RITE GEOSYSTEMS

ENCARDIO RITE METASENSING FOR MEGA STRUCTURES

Project Dossier

PROJECT DOSSIER

DEEP TUNNEL SEWER CONTRACT T01, UAE

PROJECT OVERVIEW

Contract T-01 is one of the three packages of the Strategic Tunnel Enhancement Programme (STEP) deep tunnel sewer, linking the northern part of Abu Dhabi Island to the mainland. Package T01, consisting of 16.1 km long Main Tunnel with 4 m diameter at depths ranging from 20 m to 34 m below ground level, is the longest tunnel of the project. The works included four operating shafts and three access shafts.

STEP was implemented to establish a tunnel that would cater to the immediate, short and long-term needs of Abu Dhabi's wastewater and drainage issues. It is believed to be one of the longest gravity-driven wastewater tunnels in the world. STEP consisted of the following infrastructure improvements:

- 41 km of deep gravity sewer tunnel located at depths of 20 m to 80 m below the ground level. Diameter of the tunnel is up to 6 m
- Series of link sewers connecting the existing sewerage system to the new deep tunnel sewer
- Underground pumping station located at the termination of the deep tunnel sewer at Al Wathba
- Elimination of numerous existing pumping stations
- Asset enhancement scheme in the Northwest area of Abu Dhabi Island.

Project	**Strategic Tunnel Enhancement Programme (STEP), Deep Tunnel Sewer Contract T01**
Location	Abu Dhabi, UAE
Client	Abu Dhabi Sewerage Services Company
Contractor	Samsung C&T Corporation
Consultants	CH2MHILL
Duration	2011 - 2015

Monitoring solution

Encardio-rite was awarded the I&M sub-contract for the complete monitoring and surveying solutions for shafts and tunnel alignment.

Turnkey Services

- Pre-construction and post-construction building condition survey
- Supply of geotechnical instruments, precise survey instruments and targets
- Installation of geotechnical instruments including the drilling & grouting works for subsurface instruments
- Monitoring
- Optical Surveying-precise levelling & 3D deformation monitoring
- Processing of monitoring data with daily, weekly and monthly reporting with evaluation & interpretation
- Calibration of dataloggers and sensors.

INSTRUMENT USED

Monitoring plan at shafts

- **Inclinometer:** Installed around work shaft and inside D-wall to monitor the subsurface lateral movement
- **Piezometers:** Vibrating wire type and standpipe types were installed around shafts to monitor the pore water pressure. These were also installed inside shafts to monitor ground water drawdown due to dewatering activities
- **Surface settlement points:** Installed in soil and pavements to monitor surface settlement around shafts
- **Bireflex targets:** Installed inside shafts to monitor the convergence during shaft excavation

Monitoring plan for tunnel (at monitoring zones across tunnel alignment and inside tunnel)

- **Inclinometer:** Installed till 5 m below tunnel invert to monitor the subsurface lateral movement
- **Piezometers:** Vibrating wire type were installed to monitor the pore water pressure
- **Borehole extensometers:** 3-point BHE installed in monitoring zones as well as on tunnel axis along tunnel alignment to monitor subsurface settlement
- **Surface settlement points: I**nstalled in soil and pavements to monitor surface settlement along tunnel alignment as well as in monitoring zones
- **Shotcrete cells & Strain gages:** Installed inside precast concrete tunnel segments to monitor stresses inside tunnel lining
- **Bireflex targets:** Installed in NATM sections of tunnel for deformation monitoring

Monitoring plan for structures within ZOI

- **Building settlement points:** Installed on structures/buildings to monitor settlement
- **Tilt meters:** Tilt plates installed on walls, floor slabs, supporting frames to monitor uniaxial or biaxial rotation or angle of tilt of buildings and structures
- **Crack gages:** Installed on major cracks found on the buildings within the ZOI (during pre-construction survey) to record and monitor any variation in the existing cracks due to construction works

Experienced and proficient I&M team of Encardio-rite Geosystems LLC UAE provided services for almost 4 years. Monitoring reports included interpretations of variations observed in instrument data, mentioning the factors likely to affect their behavior e.g. construction, dewatering, third party activities etc. were provided to the contractor on a regular basis.

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