

OVERHEAD CONDUCTOR RAIL IN THE CITY TUNNEL LEIPZIG

English



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Overhead conductor rail (OCR) in the City Tunnel Leipzig

In the City Tunnel Leipzig (CTL), a TracFeed®OSS2000/15 OCR-system from Rail Power Systems GmbH (RPS) was used instead of a conventional overhead contact line. Various support point designs were developed for the fastening of the conductor rail in the stations and in the tunnel sections.

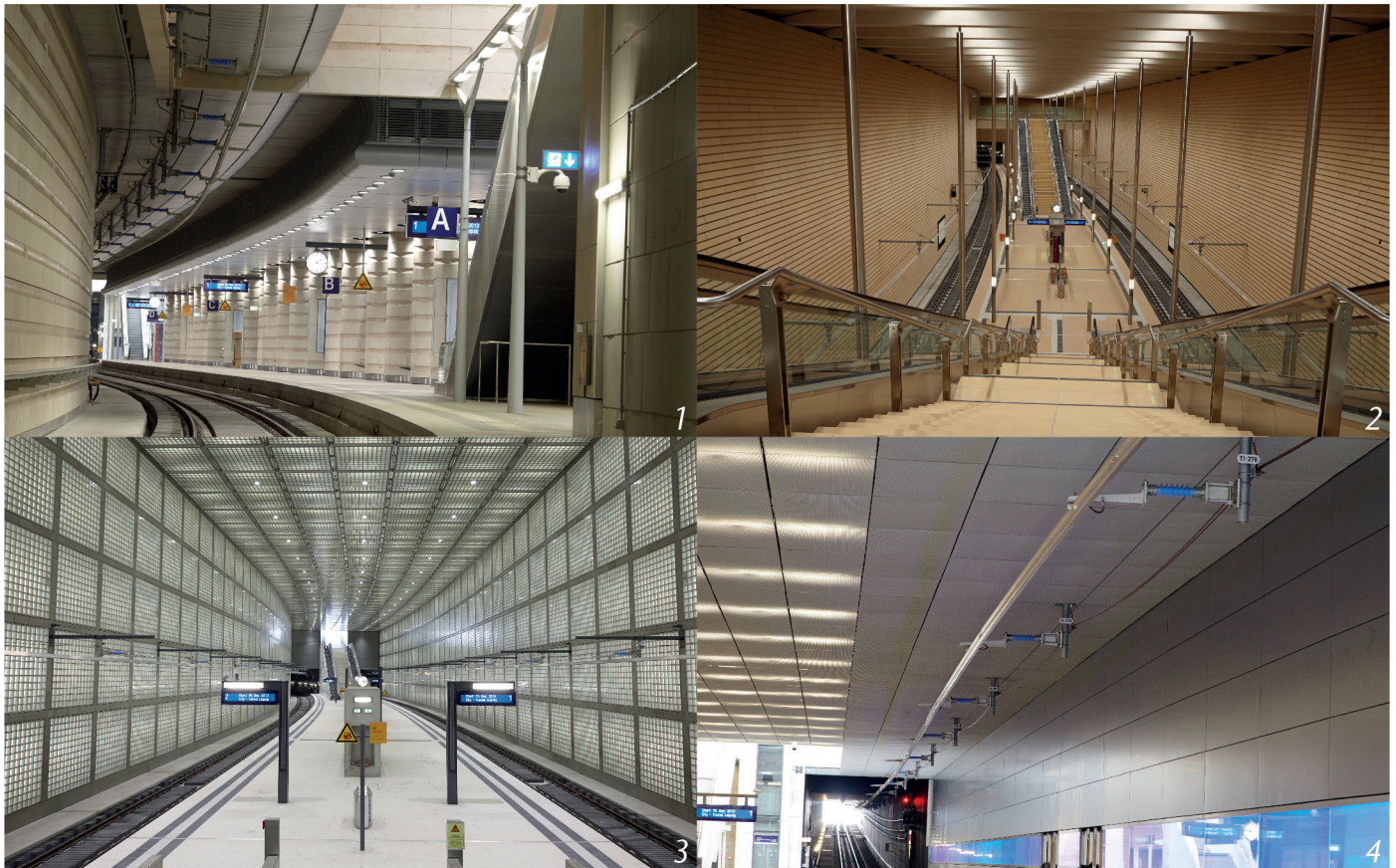


Figure 1:

Four different stations in the tunnel (all Figures: RPS).

1 – Hauptbahnhof, 2 – Markt, 3 – Wilhelm-Leuschner-Platz, 4 – Bayerischer Bahnhof

Overhead conductor rails (OCR) are a frequently used alternative when the tunnel cross-section needs to be minimised in consideration of construction costs, whereby an overhead contact line with the lowest possible installation height is required. Catenary overhead contact lines can thus be ruled out due to the requisite system height. The essential technical features of the overhead contact line in the City Tunnel Leipzig (CTL) are:

- approximately 750 support points
- 7450 m overhead conductor
- 14000 m return feeder cable
- maximum distance of 12,00 m between support points
- lateral positions alternating between +0,25 m and -0,25 m

- contact wire height in the tunnel 5,10 m
- two switches in the tunnel
- four transitions between conductor rail and the standard overhead contact line
- four insulated overlaps
- two switch frameworks
- emergency tunnel earthing system with seven substations
- track speed of 80 km/h

A characteristic of the CTL is the difference between the OCR supports in the tunnel. Each of the four train stations in the CTL was individually drawn up by an architect (Figure 1). As a result, each train station has different support points and longitudinal partitions of the conductor rail system.

The entry ramps to the tunnel and the connecting tunnels between the train stations also required their own support point designs.

In the area of the entry ramps, anchor rails were already installed in the ceilings of the rectangular tunnel, thus specifying the location and fastening of the support points (Figure 2).

Such anchor rails were not provided in the segmental liner sections of the connecting tunnel (Figure 3). The longitudinal partitions of the OCR and the arrangement of the support points were defined by the detail design from Rail Power Systems. The support points were fastened with drilling anchors, the production of which began in 2011.

A drilling template was specified for the segmental liner sections, which limited the possible hole areas to precisely eight versions of segmental liner sections of a segmental liner ring (Figure 4). A maximum diameter of 25 mm and depth of 200 mm were specified for the holes.

Holes for anchoring components with a depth greater than 50 mm were only possible in the drilling template. Damage to the reinforcement in the segmental liner sections was prevented by means of this procedure.

Precise timing and measurement of the drilling and thus the spacing of the support point partitioning according to the drilling template were necessary. For this purpose, a gauge was used in combination with laser plummet, by means of which the points for the anchoring of the overhead conductor rail could be individually, easily and precisely determined and marked for each of the 300 support points in the segmental liner tunnel.

After the measurement, the anchors were set, with the same technology being applied that Rail Power Systems used for the first time in the Katzenberg tunnel between Freiburg and Basel (CH). The anchor holes were made by means of a vacuum drilling template. The drilling templates were designed for the hole pattern fastened to the segmental liner sections by means of a vacuum. The respective hole patterns in the templates were defined with a specific hole diameter and hole depth. The dust created during the drilling was suctioned out through the closed drilling chamber. As a result, drilling dust deposits in the tunnel were largely eliminated. The result was precise and clean drill patterns. The anchor arrangements had precise measurements and thereby enabled the fastening of the support point plates according to plan.

After the anchors were set, the tunnel was equipped with the further OCR equipment starting in the second quarter of 2012, after which the tunnel stations were completed.

Starting in March 2012, the support point bearing structures and return feeder cables were installed in the north and west ramps of the CTL. In



Figure 2:

Conductor rail support point in the rectangular tunnel, fastening by anchor rails.



Figure 3:

Conductor rail support point in the round tunnel, fastening in the segmental liner section with anchors.

June 2012 the installation of the support points was completed. The two return feeder cables for each track were installed at the same time.

The installation of the OCR profiles took place from the end of June to the beginning of August 2012. The supporting traverse developed by RPS was used for the first time. With this supporting traverse, the profiles are gently, easily and safely raised from a material carriage to the installation height. The OCR profile was then drawn over the installation carriage, connected to the already installed profile and fastened in the support point clamp. Up to 50 OCR profiles could be installed in a single shift.

After the installation of all profiles was completed within five working days, the contact wire was drawn into the conductor rail. Then the support points were finely adjusted, the power connector was installed, and the annular earthing electrode was ins-

talled in the tunnel and connected to the contact line system earthing. The parallel alignment and transitions of the OCR were regulated with precision down to the millimetre.

With the renovation of two bridge structures, the electrification of the west and north access connections was interrupted until August 2013. With the installation of the transitions from the conductor rail to the catenary overhead contact line and the return feeder connections, the connection of the tunnel area to the above-ground track network began in August 2013. The AC 15 kV 16,7 Hz traction power supply of the tunnel was also established.

The transitions from the overhead conductor rail to the catenary overhead contact line separate these two overhead contact line types and were improved for the system in the CTL. The contact wire connection of the transition overhead contact line to the contact wire running parallel for the conductor rail was designed so that a smooth transition of the current collector from the catenary overhead contact line to the conductor rail is achieved.

In 2013 the automatic contact line voltage testing system for the CTL was also installed with full func-

tionality as a part of the contact line installation (see [1]).

The overall system was handed over on time and energised on 24 September 2013. Dynamic measurement runs began on 29 September 2013. Due to the ostensibly good travel quality, which can also be seen as a result of the careful installation, DB Netz approved the tunnel for travel before the evaluation by DB Systemtechnik had been issued. The conclusive test report confirmed the fulfilment of all requirements and led to the formal approval on 11 November 2013. No subsequent work was required after the commissioning.

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- [1] Lange, U.; Menscher, M.; Stecher, D.: Commissioning of the Leipzig City Tunnel In: Elektrische Bahnen (Electric Railways) 111 (2013), issue 12, pp 720–730.

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