BIOGRAPHICAL SKETCH

Emily grew up in a small town in East Tennessee called Cleveland. In addition to her B.S. degree, she has also earned her Engineer Intern certification. Her areas of emphasis are geotechnical and structural. After graduation, she plans to work for a consulting firm in the Nashville area as a geotechnical engineer. In her spare time she enjoys hiking, recreational kayaking, and reading.

EDUCATION

B.S., Civil and Environmental Engineering

Tennessee Tech University, 2016

College of Engineering

TENNESSEE TECH

The Department of

Civil and Environmental Engineering

Announces the Thesis Defense

of

Emily Reed, E.I.

In Partial Fulfillment of the Requirements

For the degree of

Master of Science

Thursday, April 5th 2018

1:30 p.m.

Held in

Prescott Hall, Room 226

FIELD OF STUDY

Civil and Environmental Engineering

THESIS TOPIC

COMPARISON OF FEA AND ANALYTICAL METHODS FOR DETERMINING STABILITY OF A RAP SUPPORTED MSE WALL

EXAMINING COMMITTEE

Dr. Daniel VandenBerge, P.E. (Chairperson), CEE

Dr. Jane Liu, CEE

Dr. Benjamin Mohr, P.E., CEE

ABSTRACT

Global stability is one of the failure modes that must be analyzed for retaining walls. Finite element analysis (FEA) of walls provides the most accurate solution but can be time-intensive and expensive. The primary aim of this project is to compare the results of FEA models with the simpler analytical Meyerhof bearing capacity method. In particular, cases were examined where rammed aggregate piers (RAPs) support a mechanically stabilized earth (MSE) retaining wall. For this project, several FEA models replicating these cases were created. Geometric parameters included the ratio of RAP to matrix soil, or “replacement ratio”, and the dimensions of the MSE wall. Each geometric configuration was then iterated over a range of undrained strength for the matrix soil, resulting in a different factor of safety for each model. A spreadsheet was also created containing the necessary calculations for the Meyerhof bearing capacity method. The factor of safety from the Meyerhof method was compared to the factor of safety computed for each corresponding FEA model. The results show an excellent relationship between FEA models and the analytical method, especially for factors of safety ranging from 1 to 1.5 which had only a 5% average difference. The major implications of this research are that a complex FEA model can potentially be replaced by the simpler analytical Meyerhof bearing capacity method. The benefit of this is that wall designers can quickly check the global stability of a retaining wall without spending the time and money on more expensive FEA modeling.