ILLUSTRATED GUIDE

ILLUSTRATED GUIDE TO O-CELL BI-DIRECTIONAL LOAD TESTING

The attached is for guidance only for a typical single level bi-directional test using O-cell® technology.

Europe & Africa
Fugro LOADTEST Ltd. (Reg. No. 4243793)
14 Scotts Avenue, Sunbury Upon Thames
Middlesex, TW16 7HZ, UK
Phone: +44 (0) 1932 784807
Fax: +44 (0) 1932 784807

Asia
Fugro LOADTEST Asia Pte Ltd
159 Sin Ming Road, #05-07 Amtech Building
Singapore 575625
Phone: +65 6377 5665
Fax: +65 6377 3359

Americas LOADTEST Inc.
2631-D NW 41st St
Gainesville, FL 32606, USA
Phone: +1 352 378 3717
Fax: +1 352 378 3934

Middle East Fugro LOADTEST
FUGRO MIDDLE EAST BV
P.O. Box 2863, Dubai, UAE.
Phone: +9714 3474060
Fax: +9714 3474069

E-mail: Europe_Info@loadtest.com Internet: www.loadtest.com

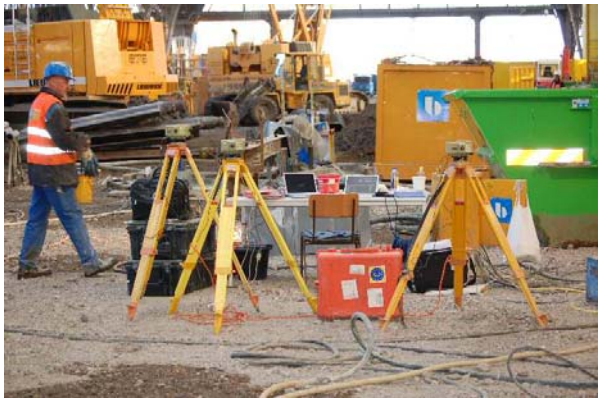
ASSEMBLY 1	Bearing plates		The bearing plates, fabricated locally, are designed specifically for the reinforcing cage and number of O-cell(s) required for the desired load to be mobilised in the test pile.
	Welding O-cell(s) to the steel bearing plate		The O-cell(s) are accurately positioned on the lower bearing plate and welded into place. Temporary lifting eyes are often used to facilitate handling of the plates and O-cell(s).
	Fabrication of the O-cell assembly		Once the bottom plate and O-cell(s) are secured, the top bearing plate is accurately aligned and welded into place. Three or four vertical bars are also welded between the plates to prevent any torsional forces being transmitted to the O-cell(s) during handling.
	Welding of the O-cell assembly to the reinforcing cage		The completed O-cell assembly will then be lifted into one side of the reinforcing cage and welded once in the correct position, perpendicular to the cage axis at the given location. Depending on the configuration, sometimes the bearing plates are butt welded to the cage(s).

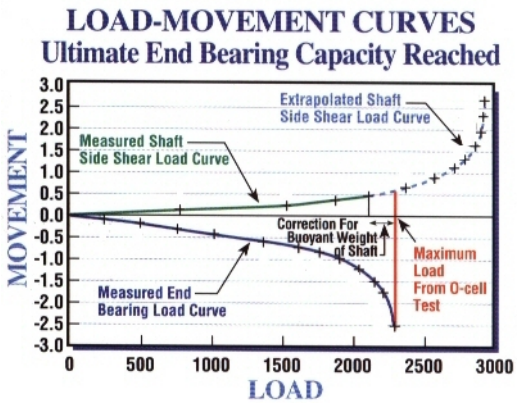
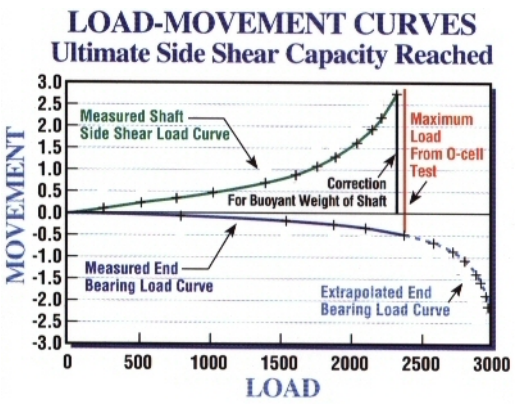
ASSEMBLY 2	Attachment of reinforcement cage to other side of the O-cell assembly		The cage for the other side of the O-cell assembly can then be positioned and welded as required. The funnel to guide the tremie passed the O-cell level can be constructed. Assembly of the cage on a flat surface is advisable.
	Fixing of instrumentation	 	Once the welding of the O-cell cage is complete the instrumentation can be fixed. LVWDTs across the bearing plates, strain gauges, rod extensometers and telltale casing will be attached to the cage. Where specified, pressure sensors or pile tip pressure plates can be fitted. All cables are routed and secured along the reinforcing cage and temporarily fixed inside the top of the cage.
	Attachment of instrumentation to O-cell assembly		Traditional telltale casing and rod extensometers extending from the top of the O-cell assembly to top of pile and any ECTs, used to measure the pile compression can be installed. Hydraulic hoses, can be connected to the O-cell assembly and routed through the reinforcement.
	Instrumentation of follow on cages above the O-cell assembly		Any additional cages that will be spliced together over the bore need to be prepared – installing lengths of hydraulic hoses and telltale and vent casing extensions with union couplers for rapid connection and any strain gauges required.

INSTALLATION 1	Lifting of cage to position		The lifting of each cage to vertical should be carried out using a lifting beam or several pick points to ensure the cage remains reasonably straight during lifting.
	Cage spacers	 	A suitable number of spacers/rollers/skids should be used to ensure that the reinforcing cage remains central to the bore as the cage is lowered.
	Lowering cage into the excavation		The temporary stiffening bars between the bearing plates (for handling purposes) will be cut just above the bottom plate. Top of the bottom bearing plate will be greased to aid development of the fracture plane at this level.
	Connection of additional cages and instrumentation		Where cage splices are required, all of the cables from the instruments of the lower cage need to be pulled up to the top of the additional cage and secured in place. Hydraulics hoses, Telltale casings and vents need to be connected and secured.

INSTALLATION 2	Concrete placement		The approved concrete mix should contain sufficient retarding agent to maintain workability. Concrete placement will commence utilizing a slick line tremie pipe (with no joints below O-cell level) of sufficient length so as to extend beyond the O-cell assembly to the toe of the pile.
	Concrete placement (post pour)		The reinforcing cage or a support assembly will be extended beyond the concrete cut off level to above ground level, where appropriate, to support telltales, instrumentation wiring, and hydraulic supply lines above the concrete level.
	Concrete cut-off level		The top of concrete need not be brought up to ground level. It can be left at cutoff level or just sufficient for the level at which the test is required. The empty bore is sometimes backfilled with granular material or just made safe.

T E S T I N G 1	Setup for testing		After the concrete reaches the minimum strength, the test may be started. An air conditioned environment (cooled or heated) is required as the working area.
	Telltale instrumentation and assembly		If not previously installed, the telltale rods (6 or 8mm) need to be coupled together and inserted so that movement of the top of the upper bearing plate can be monitored. Upward movement of the element of the pile above the O-cell is typically determined by measuring the compression between the top of the O-cell assembly and the top of the pile and adding this to the upward movement of the pile.
	Measurement of pile head movement from a reference beam		When on land, a simple reference beam can be set up using a rigid steel I-beam resting on supports at least 3 pile diameters away from the test pile. LVDTs or LVWDTs mounted on the reference beam can measure the top of pile movement.
	Typical O-cell instrumentation at ground level		Once the instrumentation is set up and before zero readings are taken, the area should be cordoned off and any adjacent site operations which might disturb the test must be stopped.

T E S T I N G 2	Instrument readings performed automatically using data acquisition system		Testing is carried out from inside a cabin. The O-cell(s) will be pressurized typically with water through high pressure hydraulic pumps. Compressed air (at 100psi) is used to energize these pumps.
	Hydraulic pump and control system		A calibrated, high-pressure bourdon gauge will be used to read the pressure on the pump line and a calibrated pressure transducer will read the pressure on the return line. Applied load is determined by relating the hydraulic pressure to the O-cell load calibration curves.
	Independent measurement of reference beam or pile head		In addition to the reference beam, an additional independent optical electronic system is used to monitor the reference beam movement automatically from a more remote location. (between 5-20m). Shading of the instrument should be provided.
	Independent reference (2)		Where other site activities may disturb the reference beam or where the test is performed without the need of a reference beam over the top of the pile, multiple electronic Leica levels may be employed to monitor the top of pile movement directly and independently.

T E S T I N G 3	Data acquisition system		A datalogger will be used to measure and record directly data from all of the sensors from within the pile and on the pile head at intervals of 30 or 60 seconds. Data is stored in the datalogger memory and transmitted directly to the field computer for live monitoring.
	Real time display		The field computer displays in real time the results from all of the sensors and records any electronic level data being measured. The computer can also control the pumps directly and allow supervision of the loading schedule according to the agreed test specification.
	Measurement data in graphical format	 	The test will start with pressurising the O-cell(s) to break the tack welds and separate the two elements of the pile. Loading steps will then be carried out according to the detailed method statement. The load will be removed and testing finished once either one of the following situations occur: 1. A predetermined maximum test load has been applied; 2. The maximum travel of the O-cell is reached (150 mm); or limited upward movement to prevent exceeding the upward skin friction. 3. Ultimate capacity of the pile above or below the O-cell location has been reached.