Measurement Science R&D Roadmap

Windstorm and Coastal Inundation Impact Reduction

Updated Wed PM Group C Report - Wind Resistance

Grand Challenge

- Improving design and construction to yield ***higher performance*** buildings
  - Educating customer (buyers) who demand higher performance in natural hazards
    - *Act of God event – unacceptable*
    - *NATURAL HAZARDS → UNNATURAL DISASTERS*
  - Citizens/leaders embrace benefits of building codes & enforcement rather than bureaucratic impediments
  - Tech transfer of research → design process/material selection leads to increasing wind resistance
- Wind-resistant community design must be multi-disciplinary (incl. economists, & social scientists)
  - Engaging communities in holistic process (from bottom-up)

Knowledge Gaps

- A/E professionals and the public lack knowledge to assess the vulnerability (risks) societal costs
  - Hold optimistic views of expected wind resistant performance of the existing built environment.
- Performance of non-engineered structures (vs. engineered structures)
  - Failure mechanisms incompletely understood
  - Lack of empirical design/predictive tools
  - Limited knowledge of Durability/Aging effects

Research Needs

- Methodologies to record demographics & "health" of existing building stock
  - Building forensics – disproportionate, cascading failure, systemic failures → where do these occur? frequency?
- Development of new &/or improved laboratory tests
- Development of field test methods
  - Scientifically based measures to evaluate existing buildings
  - Community-level interventions to improve building perf.
  - Maintenance triggers by homeowners (i.e. oil light)
- Calibrate lab./field tests against field performance
- Load paths: 3D vs. 2D models → empirical design tools
- Enhanced wind resistance of existing buildings.
  - Retrofit guidelines
- Articulate and incorporate all broader community needs within the individual building's design criteria
  - Community's risk tolerance expressed by building code,
  - Sustainable, green, resilient requirements
  - Accessibility, social, economic, environmental needs
- Refine hurricane wind-borne debris region and test missile loads
- Develop engineering model for tornado wind effects
  - Pressure
  - Debris
  - Design and extreme tornado events
- New materials/composites and structural systems
  - Loss potential comparison of fortified versus code-minimum communities