STRENGTHENING AND EVALUATING OF LATERITIC SOIL BY USING RBI GRADE 81

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ABSTRACT

This is the era of reformation and soil is considered the basic foundation for every civil structure. Now a day due to short availability of land, we would have to erect structures on weaker soil too. This is where soil stabilization comes into play. An effective soil stabilization technique should be able to bear the loads without failure. 'RBI Grade 81" an effective chemical admixture is used for strengthening and simultaneously enhancing the properties of weaker soil. In this study 'RBI Grade 81' is incorporated with soil to enhance the strength parameters on account of bearing capacity and compaction. The consequences of 'RBI Grade 81' on the soil characteristics were explored by conducting 'standard compaction tests' & 'CBR test'. The tests were performed as per Indian Standard specifications.

Keywords: *Soil stabilization, RBI Grade 81, Strength Parameters, Compaction Test, CBR Test.*

1. INTRODUCTION

RBI Grade 81 meets the requirement for a well-proven, reliable and very cost-effective method by creating a strong and irreversible impermeable layer resistant to adverse climatic conditions, from very high temperatures to permafrost conditions, and accommodating all vehicular loads. RBI Grade 81 is environmentally friendly and emphasises the use of recycled material, recognising the lack of readily available resources. Some characteristic of RBI Grade 81 is given in the following.

- Patented worldwide including India
- Cementitious powder
- Non-toxic
- Non inflammable
- Gray color powder

2. PROPERTIES OF RBI Grade 81

Table 1. Physical Properties of RBI Grade 81

Physical Properties	RBI Grade -81
Odour	Odourless
Ph	12.5
Freezing point	None
Flammability	Non-flammable
Shelf life	12 months
Storage	Dry storage
Bulk density	700 kg/m^3

Table 2. Chemical Properties of RBI Grade 81

PROPERTIES	% BY MASS
Ca	Cao 52-56%
Si	SiO2 15-19%
S	SO3 9-11%
Al	Al2O3 5-7%
Fe	Fe2O3 0-2%
Mg	MgO 0-1%
Mn, K, Cu, Zn	0.1-0.3%
H2O	1-3%
Fibers	0-1%
Additives	0-4%

3. TEST PERFORMED ON SOIL:

- **Liquid Limit Test:**
  Preparation of Samples:
  - Air dry soil sample and break the clots. Remove the organic matter like tree roots pieces of bark, etc.
  - About 100g of specimen passing through 425µm IS sieve is mixed thoroughly with distilled water in the evaporating dish and left for 24 hours for soaking.
- **Plastic Limit Test:**
  Preparation of sample:
  - Take out 50 gm of air dried soil from a thoroughly mixed sample of soil passing through 4.25 µ m IS sieve. Mix the soil with the distilled water in an evaporating dish and leave the soil mass for nurturing. This period may be up to 24 hrs.
- **Standard Compaction Test (IS2720 Part VIII)**
  - The test consists in compacting soil at various water contents in the mould, in three equal layers, each layer being given 25 blows of the 2.5 kg rammer dropped from a height of 310 mm. The dry density obtained in each test is determined by knowing the mass of the compacted soil and its water content. The compactive energy used for this test is 5880 kg cm per 2250 ml of soil.
- **California Bearing Ratio Test (CBR Test)**
  - This is a penetration test developed by the California division of highways as a method for evaluating the stability of soil sub Grade and other flexible pavement materials. The load values are noted corresponding to penetration values of 0.0,05,1.0,1.5,2.0,2.5,3.0,4.0,5.0,7.5,10.0 and 12.5mm.The load corresponding to 2.5 and 5.0 mm penetration are values are noted. The CBR value is calculated using the relation:

$$\text{CBR\%} = \frac{\text{[Load sustained by the specimen at 2.5 or 5.0mm penetration]}}{\text{[Load sustained by standard aggregates at the corresponding Penetration level]}} \times 100$$

- Normally the CBR value at 2.5 mm penetration which is higher than that 5.0mm .Reported as the CBR value of test material .However, if the CBR value obtained from the test at 5.0mm penetration is higher than 2.5 mm then the test is to be repeated for checking if it comes at 5mm it is reported as CBR value of test material.

Table3. Characteristic Value of Soil

S.NO	CHARACTERISTICS	VALUE
1.	Optimum Moisture content	18%
2.	Maximum dry density	2.1gm/cm^3
3.	Plasticity limit	9.32
4.	Liquid limit	32%

4. TEST RESULT

Table4. Standard Compaction Test

S NO.	STANDARD COMPACTION TEST	WATER CONTENT	MAXIMUM DRY DENSITY
01	Standard Compaction Test Of Untreated Soil Sample	26 %	1.581
02	Standard Compaction Test Of Soil Sample With 0 % Of RBI GRADE 81	25%	1.59
03	Standard Compaction Test Of Soil Sample With 2% Of RBI GRADE 81	24 %	1.63
04	Standard Compaction Test Of Soil Sample With 4 % Of RBI GRADE 81	23.7 %	1.631
05	Standard Compaction Test Of Soil Sample With 6 % Of RBI GRADE 81	22.4%	1.64

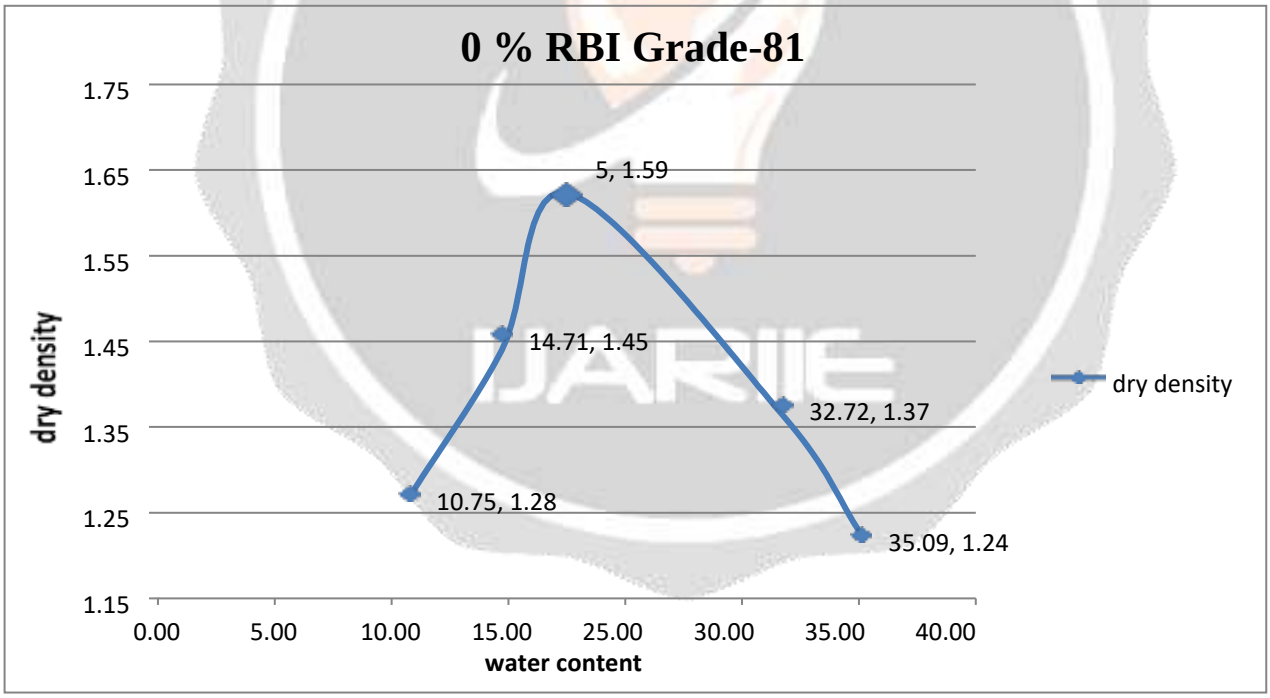

Fig1. OMC and MDD 0% RBI-81

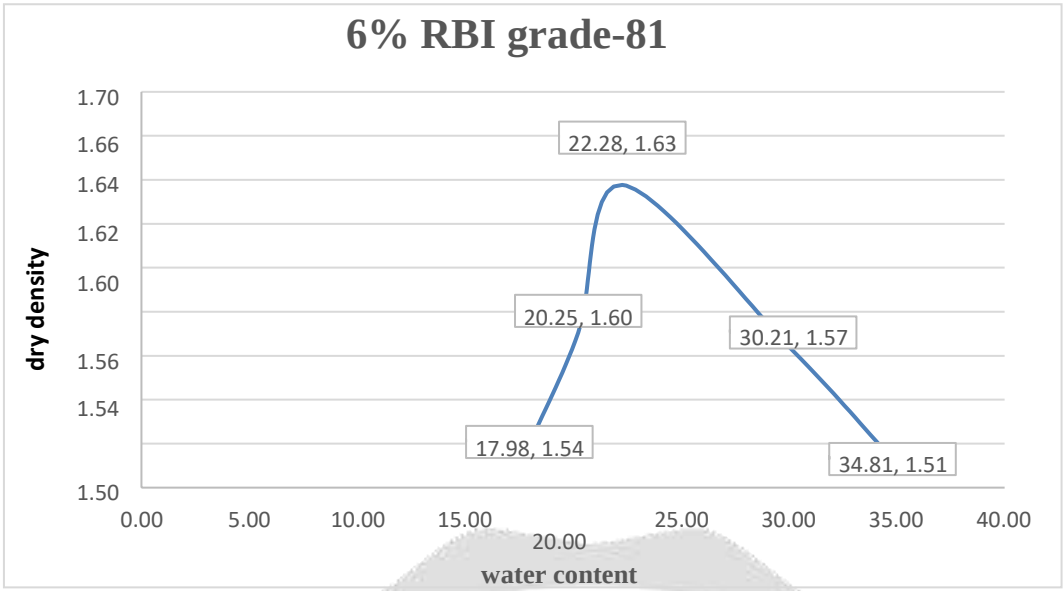

Fig 2. OMC and MDD 6% RBI-81

Table 5. California Bearing Ratio Test Result

S. No	CBR TEST	CBR Value of Soil
01	Soil Sample	2.20mm
02	Soil Sample + 0% RBI	2.68mm
03	Soil Sample + 3% RBI	3.55mm
04	Soil Sample + 5% RBI	3.74mm
05	Soil Sample + 9% RBI	4.20mm

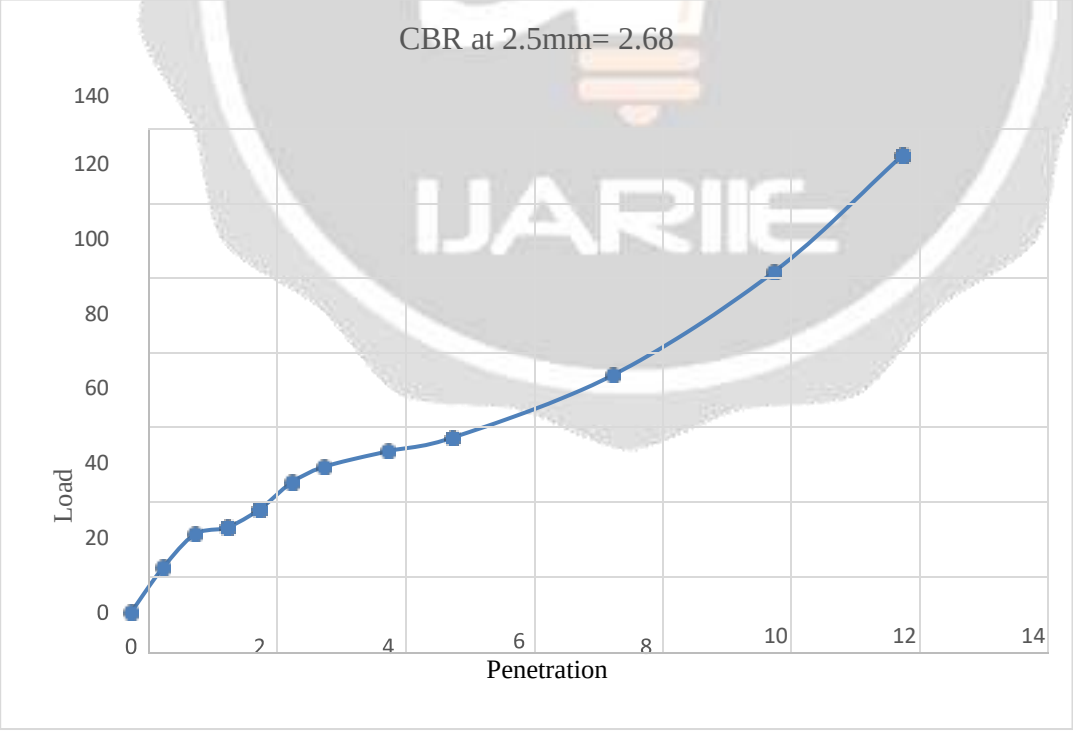

Fig 3. Un-Soaked CBR Value At 0% RBI Grade-81

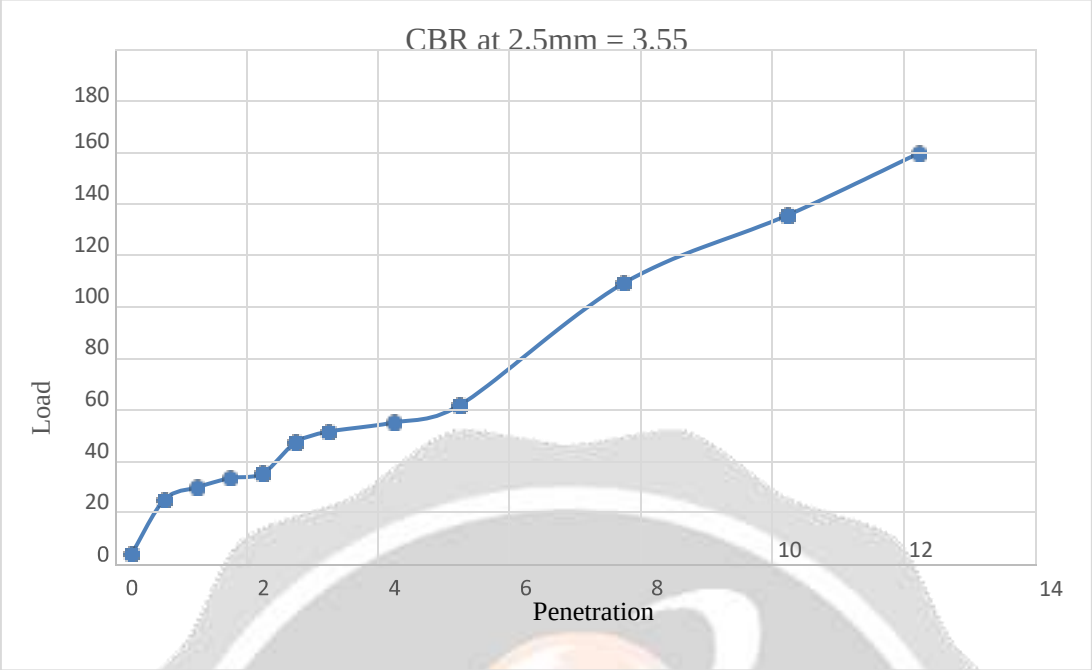

Fig 4. Un-Soaked CBR Value At 3% RBI Grade-81

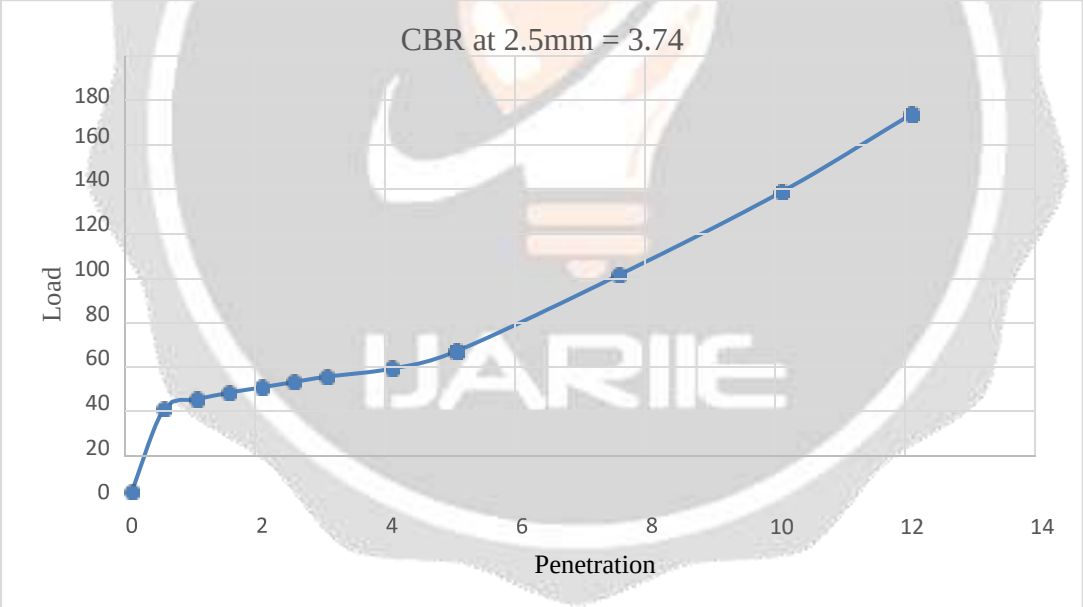

Fig 5. Un-Soaked CBR Value At 5% RBI Grade-81

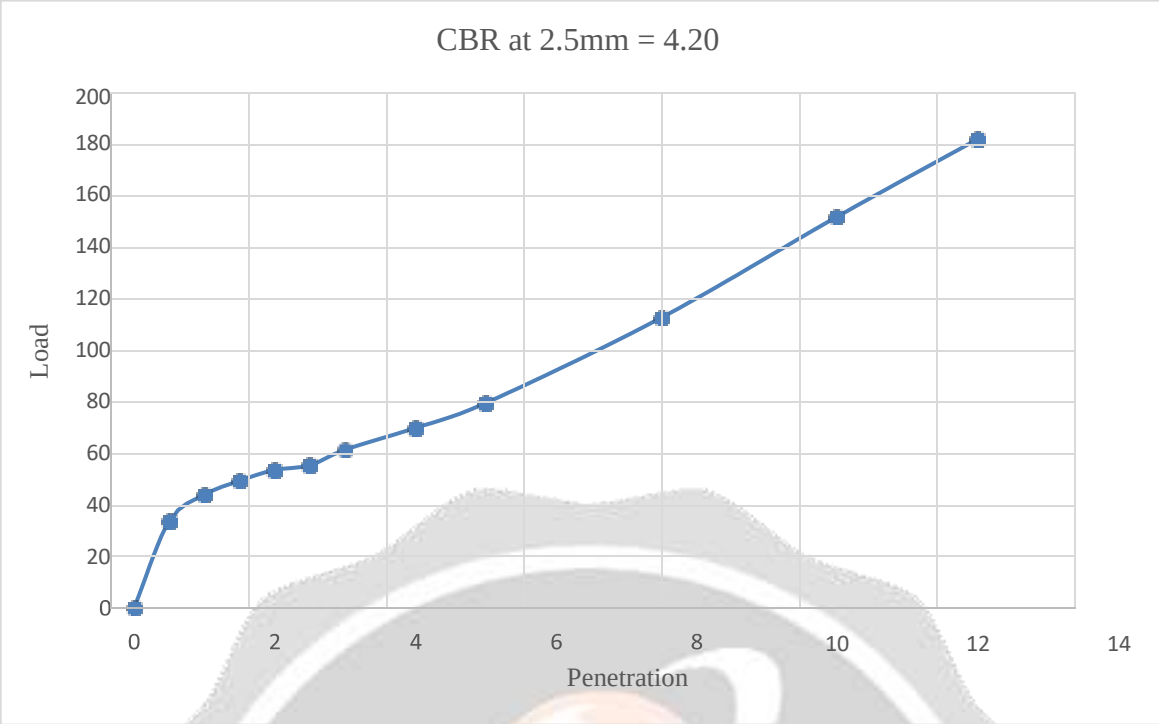

Fig 6. Un-Soaked CBR Value At 9% RBI Grade-81

5. CONCLUSION

Based on the result of CBR feasibility of RBI Grade 81stabilizer for used in different layers of road pavement i.e. sub grade, sub base and base are evaluated .

1) RBI Grade 81 additives are broadly used to enhance the engineering properties of soil particularly CBR.
2) It has been perceive that CBR value increases with RBI content 1% to 9%, for lateritic soil.
3) It is observed that value increases significantly after addition of 1% RBI content.
4) The stabilized soil can be used as a sub grade, sub base, and base course without aggregate .The test result indicates that RBI Grade 81 may be used to save natural resources like aggregate and murum.
5) RBI Grade 81 can be used as a soil stabilizer to reduce the thickness of sub grade, sub base and base course for road construction as the strength is more if compared with traditional WBM roads.
6) In earth roads RBI Grade 81 can be used as a soil stabilizer enhanced the Engineering properties of the road and provide smoother surface for vehicle to travel.
7) The cost of construction of an earth road with RBI Grade 81 in a region of low quality of soil is lesser.

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