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Research Paper

A STUDY ON VARIATION IN ENGINEERING CHARACTERISTICS OF SOME GRANITIC ROCKS

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Rock characterization provides an important input data for the design of the structures founded on or in the rocks. This paper deals with the characterization of granite obtained from certain locations of Jabalpur and Bundelkhand regions were selected for sampling the physical properties and Unconfined Compressive Strengths were determined for the selected samples. It has been observed that there is a considerable variation in the physical properties like specific gravity, water absorption, dry and saturated densities and Unconfined Compressive Strengths of the rock samples of different locations. The laboratory test results reveal that the specific gravity and water absorption values vary from 2.60 to 2.75 and 0.2 to 0.35 respectively. The dry density vary 2.59 g/cm³ to 2.70 g/cm³. The Unconfined Compressive Strength has a variation from 120 MPa to 175 MPa.

Keywords: Granite rocks, Unconfined compressive strengths, Physical properties

INTRODUCTION

Granite is a most widely distributed plutonic rock in the earth crust. These rocks occur in both the peninsular India and extra peninsular India. Ajmer(Raj.), Jhansi(UP), Jabalpur(MP), Kangra(HP), Mysore, Bangalore, Chennai, Secunderabad etc. are the major places where this rocks is found. Jabalpur has a unique position in the matter of its Geology. The entire township of Jabalpur is situated on a very thick slab of granite rock. In the Bundelkhand region granite is outcropped in many areas e.g. Chhatarpur, Khajuraho, Bijawar, Tikamagarh, Jhansi, etc. The

engineering characteristics of the rocks are strongly influenced by texture, structure, mineralogy, presence of cracks and fractures and degree of weathering. The present study envisages the geotechnical characterisation of the granite rocks of two major areas and variations in their physical and strength properties.

LITERATURE REVIEW

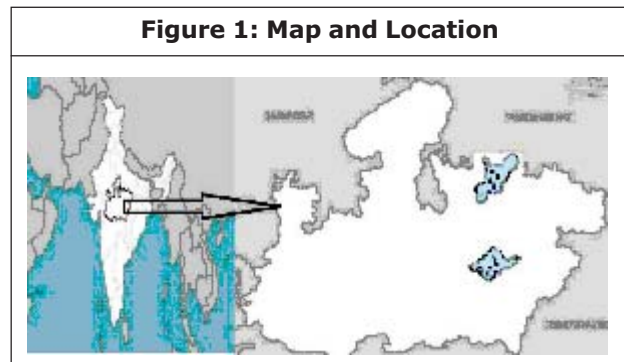
The physical and strength properties of rock depend upon many factors. They include geological, lithological, physical, mechanical and environmental factors, Ramamurthy (2010).

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A number of investigators have studied the relationship between petro graphical and engineering behaviour of rocks. Keikha Tayebbeh et al. (2013) established correlations between mineralogical characteristic and engineering properties of granitic rocks. They concluded that the grain size and mineralogical compositions influence the strength of granitic rock to a great extent. Ali Z. et al. (2013) studied petrographic characteristics and engineering behaviour of some igneous rocks of Baluchistan. The result of their study revealed that the mechanical properties of rocks can be estimated by using correlational equation between sonic wave velocity and petro graphic characteristics. Gupta and Rao (2000) studied the deformational behaviour in terms of variation in tangent modulus and initial modulus due to weathering on Malajkhand granite, Nagpur basalt and Delhi quartzite. Several other researchers have studied the effect of moisture and petrographic features on strength and deformational behaviour of rocks (Broch E, 1974, Gokhale C S, 1994, Akesson U et al., 2001).

METHODOLOGY

The granite rocks samples were collected from granite outcrops near Medical College and Bada Pathar, Ranjhi of Jabalpur city. Some samples were also collected from two locations in Chhatarpur district of Bundelkhand region. The locations are shown in Figure 1. The samples were tested for specific gravity, water absorption, dry density and Unconfined Compressive Strength as per the relevant IS code of practise/ ISRM suggested methods. The physical properties obtained are listed in Table 1.



S. No.	Location	Longitude	Latitude
1	JMC	23°09'06"N	79°53'16"E
2	JBR	23°12'30"N	80°0'5"E
3	BCB	23°50'47"N	78°44'10"E
4	BCBM	24°33'50"N	79°18'25"N

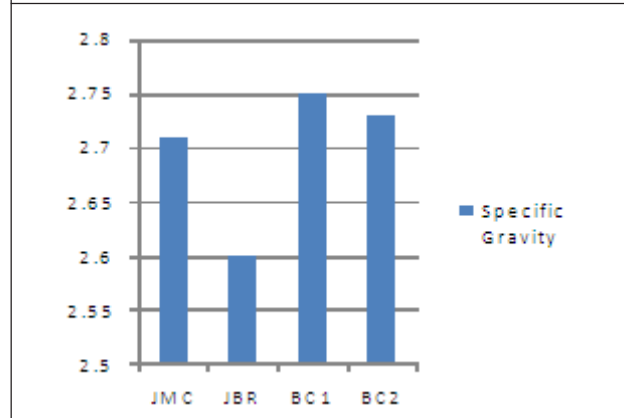
Note: JMC- Jabalpur Medical College, JBR- Jabalpur BadaPathar, Ranjhi BCB - Bundelkhand Chhatarpur- Buxwaha, BCBM - Bundelkhand Chhatarpur- Bada Malhara

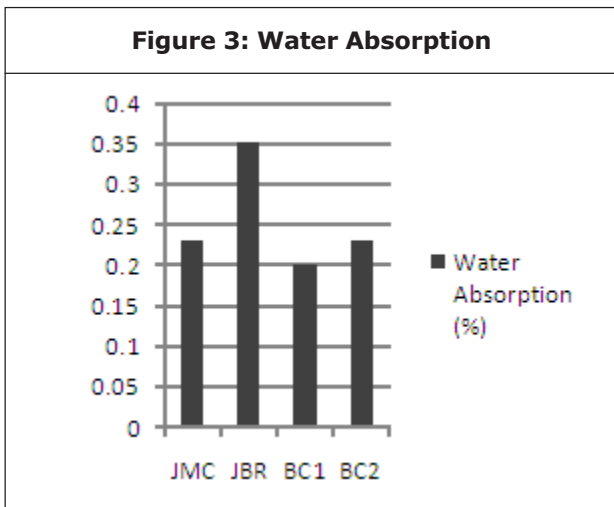
Table 1: Physical Properties

S. No.	Location	Specific Gravity	Water Absorption (%)	Dry Density (g/cm ³)
1.	JMC	2.71	0.23	2.65
2.	JBR	2.60	0.35	2.59
3.	BCB	2.75	0.20	2.70
4.	BCBM	2.73	0.23	2.66

Note: JMC- Jabalpur Medical College, JBR- Jabalpur BadaPathar, Ranjhi, BCB - Bundelkhand Chhatarpur- Buxwaha, BCBM - Bundelkhand Chhatarpur-Bada Malhara

Figure 2: Specific Gravity

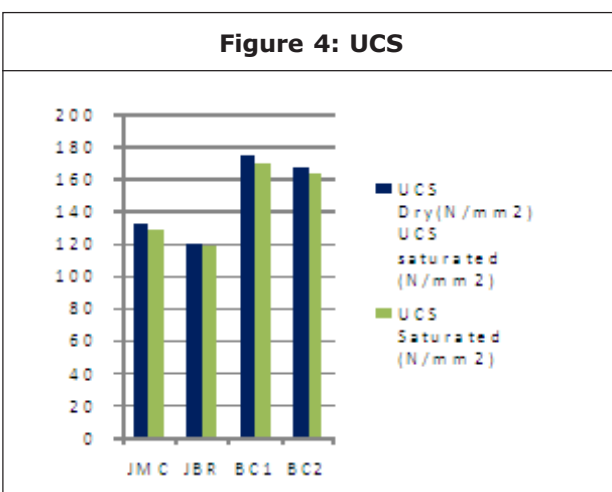




Unconfined Compressive Strength

Granite blocks were taken from the sites and the cores samples of NX size were prepared from these blocks. The test specimen having l/d= 2 were prepared as per the specifications given in ISRM suggested methods. These rock samples

S. No.	Location	UCS (Dry) (N/mm ²)	UCS (Saturated) (N/mm ²)
1.	JMC	132	129
2.	JBR	120	119
3.	BCB	175	170
4.	BCBM	168	163.5



were tested in a compression testing machine of 2000 kN capacity. The test results are summarised in Table 2.

CONCLUSION

From the laboratory investigations made on granite samples of different locations of Jabalpur and Bundelkhand regions, the following conclusions can be drawn:

1. The physical properties like specific gravity, water absorption and densities of rock samples collected from different locations vary considerably (Figures 2 and 3).
2. The Unconfined Compressive Strength also has remarkable variation (Figure 4).
3. The influence of moisture on unconfined compressive strength is very small.

The possible reasons for such variations in the characteristics of granite are due to geological, lithological, physical and environmental factors. The textural and mineralogical composition, presence of moisture, grain size, etc. influence these properties to a great extent.

REFERENCES

1. Ali Z, Akram M, Abu Bakar M Z, Shah S M A and Khan M U (2013), "Petrographic Characteristics and Engineering Properties of Some Igneous Rocks from Raskoh Range Balochistan", *PJS*, Vol. 65, No. 1, pp. 95-102.
2. Akesson U, Lindqvist J E, Goransson M and Stigh J (2001), "Relationship between texture and mechanical properties of granites, central Sweden, by use of image analysing techniques", *Bulletin of Engineering and Geological Environment*, Vol. 60, pp. 277-284.

3. Bell F G (1981), "Engineering properties of soils and rocks", *Butterworths*, London.
4. Broch E (1974), "The influence of water on some rock properties", *Proc. IIIrd Int. Cong, ISRM, Denver, USA*, Vol. 2, pp. 33-38.
5. Gokhale C S (1994), "Influence of varying moisture on uniaxial compressive strength of a sandstone", *Indian Geotech. Jl.*, Vol. 24, No. 4, pp. 368-377.
6. Goodman R E (1980), *Introduction to rock mechanics*, John Wiley and Sons, USA.
7. Gupta A S and Rao K S (2000), "Weathering effects on the strength and deformational behaviour of crystalline rocks under uniaxial compression state", *Engng. Geol.*, Vol. 56, pp. 257-274.
8. ISRM (1979), "Suggested methods for determining the uniaxial compressive strength and deformability of rock materials", *Int. J. Rock Mech. Min. Sci. & Geomech Abstr.*, Vol. 16, No. 2, pp. 135-140.
9. ISRM (1979), "Suggested methods for determining water content, porosity, density, absorption and related properties and swelling and slake-durability index properties", *Int. J. Rock Mech. Min. Sci. & Geomech. Abstr.*, Vol. 16, No. 2, pp. 141-156.
10. ISRM (1981), *Rock characterization, testing and monitoring*, In Brown E T (ed.), Pergamon Press, Oxford.
11. Keikha Tayebbeh and Keykha H A (2013), "Correlation between Mineralogical Characteristics and Engineering Properties of Granitic Rocks", *EJGE*, Vol. 18, Bund. S, pp 4055-4065.
12. Ramamurthy T (2010), *Engineering in rocks for slope, foundations and tunnels*, Second Edition, PHI Learning Pvt. Ltd., New Delhi.
13. Turner F and Verhoogen J (2004), *Igneous and Metamorphic Petrology*, 2nd Edition, CBS Publishers & Distributors, New Delhi.
14. Wallace S Pitcher (1997), *The nature and origin of Granites*, Ssecond Edition, Champman & Hall publication, London.



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