

## Geotechnical parameters investigate the marl as a fine grain material for use in Binaloud core earth dam

Mohammad Bahrami <sup>1,\*</sup>, Majid Kashani <sup>2</sup>

<sup>1</sup>PHD student in soil mechanics and foundation engineering Shahid Bahonar University, Kerman, Iran

<sup>2</sup>M.A. student in structural engineering, Rafsanjan University, Rafsanjan, Iran

**Abstract** Providing the appropriate construction materials is one of the fundamental issues in the dam building possibility studies. Building of dam would not be excused, if the beneficial and Geotechnically appropriate have not been supplied. In this paper Geotechnical properties such as; distribution of grain size, permeability, compaction, consolidation and dispersive characteristics of fine grained construction material sources of marls for Binabud dam in south of New City Binaloud in Khorasan Razavi considered. Geotechnical properties of study soils show that some samples are dispersive Therefore, they needed to pay more attention.

**Key words:** Fine grained construction material; Dispersion; Permeability; Compaction; Geological properties; Dam core

### 1. Introduction

The parameters required for fine-grained selection of appropriate Material for the core dams such as the distance, volume, source, enables handling of materials, access road conditions in the early stages of the feasibility of dam construction cost is considered. Specific requirements in terms of compressibility day core, impermeable and drainage of water from the dam, the need for adequate studies on the characteristics of the innovative fine Borrow and requires that comprehensive studies done from different perspectives. Not only from the technical steps but in relation to economic issues should be considered a supply of building materials).

### 2. Marl

A mixture of clay and other minerals, which is between 35 to 65 percent of the amount of calcium carbonate, called Marl. Chnatchh hardening or petrification, in progress, or Marlston word applies to them ((Pettijohn, 1975. Argillaceous rocks, in the context of the formation and behavior during operation, the show, as one of the most problematic, sedimentary rocks, are taken into consideration. in many parts of the world Marl as the foundation of many of the buildings, roads (part of the basis and foundation), dams etc. Due to the large spread in many countries marl rock mechanical and physical characteristics of this type of rock is necessary (Hooshmad et al, 2012).

### 3. Geographical location and access roads

Dam site at a distance of approximately 75 kilometers southwest of the city of Mashhad Binaloud upstream Sultanabad village located on the river dry river Qarcheh. The earthen dam with clay core is vertical. Crest width of 15 meters and a crest length of 455 meters and 1430 meters elevation of the dam crest. The construction of the dam, water supplies and industry Binaloud city (Fig. 1).



Fig 1: Geographical location of the Binabud dam

### 4. Geology of the study area

The study area is located between the northern and central Iran Binaloud geological zone is located in the south (Darvishzadeh, 2001). Red sandstone and conglomerate region's major lithology and red and gray Marl Eocene form. Lithology Dam site, the gypsum-bearing marls, light brown in color, with streaks of stone, conglomerate Eocene and Pliocene age, the horizontally, on which they are located and

\* Corresponding Author.

marl alternation of bright color, with layers plaster of Eocene formed. The Marl, has spread and thickness are high. Quaternary coarse conglomerates, with weak cement, are

discontinuous, on the formation and alternatively, layers of sandstone and Conglomerate also be seen in this structure (Figure 2).

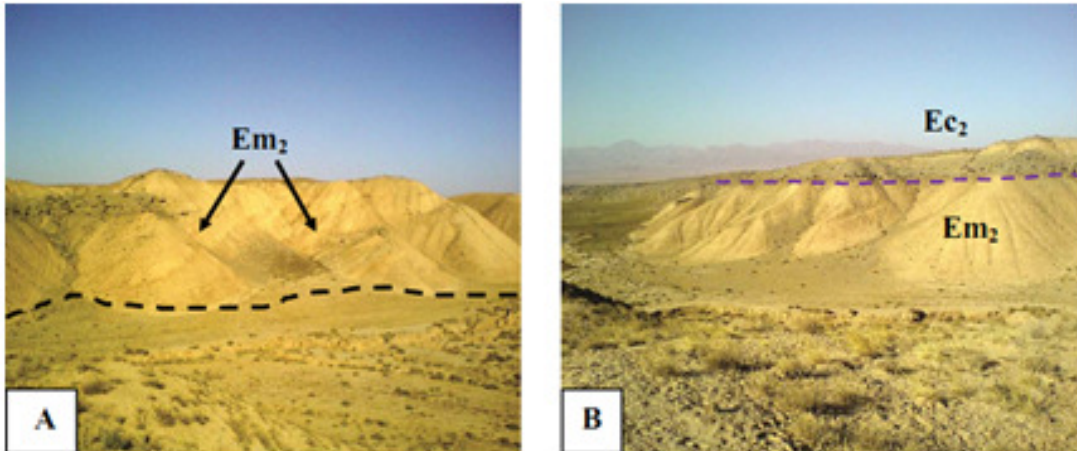


Fig. 2:A- A view of the plaster of the Snake (Em2), the reservoir (see the North West). B: A view of the conglomerate beds (Ec2), with almost vertical slope, on the marl layer (Em2) (see the North West)

**5. Fine material**

According to the geological conditions of the region stressed expansion of the marl formations within the reservoir and downstream Binaloud, fine sediments derived from the erosion of the surface formations have created the appropriate resources as a source of fine grain. To explore and assess Borrow 6 ring on the hand sink to a depth of three meters of alluvial deposits in the drilling axis and downstream of the dam site has been developed. Programs of study in selected boreholes so that the different stages of the identification field, speculation, sampling, testing grading soil chemistry are based.

**5.1. Fine grained construction material**

Borrow fine grain one-two divided by two mines and introduced. Grading materials in CL are both mine. Changes wells drilled close to each other arithmetic mean of 27.76% and a standard deviation of 2.52 for the entire mine. But changes the paste of at least 7.9 percent, up 9.3 percent to an average of 8.6% Benchmark Baanhraf 7 percent. In Table 1, results aggregation density approximately Material Binaloud dam has been fine grain

Table 1: Atterberg limits Material characteristics fine grain examples Binaloud dam

No. Mine	No. samples	USGS	%LL	%PI	d <sub>s</sub> max <sup>y</sup> gr/cm <sup>3</sup>	Wopm%
1	A1	CL	6.26	6.80	1.9	13.2
	A2	CL	6.26	9.70	1.86	14.8
	A3	CL	1.30	3.90	1.81	16.5
2	A4	CL	5.30	1.90	1.74	17
	A5	CL	9.33	1.10	-	-
	A6	CL	2.33	1.10	1.74	18

**5.1.1. Compression tests**

This simple compression tests on specimens Borrow (holes 1 and 2) have been carried out, the results in Table 2 can be seen. Based on these results, the maximum dry density in the range of 1.81 to 1.9 grams per cubic centimeter and optimum moisture content in the range of 13.2 to 16.5 percent of varying materials. The average dry density, maximum and optimum moisture, 1.85 cubic centimeters and 14.8 percent respectively.

**5.1.2. Divergence**

Divergence, physicochemical phenomenon, which, on the day particles in the presence of water, lost his grip and repels them So that, particles, suspended in water, and the ease and with very little energy from the environment to be washed. Divergence and erosion potential in a given soil depend on many factors, including minerabgy, geochemistry and soluble salts in the soil pore water and the water is flowing nearby. These soils, even in comparison with software and cohesionless soils, such as sand, water flow caused by slow erosion quickly find Divergent bam soil particles in flowing water also reacts to soil particles, suspended in water or come in. In this study, the ability of the soil

divergence, in different ways, using double hydrometer tests, pinhole and chemicals, to determine the amount of sodium ions, magnesium and calcium, in the saturation extract, has been conducted on the samples.

**5.1.3. Chemical tests**

**Table 2:** Chemical test results, the saturation extract, examples of finegrain Material of Binaloud dam

No. samples	USGS	TDS (meq/lit)	%Na	SAR (meq/lit)	Describing the divergence	%caso4
B1	CL	165.84	82.3	36.89	Div.	1.45
B2	CL	210.92	69.20	26.05	Div.	3.06
B3	CL	179.41	79.89	32.91	Div.	0.408
B4	CL	111.13	52.73	11.49	Div.	0.163
B5	CL	120.47	63.1	16.5	Suspected to divergent	0.204
B6	CL	112.1	69.26	18.93	Div.	0.244
B7	CL	167.20	79.08	33.02	Div.	0.557
B8	CL	145.21	78.8	30.5	Div.	1.822
B9	CL	116.23	74.46	22.7	Div.	0.3

Chemical test results, the saturation extract of samples obtained from boreholes, mEq per gram per liter in Table 2 is presented. Based on these results, according to the sodium ion concentration is over 60%, is the saturation extract, mine soils, divergent been detected.

**5.1.4. Double hydrometer test**

Double hydrometer test, performed on Source fine grain. % Of particles smaller than 0.005 mm Table 3 is presented (PD) the interests of the

Material, according to the results of this test is between 8 to 60 percent, it can be concluded, that the soils studied, the average is divergent.

**Table 3:** Double hydrometer tests, samples loan dam fine grain Binaloud (Abpooy Consulting Engineers, 2005)

No. samples	Depth (M)	USGS	Percentage of particles smaller than 0.005 mm		%PI	%LL	PD
			Solution scatterer	Without solution scatterer			
F1	50	CL	50	7	9.2	9.26	14
F1	1-2	CL	35	19	8.7	3.27	2.54
F1	2-3	CL	35	3	7.9	8.25	5.8
F2	0-1	CL	38	27	8.2	6.26	1.7
F2	1-2	CL	33	12	7.8	3.26	3.36
F2	2-3	CL	36	24	7.9	1.27	6.66
F3	0-1	CL	60	18	4.8	7.29	30
F3	1-2	CL	52	10	0.2	1.30	2.19
F3	2-3	CL	41	10	3.9	7.30	2.24

**5.1.5. Consolidation and permeability tests**

The experiments on some samples of optimum moisture conditions source up to a final pressure of 16563 kg per square centimeter were used. The results in Table 4 is presented.

**5.1.6. Divergence soil**

Compare the results of different tests to identify the soil divergence suggests duality soil behavior is against the phenomenon of divergence There is a potential divergence. Therefore, in this study also show that soil resistance testing pinhole in front of the phenomenon of divergence is used. Finally, it is recommended that due to the divergence of results

of chemical tests double hydrometer test, when applied to the soil divergence is due to take effect.

**6. Conclusion**

Since the distance of source studied are close to the dam axis economically These Material are affordable. source this characteristics is as follows:

1. source major constituent of soils in soil diverge from one soil core dams are suitable for implementation.
2. Geotechnical properties such as size, density, consolidation loans, and confirms the suitability of these sources.
3. Unfavorable soil chemical analysis was carried out to confirm the source of Material.

**Table 4:** The results strengthen the Material samples gained Binaloud dam permeability (Abpooy consultant Company, 2005)

Min no.	Borehole	D. (m)	USGS	P (kg/cm <sup>2</sup> )	Odometry (kg/cm <sup>2</sup> )	Prosity
1	F2	0-3	CL	0.313	19.92	0.593
				0.563	26.56	
				1.063	39.85	
				2.063	53.13	
				4.063	79.70	
				8.063	159.38	
				16.063	318.77	
2	F2-2	0-3	CL	0.313	12.76	0.725
				0.563	57.50	
				1.630	34.49	
				2.063	57.50	
				4.063	86.25	
				8.063	172.50	
				16.063	246.42	

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### References

- Consulting Engineers dynamic water company. 2005. "The report source and Binaloud dam construction materials". Darvishzadeh, A. 2001. "Geology of Iran," Tehran University Press, 901 p.
- Poursoltani, M. Mousavi, M. Alami, S. 2009. "study geomorphic Binaloud dam drainage basin", Quarterly of Applied Geology Issue 4 of the fifth year.
- Rahimi, F. 2006. "earth dam", Publishing and Printing Institute of Tehran University.
- Hooshmad, A. Aminfar, M. Asghari, E. and Ahmadi, H. 2012. Mechanical and Physical Characterization of Tabriz Marls, Geotech Geol Eng, 30-39. ICOLD (1990). Dispersive in Embacment Dams, Bullentin77, International Commission on Large Dams, Committee on Materials for Fill Dam, Paris.