ZEROCIVIL

ZC-TEST-001
INDEPENDENT ENGINEERING TESTING

The world's first means of securing bollards
preserving pavements and concrete foundations for the life of a development and making bollards reusable following even severe impact

LOW SPEED IMPACT

The bollard has a shock absorbing mechanism that absorbs the impact force and allows bollard to deflect to a maximum of 20 degrees and self recover.

HIGH SPEED IMPACT

The bollard has a strong resistance core that slows the vehicle or brings it to a stop and makes both the bollard and footings reusable following even severe impact.

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HOLDING CAPACITY TESTS

CONDUCTED BY**: PERKINS WORKINGS:**

Engineering Services

Registered Business No80184581

3-6 Bindaring Parade

Claremont WA 6010

H.J.Perkins B.Sc Eng (Hons.) FIE (Aust). CP (Eng)

Test Certificate No UTS 14562

Subject: To confirm holding capacity of the ZERO WASTE Foundations (ZWF)

I witnessed the tests carried out by Aker Unirig and verify the test results to be correct. The load cell and monitor used are checked annually by Australian Calibration Services.

All components were in an ambient temperature of 18 degrees centigrade. The ground tube and the Tapers were moulded in medium flow black polypropylene. The taper on the inside of the ground tube and the outside of the Tapers was 1° from vertical.

From the tests I would recommend the Tapers are adequately effective with 5 mm or less protruding above the top of the ground tube

Successive extractions after the initial one do not materially change the effectiveness of the ZERO WASTE Foundations

HOLDING CAPACITY TESTS

CONDUCTED BY: AAKER UNIRIG PTY LTD

ACN 082 781 691

PO Box 13

South Fremantle WA 6162

Certificate No UTS 14747-1

Subject: Confirm the holding capacity of the ZERO WASTE Foundations.

Equipment used:

- A traceable NATA calibrated tension load cell
- Horizontal tested machine, which is operated by one hydraulic ram.
- Client supplied ”ZERO WASTE Foundations” consisted of the following:
    - Two half circle tapered plastic Tapers 275 mm in length, secured to the sign post by means of self-drilling screws.
    - A tapered polypropylene ground tube (ZERO WASTE self-healing ground socket), 350 mm in length, cast in a concrete block.

Procedure

TEST ONE: 10MM PROTRUDING PROVIDES 200 KGF

A signpost with Taper attached was installed into the ground socket, cast into a concrete block, with 10mm of the Taper protruding above the ground socket.

The concrete block was secured to the dead end (or static / fixed / non-moving end) of the test bed. The signpost was fastened to the live end (or the moving end /pulling end). A slow and consistent tension was applied until the signpost complete with the Tapers (or sleeves) was parted from the ground tube (ZERO WASTE self-healing ground socket) cast in concrete. The above tests were conducted seven (7) times. The two sections parted at 200 Kg with no alteration over subsequent tests.

TEST TWO: 5MM PROTRUDING PROVIDES 280 KGF

This test was conducted using the same Taper (sleeves) and ground tube (ZERO WASTE socket) cast in the concrete block as test one The signpost was re-installed in the concrete block with seven (5 mm) of the Taper (or sleeve) protruding above the ground tube (ZERO WASTE self-healing ground socket). The test was taken up to 250 Kg with no movement or slippage. The test machine was then increased to maximum speed with the two sections parting at 280 Kg.

TEST THREE: 3MM PROTRUDING PROVIDES 430 KGF

This test was conducted using the same Taper (sleeves) and ground tube (ZERO WASTE socket) cast in the concrete block as test one The signpost was re-installed in the concrete block with seven (3 mm) of the Taper (or sleeve) protruding above the ground tube (ZERO WASTE socket). The test was taken up to 250 Kg with no movement or slippage. The test machine was then increased to maximum speed with the two sections parting at 430 Kg.

TEST FOUR: DEMONSTRATING RESISTANCE TO DAMAGE WITH 50MM OF SOCKET REMOVED

After completion of Test Two: 50 mm of the ground tube (ZERO WASTE socket) cast in the concrete block was removed with a pneumatic masonry chisel. The signpost with the Tapers (or sleeves) attached (used in Test Two) was re-installed in the ground tube (ZERO WASTE socket) cast in the concrete block with 8 mm of the Tapers (or sleeves) showing above the ground tube (ZERO WASTE socket). This was then subjected to the same pressure as Test One. The signpost parted with ground tube (ZERO WASTE socket) cast in concrete at 270 Kg.

FINDINGS: Suggest items are installed flush with the surface (with Taper not protruding from the socket), providing well in excess of 200 kg of upward force to remove.

4.1. Tests 471 - STATIC PULL FORCE - Wedges 275mm long

Figure 4.1.1. Test 471 Static pull force - wedge at 10mm above the concrete surface.

Figure 4.1.2. Test 471 Static pull force - wedge at 10mm. Maximum force 3,188N. (325kgf)

IMPACT TESTS

CONDUCTED BY:
Automotive Safety Engineering Laboratories Pty Ltd
28 Donegal Rd Lonsdale SA 5160
Subject: To confirm the post will bend at the surface of the ground and to determine that the ZERO WASTE socket will hold in the concrete base when impacted.


TEST ONE: EFFECT OF IMPACT

Two 350 mm ZERO WASTE sockets were installed in a concrete footing 300 mm x 300 mm in an impact test bed. A 60OD /50NB signpost fitted with Self-locking Taper (sleeves) was installed in one ground tube (ZERO WASTE socket) that was cast in a concrete test bed with 10 mm of the Tapers showing above the ground tube (ZERO WASTE socket). The sign post was impacted with a test trolley weighing 1800 Kg at a controlled speed of 60 Km/H, the impact point was 420 mm above ground level representing the height of an average car bumper height The effort required to remove the impacted signpost was 302 Kg/f.

TEST TWO:

Two 60OD/50NB signposts fitted with ZERO WASTE Taper (sleeves) were installed in the two ground tubes (ZERO WASTE sockets) cast in the concrete test bed, in line and 300 mm apart on the line of travel of the test trolley. They were impacted at 60 Km/h. The first post to be impacted was installed in the same ground tube (ZERO WASTE socket) used in test one with 10 mm of the Tapers showing above the ground tube (ZERO WASTE socket) and required 300 Kg/f to remove (negligible difference).

TEST FINDINGS:

Locking Capacity Tests: Conducted by Unirig Pty Ltd.
If secured according to directions, over 200 kg of upward force is required to remove items secured using the ZERO WASTE Foundations

D**urability Tests:** Conducted by Unirig Pty Ltd.
The ZERO WASTE Foundations is highly resistant to damage. Even if the top half of the socket was sheared away the taper would continue to hold effectively.

Impact Tests: Automotive Safety Engineering Pty Ltd.
Impact from a vehicle will not adversely affect the ZERO WASTE Foundations. The post will bend at the surface of the concrete footing (or paving) and the foundations will remain undisturbed.

IMPACT TESTS FOR IMPACT RECOVERY SYSTEM

CONDUCTED BY:
ZERO WASTE Urban Pty Ltd to confirm how well the Impact Recovery Bollard recovers from impact

TEST ONE:
A 650 mm Ground socket was installed in a concrete footing 400 mm square and 700 mm deep. A 60OD (2.9 wall thickness) post fitted with a Self-locking Taper was installed in the ground tube that was cast in a concrete test bed with 10 mm of the Tapers showing above the ground tube The Impact Recovery Rings and Bollard were secured to the post.

The bollard was impacted with a vehicle at low-speed, the impact point was 420 mm above ground level (the height of an average car bumper).

The bollard deflected approximately 20 degrees upon impact and returned upright without damage to the Impact Recovery System, the bollard or the concrete footings/ paving.

TEST TWO

The process was repeated using an Advanced Polymer bollard with a 400 mm square and 700 mm deep concrete foundation installed directly into soil (and secured to surrounding concrete foundation).

It was impacted using a utility vehicle with bumper bar. This test provided the same results. No evidence of damage to the concrete foundations or bollard after numerous impacts.

VIEW VIDEO

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CPB

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