AN ABSTRACT OF A THESIS

CLSM MIXTURES IN TENNESSEE: EXCAVATABLE AND NON-EXCAVATABLE

Vernon James Dotson, Jr.

Master of Science in Civil Engineering

In Tennessee, there is much debate about whether or not Controlled Low Strength Materials (CLSM) mixtures need to be excavatable. Most utility companies and municipalities feel the need for excavatability. This would allow easy access for re-entering utility cuts to perform repairs if necessary. However, the Tennessee Department of Transportation (TDOT) does not see excavatability as a sole requirement for the department's needs for a CLSM mixture.

Both excavatable and non-excavatable CLSM mixtures serve valid purposes. Excavatable CLSM mixtures or excavatable flowable fill (EFF) has many advantages over conventional soil or granular materials for backfilling utility cuts: worker safety, lack of settlement, and lower costs, to name a few. It appears however, that some poorly designed EFF mixtures, which could not be excavated with conventional digging equipment, have deterred agencies from specifying EFF. One objective of this research was to increase end user confidence in the performance (excavatability in particular) of excavatable flowable fill. Non-excavatable CLSM mixtures perform well as working platforms and as a utility cut fill where the cut-section needs to be opened to traffic as early as possible after construction. Another objective was to design a non-EFF mixture that would perform well using a variety of aggregates found in Tennessee and support traffic loading as quickly as possible.

Twenty-three different EFF mixtures were placed in trenches simulating utility cuts. Twenty of these mixtures used varying amounts of either ASTM C 618 Class F fly ash or high-unburned carbon fly ash. After approximately two years, these trenches were excavated using a backhoe and the results correlated with laboratory tested compressive strength development and a variety of field testing methods. A CLSM mixture, that utilized four different fine aggregates, was designed and the mixes were tested in the laboratory as well as field tested in several locations. All CLSM mixtures were tested for flow, unit weight, gravimetric air content and suitability for load application as per ASTM and AASHTO procedures. The results of the research will be used to prepare a model specification for both types of CLSM mixtures.