

# SOIL CLASSIFICATION OF JABALPUR CITY USING BORE LOGS

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**Abstract:** Jabalpur is one of the most important cities of Madhya Pradesh and is located at the center of the State. The city is situated in the 'Mahakaushal' region. Narmada River flows through the entire district. The city is located between 23°10' North latitude and 79°59' East longitude. The central point of India is located in Jabalpur district. It has an average elevation of 411 metres (1348 ft.). Generally Engineer has to place his structure on soil and to some extent in the soil. This paper attempts to obtain the characteristics of soil of Jabalpur city using field soil tests and laboratory tests, to achieve this geotechnical bore logs are made for different locations. In this paper, I am showing bore logs of 10 different locations of Jabalpur city. These bore logs will help designers in deciding which type of foundation and construction activity is to be carried out for particular project depending on the type of soil.

**Keywords:** Bore Logs<sup>1</sup>, Soil Samples<sup>2</sup>, Group Name<sup>3</sup>, Group Symbol<sup>4</sup>.

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## 1. INTRODUCTION

The term "soil" can have different meanings, depending upon the field in which it is considered.

To a geologist, it is the material in the relative thin zone of the Earth's surface within which roots occur, and which are formed as the products of past surface processes. The rest of the crust is grouped under the term "rock".

To a pedologist, it is the substance existing on the surface, which supports plant life.

To an engineer, it is a material that can be:

- built on: foundations of buildings, bridges
- built in: basements, culverts, tunnels
- built with: embankments, roads, dams
- supported: retaining walls

The constituents of soil are extremely variable in size, shape and chemical composition. The size of particles is one of the most significant characteristics. Water absorption, air movement and ease of digging are a few things that are affected by particle size. The texture of soil refers to particle sizes and is classified on an arbitrary scale. It can be coarse, sandy, or clayey. Sand would be about the size of sand, coarse would refer to soil that is larger and clayey would be smaller.

In the Indian Standard Soil Classification System 1498 – (1970), soils are classified into groups according to size, and the groups are further divided into coarse, medium and fine sub-groups. The grain-size range is used as the basis for grouping soil particles into boulder, cobble, gravel, sand, silt or clay.

**Table.1: Soil Classifications**

Very coarse soils	Boulder size		> 300 mm
	Cobble size		80 - 300 mm
Coarse soils	Gravel size (G)	Coarse	20 - 80 mm
		Fine	4.75 - 20 mm
	Sand size (S)	Coarse	2 - 4.75 mm
		Medium	0.425 - 2 mm
Fine soils	Silt size (M)		0.002 - 0.075 mm
	Clay size (C)		< 0.002 mm

**Table.2: Prefixes of Indian Standard Soil classification System [IS 1498, 1970]**

SOIL TYPE	PREFIX
Gravel	G
Sand	S
Silt	M
Clay	C
Organic	O
Peat	Pt

**Table.3: Suffixes of Indian Standard Soil classification System [IS 1498, 1970]**

SUB-GROUP	SUFFIX
Well Graded	W
Poorly Graded	P
Silty	M
Clayey	C
$W_L < 35\%$	L
$35\% < W_L < 50\%$	I
$W_L > 50\%$	H

The construction activities in the city JABALPUR, which is located in the Mahakoshal region situated at the center of India in the state of Madhya-Pradesh, are in very good shape, with rapid progress on industrial developments. This city is also tipped to be an ideal place for IT industry, in central India as all other prominent cities are in a level of saturation. The cosmopolitan environment and pleasantness of the city has attracted peace loving citizens to settle down here by building their own hamlets. For better construction work and stable structure engineer should be familiar with the soil condition of the area, as Engineer has to place his structure on soil and to some extent in the soil. This paper will be very useful for engineers in making decision for type of foundation, material and location require for a particular project.



**Figure No.1: Jabalpur City Google Map**

This paper present the classification of soil of Jabalpur city using field soil tests and laboratory tests, to achieve this geotechnical bore logs are made for different locations. In this paper, I am showing bore logs<sup>1</sup> of 10 different locations. A bore log is basically a record of information obtained from in situ tests and summary of laboratory tests on samples for a particular borehole. It includes description or classification of various soil / rock types at different depths with summary of essential properties including presence or otherwise of ground water table.

## 2. METHODOLOGY

The process of creating bore logs, i.e., Log of Test Borings (See Figure No. 2):

- (a). Field sampling and descriptions
- (b). Quality check of field descriptions and samples
- (c). Refinement of descriptions and classification of soil based on laboratory test results, if performed
- (d). Preparation of the bore log(s) prior to the field investigation

A combination of field observations and laboratory test results used to classify the soil samples<sup>2</sup>, and generate soil sample description for the bore logs. A soil's classification is determined on the basis of laboratory test results whereas; its identification is determined by visual/manual methods.

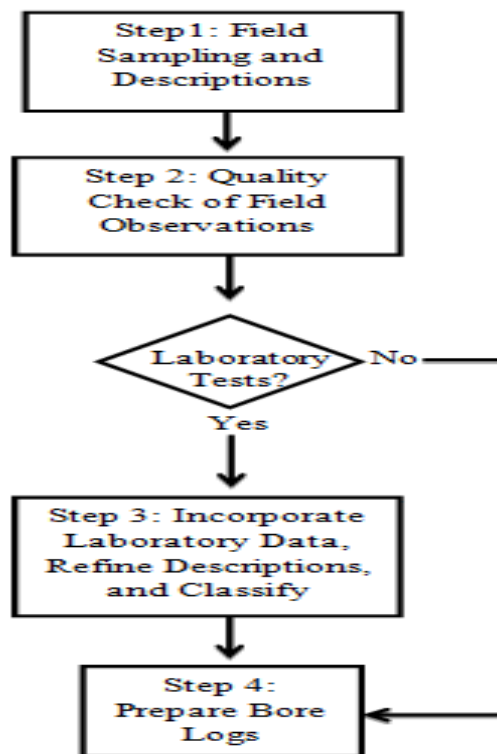


Figure No.2: Process of Creating Bore Logs.

Most of field procedures are sufficient to identify and describe the soil in qualitative terms, and are appropriate for reporting in final boring logs. Field-generated descriptors can be correlated to engineering parameters for use in geotechnical designs. The Group Name<sup>3</sup> and Group Symbol<sup>4</sup> are determined in the field using visual and manual procedure. The field method requires the user to make judgments on a number of observations (e.g., percent of constituents by weight, whether a soil is well or poorly-graded, and whether the soil is clay or silt or some combination thereof). However, we can quantitatively and definitively characterize a particular sample using laboratory test results. Laboratory test results of particle-size analysis, liquid limit, and plasticity index provide a quantitative basis for classification of the soil. These results must be used on the bore logs and in the geotechnical report.

### 3. RESULT AND DISCUSSION

Tests were performed for 10 locations of the Jabalpur city. Using field observations and laboratory test results soil of 10 different locations are classified on the basis of Indian Standard Soil classification System [IS 1498, 1970]. The values shown on y axis represent bore log depth in meters below ground level. The bore log data are summarized in Table 4 and soil classification of different location using bore logs are in figure: 3, 4 & 5.

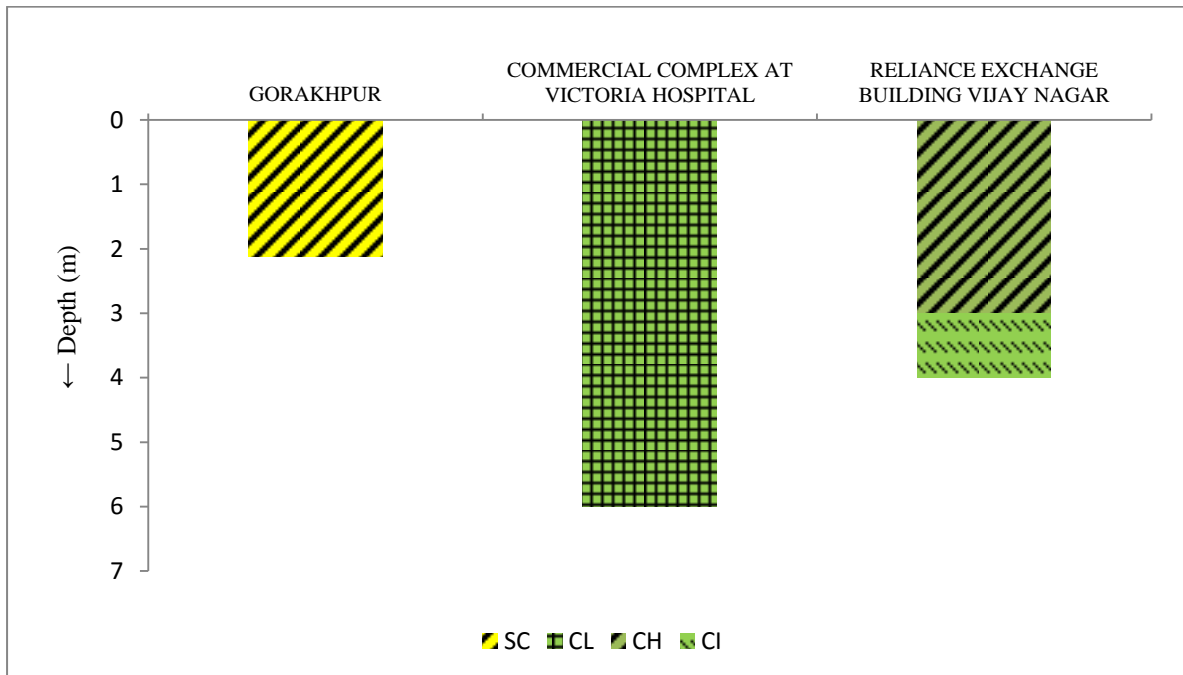


Figure No.3: Bore Logs of 3 Different Locations

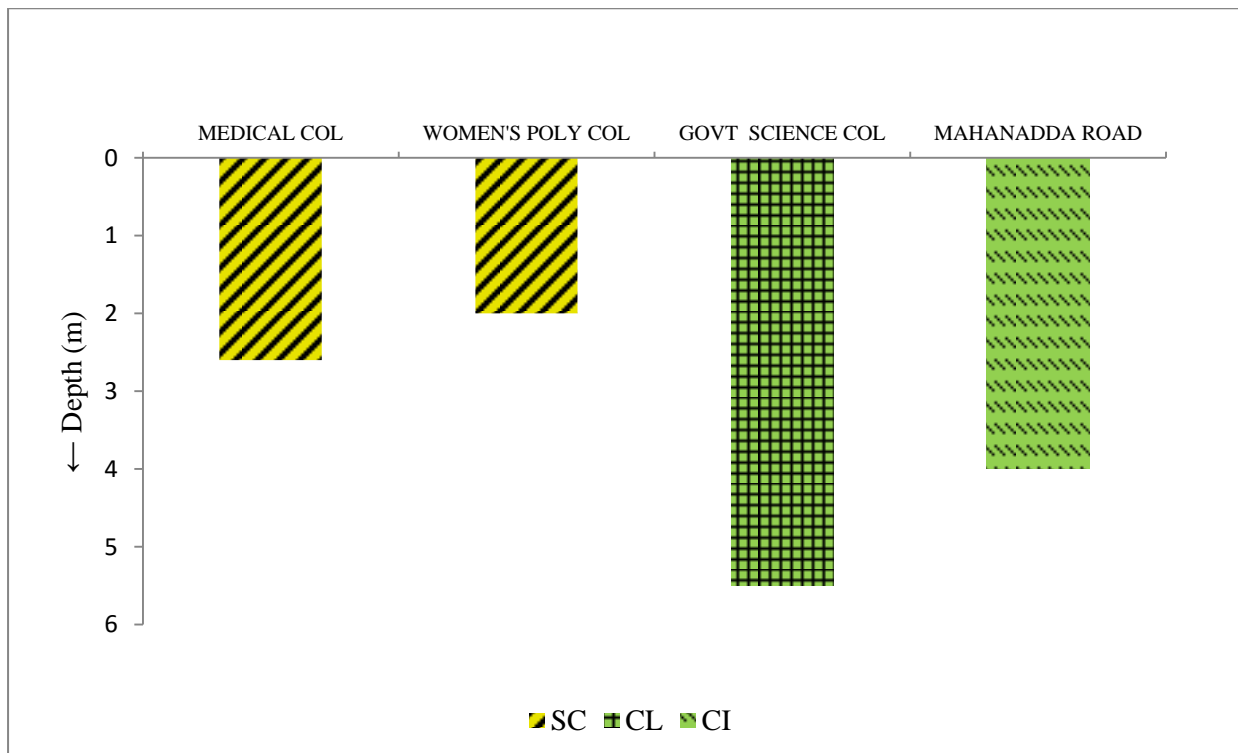


Figure No.4: Bore Logs of 4 Different Locations

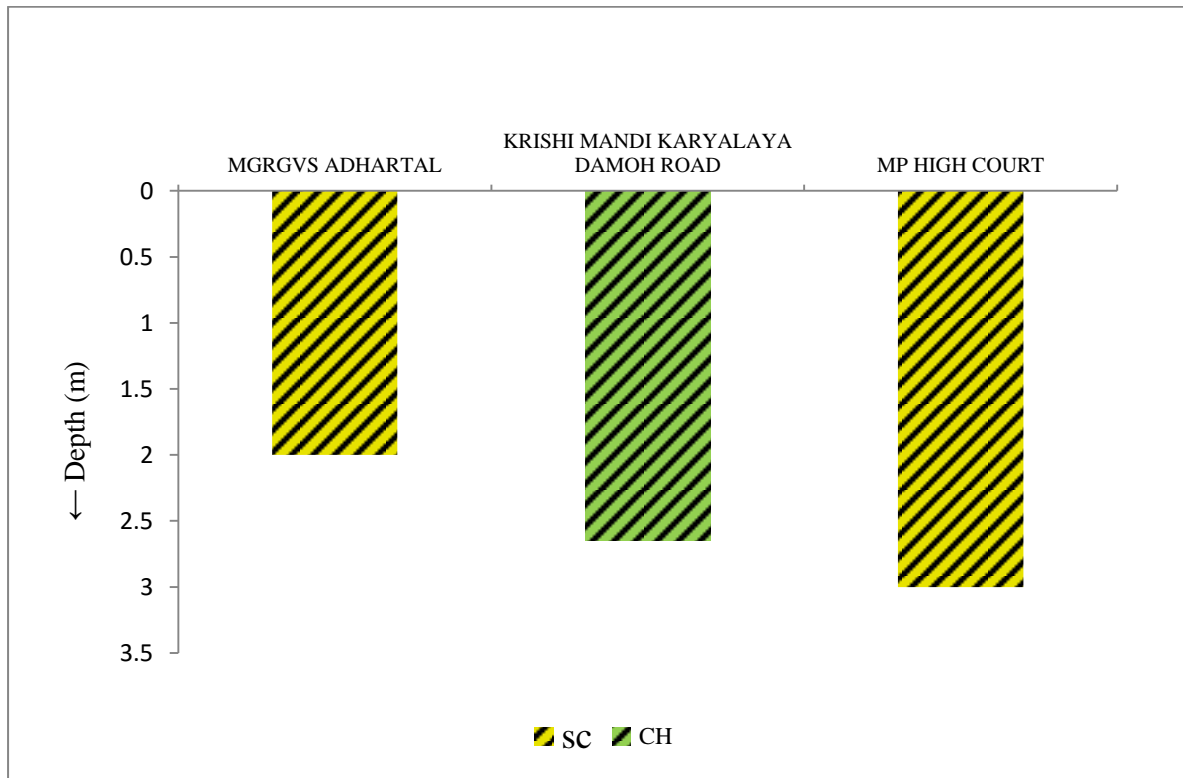


Figure No.5: Bore Logs of 3 Different Locations

Table No.4: Summarized Bore Log Data

S:N O	LOCATION	LONGITUDE	LATITUDE	GROUP SYMBOL	GROUP NAME
1.	GORAKHPUR	79°55'59"E	23°9'14"N	SC	CLAYEY SAND
2.	COMMERCIAL COMPLEX AT VICTORIA HOSPITAL	79°56'14"E	23°10'20"N	CL	LEAN CLAY
3.	RELIANCE EXCHANGE BUILDING VIJAY NAGAR	79°54'41"E	23°11'32"N	CI-CH	FAT CLAY
4.	MEDICAL COLLEGE	79°52'52"E	23°8'59"N	SC	CLAYEY SAND
5.	WOMENS POLYTECHNIC COLLEGE	79°56'59"E	23°10'28"N	SC	CLAYEY SAND
6.	GOVERNMENT SCIENCE COLLEGE	79°58'8"E	23°9'49"N	CL	LEAN CLAY
7.	MAHANADDA ROAD	79°55'9"E	23°9'6"N	CI	CLAY OF MEDIUM PLASTIC
8.	MGRGVS ADHARTAL	79°56'46"E	23°11'58"N	SC	CLAYEY SAND
9.	KRISHI MANDI KARYALAYA DAMOH ROAD	79°54'57"E	23°11'16"N	CH	FAT CLAY
10.	MP HIGH COURT	79°57'30"E	23°9'43"N	SC	CLAYEY SAND

#### 4. CONCLUSION

This paper present bore logs of 10 different location of Jabalpur city. Bore logs represent type of soil in depth of different locations. As the decision made during project planning will improve the constructability, this bore logs will help in taking such decisions before construction work to be started. These bore logs offer considerable insight to the variability of soil type and thickness. Soil in these 10 different locations varies from clayey sand deposits, to lean clay and fat clay deposits.

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