Case Study:
Cable Management Sleepers

THAMESLINK PROGRAMME
LEARNING LEGACY

Developing a new design of cable manager sleeper, reducing the need for under track crossings, led to a significant cost saving for Thameslink Programme.

Over the duration of the Thameslink Programme, it was envisaged that approximately 200 Under Track Crossings (UTXs) would be required to take cables across the line. Many of these would be on brick viaducts with shallow ballast depths, where conventional crossings might not be possible.

There was a clear opportunity to develop a new design of cable management sleepers to reduce the need for UTX's and to provide a safe and constrained environment for the management of cables that cross the track. The sleepers would predominantly be used for third-rail DC power supply cables which are up to 57mm in diameter. These cables, if not contained within UTXs, would normally be laid across the ballast and be vulnerable to damage from tampers or other track plant.

1. Benefits of the new design

Steel variations of cable management sleepers already existed on the market. However, being conductive, these were not permitted for use in third rail areas. The new design would have to be made from an insulating material, and the obvious choice was the same concrete as that of plain sleepers. If the new cable management sleepers would cost around £100, a comparison could be made with conventional crossings. The costs of UTXs vary greatly, but typically:

- the lowest cost of a simple drilled UTX is £20,000 (two tracks)
- the lowest cost of a ducted UTX in a new site is £25,000 (two tracks)
- the average cost of a ducted UTX in a existing site is £45,000 (two tracks).

There appears to be no upper limit for the price of a UTX, some are considerably more than the figures above. Taking the total cost of a crossing using cable management sleepers to be in the region of £8,000 to £10,000, it was calculated that replacing just six UTXs would recoup the design cost. If 150 of the planned 200 crossings were to use the new cable management sleepers, then the potential saving to the Thameslink Programme would be a minimum of £2.4 million up to December 2016.

As far as could be foreseen, there would be no negative impact for the Thameslink Programme. The cable management sleepers, being made from the same materials as regular sleepers, should be no more difficult to install. In addition, there was a significant reduction of risk. There were no earth works and a reduction of site labour, possession time and plant requirement. Installation and use of cable management sleepers would not be affected by ground conditions. There should be less maintenance requirements than UTXs and the level of site safety would be improved.

2. Development

Cemex was successful in winning the contract to undertake the detailed design of the new sleeper, together with the manufacture of the necessary moulds and the production of prototypes for testing and type approval. This would run in parallel with Network Rail's product approval process.

The preferred final design was to provide a central slot or groove in the top of the sleeper that could be used to carry DC power cables up to 57 mm in diameter across the four feet. In addition, they could be used for all other cables associated with signalling and telecommunications – of interest to engineers installing new 'plug and play' systems. The groove could also be widened towards the midpoint of the sleeper to accommodate fixings with impedance bonds.

It was considered that, to meet the performance requirements, only a pre-stressed concrete mono-bloc sleeper with a central cable groove would be acceptable. The method of design and manufacture matched that of existing sleeper and bearer designs, as did the main of the dimensional properties. Also, the requirement for an inclined and vertical rail seat version was identified to match the soffit depth of adjacent sleepers (EG47) or

bearers (001E). The fastening method would also match the adjacent sleeper or bearers, using either Fastclips or traditional Pandrol e-clips. Consideration was also given to accommodating the new Pandrol Fastclip FE.

3. Product Approval

In conjunction with the design development and testing, the new products were put through product approval within Network Rail. As part of this process, the prototype product was dynamically tested under the full axle load with two million cycles to check durability.

As with other new products, there was also a requirement to provide risk assessments, operation and maintenance manuals and prove compliance with compliance with standards and the original performance specification written for the cable management sleeper.

Once all this was finished, the Thameslink Programme installed the new cable management sleepers and made a £2.4 million saving.

4. Recommendations for future schemes

As the difference in cost between conventional and cable management sleepers is comparatively low, several of them could easily be installed when renewing track in areas of high cable density. It will be much more efficient to do this at the installation stage, into pre-arranged gaps every 14/28 sleepers in plain line, than retro-fit. And even if there is no immediate use for them, installing them makes the line future-proof in terms of cable crossings for almost no additional cost.

In addition, cable management sleepers could be used in the standardisation of design for switches and crossings to be installed with every new set of points.

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Further information

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