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Research Article

ENGINEERING GEOLOGY CHARACTERISTICS OF DODAROO DAM SITE (SOUTHEASTERN IRAN)

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ABSTRACT
Dodaroo dam is located 20 kilometers south west of Mirjaveh in Sistan and Baluchistan province. Location of dam is in eastern Flysch zone considering Iran structural national classifications. The mass of stones consists of shale stone and Eocene sand as well as covenant present era. The goal of current research is to identify geological conditions, engineering geology of area around reservoir and abutment of dam, and investigation of rock mass discontinuity. In this research, data was first collected, and then desert investigation and finally data analysis were done by Dips software. The bed stone of the dam has been created by thick alteration of Eocene Flyschand deposits of the present era in that air-filled zone and surface split in right abutment, middle section and left abutment are 10, 14 and 13.5 meters. According to quality percentage, right abutments considered weak. Penetration depth in left abutment is varying between 10 to 30 meters, and in river bed, 60 to 80 percent of weak ductile is located in the depth of 7 to 14 meters from ground level .According to obtained results from penetration test, penetration depth is left part is 30 meters. It is 14 meters in middle valley and right part .The mass of construction stones in geo mechanical classification (RMR) lies in fairly good rocks. Results from single axial compressive strength vary between 51.8 to 149.2 mega Pascal. In terms of structure, Shili– sand stone of construction has a close to vertical direction and the direction of slope is toward west and North West. This structural condition of construction can lead to water escape from gaps between layers. In fact, in left abutment, thick Shili layer and sand can function as block as a result of filling materials in gaps and marine layers, although it can cause water to escape because of liquidation.

Keywords: *Engineering Geology, Dodaroo, Mirjaveh, Earth Dam, Geotechnic*

INTRODUCTION
Dams of hydraulic structures which are constructed with the aim of collecting surface water. May for purposes such as storing water for various uses, power generation, and flood control are used (Rahnamarad *et al.*, 1392).

To run any dam project, check subsurface geological and hydro-geological and geomechanical parameter estimation foundation and anchor the dam.

So that we can properly evaluate the geotechnical characteristics of the bedrock in the area was the site (Rahnamarad *et al.*, 1392; Farhoudi *et al.*, 1386; Kockbay and Kilic, 2006; Dadkhah, 2010; Ajalloeian and Moein, 2009; Lashkaripour and Ghafoori, 2002; Ghafoori *et al.*, 2011).

Careful study of the phase detection can prevent problems in the implementation and operation of dams (Haftani *et al.*, 2014).

The question of dams to harness water and surface water storage and flood season precipitation and its use in the dry season is vital and inevitable (Mahtabi *et al.*, 1392).

Dodaroo dam located in the Sistan and Baluchistan province, 20 kilometers south of West Mirjavehin 28° 52' 33" and 61° 14' 9" geographical location.

Access road to Dam site, possible with Zahedan- Mirjaveh- Ladiz Main road then toKhooshab village (Figure 1).

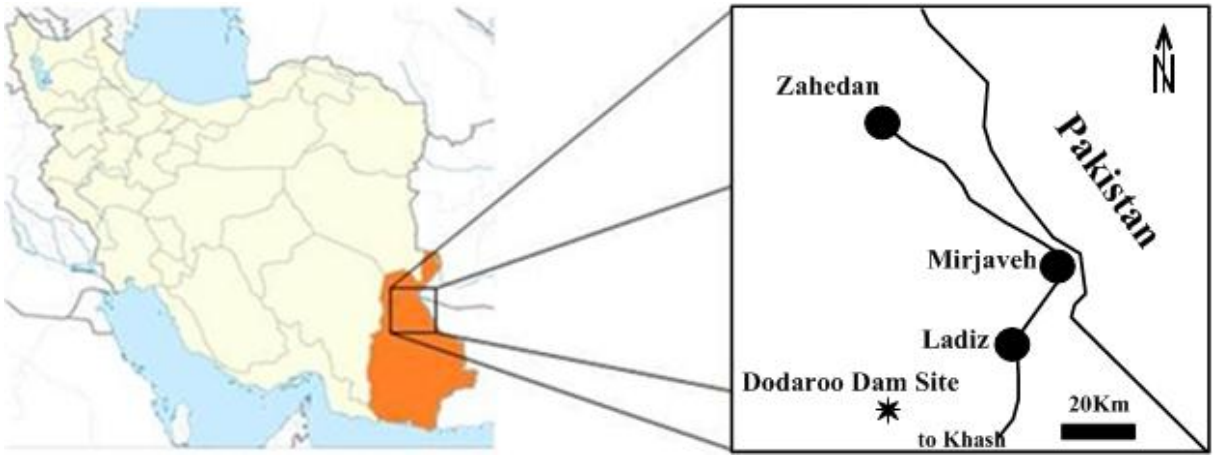

Figure 1: Geographical location and the access road to dam site

Study area, the structural division of the zone Nhbndan- Khash (Aghanabati, 1383), the fault Hryrvd the East and the West is Nehbandan fault. According Map 1: 100,000 Geological and Mining Exploration Taftan the country produced more rock units in the study area contains a mixture of colored flysch Cretaceous, Paleocene, Eocene flysch with the ultrabasic products Neogene volcanic and clastic rocks is (Stoklin, 1968).

Taftan peak height of 4000 meters, in the southern plains Ladiz, the highest point of elevation in the output is plain. 960 m above sea level, height, average height of 1770 meters and an average altitude desert basin is 1070 meters.

The tectonically, the zone Ladyz Nehbandan - Khash is the most important geological features colorful mixture of oceanic basement and flysch Cretaceous and Eocene. Faults in the study area consists of a single stone with their movements are sometimes a source or by movements in the Quaternary resulted are the formation of various alluvial deposits (Figure 2).

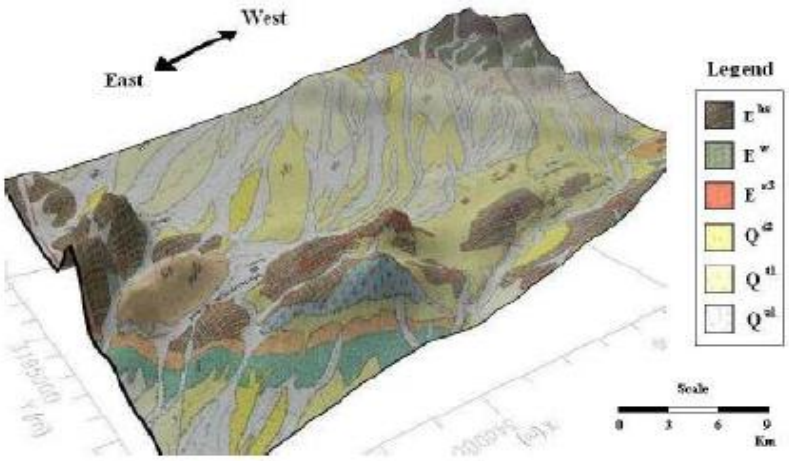

Figure 2: Geological Map of study area

In the study area, non-seen the boundary between the Cretaceous flysch- Paleocene and Eocene flysch. However, in areas farther, Eocene flysch place gradually and are on Cretaceous flysch. The main difference flysch Cretaceous- Paleocene and Eocene flysch is in amount of sand. Volcanic lava much more of the Eocene Flysch. Open Eocene flysch, has caused the de-sedimentation area, in general, depend on the unit.

The System Discontinuities

Prairie Harvest rupture include the amount and direction of the gradient, repeat interval, during the opening, roughness and the attacks carried out by the software repository and Dips V.5.101 Stereograph classified. Harvested 233 joints were from the abutments. The layers gradient in the right abutment slope varies between 60 and 85 and between 145 to 335 degrees layering.

3.1 right amount discontinuity:

Harvested 64 discontinuities in right amount. Surface discontinuities harvested, rough, without filling, an average of 1 to 2 mm distance between the joints and in some cases, such as the location of folds and faults more than 2 centimeters. The backrest joint sets that include a total of 2 layers and lots of tangled fractures have been identified. Charts and graphs of polar curve equivalence rose joints 3 and 4 are shown in the image.

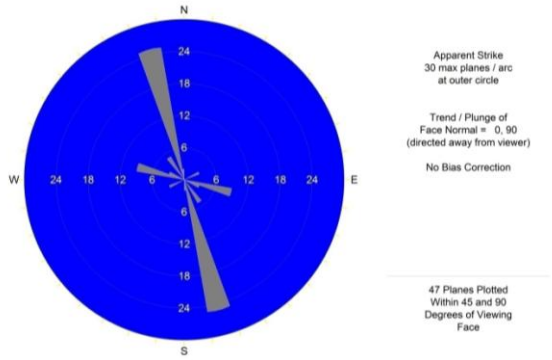

Figure 3: Diagram Pole joint equivalence curve in rosejoints on the right abutment

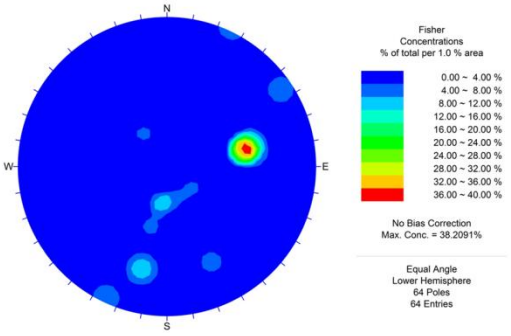

Figure 4: The diagram on the right abutment

Left Amount Discontinuity

Harvested 64 discontinuities in left amount. Total of 3 sets of joint specified. Equivalence polar curve charts and graphs rose joints are shown in Figures 5 and 6.

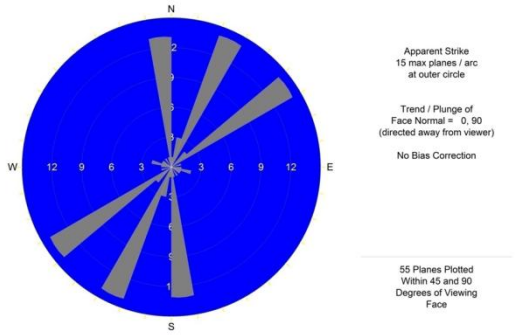

Figure 5: The graphical equivalence joint pole at the left abutment

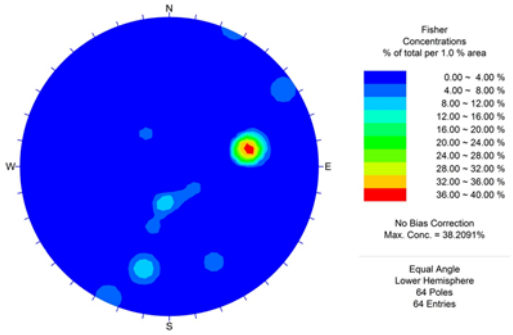

Figure 6: The figure rose joints on the left abutment

Dam Site Geological and Geotechnical Characterization

To achieve the research objectives, were drilled a number boreholes. Based on the results of speculation, the thickness of the alluvial river, less than one meter and its materials, mainly sand and stone and bulder.

On the Right

S1boreholes, 106 meters have been drilled on the results, the thickness of 5/3 to 5/4 meter zone worn and quality index is an average of 55% and placed in the middle class. Weak area of the S1boreholes, 13/8% to 50% of it is worn down to 5/4 meter zone. The permeability of the rock to a depth of 21 meters.

K106boreholes, at the side and downstream of the dam, spillway is located on the route. Zone thickness boreholes worn in the 13% that is placed in the category of very poor quality.

On the Left

4 boreholes on the on the left the site S3, K103, K104 and K105 in the dam and diversion tunnel was dug and output. Based on the results, the thickness of the alluvial deposits in the boreholes K103 to 5 meters and its materials are mainly of sand and rubble. The boreholes, aged 1 to 5.5 m thick zone in S3 that angled boreholes located in the marginal range, 5.13 meters. Penetration depth in the range of 10 to 30 meters.

Riverbed

On the river bed, three boreholes S2, K101 and K102, respectively, in the dam, coffer dam section was drilled and downs. Based on the results, the thickness of alluvial deposits from 56/0 to 9/0 m thick zone of boreholes worn in the above 2, 2 and 8.1 meters. About 60 to 80 percent of the weak zone, to a depth of 7 to 14 meters from the ground to the highest permeability at the same depth. The quality of the rock mass, on average, 45% of the stones is placed in the middle class. As the depth increases, the quality of the rock mass increases and permeability decreases.

Engineering Classification of Rock Masses Site

Rock Mass Quality Classification

For geotechnical parameters of the rock dam, data from exploratory boreholes, were analyzed. By layers of rock lithology of the rock mass quality in every boreholes and compression joints and fractures in the rock system and their angles. Rocks anchor the dam, located in the category of poor quality.

Geomechanical Classification (RMR) Rock Mass

To evaluate the classification of foundation and abutments have been studied boreholes. In this context, the structural properties of the rock mass containing discontinuities, faults and joints were examined. Based on the results of laboratory and field tests such as uniaxial compressive strength, RQD, permeability and discontinuity systems and their status, RMR for rock mass classification was done. The results are shown in Table 5.

Table 5: The system of rock mass rating (Bieniowеski, 1989)

Rock type **Parameters**	**Right Abutment**	**Left Abutment**
Uniaxial compressive strength (Mpa)	90	90
Score	7	7
RQD%	20	20
Score	3	3
Speacing	0.1	0.1
Score	8	8
Discontinuities surface	Rough and uneven	Rough and uneven
Score	10	25
Ground water	Dry	Dry
Score	15	15
Total Score	42	58
Discribtion	relatively good	relatively good

CONCLUSION

1. Eocene flysch bedrock dam and the alternation of thick deposits have created the present era, the zone of weathering and ground surface it rests on the right, middle and left abutment respectively 10, 14 and 5 / 13 meters.

2. Poor quality rock masses can be caused by multiple faults within the site.
3. In terms of structure, layers of sandstone Shyly- site has nearly vertical slope and the slope to the west to the northwest. The conditions of the site can be layered escape of water from dissociation intervals. It also left a thick layer of shale and sandstone base due to the fragmentation of the filling material and the marl layer can act as a seal, yet the dissolution process can cause the water to escape.
4. In terms of permeability, mass bedrock to a depth of 30 meters above the ground at on the left, in the middle of the valley, to a depth of 14 meters above the ground and the right to a depth of 5 meters above the ground is permeable.
5. The left side of the membrane seal in the middle of the valley, up to 35 meters above the ground and the right to a depth of 10 meters above the ground is recommended.
6. The structure of the rock mass geomechanical classification (RMR) in the category of stones are relatively good.

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