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To study moisture variation in saturated Subgrage soil in pavement

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Abstract
The strength of subgrade soils is dependent on the type of soil, density and moisture content. Hence to determine the subgrade strength, which would be used for design of the road pavement structure, it is apparent to ascertain the density-moisture content-strength relationship specific to the subgrade soils encountered along the project road. The design CBR of the subgrade soil, therefore, should be evaluated at the moisture content and density representative to the subgrade condition during the service time of the pavement structure. For wet or moderate climatic zones and where the ground water influences the subgrade moisture content, the CBR test is carried out after 4 days of soaking. Laboratory investigations have been carried out on a number of soil samples. Preliminary tests, such as index tests and particle size distribution tests, used for soil classification, have been taken up followed by Proctor compaction and CBR tests. CBR tests have been conducted for same samples under various conditions of soaking, with due emphasis on moisture content parameters in the soil sample.

Keywords: Moisture variation, Subgrade soil, Pavement, Subgrade strength, CBR test.

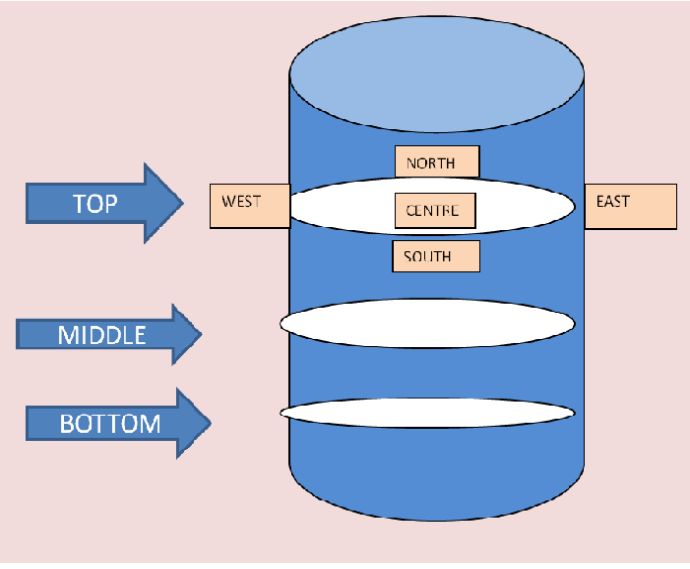
Introduction
In transport engineering, subgrade is the native material underneath a constructed road, pavement or railway track. It is also called formation level. Sub grade soil is an integral part of the road pavement structure as it provides the support to the pavement from beneath. The sub-grade soil and its properties are important in the design of pavement structure. The main function of the sub grade is to give adequate support to the pavement and for this the sub grade should possess sufficient stability under adverse climatic and loading conditions. Therefore, it is very essential to evaluate the sub grade by conducting tests. The characteristics of soil grains depend on the size, shape, surface texture, chemical composition and electrical surface charges. Moisture and dry density influence the engineering behavior of a soil mass.

Moisture content: Moisture tends to affect a number of subgrade properties including load bearing capacity, shrinkage and swelling. Moisture content can be influenced by a number of things such as drainage, groundwater table elevation, infiltration, or pavement porosity (which can be assisted by cracks in the pavement). Generally, excessively wet subgrades will deform excessively under load.

Experimental work: The experimental work contains-

- Index properties Liquid limit-
- Plastic limit
- Plasticity index
- Differential Swell Index
- Specific gravity
- Sieve analysis
- Modified protor test
- California bearing ratio test

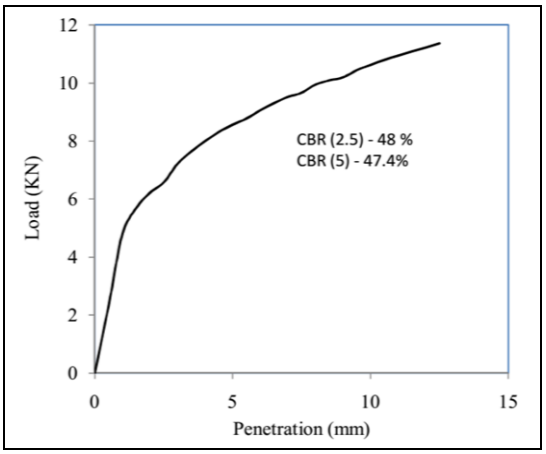
Attempts have been made to take soil samples from various parts of a CBR sample for determination of moisture content, as per the schematic diagram given in Figure. Middle layer is almost in the middle of the sample (vertical level). The top and bottom layers are about 15 cm from the top and bottom of a sample respectively. The east and west for each layer (horizontal) indicate towards left and right side of the sample respectively, while north and south represent samples away and towards the observer respectively.



Results
Index Properties of soil

Index property	Experimental Value
Liquid Limits	55.45%
Plastic limit	33.60%
Plasticity Index	21.25%
Specific gravity	2.63%
Differential Swell Index	57%

California Bearing Ratio Test



Moisture content for test soil for soaked (day - 1) condition

Vertical Positions	MOISTURE CONTENTS%				
	Horizontal Positions				
	EAST	WEST	NORTH	SOUTH	CENTRE
TOP	16.93	17.52	17.74	18.90	18.64
MIDDLE	16.77	16.56	16.65	16.50	16.70
BOTTOM	16.62	17.80	15.65	16.49	16.73

Moisture content for test soil for soaked (day - 4) condition

Vertical Positions	MOISTURE CONTENTS%				
	Horizontal Positions				
	EAST	WEST	NORTH	SOUTH	CENTRE
TOP	25.52	24.97	24.60	24.67	25.40
MIDDLE	19.33	20.94	21.43	22.75	22.76
BOTTOM	20.64	19.57	19.82	20.22	21.84

Conclusions: When soil samples are taken from different points of the CBR sample and tested for its moisture content, it is observed that there variations in moisture content in a given layer are not significant in unsoaked conditions and 1 day of soaking. However, it is observed that for a longer soaking time, higher moisture contents result at top layer compared to that in the lower layers.

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