

An Investigation of Nut Loosening and Review of Tightening Procedures for Anchor Rods in Highway Ancillary Structures

Japsimran Singh

Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

In

Civil Engineering

Matthew H. Hebdon, Chair

Thomas M. Murray

Matthew R. Eatherton

Ryan J. Sherman

March 23, 2020

Blacksburg, Virginia

Keywords: Anchor Nuts, Anchor Rods, Double Nut Moment Connection, Nut Loosening, Ancillary Structures, Wind-induced Vibrations, Tightening, Thread Tolerance, Snug-tight

Copyright © 2020 Japsimran Singh