Customer case study

Channel Tunnel Rail Link

Project specifications

Project type: High-speed rail
Application: Precast segmental lining

Partners

Owner: Union Railways (north) Ltd.
Contractors: Nishimatsu/Cementation/ Skanska JV and Costain/Skanska/Bachy Soletanche JV
Concrete: Malling Holzman JV Ltd (Laing O' Rourke Group)

The final component of the celebrated high-speed rail line connecting London and Paris, the Channel Tunnel Rail Link (CTRL) included more than 25 miles (40km) of precast-lined tunnels in water-bearing sands and London clay, with water pressures up to 3 bar. Contracts 220 and 240 specified a steel fiber reinforced segmental lining to ensure corrosion resistance, structural performance and a more efficient production process.

The challenge

The client had concerns about conventional steel rebar cage reinforcement having an increased risk of corrosion due to damage during handling, storage and erection of tunnel segments. In addition to this, it wanted a lining solution that would maintain its structural integrity in event of a fire, as well as ensuring a service life of 120 years.

At the time, there were no specific UK design codes for fiber-reinforced segments. Extremely demanding durability requirements were defined in the invitation to tender, and fiber-reinforced concrete segments first underwent a series of full-scale tests to verify their fit for purpose and use for the CTRL tunnels.

The solution

The CTRL's tunnels connecting St Pancras and Stratford stations in London used Dramix RC- 80/60-BN steel wire fibres at a dosage of 30kg/m3 for the 350mm thick lining. This comprised nine segments plus a key for a 7.15m internal diameter using concrete of >60MPa quality.

The fibers eliminated the risk of corrosion from build damage on segment joints, and the tunnels proved to be one of the early test cases for fiber-reinforced segmentally-lined tunnels in the UK.

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