SIP - Daily Report

Date: 2026-06-03 (Wednesday)
Day: 10
Time: 10:30 AM – 04:00 PM
Location: SMEC HQ (8th Floor, Anabil Tower, Plot: 3 NW(J) Gulshan North Avenue, Kemal Ataturk Ave, Dhaka-1212, Bangladesh)

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Overview

Today marked the 10th and final day of this internship program. It revolved around hydraulic engineering principles, river training, and structural challenges in major national infrastructure projects. The day concluded with the issuance of completion certificates.

Chronological Activities

1. 10:30 AM: Arrival at office
2. 10:50 AM: Session on hydrology and river training
3. 02:10 PM: Case studies of megaprojects by SMEC at Bangladesh
4. 03:30 PM: Issuance of certificates
5. 04:00 PM: Dismissal

Session 1: Hydrology and River Training

Instructor: Engg. MD Asifur Rahman.

This session covered the fundamental role of water behavior and river management in civil engineering projects. Key concepts include:

- Hydrology: The study of the occurrence, distribution, and movement of water on and under the Earth's surface.
- Hydrography: The physical measurement and mapping of the features of water bodies (such as depth and flow path).
- Hydraulics: The study of the mechanical properties and physical behavior of liquids in motion.
- Morphology: The study of the shape, layout, and changes of river channels over time.
- Return period (recurrence interval): The average time interval (expressed in years) between occurrences of a hydrological event (like a flood) of a given scale or greater.

Measurement Techniques

- Depth measurement:
    - Single-Beam Echo Sounder: Measures depth directly beneath a vessel using a single acoustic path.
    - Multi-Beam Echo Sounder: Uses a fan of acoustic beams to map a wide path of the riverbed, providing high-resolution 3D depth data.
- Velocity measurement: Acoustic Doppler Current Profiler (ADCP) surveys are used to measure how fast water is moving at different depths across the river cross-section.

Design Standards & Bank Protection

- Design water levels: We were explained the concept of Design High Water Level (DHWL) and Standard High Water Level (SHWL) based on historical flood data.
- Riverbank Protection:
    - Sandbag placement: Used for immediate geo-textile filtering and localized erosion control.
    - Edge protection: Large rock rip-rap or concrete blocks are placed over a long distance along the riverbed edge. This prevents current-driven erosion and provides a buffer of several years for maintenance teams to detect and repair damage.

Session 2: Case Studies of Megaprojects by SMEC

Instructor: Mohammad Masudur Rahman Bhuiyan (Country Manager, SMEC).

This session focused on real-world engineering challenges faced during three national projects and how those challenges were resolved.

Padma Multipurpose Bridge

1. Challenge: Low pile friction; the riverbed soil in several areas consisted of ultra-fine, soft particles (smaller than regular cement particles), which resulted in very low skin friction for the bridge piles.
   Solution: Micro-fine cement was used to grout and stabilize the soil around the piles. Additionally, inclined piles, up to 9 in number per pier group was used to distribute weight.
2. Challenge: Seismic risk; the bridge is in an active earthquake zone.
   Solution: Installed friction pendulum bearings at the base of the piers. During an earthquake, this allows the lower pier to shift and slide while keeping the upper bridge structure stable.

Karnaphuli Tunnel Project

1. Challenge: Excavation & ground stability; constructing cross-passages between the twin tunnels presented massive water inflow and soil collapse risks.
   Solution: Ground freezing technology was used to temporarily freeze the surrounding wet soil into solid rock, allowing safe excavation.
2. Challenge: Liquefaction; the loose soil under seismic stress was highly prone to liquefaction and had potential to float up.
   Solution: Vibroflotation (deep soil compaction using water jets and vibration) was used to densify the ground before construction.

Jamuna Railway Bridge

1. Challenge: Upstream scouring and high velocity; this new railway bridge is being built upstream of the existing Jamuna Bridge. This narrowed the path for water flow, significantly increasing water velocity and causing heavy scouring around the piers of the older bridge. It is estimated that up to 40 meters of scouring could occur near the second bridge over 70-to-80-year.
   Alternative & constraints: Building the new bridge downstream would have minimized this scouring effect. However, this option was ruled out because the local land was not readily purchased by the government, and the international contractors lacked localized geological experience to early determine the exact scouring effect.