MarTREC
Maritime Transportation Research & Education Center

MarTREC UTC Project Information Form
USDOT Tier 1 University Transportation Center
Agency ID or Contract Number 69A3551747130

Project Title: Port Infrastructure Resilience through Combined Wind-Surge Demand Characterization
Project Abstract (Brief Description): This project aims to understand the interactive effects of severe wind and storm surge demands on port infrastructure and to develop hazard demand models to aid improvements to infrastructure design. An integrated analytical and experimental research approach is proposed herein, combining information from detailed fluid-structure-interaction simulations and scaled wind-wave experiments. Additionally, review of historical wind-surge events within the literature will be used to validate and assess the demand models developed. It is anticipated that at least one graduate student will be trained on the project, gaining experience in both computational and experimental research.
Describe Implementation of Research Outcomes: The proposed project has the potential to improve the resiliency of future waterway port infrastructure to storm-surge and extreme wind events. Additionally, the combined wave-wind demand models to be developed would aid in port risk assessment and have broader impacts for insurance/government agencies. Additionally, detailed pressure, stress, and strain data will be collected from the scaled fluid-structure interaction experiments, aiding future finite element analysis efforts. All procedures and gathered data will be summarized in project report updates, to be provided to MarTREC and other project stakeholders at the requested intervals and in a final report the end of the project duration. All data (experimental measurements, FEA files, and images) will be documented and stored on CERN's Zenodo server platform for access. Additionally, at least one peer reviewed scientific journal article and one conference paper are expected from the proposed research, with a focus on publishing within high impact journals.
Impacts/Benefits of Implementation: This research aims to improve the understanding of storm-surge associated demands to coastal port infrastructure for improved structural evaluation and resilience in new design. The objective of the proposed research is to analytically and experimentally develop simultaneous wind and storm-water surge hazard demand models to aid US port infrastructure design and evaluation. In order to have a resilient infrastructure design, strength/capacity must be able to exceed the imposed demand. While significant research at the material, component, and system level scales has led to improved understanding of structural capacity, understanding of the demands during complex combined wind-water surge events is lacking and needs improvement. Due to the nature of storm surge causes, extreme wind and water surge often combine to impact the structural resilience of port infrastructure.
Web Links: martrec.uark.edu
Budget (Funding) Amounts & Source(s) (US DOT +Match(s) =Total Costs): MarTREC funds $149,000. Matching funds $75,104. Total funds $224,104
Project Start and End Dates: 07/01/20-08/31/2023 Complete
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