

ABSTRACT

Phase I was initiated as a result of internal Iowa DOT studies that raised concerns about the quality of embankments being constructed. Some large embankments have recently developed slope stability problems. In addition, pavement roughness has been noted shortly after roads were opened to traffic. This raised the question as to whether the current Iowa DOT embankment construction specifications are adequate. The primary objective of Phase I was to evaluate the quality of embankments being constructed under the current Iowa DOT specifications.

The project was initiated in May 1997 with a tour of several embankment projects being constructed around the state. At each of these projects the resident construction engineer, field inspector, and contractor were interviewed with respect to their opinion of the current specifications. From construction observations and discussion during these visits it became obvious that there were problems with the current embankment construction specifications. Six embankment projects were selected for in-depth analysis and to represent the full range of soil types being used across the state. The results of Phase I field and laboratory construction testing and observations and post construction testing are briefly summarized as follows.

Field Personnel (Iowa DOT and Contractors) Observations – Personnel appear to be generally conscientious and trying to do a good job but they are misidentifying soils (“unsuitable” and “class 10” soils being used as “select”), they lack soil identification skills (knowledge and equipment), and they are relying heavily on soil design plan sheets for determining unsuitable, suitable and select soils. Soils design data appear accurate, and are necessary, but spacing between borings and soil mixing during construction operations makes it difficult to differentiate the soils in the field.

Current Specifications – The current method of identifying unsuitable, suitable, and select soils may not be adequate. The one point Proctor does not appear adequate for identifying, or for field verification of compaction for all soils. The “sheepsfoot walkout” specification is not, for all soils, a reliable indicator of 1) degree of compaction, 2) compaction moisture content, and 3) adequate stability.

Construction Observations and Testing (Cohesive Soils) - The sheepsfoot walkout specification is producing embankments where soils are being placed wet of standard Proctor optimum moisture, compacted to near 100 percent saturation, and overcompacted resulting in an embankment that 1) has low soils shear strength (inadequate stability), 2) has a possibility of positive pore water pressure development (as embankment height increases) which results in a further reduction in shear strength, and 3) sets the stage for potential slope failure.

Construction Observations and Testing (Cohesionless Soils) - Compaction was being attempted with sheepsfoot rollers (vibratory necessary), and being monitored using standard Proctor testing which is an inappropriate method and can grossly overestimate degree of compaction.

Overall evaluation of the results of Phase I indicate that we are not consistently obtaining a quality embankment constructed under the current Iowa DOT specifications. Based on the foregoing, recommendations were made for Phase II to evaluate alternative specifications and develop rapid field methods for compaction control and soil identification.