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STABILIZATION OF DREDGED MATERIAL OBTAINED FROM FLOODSPILL CHANNEL [SRINAGAR], FOR ITS POTENTIAL USE AS SUBGRADE MATERIAL FOR DESIGN OF FLEXIBLE PAVEMENTS.

JUNAID ARFAT GUL[1] AND ER. SAKSHI BHATIA[2]

[1]*M.Tech Scholar, Department of civil engineering, RIMT University, Mandi Gobindgarh, Punjab, India.*
[2]*Assistant Professor, Department of Civil Engineering, RIMT University, Mandi Gobindgarh, Punjab, India.*

ABSTRACT

Efforts in this study were primarily aimed at in making use of dredged material for potential use as road subgrade in the design of flexible pavements. It was decided to evaluate use of polymer-based additives for stabilization of such soil. Soils are strong in compression but weak in tension. The current practice is to modify the strength of the soils to meet the design specifications. There are many techniques employed to improve the engineering and mechanical properties of poor soils. The techniques employed to improve the properties of soil in respect of strength and other relevant characteristics of soil are Soil stabilization. Soil can be stabilized using other material (e.g., chemical additives, rewetting, soil replacement, compaction control, moisture control, surcharge loading, and thermal treatment). All these methods are expensive and do not last for a long time. Fiber reinforcement is the simplest. Mechanical stabilization processes in which natural or synthetic materials are introduced in the soil mass in the direction of stress to enhance the tensile or shear strength.

KEYWORDS*: *Dredged material, Polypropylene, Stabilization, Flexible.

INTRODUCTION

In September 2014, the Kashmir region suffered disastrous floods across many of its districts caused by torrential rainfall. The Indian administrated Jammu and Kashmir, as well as Pakistan administered Azad Kashmir, Gilgit-Baltistan and Punjab were affected by these floods. By September 24, 2014, nearly 277 people in India and about 280 people in Pakistan had died due to the floods. The Jammu and Kashmir state and adjoining areas received heavy rainfall from 2 September 2014 onwards, during last stage of monsoon in India. This triggered flooding and landslides in India and the adjoining areas of Pakistan. On 5 September, the Jhelum River in Srinagar was reported to be flowing at 22.40 feet (6.83 m) which was 4.40 feet (1.34 m) above the danger mark and at 33 feet (10 m) at Sangam in Anantnag district above the danger mark. The discharge rate in the river was recorded as 70000 m3/s against the normal discharge of 25000 m3/s. The Chenab River was also reported to flow above the danger mark by which hundreds of villages were affected in Pakistan. These rivers flooded into the streets causing heavy casualties and loss of property. Even though the rains are a natural phenomenon and one cannot control the nature's fury in that sense, but the magnitude of disaster could have been easily minimized by proper city/urban planning and development. Many old canals in the Srinagar city have been transformed into roads, and wetlands have been drained for illegal constructions. By virtue of being the heaviest militarized zone in the world, the plateau lands that were left were also allotted to the armed security forces who also could not escape the brunt of nature and nearly 10 cantonment areas were completely inundated. In such a scenario where else would the surplus water go? A river body is like a conduit with only limited capacity and when that is over reached, that leads to breaches and silting in the river that happened with Jhelum and therefore there was massive inundation and depressingly so in the urban settlements. In order to avoid such drastic scenarios in future, government of J&K became very conscious and decided to take some measures so that situations like this can be easily minimized in future. One such step was desilting of flood spill channels and river JHELUM. By desilting, the capacity of channels/ rivers can be increased to a great extent. The mud and clay that's cleared from the channels can be placed on the banks of these channels after removing them. Desilting and cleaning increase the capacity at least by 5-10 per cent by enhancing the volume and depth of the channels. At the time of desilting, garbage from the channels and surrounding places can be cleared as well. When in small quantities, desilted material can be easily dumped on banks but the quantity of desilted material was so huge that it became a serious concern for government how to handle the desilted material. In this study efforts are being made in order to utilize the desilted material in the preparation of soil subgrade for the design of flexible pavements after its stabilization.

OBJECTIVES

- To increase shear strength of the dredged material.
- To apply different tests on proposed composition of dredged material.
- To utilize the desilted material in the preparation of soil subgrade for the design of flexible pavements after its stabilization.

METHODS

EXP: 1

Determination of water content by oven drying method.

Device:

1. Non-corrodible air-tight container.

2. Electric oven, maintain the temperature between 1050 C to 1150 C.

3. Desiccator.

4. Balance of sufficient sensitivity.

Test procedure:

1. Clean the container with lid, dry it and weigh it (w1) after tearing balance.
2. Take a specimen of the sample in the container and weigh with lid (W2).
3. Keep the container in the oven with lid removed. Dry the specimen to constant weight maintaining the temperature between 1050 C to 1100 C for a period varying with the type of soil but usually 16 to 24 hours.
4. Record the final constant weight (W3) of the container with dried soil sample.

RESULTS

The natural moisture content of sample 1 is 24**%** and that of sample 2 is 20**%.**

EXP: 2

STRENGTH TEST

California bearing ratio test [CBR].

Apparatus:
Compression machine, Proving ring, Dial gauge, Timer, Sampling tube, Split Mould, Balance.

Procedure:

1. The Mould containing the specimen with the base plate in position but the top face exposed is placed on the lower plate of the testing machine.
2. Surcharge weights, sufficient to produce an intensity of loading equal to the weight of the base material and pavement is placed on the specimen.
3. To prevent upheaval of soil into the hole of the surcharge weights, 2.5 kg annular weight is placed on the soil surface prior to seating the penetration plunger after which the remainder of the surcharge weight is placed.
4. The plunger is to be seated under a load of 4 kg so that full contact is established between the surface of the specimen and the plunger.
5. The stress and strain gauges are then set to zero. Load is applied to the penetration plunger so that the penetration is approximately 1.25 mm per minute.
6. Readings of the load are taken at penetrations of 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 4.0, 5.0, 7.5, 10.0 and 12.5 mm.
7. The plunger is then raised and the mould detached from the loading equipment.

Results:

- It has been observed that for Sample-1 significant increase in CBR values were obtained at a dosage of around 0.75%.
- There has been almost 44% increase in CBR with polymer stabilization in comparison to unstabilized sample.

Tables:

Table 1: - CBR TEST

Def(mm)	Load (0.0% P)	Load (0.25% P)	Load (0.5% P)	Load (0.75% P)	Load (1.0% P)	CBR-1	CBR-2	CBR-3	CBR-4	CBR-5
0.5	**7.9**	**3.95**	**7.9**	**7.9**	**13.43**					
1	**25.28**	**8.69**	**27.65**	**11.06**	**31.6**					
1.5	**48.19**	**14.22**	**52.93**	**48.98**	**54.51**					
2	**63.2**	**18.96**	**76.63**	**75.05**	**75.84**					
2.5	**75.05**	**25.28**	**98.75**	**100.33**	**96.38**	**5.478102**	**1.845255**	**7.208029**	**7.323358**	**7.035036**
3	**81.37**	**31.6**	**116.92**	**125.61**	**115.34**					
3.5	**86.9**	**37.92**	**132.72**	**146.15**	**132.72**					
4	**90.85**	**44.24**	**144.57**	**165.11**	**148.52**					
4.5	**94.8**	**51.35**	**157.21**	**184.07**	**163.53**					
5	**98.75**	**57.67**	**169.85**	**201.45**	**176.17**	**4.805353**	**2.806326**	**8.265207**	**9.80292**	**8.572749**
5.5	**101.91**	**64.78**	**182.49**	**218.04**	**190.39**					
6	**105.07**	**71.1**	**194.34**	**234.63**	**203.03**					
6.5	**109.02**	**79**	**206.19**	**252.01**	**217.25**					
7	**112.97**	**86.11**	**218.04**	**267.81**	**230.68**					
7.5	**116.13**	**93.22**	**229.1**	**284.4**	**244.9**					
8	**119.29**	**100.33**	**240.16**	**300.2**	**257.54**					
8.5	**122.45**	**107.44**	**251.22**	**314.42**	**271.76**					
9	**125.61**	**113.76**	**261.49**	**329.43**	**286.77**					
9.5	**128.77**	**120.87**	**271.76**	**342.86**	**300.99**					
10	**131.93**	**127.98**	**282.03**	**355.5**	**313.63**					

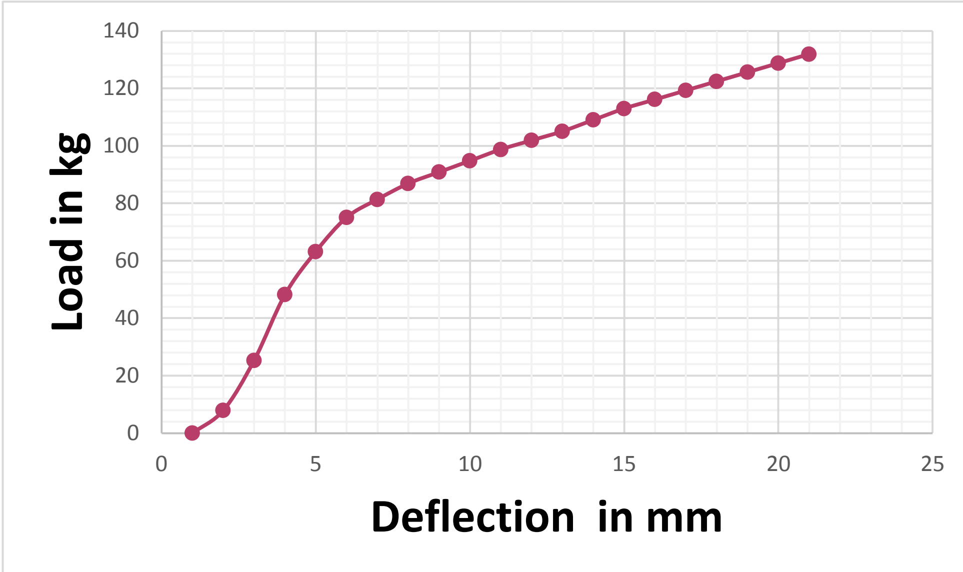

Fig:-1 Load deformation curve of Sample-1 at 0% fiber

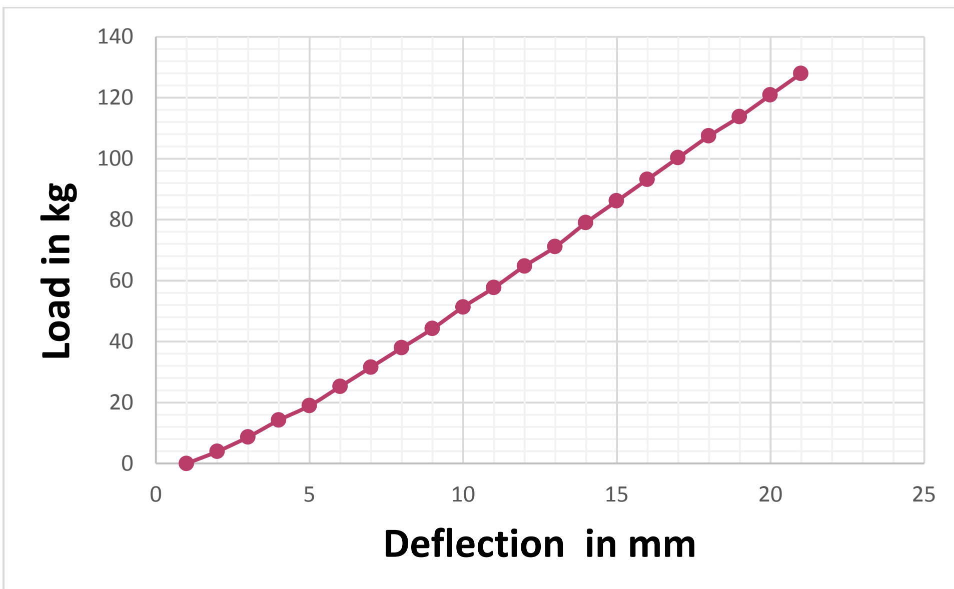

Fig:-2 Load deformation curve of sample 1 at 0.25% fiber

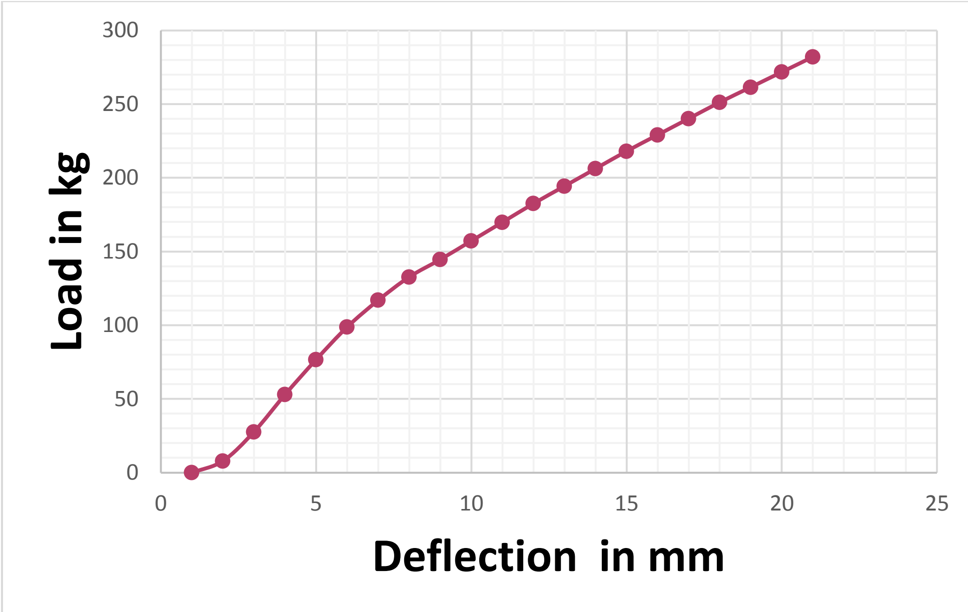

Fig:-3 Load deformation curve of sample 1 at 0.50% fiber

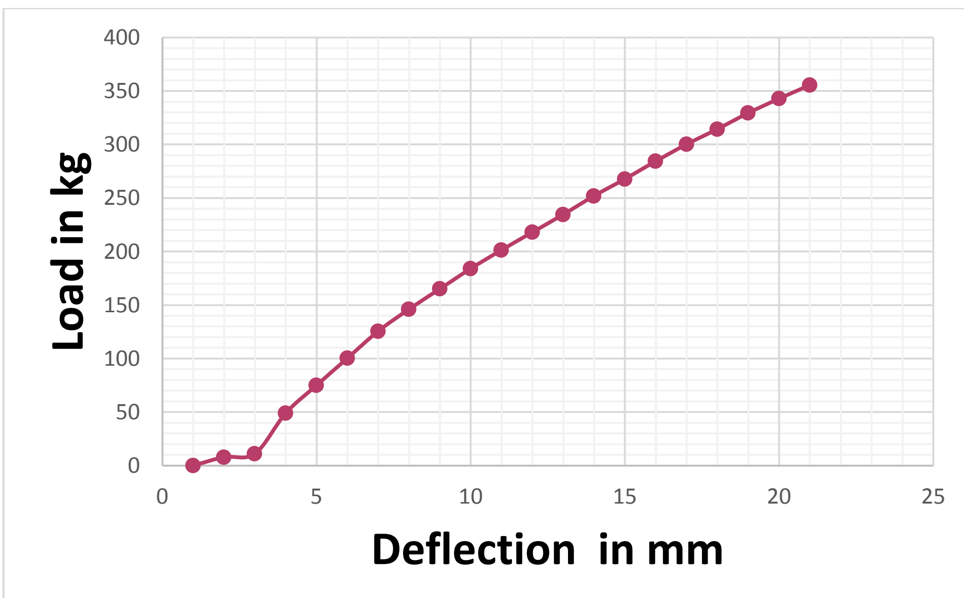

Fig:-4. Load deformation curve of sample 1 at 0.75

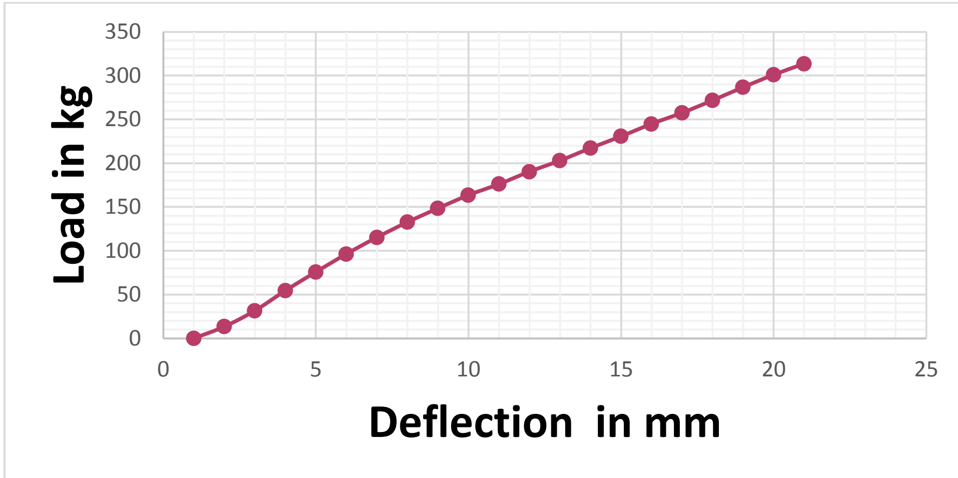

Fig:-5 Load deformation curve of sample 1 at 1% fiber

Fig:-6 Load deformation curve of sample 1 at different %age of polymer

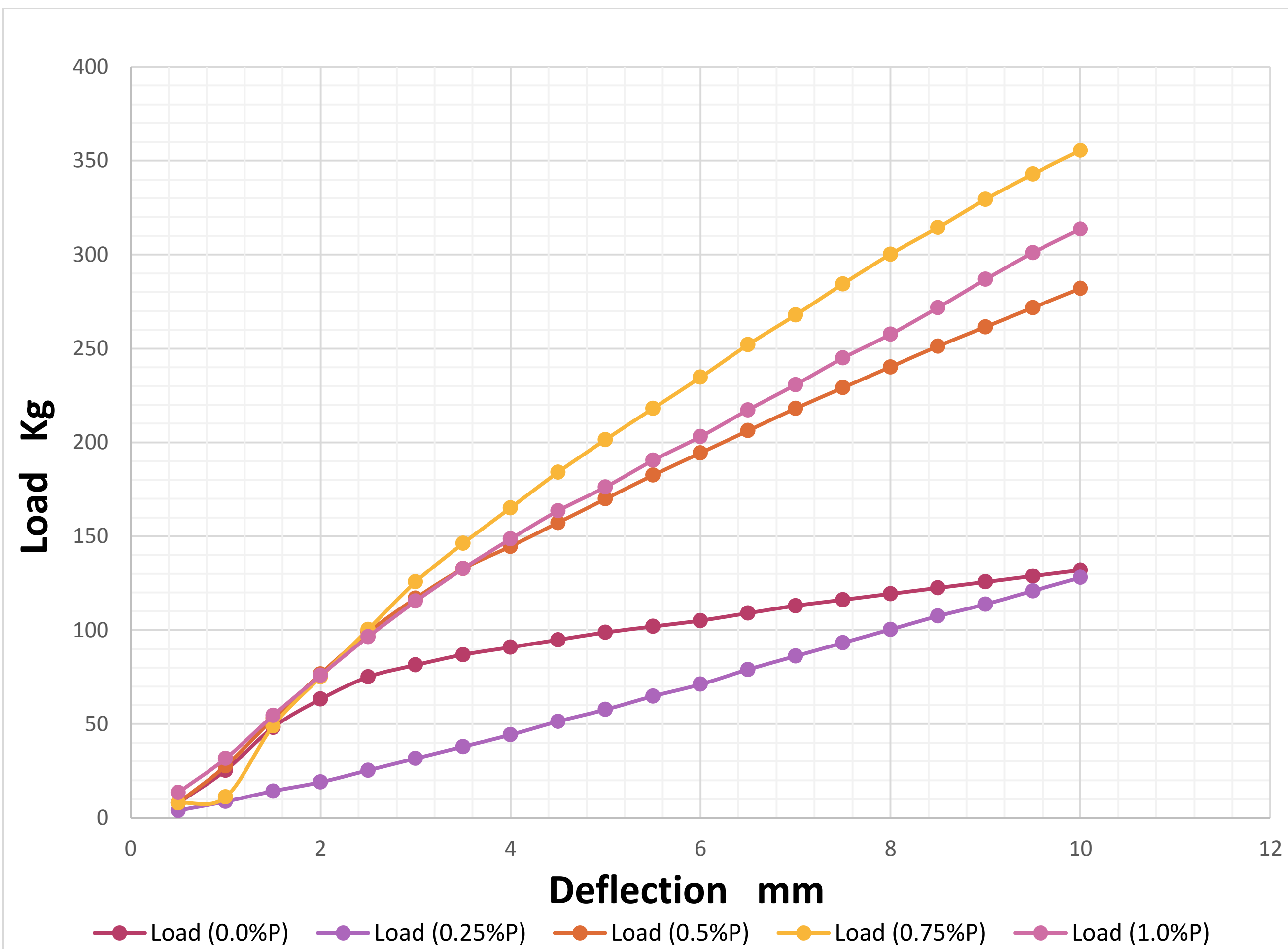

Table 2: Determination of water content by oven drying method.

S.NO.	SAMPLE NO.	1		2	
	PARTICULARS	TRIAL 1	TRIAL 2	TRIAL 1	TRIAL 2
1	W_1 =Weight of empty container + lid (grams)	46	34.05	44	30.11
2	W_2 =Weight of empty container + lid +moist soil(grams)	246	110	244	110
3	W_3 =Weight of empty container +lid + dry soil(grams)	210	94.34	210	96.83
4	**W**=Water content % = $(W_2 - W_1)/(W_3 - W_1) \times 100$	22%	26%	20%	20%
5	Average water content (%)	24%		20%	

CONCLUSION

Dredged material can well be used for engineering projects with some stabilization techniques like use if polypropylene.

In present study, in case of Sample-1 there has been 44% increase in CBR strength in comparison to unstabilized CBR value.

There is quite a variability in type of deposition of silt material as sample no. 2 has not responded well to use of polypropylene stabilization. This necessitates use of other specific stabilization technique for different types of dredged material that is coming out from flood spill channels.

Approximate cost estimate for the use of polypropylene as a stabilizing agent at 0.75% has been worked out to a value of Rs. 6750 per cubic meter of soil at specified compacted density of 1.8t/m3. It has been observed that sample no.1 after stabilization, can very well be used as flexible pavement subgrade material with design pavement crust requirement of 450mm (@9.8CBR) In comparison to a much higher and uneconomical value of 610 (@5.7 CBR) for unstabilised soil.

Declaration of interests:

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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