# TrackReport

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# Pandrol Success at Belgrade Central Station

## Construction of Railway Tracks on Continuous Concrete Slabs in Belgrade Central Railway Station

Overview of the construction area

**Belgrade Central Railway Station is a passenger station with 10 tracks/platforms, designed as a part of the main railway station in the City of Belgrade. In the city transport system, Belgrade Central Railway Station together with the New Belgrade station and the standing platform "Vukov spomenik" will form part of the urban mass transport system and stations on the underground line. The Station will be constructed at ground level and covered with 50,000 m² of concrete slab, which will be the base for a Commercial Centre and internal traffic network with parking lots and connection to the city street network.**

Belgrade City administration decided to improve their entire public transport system, and this included improving urban rail transport as well. One of the main investments was construction of missing tracks in Belgrade Central Railway Station. The contract for construction of the Tracks 5 and 6 in the station was signed in December 2009 and certificates for works issued in June 2010. The Station construction started with operations based on a temporary certificate for use on June 31st 2010.

Prior to the construction of tracks 5 and 6, operations in the Station had been performed on only two tracks (9 and 10) out of 10 planned tracks. These tracks were constructed on classical permanent way with ballast, wooden sleeper and rigid "K" fastenings. Design documentation was carried out by the Consultant – Traffic Institute CIP, Belgrade. CIP's consultants envisaged tracks 5 and 6 to be built on continuous reinforced concrete slabs equipped with state of the art elastic fastenings and resilient rail pads, a modern system which would be used for the first time on the Serbian Railways network.

The main contractors responsible for the installation on behalf of Serbian State Railways were Energoprojekt, who in turn subcontracted the Permanent Way works to a

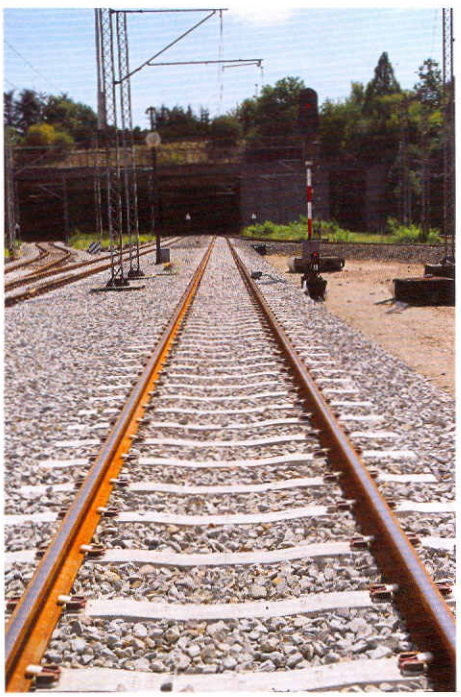
specialised subcontractor, ZGOP-Novi Sad, who undertook the installation of the superstructure and concrete slab track. Both companies worked closely with CIP and Pandrol when specifying the track construction method and rail fastening product to meet the requirements of the client.

Track numbers 5 and 6 were constructed under the covered reinforced concrete slab level 105, between the existing platforms, a total length of 460m. The width of the concrete base plate is 4,08m and thickness 30cm. The concrete was of C40 quality with polypropylene fibre added to a mix ratio of 900gr/m3. Construction joints were at 6m spacing and expansion joints set at 48m apart.

PANDROL VANGUARD in the station area

Transition track

It was a key design concern that any vibration generated by train traffic was not transmitted into the structure, thereby causing disruption to the retail units above. The EN60E1 rails were fixed with VANGUARD rail fastenings produced by the reputable manufacturer Pandrol UK, from Great Britain. These baseplate assemblies have a very low vertical stiffness, providing high levels of vibration isolation without compromising the retention of track gauge, and reduce noise and vibration by preventing them being transmitted through the concrete base plate, subbase and to the foundation of the columns and structure of the upper concrete slab.



PANDROL FASTCLIP FE in ballasted track

This feature was of great importance to limit noise to the level specified in the track design standards, hence reducing noise disruption to the occupants of the retail space above the concrete slab on level 105.

Connections of the concrete slab track within the platforms and the ballasted tracks outside the platforms were made by using transitional sections on one end length of L=11,70 and on the other end length of L=7,80, using the VIPA elastic baseplate fastening system manufactured by Pandrol UK. This transition stage was necessary as the change in stiffness from the ballasted track outside the platforms to the VANGUARD section on slab track meant trains would experience too large a change in stiffness over a very short length of track.

Trackwork on the section approaching the Station did not require protection from noise and vibration, and was constructed using pre-stressed concrete sleepers in ballast with pre-stressed type B70 equipped with the FASTCLIP FE fastenings from Pandrol UK. Again, the rail type was EN60E1.

Serbian State Railways' existing concrete sleeper Putevi-Invest Stalac, who are the only supplier of the FASTCLIP fastening in the region, adapted their moulds to produce FASTCLIP FE sleepers on an existing approved sleeper design. These sleepers were used on the sections of track leading up to the Station building, where vibration isolation was not as important.

This track system comprising of VANGUARD and VIPA fastenings on concrete slabs and FASTCLIP on ballast is a unique system providing an ingenious technical solution to meet the need for reduced noise and vibrations. It also offered additional benefits, such as a longer period of track exploitation, minimum maintenance costs, simple cleaning of the platform track section and aesthetic effects fit to the station space.

Belgrade is one of a few European cities to install these types of rail fastenings assemblies to try and reduce environmental noise pollution from railway traffic.

Track construction was by the 'Top Down' method. The rails, pre-assembled with the VANGUARD fastening, were suspended by track jigs to obtain line and level. Anchor studs were then core-drilled into the base slab, before a grout plinth was poured. Two lines were constructed using this method.

Pandrol supported the client and contractor throughout the installation, achieving an excellent result and a satisfied client. There are eight more tracks to be installed through the Station, and there is every confidence that these will utilise Pandrol brand products.

The track has now been opened to traffic, with approximately one train every 20 minutes on each track and it is clear that VANGUARD is reducing vibration into the structure as, even with a combination of passenger and freight trains travelling through the station, the amount of vibration felt on the platform is minimal. ■

Photographs by Mr Miloš Mrdjenović