LOADTEST
O-Cell® Technology in Moscow City, Russian Federation

RMJMs Twisting Wedding Palace.

The City of Capitals (photo Bradmoscu)

Naberezhnaya Tower

Federation Towers

The Moscow International Business Center

The Moskva-City (also known as the Moscow International Business Center) Project is a $12 billion development close to the heart of Moscow. This new international business centre will consist of offices, hotels, retail and residential development. It will be the first of its kind in Eastern Europe and will offer the most up to date transport and telecommunications network.

These large high-rise projects have required foundations into the Suvorov Limestone through the Voskrensky clay. Since the behaviour of the Limestone is relatively unknown, pile tests have been recommended to verify the foundation designs. Bi-directional testing using O-cells was employed to verify rock socket behaviour. Tests were performed on piles of diameters between 900 mm and 1500 mm, located on several separate plots, mobilising total capacities in excess of 60 MN.

Plots 2-3 required testing for the foundations of the City Palace, formerly known as the Wedding Tower, designed by RMJM as “a wedding chapel in the sky”. This 46 storey twisting skyscraper will incorporate a top floor ball room with stunning views over Red Square.

Plot 4, Imperia Tower is a multipurpose 2 building complex located on plot 4 of the Moscow International Business Center, the mixed-use Building A and the water park entertainment complex in Building B. Office space, apartments, a 280 room hotel and a water park will make up the project and will be a focus of entertainment for MIBC with a shopping mall, restaurants and cafés.

Plot 9, the first project for Loadtest in Russia, was the twin, 53 and 63 floor towers, The City of Capitals consisting of Moscow Tower and St.-Petersburg Tower

Plot 10, the Naberezhnaya Tower C, a 250m high, a 56 storey tower block.

Plot 11, also incorporating the transport link which will be the transfer point between different subway lines and light rail lines and other public systems. There will also be offices, hotels, a clinic, and parking.

Plot 13, The Federation Tower complex consists of three towers, Tower A at 93 floors, Tower B at 62 floors and Tower C, Spire at a maximum height of 506m.

Moscow International Business City At Night *Source: Wikipedia.com*

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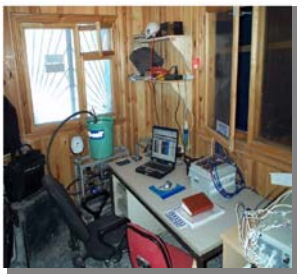
City of Capitals
(photo Bradmoscu)

Installation of the reinforcing cage with O-cells



Testing monitored and controlled from inside a heated cabin

Testing in progress protected from the elements

Load testing programs

Load testing has been performed, on each of the projects previously mentioned, with two bi-directional tests using O-cell technology on each site. Unique to bi-directional O-cell testing, the applied load could immediately be directed onto the end bearing portion of the pile. By using the skin friction as a reaction, there is no need for a reaction beam at the surface with expensive anchor piles. If the tests were carried out by top down testing it would have been necessary to devise complex sleeving arrangements to reduce the friction above the rock socket.

Pile Tests

Despite testing at times in snow and freezing weather conditions, all the testing programs at the Moscow International Business Centre were successful. The effective mobilised capacity in each of the test piles was carried out to the desired maximum loading, and upon request, taken to higher loads; in the case of plot 13, the piles were tested to twice the required capacity. Total mobilised capacities for each plot were dependant upon size of structure and foundation design with a maximum of over 60 MN achieved on Plot 13.

The two 1500 mm piles tested at Plots 2-3 were tested to loads exceeding 40 MN. The main concern on this particular site was the settlement expected at the working load. Analysis of the test results enabled the confirmation of acceptable settlements, allowing the construction to proceed with confidence in the foundation design.

Moscow City Business Centre *Source: Wikipedia.com*

O-cell® Technology in Moscow Business City
Plot 17-18

Project:	**Plots 17-18**
Location:	**Moscow Business City, Russian Federation**
Piling Contractor:	**KASKTAŞ A.Ş**
Main Contractor:	**RENAISSANCE CONSTRUCTION**
Consultants:	**NIIOSP**

Project Description:

The Presnensky district of Moscow has been completely rejuvenated with the iconic buildings of the Moscow International Business Center, now known as Moscow-City. Fugro Loadtest were delighted to be invited back for three more tests, located at Plot 17-18, having already successfully tested piles constructed for the foundations of the majority of the other high rise buildings in Moscow-City (Plots 2-3, 4, 9, 10, 11 & 13).

Artists impression of the final construction

The, as yet un-named towers on this plot, are expected to be 60 and 65 floors respectively, at a maximum height of 288 metres.

Installation of the O-cell cage

The testing program as specified by NIIOSP would require 3 preliminary test piles to allow verification and optimization of the pile design. Although the majority of piles for the high rise buildings in this area of Moscow are founded in the solid Suravov Limestone, the soils are more complex than might be imagined. A layer of hard marly clay is sandwiched between two very hard limestone layers. In order to test the properties of both the Limestone socket and the Voskrensky marly clay, a series of tests were designed by NIIOSP, two of which would be multi-level tests with a third single level test to confirm the loading in the Limestone.

Pile Testing in progress

The single level test was undertaken with 3 x 610 mm O-cells and the two multi-levels having the same O-cell configuration at the lower level supplemented by 3 x 530 mm O-cells at the upper level to assess the skin friction in the marly clay layer. The single level test pile was loaded to 115.5 MN making it the highest single level pile load test in Moscow. The multi-level tests achieved combined loads of up to 131 MN, a European record for a 1500 mm diameter bored pile.

Placement of vibrating wire sister bar strain gauges provided an excellent load distribution estimation allowing the designers to potentially increase the load on each pile or reduce their overall design length thus optimizing the design and providing value engineering solutions.