

RAPID CONNECTION  
FOR EASTERN EUROPE  
**ELECTRIFICATION OF THE  
BUCHAREST-  
FETESTI-CONSTANTA RAILWAY**





## ***Modern rail infrastructure for Romania: rehabilitation of the Bucharest– Fetesti-Constanta line***

### **The line**

The Bucharest–Constanta rail line forms part of the Romanian section of the pan-European transport corridor IV. It connects the Bucharest rail junction with the country's main line from Curtici via Arad, Sighisoara, Brasov and Bucharest to Constanta, the largest and strategically most important port on the Black Sea.

### **The route**

The first section of the line, which forms part of the Bucharest rail complex, used to run as a single track for five kilometres and, because of the topography, had tight, 300-metre-radius curves in places. The second, double track section was also characterised by special features as it crossed the River Danube and ran parallel to the A2 Bucharest–Constanta motorway and the Danube–Black Sea Canal. The natural topography of the terrain and the existing structures presented special challenges for planning the geometric elements and longitudinal sections ( $R < 1,000\text{ m}$  and  $i_{\text{max}} = 14.80\%$ ) of the new catenary.

### **The project**

Complete rehabilitation of the outdated mixed-operation route. It was planned that rail transport on this line, which is as important for Romania as it is for Europe, was to be made faster and more efficient, with maximum speeds of 160 km/h for passenger trains and 120 km/h for freight traffic. In addition, the levels of comfort, service and operational safety of the line, which serves a key portion of the Romanian transport market, were to be significantly improved. The multidisciplinary rail infrastructure project included earthworks and track construction work, rehabilitation of train stations, bridges and canals, railway electrification, and installation of signalling and telecommunication systems.





### The contract

In December 2005, as part of a FIDIC contract, Romanian State Railways (CFR S.A.) awarded Balfour Beatty Rail the contract of rehabilitating and modernising the double-track railway line over a total distance of 80 km (single-line 265 km) and the ten stations located along the line. Balfour Beatty Rail thus took responsibility for the rail electrification package (Lot 5) of the multi-disciplinary rail project Bucharest–Constanta, which was contracted out in a total of five lots to various companies specialising in railway infrastructure.

### Focus on multidisciplinary cooperation

The rehabilitation work began on 19 December 2005 and was carried out section by section on portions of the track, which were closed for this purpose. This called for a high level of coordination between the different lots, since the materials needed to be transported by rail and there was only one track available, which was in constant use. The railway stations presented a particular challenge, because temporary connections needed to be created between the new and old catenaries in order to maintain a minimum level of operations throughout the rehabilitation phase. The bypass work was performed in short night-shift operations, during which work was carried out in possessions of four hours in which the line was de-energized to allow safe working conditions for the installers.

The key to the success of the project was the integrated overall programme across all the construction lots. This guaranteed CFR a maximum transport flow during the rehabilitation work on the line, regulated unrestricted performance of all construction work and ensured the optimum use of all resources – both equipment and manpower. At the same time, Balfour Beatty Rail commenced implementation of the Balfour Beatty Rail Safety, Health, Environment and Quality (SHEQ) policy within its own organisation and also at its Romanian subcontractors.

### Overview of facts

#### Catenary rehabilitation

- ▶ Dismantling of the old catenary, installation of the new catenary system, including masts and foundations
- ▶ Safeguarding of the tracks and installations
- ▶ Laying of fibre-optic cable along the line
- ▶ Provision of maintenance vehicles and equipment

#### Power supply

- ▶ Rehabilitation of two 110-kV / 25-kV substations, construction and provision of two container substations
- ▶ Installation of switchgear and station equipment
- ▶ Installation of a SCADA centre in Constanta for the monitoring and remote control of the power supply to the railway line





### **Achieving targets faster through expertise, teamwork and structure**

Although the defined target objective was tightly scheduled, a solution to this problem was found. In order to comply with the deadlines, a Balfour Beatty Rail Romanian design team was integrated into the project organisation. Special installation teams with their own tools and equipment were deployed. Everyone at Balfour Beatty Rail joined forces to ensure the success of the project. Heavy haulage equipment and special vehicles were brought in from Germany, along with experienced supervisors, who trained the installation team on site to become skilled catenary installers.

Balfour Beatty Rail now has its own legal entity in Romania which can handle an extensive range of rail infrastructure tasks – from design and own pre-fabrication through to providing an expertly trained team of catenary installers.

### **The success of the project: a reliable partner for the future**

Once again, Balfour Beatty Rail was able to demonstrate its professionalism in Romania, and CFR discovered it could rely on the support of a capable and committed partner. Our skilled rail infrastructure professionals approach problems under their own initiative for solutions, adhere strictly to contractual arrangements and provide their comprehensive expertise for multidisciplinary rail construction projects.

### **Technical specifications for the overhead line system**

Nominal voltage (single-phase)	25 kV / AC; 50 Hz
Max. speed	160 km/h
Max. retensioning length	1200 m
Maximum lengthwise tensioning width	54 m
Contact wire lateral position	+/- 200 mm (max. 250 mm in curves)

Fully retensioned overhead line in the main track;  
semi-retensioned overhead line in the side track;  
steel catenary masts with synthetic insulators.

### **Technical specifications for the substation equipment**

Substation operating voltage (in accordance with IEC60038+A1):	
Nominal voltage	110 kV; 50 Hz
Max. three-phase short-circuit level	31.5 kA
Main transformer (2 per substation)	
Primary rated voltage	110 kV; 50 Hz
Secondary rated voltage	25 kV; 50 Hz
Rated power (pursuant to ICE60076-1)	16 MVA
Container substation with 25-kV gas-insulated switchgear stations and Balfour Beatty Rail protection and control device and on-site control	

### **Technical specifications for the SCADA system**

*TracFeed*® SCADA as control system for monitoring and remote control, based on IEC 870-5-104  
Protocol link via Ethernet to SDH.

The DEF Centre in Constanta monitors:

- Station remote control systems	11
- Switchgear stations	10
- Railway substations	2

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