



Image courtesy Ross Barney Architects

# O'HARE MULTI-MODAL FACILITY

## CHICAGO, ILLINOIS, USA

O'Hare Airport's 2.5 million square feet multi-modal facility hosts all rental car agencies under one roof to add airport efficiencies and reduce surface traffic congestion. Linked by light rail, to eliminate cumbersome shuttle buses, this facility will accommodate 30,000 daily travellers and provide dramatic benefits to the airport expansion and modernization.

The multi-modal facility is one of the Midwest's largest structures and includes a 6700 vehicle five-level main parking structure and a Quick Turnaround maintenance garage. It is designed for future expansion to nine stories. The multimodal center connects airlines, light rail transit, traditional rail, buses, shuttles, rental cars and private vehicles all at one location to facilitate travel within the Chicago region and to destinations throughout the world.

### O-CELL® LOAD TESTS

To provide foundation optimization Fugro Loadtest advised using "Chicago-Method"

O-Cell® tests for the project to prove higher foundation end-bearing values. It is a variation of the traditional O-Cell test that uses the hydraulic jack at the pile tip with a reduced diameter circular bottom plate, as compared to pile diameter, to concentrate end bearing load. As in regular O-Cell tests the load is applied to the reduced diameter bottom plate using the available side shear capacity above as reaction.

Two tests were performed on production 72-inch diameter caissons. The O-Cell configuration for both piles utilized single 20-inch diameter O-Cells located at the

### PROJECT INFORMATION

- Owner: Chicago Department of Aviation
- Foundation Contractor: Case Foundation
- Architect: Ross Barney Architects
- Completion Date: 2018
- Project Cost: \$800 Million
- Maximum Load: Shaft End Bearing 287 tsf; CFA End Bearing 180 tsf

### SERVICES PROVIDED

- 3 O-Cell load tests
- SONICaliper™

shaft base with a 24-inch reduced diameter bottom plate to provide a maximum unit end bearing confirmation up to 319 tsf. The stratigraphy was generally overburden, weathered bedrock and Dolostone. One caisson penetrated through the overburden with the pile tipped about a foot above the Dolostone. The second was extended with the pile tip socketed about a foot into the Dolostone. The excavations were inspected with the SONICaliper™ for plumbness, alignment and shape to assure that anomalies were not introducing errors in the load test results. The included SONICaliper image indicates one of the shaft profiles.

The third test was performed on a 48-inch diameter Continuous Flight Auger Cast (CFA) pile. As this was the first ever “Chicago-Method” O-cell test for an augercast pile, this proved a welcome challenge. Unlike traditional caissons, augercast piles are grouted as they are constructed, with the reinforcing steel then placed into the grout filled hole. The production CFA test pile was drilled through the overburden with the tip bearing in weathered bedrock about a foot above the dolomitic limestone bedrock. The O-Cell configuration was a single 13-inch diameter O-Cell with an 18-inch reduced diameter bottom plate located at the shaft base to provide a maximum unit end bearing confirmation up to 220 tsf.

Fugro Loadtest performed the three O-Cell static load tests in November and December 2015 in accordance with the Quick Load Test Method for Individual Piles (ASTM D1143) using twenty nominally equal load increments. The 72-inch caisson test tipped



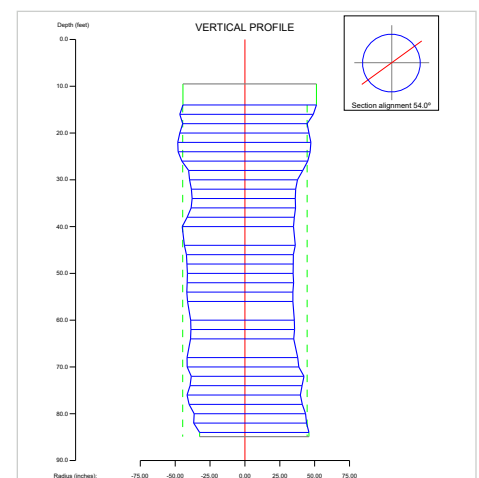
Cage assembly

1-foot above Dolostone had a maximum applied unit end bearing of 287 tsf while the second 72-inch caisson socketed into the Dolostone had a maximum applied unit end bearing of 279 tsf. These tests proved that foundations sitting on bedrock could obtain large end bearing values without having to penetrate the rock.

By the foundation not having to penetrate the rock, faster and more economical drilling techniques other than traditional caissons become viable. This was proven by the augercast pile test, founded just above the dolomitic limestone, which produced a unit end bearing of 180 tsf. This made the 48-inch augercast piles a viable foundation alternative for the Multi-Modal Facility.



O-Cell assembly



SONICaliper profile