## BIOGRAPHICAL SKETCH

Zachery Tyler Dayne Grigg was born in Orange Park, Florida on August 13, 1993. He graduated from Lincoln County High School in May of 2012. He first attended Motlow State Community College, then transferred to Tennessee Technological University in the Fall of 2014. He later graduate with a Bachelor of Science Degree in Civil Engineering with an emphasis in Structures in the Spring of 2018. He decided to continue his education, entering graduate school at Tennessee Technological university in the Summer of 2018. He received his Master of Science Degree in Civil Engineering with an emphasis in Structural Engineering in the Spring of 2019.

## EDUCATION

B.S., Civil Engineering

Tennessee Technological University

2014-2018

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TENNESSEE TECH

The Department of

Civil and Environmental Engineering

Announces the Dissertation Defense

Of

Zachery Grigg

In Partial Fulfillment of the Requirements

For the degree of

Master's in Civil Engineering

Friday, March 29, 2019

1:00 PM

Held at

PRESCOTT HALL ROOM 325

**FIELD OF STUDY**

Civil and Environmental Engineering

**DISSERTATION TOPIC**

**CONSTANT DUCTILITY INELASTIC SEISMIC DESIGN SPECTRA: VARIABILITY IN DESIGN SUITES**

**EXAMINING COMMITTEE**

Dr. Timothy Huff – Chairperson

Dr. Jane Liu

Dr. Daniel VandenBerge


**ABSTRACT**

Ground motion selection and modification for nonlinear response history analysis (NRHA) is typically based on mean, elastic acceleration target spectra. However, structures are typically designed to behave in an inelastic manner during strong ground shaking, with inelastic displacement the variable of prime interest. In order to place confidence in the use of elastic acceleration target spectra as the basis for NRHA, the variance of inelastic displacement needs to be studied. Since seismic response is typically presented as log-normally distributed, a comparison of the variability in inelastic displacement and variability in elastic acceleration can be performed. Further, knowledge of the variance of inelastic spectral displacement can lead to a better understanding of the appropriate number of records required for analysis. A total of 66 design ground motion records were selected and scaled based on site-specific hazard conditions to generate elastic acceleration and inelastic displacement spectra. Of the 66 records, 55 were separated into five non-pulse type design suites containing 11 records for varying significant earthquake durations: 10-20 seconds, 20-30 seconds, 30-40 seconds, 40-50 seconds, and 50-99 seconds. The remaining 11 records are comprised of pulse-type ground motions that belonged to a single characteristic bin. Each design suite was used to develop elastic acceleration and inelastic displacement spectra in order to compare the variability in inelastic displacement to the variability in elastic acceleration. The study shows that the use of elastic acceleration target spectra for ground motion selection and modification for NRHA is more appropriate for structures with a fundamental period typically less than 1-second. For fundamental structural periods greater than 1-second, the variability and trend in inelastic displacement spectra changes significantly with respect to significant earthquake duration, ductility, and post-yield stiffness