

# LOADTEST O-Cell® Technology in Leipzig, Germany



Project: **City Tunnel Project**

Location: Railway Station, Leipzig, Germany

Client: City of Leipzig

**Project Description:** The City Tunnel of Leipzig is the last and central component of the railway system restructuring process in Greater Leipzig. Not only can the suburban train system be restructured after the tunnel has been put into operation, but traffic connections between the region and the City will be improved, giving major impetus to the development of the City's traffic system. One section of the tunnel was scheduled to go under the existing Railway Station.



Leipzig Railway Station



Shops in the Railway Station



O-cell Assembly Placement



Test in progress (diaphragm wall grab and tunneling machine in the background)

The main Leipzig Railway Station is the biggest terminus and most significant passenger station in Europe. There are 26 platforms and 5 external platforms. The station has a shopping area on three floors with a total of 30,000 m<sup>2</sup> for strolling, shopping and eating.

Under the affected area of the shopping centre, there are several piles which may have been undermined by the tunnel construction. A method of improving their capacity and the effect of the potential processes were to be evaluated on similar dummy test piles.

The challenge was to evaluate the change in pile performance, while under load, as injection grouting was being performed to improve the general capacity of the piles. For this evaluation to take place, a series of expendable test piles were installed adjacent to the affected piles, so that several injection processes and techniques could be evaluated. Traditional top-loading would have encroached on the process equipment and seriously impeded execution of the process.

Tests were performed on one control pile, two process evaluation piles and one dedicated pile to determine the in-situ end bearing performance of these 1500 mm diameter piles. The piles were constructed under limited headroom to depths of approximately 22 m and fitted with Geokon model 4855 pile-tip pressure cells.

Three 405 mm diameter O-cells were installed in each pile, giving a maximum loading capacity of 30 MN. This allowed upward evaluation of level reduction, application of constant load during boring for low pressure and high pressure injection grouting and evaluation of the friction and end bearing of the lower section of the pile (below the level of influence of the tunnel), without interfering with the numerous other site activities.

In order to achieve sufficient reaction on the upper section of one of the test piles, shaft grouting and jet grouting was employed, allowing the test load to exceed 17 MN in each direction.

Skin friction was less than expected, making the enhancement of skin friction challenging without causing additional unwanted settlement. Ultimate end bearing capacity was excellent and larger than expected.



Tunnel scheduled for opening In 2010

Source: Strabag.com

