Bheri Babai Diversion Multipurpose Project

Report Contents

- Project Introduction
- Project Progress
- Segment Production
- TBM Transportation and Construction
- Achievements and Social contribution

Content of Project Construction
Second Chapter

Project Progress

Key Points in Project Progress

1. 2015.06.04, Commencement
2. 2015.09.20, Start Civil works
3. 2016.04.24, TBM Manufacture
4. 2017.01.01, Construction of DBM Tunnel
5. 2017.05.31, Completion of DBM Tunnel
6. 2017.08.14, Segment Production
7. 2017.09.14, TBM Arrival
8. 2017.10.15, TBM Launching
9. 2017.12.07, TBM completed 500-meter excavation
10. 2018.04.23, TBM Monthly Tunneling Record exceeded 1000 Meters

TBM Weekly Tunneling Record

Third Chapter

Segment Production
Segment Introduction

4 blocks form a ring and concrete strength is M50.

Layout of the Segment Yard

4 Major Areas
1. Reinforcement and Reinforcement Cage Processing Area
2. Segment Production and Steaming Curing Area
3. Segment Water Curing Area
4. Segment Stacking Area

Reinforcement Cage and Concrete Processing
### Quality Control

1. Mold must be cleaned completely
2. Fully vibrating
3. Curing temperature should be sufficient to ensure early strength
4. Covering the segments in time after plastering
5. The demoulding strength should not be less than 15Mpa
6. The curing time should not be less than 7 days
7. The Ph of the water curing ponds should meet Ph: 9 - 11
8. Sprinkling water curing in the stocking yard shall not be less than 7 days
9. Concrete working performance shall be in good condition

### Quality Guarantee Measures

- Concrete try mix
- Test PH value of curing tank
- Strength test
- Steel bar test
- Aggregate test
- Water content test
Fourth Chapter

TBM Transportation and Tunneling

TBM Tunnel design
1. Total length: 12000m, maximum over burden: 820m.
2. Segment diameter is 4.8m, internal diameter is 4.2m, thickness is 0.3m.
3. Gradient 0.3%, uphill tunneling.
4. The tunnel has a curve with a radius of 700m and a length of 368.87m in the initial section and the rest of the tunnel is straight line.

TBM transport
1. Departure from Shanghai Port on 2017.06.26
2. TBM dismantled and loaded in transport Vehicles (total 56)
3. TBM arrived at site on 2017.09.14
4. The maximum load was 67T (cutter head).
5. The maximum size is 5.2m*5.2m
The total duration for assembling TBM was 14 days.

TBM Tunneling Process Flow

1. Launching Stage:
   - Launching Arrangement
   - TBM Install
   - TBM Launching

2. Tunneling Stage:
   - Excavation
   - Segment Erection and Handling
   - Transportation in Tunnel
   - Excavation Supply system

3. Receiving Stage:
   - Construction of Receiving Site
   - Construction Control

TBM Tunneling Construction

1. Double shield tunneling:
   - Process Flow and Tunneling Parameters shown in the figure.
   - TBM tunneling: the gripper shield stretches out and rests on the rock wall to provide reaction force for TBM tunneling, and the cutterhead moves forward to cut off the soil mass.
   - Regripping: the cutterhead stops rotating and withdraws the gripper shoes back; the gripper shield moves forward under the traction of the main thrust cylinder or the reaction force by pushing of the auxiliary thrust cylinder; the back assembly moves forward simultaneously with the body, and then the gripper shoes stretch out to brace the tunnel walls tightly again to start the next tunneling cycle.

2. Single shield tunneling:
   - In this mode, the tunneling thrust is provided by the auxiliary thrust cylinder, and the reaction force is from the segments. Thus the tunneling and segment assembling cannot be carried out simultaneously.
Segment Erection

Assembling sequence: block-L at right and left sides will be assembled first, then block-B, and block-L in the last.

Backfilling behind Segments

Mainly consists of four parts:
1. Pea gravel blow-fill
2. Segment-B mortar injection from working holes at the bottom.
3. Both sides segment block-L grouting in #4 deck area
4. Grouting on the top segments at the shield tail

Transportation inside Tunnel

1. Diesel locomotives and switching platforms are used in the tunnel for segments and other materials supply;
2. A single train of diesel locomotive is composed of 4 segment cars, 2 flatbed trailers (with one flatbed trailer provided with a pea gravel tank), 8 muck cars and 1 diesel locomotive
3. Additional two 20-person capacity man cars are used for construction personnel going in and out the tunnel.

Muck Dumping outside the Tunnel
Ventilation in TBM Tunnel
A set of 4×90 kW ventilation systems are installed at the portal.

Geological Record

TBM Tunneling Control Point

TBM Tunnel
Fifth Chapter

Achievements and Social Development

Achievements

➢ The assembly of TBM was completed within 14 days, setting a record for the same type of double shield TBM assembly at home and abroad;
➢ The excavation of 500-meter initial section was completed within 35 days, setting the fastest record of the same type of TBM test tunneling at home and abroad;
➢ In 2017, BBDMP recorded 135.4 per cent progress and rank first in the National Pride Project List according to The Himalayan Times;
➢ In February 2018, the 820-meter buried depth area was successfully passed without any jamming or other anomalies;
➢ Since the launching of TBM, the average monthly tunneling record is 660m and the highest record is 1057m.

Social Contribution—assistant on highway accident
Social contribution – Responsibilities for local

- Former Prime Minister Attend the Project Commencement Ceremony
- Nepalese Officials Attend DBM Tunnel Section Commencement Ceremony
- Minister of Irrigation Attend TBM Launching Ceremony

Stride forward boldly; Strive for Excellence

Moments

Thanks for your time^_^