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SHALE EMBANKMENT CONSTRUCTION CRITERIA

Experimental Feature
Interim Report

by

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Considering past problems encountered in construction of embankments using coastal shales, state highway engineers decided to conduct a study to evaluate the performance of shale as a fill embankment material and to assess its strength, compressibility and settlement characteristics.

The research was conducted in the summer of 1983 during the realignment construction of the Mystic Creek - Camas Valley section on the Coos Bay - Roseburg Highway. Construction is still in progress. As outlined in the experimental features work plan "Shale Embankments", three items were to be evaluated during the road construction. This report briefly describes the work that has been completed on those items and presents some preliminary conclusions. A final report, due 2 years after construction is completed, will detail any problems encountered and will offer recommendations.

The shale/sandstone formation was classified by determining its index properties. The slake durability, point load and Atterberg limit tests were used in the classification process.

A total of 30 slake durability tests were performed. The material used in the testing was representative of the material being taken from the cuts and used for either selected rock embankment, fill embankment or wash material. In general, the obtained values of the SDI (Slake Durability Index) are within the range of the expected results after observing the compaction of the material. Lift thicknesses of the embankment were adjusted depending upon the SDI values and the results from the test pit construction. However, the material used for selected rock embankment (SDI>90%) is subject to spheroidal weathering. The SDI results, therefore, may not correspond to long term wetting and drying cycles. This can be evaluated by testing samples "weathered" in the laboratory. The weathering process could be accelerated by using DMSO as the slaking fluid instead of water.

A total of 10 point load tests were performed. The original idea of using the point load tests was to correlate its index to that of the SDI and the unconfined compressive strength. The results of the point load tests for this project did not correlate well with the SDI and the unconfined compressive strengths.

A limited number of Atterberg Limit tests were performed during the construction phase. It is anticipated that more will be completed during the third phase of the work plan.

Test pads on the bridge and fills were constructed and evaluated. Separate test pads were constructed for each different type of compactor used by the contractor. A total of 4 test pads were constructed, utilizing three different types of compaction equipment. The compaction equipment consisted of (1) CAT 815 SUTON Tampin, Foot Roller, (2) CAT 627B Earthmoving Scraper, and (3) CAT D7 Bulldozer. The first pad was constructed as outlined in Volume II "Shale Embankement". After construction of the pad, this procedure was subsequently dropped because it did not reflect the contractor's operation, nor the type of material being removed from the cut.

The final report will detail the problems associated with the first pad construction and describe the adopted procedure.

Preliminary conclusions from the test pad construction are listed below. The conclusions should be supported by additional data from both the field and the laboratory.

1. The test pad should reflect the contractor's operation and should be built during that operation.

2. A separate bid item should be set up to cover the contractor's costs associated with pad construction.

3. It was virtually impossible to count the number of passes by the compaction equipment. An end-result other than the number of compaction passes should be sought.

4. The nuclear gauge, as used on the coarse material, gave acceptable results when compared to the Washington Densometer and the Sand and Cone Test.

5. The test pad approach is most useful in the determination of the maximum dry density of the shale fill.