

# Water Conveyance Tunnel Ghorveh-Dehgolan Dam and Tunnel Project

Kurdistan, IRAN

## Ghorveh-Dehgolan End Tunnel

### Project aim

The dam has an installed electricity generating capacity of 10 MW. A 175 km (109 mi) canal connecting the dam with towns of Qarveh and Dehlegan will annually supply over 0.25 cubic km (200,000 acre-ft) of water for agricultural purposes to these towns. The tunnel is the last part of this connection.

### Construction Costs

Construction Azad TU: approx. USD 35 million

### Project Schedule

Design: on going  
Construction: will be started in 2013

### Project Description, Construction Headrace

Azad end tunnel will receive water from pipeline and transfer it into Ghocham dam reservoir, circular profile

Length: 10840 m  
Final diameter: 3.00 m  
Curve radius: Straight  
Gradient: 0.1 %

### Method of Excavation

EPB-Hard rock TBM  $\varnothing$  3.70 m

### Geology

75%: Sandstone, Conglomerates and Mudstones,  
25%: Alternation of Andesites and Andesitic Tuffs,  
Grey Argillaceous Limestines, Cretaceous Basement Rocks

Max. overburden: 300 m

### Our Services

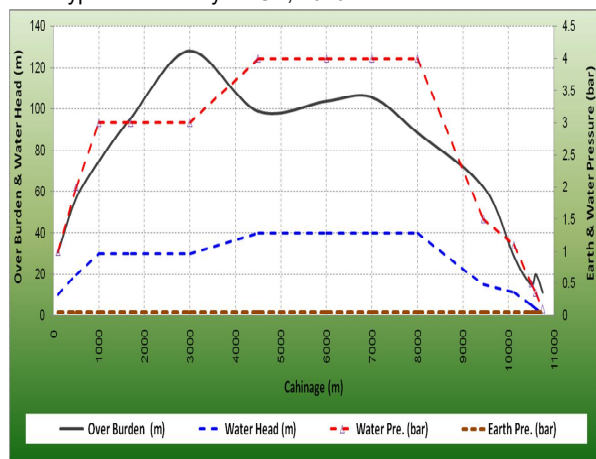
Complete package of Planning and detail design, including: Geology, Engineering geology, hydrogeology studies (phase 2) considering TBM tunnelling Method statement, TBM selection, preparation of TBM specifications, Segmental lining design (geometrical and structural design), Design of site installation Design of all technical services like transport, ventilation, drainage, water supply, compressed air Face pressure calculations, Preparation of Risk Management Plan, Backfill grouting, Monitoring plan Segment factory detail design, Ground treatment by foam, Project organization chart, Detailed time plan of design and construction, Waterproofing, HSP (Health and Safety Plan)

### Client and Contact Person

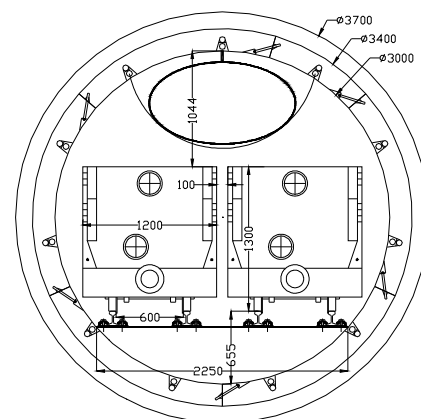
Mr. Golshan (Managing director)

Tunnel Boring Machines	unshielded tunnel boring machines jacket Gripper TBM			Double Shield Machine (DSM)			Shield Machine with full-face and without support (SM-V1)			Shield Machine with full-face and compressed air application (SM-V3)			Shield Machine with full-face and fluid support (SM-V4)			Shield Machine with full-face and earth pressure balance support (SM-V5)		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Weight	0.765	0.74	0.695	0.765	0.74	0.695	0.765	0.74	0.695	0.765	0.74	0.695	0.765	0.74	0.695	0.765	0.74	0.695
UCS (MPa)	-	+	0	0	+	0	0	+	0	0	+	0	0	+	0	0	+	0
RQD (%)	0	+	0	0	+	0	0	+	0	0	+	0	0	+	0	0	+	0
RMR	-	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Water inflow per 10 m tunnel (l/min)	+	0	+	+	0	+	+	0	+	+	0	+	+	0	+	+	0	+
Abrasiveness (CAI)	+	0	+	+	0	+	+	0	+	+	0	+	+	0	+	+	0	+
Swelling behaviour	0	+	+	0	+	+	0	+	+	0	+	+	0	+	+	0	+	+
Supporting pressure (bar)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
UCS (MPa)	0	1	0.5	0.5	1	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
RQD (%)	0.5	1	0	0.5	1	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5
RMR	0	0.5	0	1	1	1	1	1	1	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Water inflow per 10 m tunnel (l/min)	1	0.5	0.5	1	0.5	0.5	1	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Abrasiveness (CAI)	1	0.5	1	1	0.5	1	1	0.5	1	0.5	0.5	1	0.5	0.5	1	0.5	0.5	0.5
Swelling behaviour	0.5	1	1	0.5	1	1	0.5	1	1	0.5	1	0.5	1	1	1	1	0.5	1
Supporting pressure (bar)	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
Total	0.441			0.649			0.649			0.632			0.625			0.658		

TBM type selection by DAUB, 2010



Summary of face pressure calculations



Control of clearance for rolling stock and duct in switch area