

PROJECT OF THE YEAR BETWEEN €50 MILLION AND €500 MILLION -

# **Túnel Emisor Poniente (TEP) II**

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# **Stakeholders**

Owner: National Water Commission (CONAGUA) Designer: SENNER Construction Management: DIRAC Ingenieros Consultores Contractor: Aldesem/Proacon/Recsa Consortium Manufacturer of TBM & Related Equipment: The Robbins Company









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# **Túnel Emisor Poniente II**

- Location: West of Mexico City
- Excavation Diameter: 8.7 m
- Final Diameter:
  7.0 m
- Max Flow: 150 m<sup>3</sup>/min
- Mechanized Tunnel







# **Geological Layout**



#### **Expected Challenges:**

- Estimated Water Inflow: 180 liters/min
- Fault (silty clay): 69 m @ Chainage 5 + 718 to 5 + 649









### **Crossover TBM**

- Hard Rock conversion to EPB resulted in 30% cost savings
- Bore Diameter: 8.72 m
- Cutterhead Power: 3,630 kW (VFD)
- Cutterhead Max Torque: 14,875
   kNm
- Cutterhead Max Speed: 6.5
   RPM
- Thrust Max: 72,000 kN
- Active Articulation
- TBM Weight: 1,000 tons









#### **Special Features**

- Adaptable Cutterheads
- Wide-ranging Drilling
   Equipment
- Two-Stage Main Drive Reducers
- Bulkhead Closure Gates
- Conversion of the de-mucking system









# **Hard Rock Configuration**













# **Soft Ground Configuration**









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# **Challenge While in Hard Rock Mode**







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# **Challenge While in Hard Rock Mode**







• Foam injected from TBM, 930 liters



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#### **Conversion to EPB Mode**

Wear Plates on Helix



Wear Plates on Casings











#### **Conversion to EPB Mode**





Cut Plates on the Cutterhead



Remove TBM Conveyor







#### **Conversion to EPB Mode**



Screw Conveyor Installation in Two Sections

**Rotary Union** 



PARIS-15 November 2017

AITES





## **Conditioned Muck**

In soft ground, watery muck was conditioned and controlled well















# **Challenge While in EPB Mode**



- As low as 4 m of cover between the top of the tunnel and residential foundations
- Micropiles used at 1 m intervals to successfully stabilize the soils









#### **Three National Records**

- Final breakthrough occurred on June 8, 2017
- Best Day: 57 m
- Best Week: 231 m
- Best Month: 702 m
- Tunnel completed on time and on budget



Intermediate breakthrough May 2016











#### **Takeaway Points**

- Crossover features including high torque low rpm mode enabled excavation in fault zones
- Plans were in place to deal with challenges
- Crews were able to get through problem areas and make the most of good ground conditions with record-setting rates, all while maintaining excellent safety





Lessons Learned

