ZACHARY M. GABAY

ENGINEER IN TRAINING
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M.S. in Structural Engineering
The Pennsylvania State University
Anticipated Graduation: May, 2011
GPA: 3.63/4.00

B.S. in Civil Engineering
The Pennsylvania State University
Graduated: May, 2009
Major GPA: 3.78/4.00

RELEVANT COURSES

Dynamic Structural Analysis	Metal Str. Behavior and Design	Earthquake Engineering Design
Finite Element Analysis	Reinforced Concrete Design	Foundation Engineering Design
Indeterminate Str. Analysis	Steel Bridge System Design	Transportation Network Analysis

RESEARCH

Investigation of Progressive Collapse in 8-Story Steel Framed Office Building
Advisor: Dr. Jeffrey A. Laman

- Optimize collapse resistant design with consideration of safe and efficient occupant evacuation for an OC III structure with unrestricted public access to the lobby and underground parking levels.
- Compare Nonlinear Static and Nonlinear Dynamic analyses considering nonlinear modeling phenomena and computational efficiency.
- Simulate pedestrian evacuation after collapse event to accurately model occupant load patterns.

WORK EXPERIENCE

Urban Engineers Inc., Philadelphia, Pa. Summers 2008 & 2009
Bridge Department Intern

- Designed 13 cantilever and overhead tri-chord truss sign structures and a culvert extension.
- Assisted with superstructure and abutment design for several bridges on the PA NE EXT.
- Gained experience with PennDOT bridge design manuals, specifically the DM-4, the Bridge Design Manual (BD) and the Bridge Construction Manual (BC).
- Evaluated highway alignment, retaining wall calculations, and work point locations for several bridges and structures, including SR RT 422 Schuylkill River Bridge and the Sugarhouse Casino.
- Calculated superstructure, abutment, and foundation quantities for bid packages.

Gilbane Building Co., Philadelphia Int'l Airport Summer 2007
Construction Engineering Intern

- Terminal D&E Expansion and Modification Project: learned the intricacies of communication, scheduling, and finance involved with a $350 million high security project.
- Met with architect and structural engineers to discuss structural problems and solutions.
- Tracked requests for information, incomplete field items, and pending submittal packages for the foundation/ steel erection project phase and the MEP/ satellite thermal plant project phase.

TEACHING EXPERIENCE

Civil Engineering Department, PSU Fall 2009 - Spring 2011
Teaching Assistant

- Advanced Structural Design – Structural conceptualization, environmental and induced load determination, detailed design, modeling and analysis of steel and concrete structures.
- Surveying Lab Instructor – Equipment and measuring, topographic survey, highway curve stakeout.
- Structural Analysis – Analysis of statically determinate/ indeterminate trusses, beams and frames.

SOFTWARE ABAQUS SAP2000 MATLAB Mircosoft Excel AutoCAD MicroStation

SOCIETIES

Earthquake Engineering Research Institute, Officer
American Institute of Steel Construction, Member
Chi Epsilon Honor Society, Member
American Society of Civil Engineers, Member

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MS Thesis Research Details

My M.S. Thesis focuses on Progressive Collapse of Steel Buildings. The building model I am focusing on is an 8-Story, 152’ x 192’ moment –framed office building with two underground parking levels, designed as part of a graduate course.

Because of its public accessibly and large number of occupants, this structure is considered Occupancy Category III and therefore requires some careful considerations for designing against extreme loading events such as progressive collapse.

To simulate a collapse event, columns are removed while the structure is loaded for serviceability for dynamic analysis or ramp continuously for limit-load static analysis. Using the finite element software Abaqus, material behavior and geometric non-linearity can be appropriately addressed through element selection, mesh density and material definition. These modeling decisions are made to accurately model large-deflections and plastic behavior with computation efficiency in mind.

Building model behavior and collapse resistance are being evaluated at several column removal locations, including: a corner column, the middle column along both the long and short sides of the building, and an interior column supporting the central stairwell.

At each of these locations, model variations incorporating slab and infill beam offsets with respect to the girders, as well as plastic hinge location will be evaluated for their impacts on building model behavior. Also, the number of infill beams and their connection type, as well as the slab strength and thickness will be evaluated for their impacts on collapse resistance.

In order to establish reasonable design criteria/ strength requirements for damaged OC III structures, load effects on the structure due to occupant evacuation should be considered. To develop these loads, the pedestrian egress was designed and analyzed as a transportation network to simulate realistic evaluation phenomena, such as crowding around exits, queuing in stairwells, etc… These loads are placed on the building to better understand the behavior of members critical to evacuation through the damaged structure.

The study’s conclusions will present modeling and design recommendations for progressive collapse events, considering building response to both immediate column removal and the ensuing occupant evacuation.