Predicting the California Bearing Ratio From Compaction and Classification Data

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ABRIDGMENT

•THE objectives of the investigation were (a) to obtain an equation(s) usable by the North Dakota State Highway Department that predicts the California Bearing Ratio (CBR) from the results of the routine compaction and classification tests on the soil, (b) to determine the reproducibility of the results of the CBR test, and (c) to obtain the effect of the molding moisture content on the CBR value.

To satisfy the first objective the following laboratory testing was carried out. Samples with a variation in classification properties were selected from each of the subgroup classifications of the Bureau of Public Roads soil classification system. They were tested for compaction and classification values as well as for CBR at 90, 95, and 100 percent of the maximum dry density. The second objective was investigated by (a) performing three consecutive CBR tests on a single sample from each subgroup classification, and (b) testing individually for CBR five samples of an A-4 soil coming from the same location and having similar classification properties. To fulfill the third objective a single sample from each subgroup classification was tested for CBR for a low, optimum, and high molding moisture content.

A multiple linear regression analysis was carried out on the data to obtain prediction equations. The resulting equations (Table 1) give the CBR for soil at 90, 95, and 100 percent of maximum dry density in terms of the compaction and classification properties of the soil. The standard error of estimate from these equations was compared with the standard error of measurement as determined by reproducing certain CBR tests (Table 2). The comparison showed the equations to be more reliable (having a lower standard error) than a single test result for certain soil subgroups. The effect of molding moisture content on CBR was discussed for the different soil groups. In general, the higher CBR's were obtained for soil molded at the optimum moisture content.

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TABLE 1

PREDICTION EQUATIONS FOR CBR

Soil Types	Percentage of MDD Compaction	Equation	Standard Error
Plastic soils of A-4 A-6 A-7-5 A-7-6	100	CBR = -415.68 +0.44·CS -0.21·FS +0.05·S -0.69·C +1.20·LL -1.17·PI +48.71·SR -0.08·SN +4.26·OMC +2.52·MDD	3.98
	95	CBR = 17.07 -0.27·FS -0.19·C -0.40·LL +0.56·PI -1.31·SL -21.24·SR +1.95·OM +0.43·MDD -0.94·GI	1.62
	90	CBR = -42.38 -0.09·CS -0.07·FS -0.15·C +0.08·LL +4.60·SR +0.89·OMC +0.28·MDD +0.34·GI	0.63
Plastic and non-plastic soils of A-2-4 A-2-6 A-2-7	100	CBR = 21.65 -0.35·CS +0.09·FS -0.21·S +1.11·C +1.29·SN -2.75·OMC	1.34
	95	CBR = -86.15 +0.29·FS -0.12·S +0.39·C +0.90·SN -0.85·OMC +0.63·MDD	1.93
	90	CBR = -126.06 -0.10·CS +0.14·FS +0.37·C +0.73·SN +0.36·OMC +0.87·MDD	1.70
A-1-a A-1-b A-3	100	CBR = 44.70 +7.27·C -2.46·SN +0.39·MDD	4.25

TABLE 2

CBR AND COMPACTION TEST RESULTS AND STANDARD ERROR ON 5 IDENTICAL SAMPLES

Sample	CBR			OMC	MDD
	100% MDD	95% MDD	90% MDD		
1	22	8	4	13.0	116.5
2	29	14	8	12.0	121.3
3	28	14	7	12.5	119.3
4	35	10	5	11.1	120.6
5	30	10	6	11.5	120.9
Standard Error of Measurement	4.7	2.7	1.6	0.8	2.2