COASTAL INFRASTRUCTURE RESILIENCE

Improving Damage and Loss Estimation

Project title: *Experimental and Numerical Study to Improve Damage and Loss Estimation due to Overland Wave and Surge Hazards on Near-Coast Structures*
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As coastal infrastructure owners, city planners and emergency managers seek to mitigate damage, risk to property and structure loss during overland wave hazards (from hurricanes and tsunamis), it is necessary to update federal standards to include a broader range of building types, storm conditions and potential for resulting damages. Effective decision-support tools such FEMA's HAZUS-MH (flood loss estimation model that covers a geographic region) rely on multi-hazard fragility curves - a statistical representation of the chances a hazard event exceeds a certain level of structure performance and suffers damage or loss.

Researchers are developing computer models to predict the fluid pressures caused by waves on doors, windows and other components of buildings. Combined with the structure's limit states, probabilities of failure (fragility curves) are generated and then combined to form system-level damage models.

Companion hydraulic laboratory tests are used to parameterize and validate these models providing confidence that they can be used to provide accurate predictions of damage over a wide range of wave hazard conditions.

Researchers will work with end users in FEMA's HAZUS team to improve federal damage and loss estimation. Results can also be used for improvement of and retrofits to residential and commercial structures.

FAST FACTS

- Researchers have developed fragility curves to predict building damage from storms.
- Findings could help improve structural retrofits funded through FEMA hazard mitigation grants.
- OSU hosts engineering students from the University of Puerto Rico-Mayagüez annually through a CRC program.

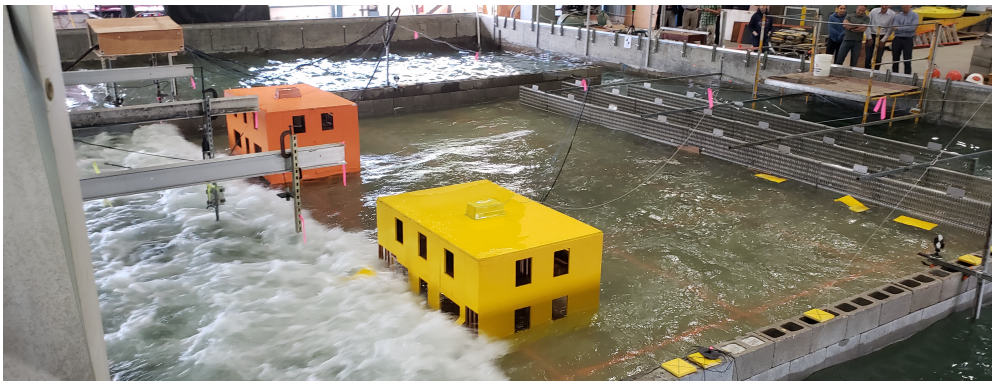

Fig. 1

Model structures during hydraulic laboratory test at OSU.