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Comparison of Super-cell and Others

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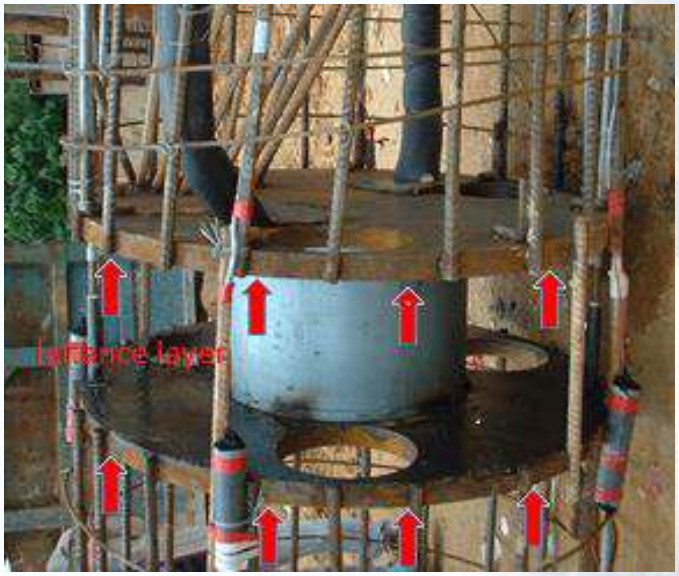
Comparison of Super-Cell and other systems used for Bi-Directional Static Load Test

1.

Typical BDSL Hydraulic Jack



.The hydraulic jack's cylinder and piston are welded to 50mm thick steel bearing plates. The bearing plate's flat surfaces become detrimental to the test function as they encourage build-up of a low strength laitance layer which affects the measured settlement. The Bearing plates can restrict the concrete flow inside the pile which can weaken the pile causing it to fail.

These heavy 50mm thick steel plates serve two purposes –

(1) they are used to support the hydraulic jacks which are attached to the bearing-plates by welding directly to the cylinder and the piston top plate, they give support to the cell's weight after installation inside the rebar cage,

(2) are necessary to help distribute the concentrated jack load over the whole pile cross-sectional area,

Continue on next page...

1. Super Cell

The New Generation of

PILE TESTING LOAD CELLS

The innovative design of Super-Cell provides a very much lighter and easier to handle assembly which is readily secured inside the re-bar cage without the use of bearing plates, the cell-maker provides integral brackets or struts to give support for the cells inside the rebar cage.

Above and below the Super-Cell cone-shaped flow guides are fitted to -

(1) help to prevent the build-up of laitance below and above the cells by helping the smooth flow of concrete around the Super-Cells.

(2) Assist with the distribution of forces through the Super-Cells by acting as a bearing pad.

The Super-Cell's light weight makes it much easier to install inside the cage which reduces the risk of bending of the rebar cage during lifting and lowering in to the bore-hole.

Continue on next page...

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This assembly procedure may cause damage to the jack seals as follows;

- during lifting from ground level in to the borehole the heavy-weight of the hydraulic jacks may cause the cage to bend which can misalign the bearing plates as well as the piston and cylinder, this cage bending can cause a high risk of damage to seals as well the subsequent seizure and failure of the jack.

- the substantial extra weight of the bearing plates attached to both the cylinder and the piston may cause misalignment between piston and cylinder which may affect the functionality of the seals.

- after installation and casting in to concrete the piston and cylinder might already be skewed or misaligned off-centre which is a potential for the piston to seize inside the cylinder or prevent the piston of moving under pressure.

- the heat of arc-welding when attaching jacks to the bearing plates can weaken the properties of the flexible seals inside the jacks causing them to fail under high hydraulic pressures,

- even a small hairline scratch or tiny weld splash on the surface of the piston will cause a substantial leak at 700bar pressure,

- after assembly in the factory contamination can enter the small gap between piston and cylinder that cannot be removed, even a small piece of sand can scratch the piston surface sufficiently to cause a leak,

The photo below illustrates how the cone guides help to provide easy flow of concrete around the cells –

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2. 	2. 
As the hydraulic jack opens under very high pressures of >700bar the large Seals inside the cylinder may leak as the piston is pushed out of the cylinder, the function of the seals is critical to the success of the test if they're damaged during installation the test could fail. After these hydraulic Jacks have been in storage for a long time, especially in very hot climate, the seal materials begin to lose their flexibility and their capacity to provide an effective high pressure seal is substantially reduced. This type of hydraulic jack is designed for applications where it can be readily replaced or repaired if a leak should occur, but for the BDSL cast-in-situ use where it's embedded inside a concrete pile it is not considered to be as reliable as the Super-Cell.	Here is an expanded Super-Cell under pressure test, it operates at much lower pressures < 250bar. There's **No** large high-pressure moving seals, the cell is an all-steel hermetically sealed fully pressure tested assembly. The expansion (pile settlement) of the cell is provided by its unique design. There is **No risk** of damaged seals or large leaking O ring seals with a Super-Cell.

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Typical BDSL Hydraulic Jack	Super-Cell
3.  The piston may seize in the cylinder if reaction forces acting on them both are not perfectly uniaxial. In a Bi-Directional Static Test due to the different ground conditions which exist in the borehole it is incorrect to assume absolute uniaxial forces will act on the pile. The Piston – Cylinder interface has very tight clearance (to provide the high-pressure sealing that's required), a small lateral or non-axial force acting on the cell may cause the piston to seize inside the cylinder and it may fail to open.	3.  The fluted bellows design of the Super-Cell is much more compliant to non-uniaxial forces acting on it, there is no risk of the cells expanding parts seizing. Super-Cell is a true expanding hydraulic pressure cell.

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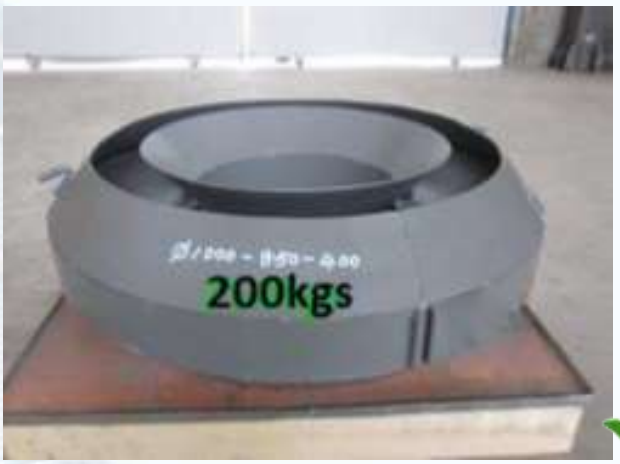
Typical BDSL Hydraulic Jack	Super-Cell
4.  For a typical 1800t test load of 1000mm dia pile there will be 2 x 600t jacks weighing 450kgs each and 2 x 50mm bearing plates weighing a similar amount giving almost 1,800kgs total weight.	4.  The equivalent Super-Cell patented Ring-Cell design has both low-height and low weight 200kgs making it much easier to handle at site, and less costly to ship, it can even be sent air-freight without too great cost if required urgently at the test site.

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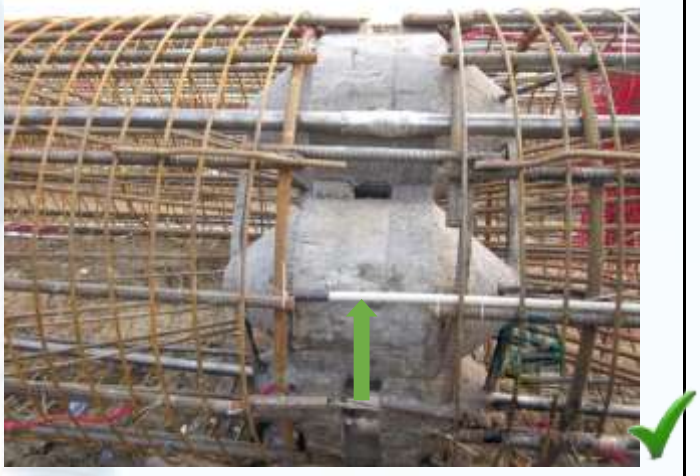
5. 	5. 
Since 20yrs from the introduction of the BDSL technique the Jacks Top and Bottom movements has been measured using a very simple Tell-Tale method – by joined sections of solid steel rods aligned inside a steel conduit. There are numerous difficulties and disasters associated with this now out-of-date procedure. Dropped rods during installation, conduits filled with grout are frequent shortcomings of the 20yr old method. The rods also tend to snake inside the conduit which will reduce the settlement readings.	An innovative technique is now used for Super-Cell to measure the upward and downward movement of the pile. Special flexible stranded steel-wire inside an armoured submersible sheath is used, it comes in coil is easily handled on site and is installed complete in one go at the same time as the hydraulic hoses. Loss or failure of Tell-Tales virtually eliminated entirely by the inventors of Super-Cell.

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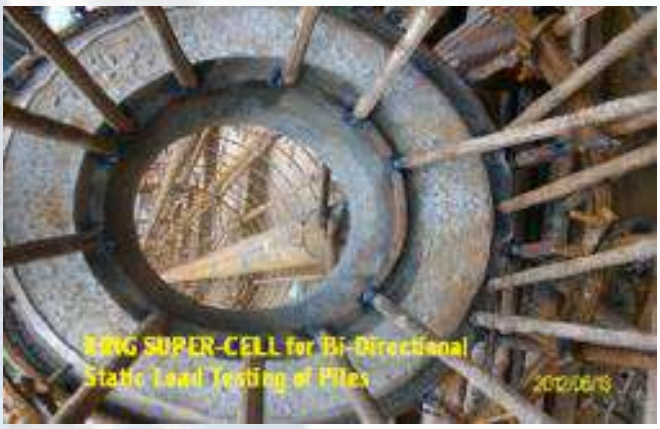
Typical BDSL Hydraulic Jack	Super-Cell
6.  A typical piston/cylinder jack is made in fixed sizes which govern how may jacks can be installed inside the pile's cross-sectional area. This results in a lot of wasted area of the cross-section, it also means the jacks must be designed for much higher pressures to achieve the required test-loads.	6.  The innovative structural design of the Super-Cell BDSL cell enables more cross-sectional surface area of the cell to be used for applying the load hence for any given diameter of pile the Super-Cell can apply more load than an equivalent piston/cylinder BDSL jack.  The patented Ring Super-Cell© applies load over a much larger cross-sectional area of the pile making it very suitable for Working Pile tests because the pile's load bearing capacity can be restored fully by controlled grouting of the cell's chamber and pile. 70% to 80% of Super-Cell tests to date have been on Working Piles !