750mm (high) wall of the pit. This is equivalent to the applied 435kg central load.
   - An 8 tonne vertical load plus a fill density of 2 tonnes/sq.m of soil will result in a maximum expected load of 580kg on the 600mm x 750mm (high) wall of the pit. This is equivalent to the applied 290kg central load.

Laboratory testing

Vertical load tests for both EzyBrixx® pits (900mm x 900mm x 750mm & 600mm x 600mm x 750mm) were carried out by Lloyds British with reports issued on 19/11/2019 and 30/7/2020. The pits were also positioned on their sides (lateral load tests) and tests were conducted in accordance to EN124. The test arrangement simulated the theoretical model described above. Most essentially a member positioned along the height of the pit was the only contact point at the mid span of wall being loaded. This is illustrated in Figure 1.

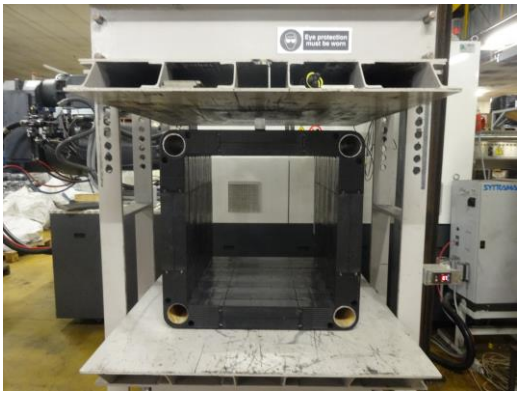

Figure 1 – Compression test with test piece vertical C/W plates on top/underneath

Vertical wall test results

- The 900mm x 900mm x 750mm pit met the vertical load requirements for 40,000 kg, where the wall compression of 4mm was recorded. The load was then allowed to increase to 50,000 kg resulting in a wall compression of 5mm.
- The 600mm x 600mm x 750mm pit met the vertical load requirements for 25,000 kg resulting in a wall compression of 13mm. The load was then allowed to increase to 30,000 kg resulting in a wall compression of 15mm.

Lateral wall test results

- The 900mm x 900mm x 750mm pit was able to support a central load of 500kg, resulting in a deflection of 20mm at the centre of the wall and no structural damage.
- The 600mm x 600mm x 750mm pit was able to support a central load of 500kg, resulting in a deflection of 10mm at the centre of the wall and no structural damage.

Conclusion

Both pits are able to support the vertical and lateral loads derived from a vertical live load of 8 tonnes (half an axle). **This is the recommended wheel load for Class D240kN (AS 3996).**