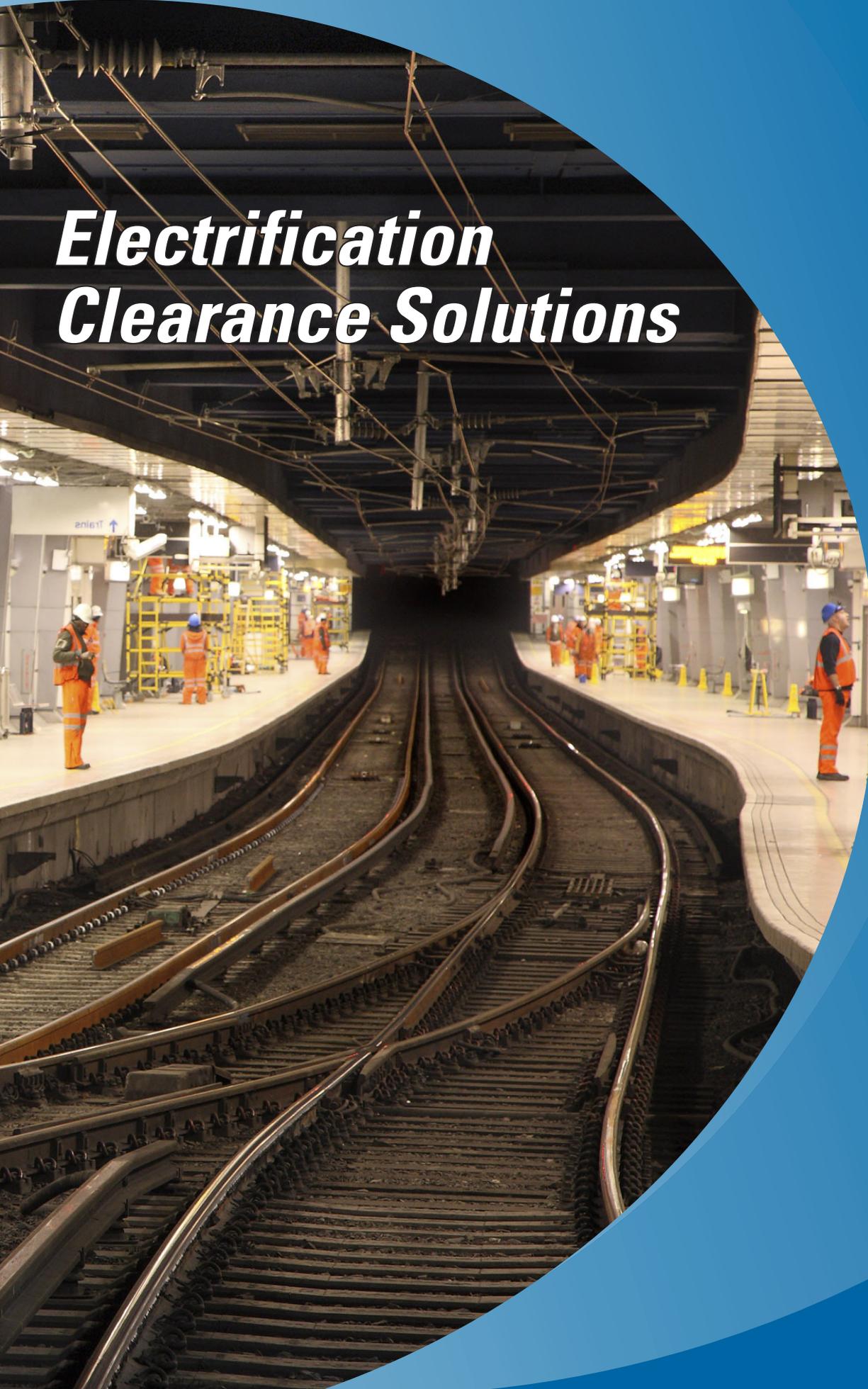


***Electrification  
Clearance Solutions***



# *Electrification Clearance Solutions*

Overhead line electrification of an existing railway often presents problems at structures where the available space is limited. Particular problem areas are bridges and tunnels, where the cost of modifying the structure or the track can be very expensive and the track possession time to do the work is very disruptive.

Balfour Beatty Rail have a range of innovative solutions to improve clearances for electrification, which include:

- XiTRACK and ERS (Embedded Rail System) for cost effective track lowering and fixity improvement
- Reduced depth conductor beams
- Accurate measurement of the true clearances needed
- Sophisticated dynamic pantograph gauging techniques

Used on their own or in combination these solutions can provide a significant amount of additional space, minimising or avoiding completely the need for structure modification and making a considerable saving in the cost of electrification.



# Improving Clearances with XiTRACK and ERS

Balfour Beatty Rail's XiTRACK is a polyurethane ballast modification solution that holds ballast in place to create an engineered structure. Balfour Beatty Rail's ERS is a very low profile slabtrack solution.

XiTRACK and ERS improve clearance in two ways. Firstly, as track is less prone to lateral and vertical movement, the track fixity classification can be increased from low to medium or high. This allows reduced clearance requirements to be used, typically freeing up tens of millimetres of additional space.

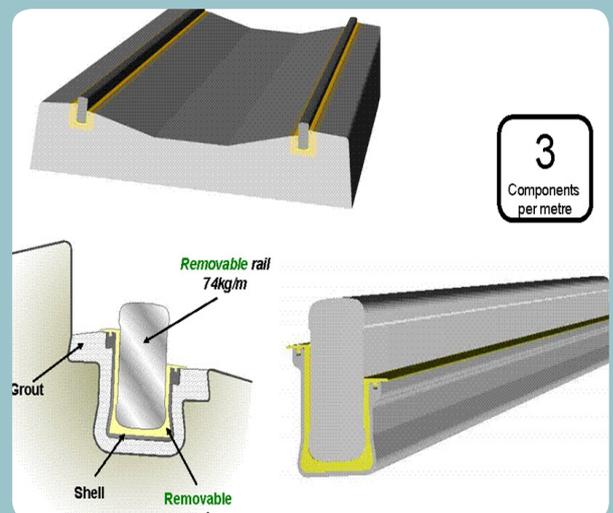
XiTRACK can help further if the track still needs to be lowered as it allows a significantly reduced under-sleeper ballast layer to be used. The standard approach would be to use 300mm of ballast below sleeper bottom, but following extensive testing at Heriot-Watt University, including a 30 year accelerated fatigue life assessment, Balfour Beatty Rail has proved that a 150mm XiTRACK layer of ballast will provide the required performance, providing 150mm of additional clearance.

XiTRACK will also provide benefits in:

- Improved ballast stress management
- Prevention of ballast migration
- Increased ballast life
- Reduced track maintenance

## ***Balfour Beatty Rail Embedded Rail System (ERS)***

The very low height and absence of sleepers with ERS can provide a further increase in clearance of up to 150mm.



# Reduced Depth Conductor Beams

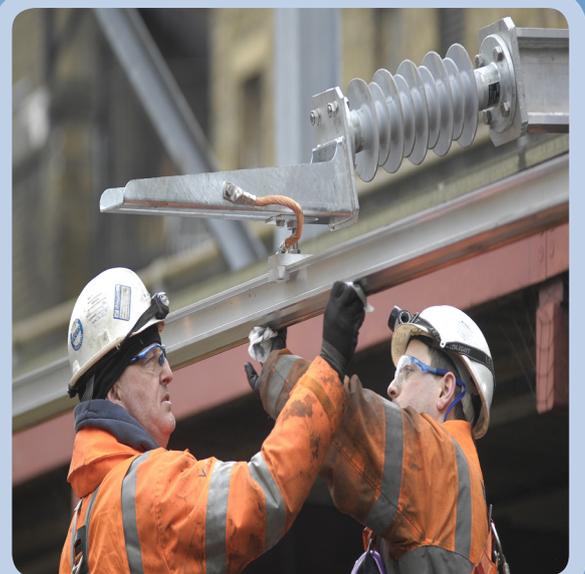
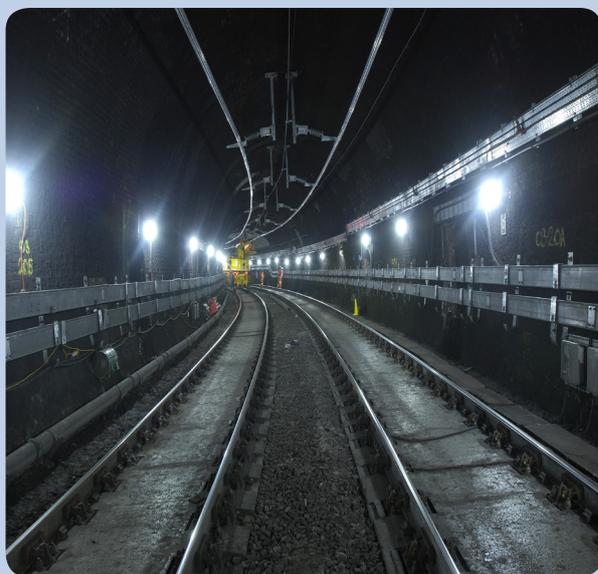
Developed by Balfour Beatty Rail, these special reduced depth conductor beams provide a robust, easily constructed, low maintenance solution where space is at a premium.

The beam is supplied in sections with a hollow extruded aluminium profile which can be cut to length and joined using bolted splice plates, forming a continuous beam into which an un-tensioned conventional contact wire is inserted.

The lightweight design makes it easy to install and supports a production-line approach. The use of un-tensioned contact wire eliminates the need for bulky tensioning devices, reducing the loading imposed onto the surrounding infrastructure and eliminating the use of tunnel niches to house the tension weight assemblies.

Maintenance is minimal, with barely any moving parts, and as the contact wire is un-tensioned the wear allowance can be safely increased, extending life by around 10%. Wear on the pantograph carbon strip is also improved as the conductor beam is installed laterally in a sinusoidal wave rather than a staggered profile. The conductor beam significantly reduces the chance of de-wirement due to its non-tensioned characteristics, absence of hard spots and the improved interaction between pantograph and contact wire under dynamic conditions.

Electrically the beams increased short circuit rating provides a more robust solution and electrical sectioning is achieved by creating an air gap between two sections of beam, avoiding traditional section insulators, which are a common source of maintenance issues.



# Measurement

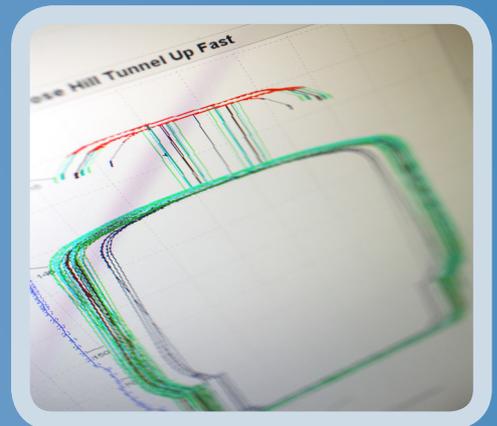
Balfour Beatty Rail is a leader in providing products and services for the measurement of railway infrastructure and particularly for structure gauging. Options range from the latest rotary laser scanners to high speed laser triangulation systems for rail vehicles. Our practical railway experience and knowledge of the standards and appropriate measurement systems means we can offer the most efficient and cost effective solution to any measurement need.



Our in-house software and data management systems provide the processing efficiencies and data quality control needed to meet Network Rail Standards and ensure results are provided in a format compatible with the National Gauging Database.

# Analysis and Consultancy

Balfour Beatty Rail's ClearRoute 2 is the industry standard software used for a wide range of gauging projects and investigations. ClearRoute 2 calculates clearances between vehicles and infrastructure to accurately determine areas in need of improvement.



Balfour Beatty Rail's gauging consultancy team have helped shape the current UK electrification programme. Pantograph gauges developed in consultation with Network Rail were analysed using HyperRoute to determine the effect on structures of installing OLE and assess electrification schemes.

We are currently developing a pantograph gauging module which allows benefits of using track or OLE solutions to be included in clearance assessments. This improved understanding of electrical clearance requirements allows a reduction in tolerances used for "unknown" factors. Through careful risk assessment, clearance requirements may be reduced and the space "released" to provide further structural modification cost savings.

This intelligent application of software and technology solutions means, it is often possible to achieve the necessary clearance without removing or rebuilding structures. A recent feasibility study on a major Midland Mainline station indicated a track lower scheme using these solutions could save the reconstruction of four major structures, providing significant cost and programme savings.

# *Electrification Clearance Solutions*



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