

CHALLENGES AT THE PLANNING, DEVELOPMENT AND PERFORMANCE AT THE 275KV XLPE CABLE PROJECT IN THE CITY OF LIVERPOOL

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ABSTRACT

A 275 kV extra high voltage cable system has been designed, supplied, installed, commissioned and put in operation between the substations Kirkby and Lister Drive in Liverpool for National Grid, UK. This project was demonstrating the successful performance of almost every implication in an EHV direct buried cable project within big city metropolis.

1. DESCRIPTION OF XLPE CABLE SYSTEM

A 275 kV extra high voltage cable, type 2XS(F)K2Y 1x1600 RMS/190 160/275 kV system has been designed, supplied, installed, commissioned and put in operation between the substations Kirkby and Lister Drive in Liverpool for National Grid, UK. The cable route consisting of 15 single sections and 14 joint bays.

The cable is rated for a load of 1.600 A respectively 762 MVA. The cable arrangement is seen in figure 2 and 3. The cable is laid in CBS (Cement Bound Sand) with a thermal resistivity of 1.05 Km/W (wet condition) and 1.2 Km/W (dry condition). The standard laying depth of the cables is 1200 mm and the phase distance center to center is 400 mm.

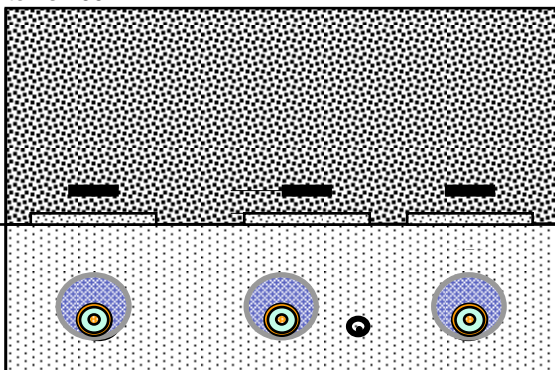


Fig. 1: Cable ducted laying condition

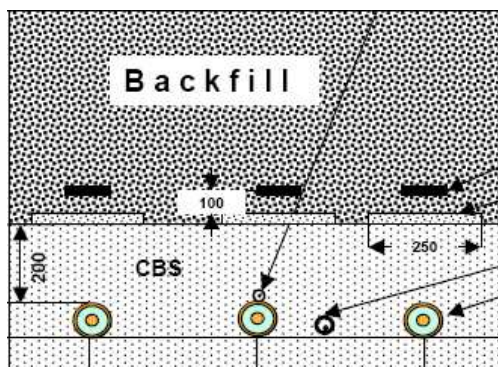


Fig. 2: Cable trench laying condition

The cable manufacturer has recommended the mixture of the CBS to reach the required thermal resistivity values. The civil work company as part of the National Grid Alliance West has installed the CBS under the cable manufacturer I supervision.

The cable route followed the main streets across the city of Liverpool. Many other services, cables, gas pipes, sewers have to be crossed or laid in parallel to the 275 kV cables. For all these laying conditions rating calculations have to be performed by the cable manufacturer. For some sections directional drilling with laying depths of up to 8 m (where necessary) and phase distances have to be increased up to 2 m in order to reach the required load.

The cable route has a total length of approx. 10.3 km, which means a total length of approx. 31 km XLPE cable quantity with a conductor size of 1600 mm² (figure 3). The conductor was designed in segmental construction consisting of oxidized wires to reduce the skin effect in order to increase the transmission capacity [9].

The cable shows an insulation thickness of 25 mm and a composite copper screen wire / lead sheath screen for advanced mechanical strength. A HDPE outer jacket provides the corrosion protection of the cable.

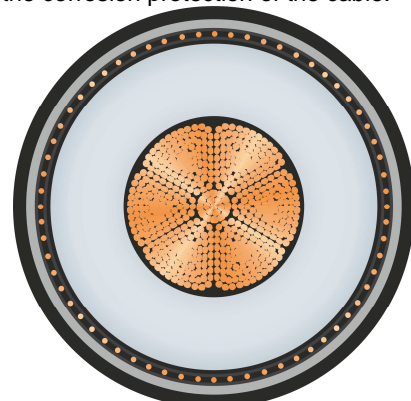


Fig. 3: Cable design

In order to reduce the sheath losses to a minimum, a cross bonding system has been implemented. The link pillars, which contain also the sheath voltage limiters (SVL) are installed along the route at the joint bay positions above ground.



Fig. 4: Pedestrian link pillar