THE 2010 HAITI EARTHQUAKE: AN EMPOWERING MODEL FOR RESIDENTIAL RECONSTRUCTION

Tracy Kijewski-Correa, Alexandros Taflanidis, Dustin Mix, Ryan Kavanagh
Department of Civil and Environmental Engineering & Earth Sciences, University of Notre Dame

Market Value for EQ Resistant homes: $10,000, $25,000, and $50,000

Hazard & Vulnerabilities

Common System: Unreinforced masonry walls, RC columns, no beams. RC slabs
Primary Vulnerability: Rigid CMU walls fail and transfer shear forces to columns
Secondary Vulnerability: Unreinforced/Unreinforced columns
System Vulnerability: Flexible Diaphragms, no beams to tie system

Key Lesson for Future Housing Models: Must resist multiple hazards and reduce seismic demands from stiff block partitions.

Case Study in Necessity Driving Continuation of Vulnerable Practices

March 2010: Pancake collapse, system: RC columns, CMU walls, RC slabs, no beams
August 2010: Re-educated mason leads reconstruction with concerns over how to cast floor slabs
December 2010: Second floor added, same vulnerable practices that contributed to initial collapse

Resiliency

Viability

Sustainability

Feasibility

Empowerment Model for Post-Quake Reconstruction

Quick Facts:
- City of approximately 100,000 people
- One of Haiti’s 140 communities
- Home to Notre Dame Haiti Program since 1993
- Effective epicenter of January 12, 2010 earthquake
- Estimated damage to 93% of buildings, 30% collapsed

Quick Lesson for Future Housing Models: Modern appearance, support heavy partitioning, secure building envelope, support future modifications

Functional Needs:
- High security, avg 4.35 persons in 3.29 rooms
- Internal partitioning requires innovative quality control mechanisms

Cultural Context

Low-Cost Concrete Construction Sequence:
- Rebar cage, CMU wall, cast column, cast RC slab

Market Constraints

Without new affordable housing options, families desperate to escape these conditions revert to old, vulnerable construction practices

Providing a Voice to the Voiceless:
- Rebuilding Léogâne Planning Workshop (March 2011)

Quantifying Empowerment: A Rubric to Assess Housing Options

- Database typologies, systems, material choices (structural, non-structural)
- Identify attributes for resiliency, viability, functionality, sustainability & have community prioritize
- Result: Rubric to score compliance with empowerment model, identify strengths, weaknesses

Paradigm Shifts to Maximize Empowerment

- Learn from the Past: Historical gingerbread houses survived
- Modernize Concept: Concentrated limited finance in seismic RC frame, clad with lightweight panels (pt-precast concrete)
- Engineer Quality Control: Standardized panels, reusable formwork, reinforcement templates, portable mixers, Prefabricated cages, panels