



# SOIL STABILISATION USING HUMAN HAIR FIBER

<sup>1</sup>Deepak Sehra, <sup>2</sup>Mohammad Shahid Ali Khan, <sup>3</sup>Mohit Agarwal, <sup>4</sup>Mohit Kaswan, <sup>5</sup>Naveen Kumar, <sup>6</sup>Naveen Kumar Nagar, <sup>7</sup>Dr.Omprakash Netula, <sup>8</sup>Akhil Maheshwari, <sup>9</sup>Dr. V.K.Chandna

<sup>1,2,3,4,5,6</sup>B.Tech, <sup>7</sup>Professor & HOD, <sup>8</sup>Assistant Professor Dept. of Civil Engg. , <sup>9</sup>Professor & Principal, Jaipur Engineering College and Research Centre, Jaipur, India

**Abstract:** - This research paper deals with stabilisation of low bearing capacity soil with the help of human hair fiber as reinforcing material. Human hair is a non-biodegradable waste material, which causes disposal problem. Human hair is mixed in soil sample in different percentages. The objective of studying human hair fiber in this process is to find an alternative of commercial fiber materials.

Index Terms: Soil Stabilisation, Human Hair Fiber (HHF), California Bearing Ratio (CBR), Optimum Moisture Content (OMC), Maximum Dry Density (MDD).

## 1. INTRODUCTION

Soil stabilisation is the method of refining the engineering properties of soil. Stabilisation of soil is needed when the available soil at site is not suitable for the proposed purpose. Stabilisation is can also be defined as the process which changes the composition of soil for betterment of its properties.

Generally, soil stabilisation is used to reduce compressibility and permeability of the soil and to increase bearing capacity and shear strength. The process of increasing bearing capacity and shear strength of soil is found to be cost effective and more economical in terms of energy consumption.

Human hair fiber is considered as waste material and creating environmental problems. In recent research it has been found that human hair can be used as a reinforcing fiber in soil stabilization to increase its shear strength and bearing capacity and hence the problem associated with disposal of human hair is minimized significantly.

## 2. METHODOLOGY

### 2.1. Material Used

#### 2.1.1 Soil Sample

Sample of soil was taken from college football ground and lab tests for evaluating different index properties of soil sample were conducted as per IS code.

#### 2.1.2 Human Hair Fiber

The various properties of hair fiber make them useful in soil stabilisation. It is used as a reinforcement material. It is a natural fiber formed by keratin containing sulphur from amino acid cystine in high in high concentration.

## 2.2. Sample Preparation

Soil sample is prepared using human hair fiber in 0.0, 0.4, 0.8, 1.2, 1.6, 2.0, 2.4 percentages by weight of soil sample. All samples are prepared at optimum moisture content (OMC) and maximum dry density (MDD). In air dried soil these percentages of human hair is mixed in random orientation.

## 2.3. Laboratory tests

- a) The liquid limit and plastic limit of soil sample is determined as per IS: 2720 (Part -5) using casagrande apparatus.
- b) Specific gravity of soil sample is determined as per IS: 2720 (Part-3) using pycnometer.
- c) For determination of OMC and MDD a graph is plotted between water content and maximum dry density by light weight compaction test carried out as per IS:2720 (Part-7).
- d) Using OMC and MDD obtained from light weight compaction test is used in soil sample preparation for CBR test.

## 3. RESULTS

- a) Results of various tests conducted on unreinforced soil sample is shown in table 1.
- b) Variation in CBR value with different amount of HHF in soil sample is shown in table 2.

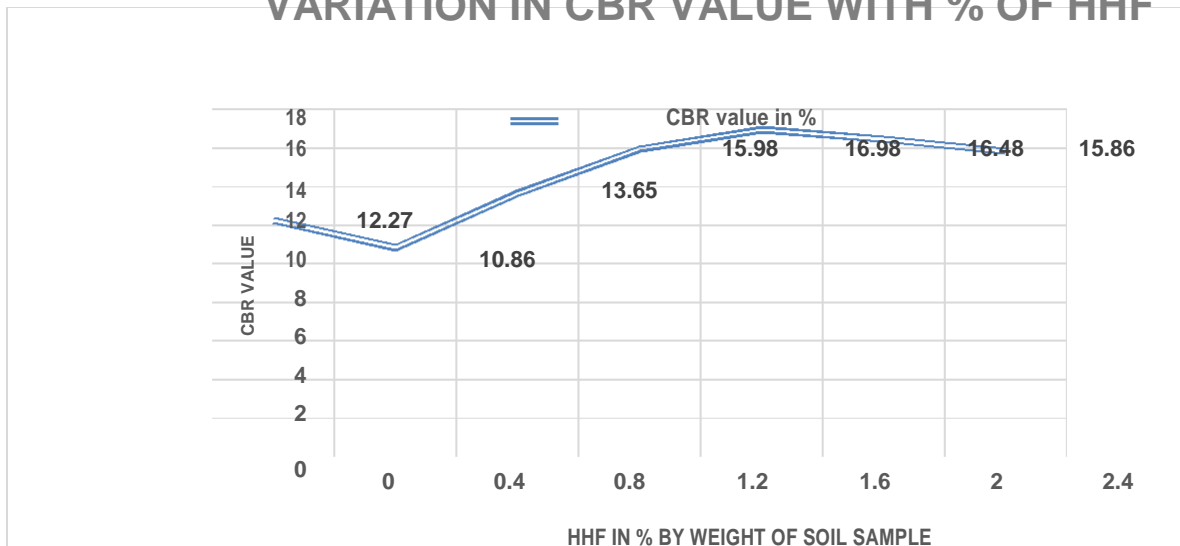
Table 1: Properties of unreinforced soil

Sr.No.	Property	Value
1	Liquid limit	48 %
2	Plastic limit	30 %
3	Specific gravity	2.49
4	Maximum dry density	1.81 gm/cc
5	Optimum Moisture Content	19.35 %

Table 2: CBR value for different % of HHF

Sr.No.	CBR value	% of HHF
1	12.27%	0
2	10.86%	0.4
3	13.65%	0.8
4	15.98%	1.2
5	16.98%	1.6
6	16.48%	2.0
7	15.86%	2.4

## VARIATION IN CBR VALUE WITH % OF HHF



### 4. CONCLUSION

- CBR value soil specimen is decreased at 0.4% of human hair fiber content as compared with 0% of human hair fiber content.
- CBR value is observed to be maximum at 1.6% of HHF content in soil specimen, then on further addition of human hair fiber CBR value tends to decrease.
- At high fiber content decrease in CBR value can be due to balling effect.

### 5. REFERENCE

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