Customer case study

STEP

Project specifications

Project type: Sewer tunnel
Application: Precast segmental lining

Partners

Owner: Abu Dhabi Sewerage Services Company
Contractors: Samsung C&T (T-01) and Impregilo (T-02 and T-03)
Designer: COWI
Precast: Commodore Cement Industries

Abu Dhabi's Strategic Tunnel Enhancement Programme (STEP) is a deep gravity wastewater sewer system. The size and scale of this megaproject was ground-breaking for the region, deploying seven TBMs at depths down to 80m. The robust tunnel system has provided a sustainable solution that reduces the agency's operating budget and carbon footprint, as well as improving the local environment.

The challenge

The STEP project is divided into several different contracts with TBM drives averaging 10-15km in length, excavated in mudstone and gypsum ground conditions with high concentrations of chlorides and sulphates. The chloride levels were particularly extreme – considerably higher than even seawater.

With this severe environment, the designer sought out durability solutions for the tunnel lining's concrete mixes and reinforcement to ensure the design had as little susceptibility to chloride-induced corrosion as possible, while still meeting flexural tensile strength requirements.

The solution

Numerous research initiatives have shown that the durability of steel fibre reinforced concrete under chloride exposure is superior to that of steel bar reinforced concrete. In fact, it has been demonstrated that the chloride threshold of fibre is actually 5-10 times higher, and, in such conditions, chloride-induced corrosion within a steel fibre concrete segment is highly unlikely.

For STEP's precast segmental tunnel lining in contracts T-01, T-02 and T-03, Dramix® 3D 65/60BG fibres have been chosen for the reinforcement, meeting project specifications for residual strength. The dosage rate was 40 kg/m3 and the tunnel has a maintenance-free life of 100 years.

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