2017-2018 Annual Report

Stanford University Student Chapter
of the Earthquake Engineering Research Institute

Report Date: August 22, 2018

This report summarizes the membership and activities conducted by the Stanford University Student Chapter of the Earthquake Engineering Research Institute during the 2017-2018 academic year.

Mission & Goals

The purpose of the EERI Stanford Chapter is to advance Earthquake Engineering research, advance understanding of earthquakes and their consequences, and promote measures to mitigate their harmful effects. The EERI Stanford Chapter organizes various events for professional development, education and outreach, and networking. These activities include technical seminars, student seminars, SPLASH, School Earthquake Safety Initiative (SESI), a post-earthquake building evaluation workshop, happy hours and others.

Membership

The Stanford University Student Chapter had a total of 28 members in 2017-2018.

OFFICERS

The initial Board for the 2017-2018 Academic year was elected in June 2017. At the end of the Spring quarter the President stepped from the position and the new board was elected in July 2017 to lead the chapter for the following academic year. The Board consisted of the following members:

Role	Name	EERI Member Number	Email	Student Status
President	Amory Martin	19206	amorym@stanford.edu	Graduate student
Vice-President	Bo Peng	NA	bpeng@stanford.edu	Graduate student
Treasurer	Anne Hulsey	16179	ahulsey@stanford.edu	Graduate student
Secretary	Nick Burton	NA	ngburton@stanford.edu	Graduate student
Activities Coordinator	Sabine Loos	18993	sloos@stanford.edu	Graduate student
Geophysics Representative	Jackson MacFarlane	NA	jmacfarl@stanford.edu	Graduate student
SLC Representative	Shannon Spiers	16655	sspiers@stanford.edu	Graduate Student
SDC Graduate Advisor	Amory Martin	19206	amorym@stanford.edu	Graduate Student

Board meetings were held on a regular basis to support chapter activities and track their progress throughout the academic year.

FACULTY & INDUSTRY ADVISORS

The chapter advisors are:

	Name	Email	Affiliation
Faculty Advisor	Gregory Deierlein	ggd@stanford.edu	Stanford University
Industry Advisor	John Osteraas	osteraas@exponent.com	Exponent

MEMBERS

A complete list of student members is shown below.

Name		EERI ID	Email	Student status
Nenad	Bijelic	15714	nbijelic@stanford.edu	Active
Cristian	Acevedo	15786	cacevedo@stanford.edu	Active
Anne	Hulsey	16179	ahulsey@stanford.edu	Active
Hector	Dávalos	16641	hdavalos@stanford.edu	Active
Luis	Ceferino	16644	ceferino@stanford.edu	Active
Shannon	Spiers	16655	sspiers@stanford.edu	Active
Kuanshi	Zhong	18166	kuanshi@stanford.edu	Active
Jose Ramon	Silos de Alba	18269	josilos@stanford.edu	Active
Tim	Ngo	18768	ngotm@stanford.edu	Active
Sabine	Loos	18993	sloos@stanford.edu	Active
Nikhil	Chaudhuri	19203	nikhilc@stanford.edu	Active
Evelyn	Li	19212	evelynli@stanford.edu	Active
Daphne	Basangwa	19499	daphneb@stanford.edu	Active
Gitanjali	Bhattacharjee	19550	gjee@stanford.edu	Active
Shannon	Spiers	19606	duplicate@duplicate.com	Active
Ziyang	Jiang	19633	zij004@stanford.edu	Active
Addison	Bliss	19635	alb041@stanford.edu	Active

Prajwal	Kammardi Arunachala	19657	prajwalka995@gmail.com	Active
Corinna	Slater	19699	cslater@stanford.edu	Active
Asherin George	Anto George	19722	asherin@stanford.edu	Active
Maryia	Markhvida	19758	markhvid@stanford.edu	Active
Karen	Barns	19768	kbarns@stanford.edu	Active
Yilin	Chen	19899	yilinc2@stanford.edu	Active
Joel	White	20028	jwhite56@stanford.edu	Active
Gabriela	Palavecino	20344	glps@stanford.edu	Active
Masao	Terashima	22505	masaot@stanford.edu	Active
Francisco	Galvis	23568	galvisf@stanford.edu	Active

BUDGET & FINANCIALS

This year, most the events that included a budget were supported by the John A. Blume Earthquake Engineering Center. Additionally, the national SESI program provided reimbursements for materials purchase for the high school outreach ($176.12). Due to this generous support from both entities, the student chapter's financial balance remained at $2057.62.

CHAPTER ACTIVITIES

The EERI Stanford Student Chapter was involved in variety of activities over the year. Activities included organization of research forums, presentations and workshops as well as outreach events to other schools and industry professionals.

REGULAR CHAPTER MEETINGS

Board meetings were held on regular basis. Meetings covered chapter logistics and planning of events. In addition, follow-ups and additional planning details were done via email. Following is the summary of the meetings:

Meeting #1 Date: 01/24/2018 Duration: 1h Attendance: 5

Discussed industry events including Arup technical seminar, Winter forum and SEG/SDC career fair. Also discussed social events and outreach (including Meet a PhD) and seismic design competition. Met geophysics representatives with intention of establishing continuing relationship.

Meeting #2 Date: 02/03/2018 Duration: 1h Attendance: 5

Discussed EERI publicity, including the website and potential quarterly newsletter. Discussed upcoming events, including the Arup technical seminar, SESI, student seminars and happy hour with the geophysics program.

Meeting #3 Date: 04/04/2018 Duration: 1h Attendance: 8

Planned events for Spring quarter, including seminars with Exponent, Newtechnic and student seminar series. Discussed school outreach programs including SESI and Splash. Began discussions on annual report.

Meeting #4 Date: 05/02/2018 Duration 1h Attendance: 4

Discussed SEG/SDC/Geophysics happy hour. Planned time and location, catering and games and activities.

*Note: this is not a complete list of meetings.

PHD SEMINARS – SUMMER QUARTER ON THURSDAYS

PhD and masters' students presented their research every Thursday afternoon of the Summer Quarter. The seminar gave the opportunity to students to present their current projects in a non-pressured environment. In addition, presenters were exposed to constructive feedback from their peers. The seminars involved refreshments and gave students the chance to interact.

	Day	Presenter 1	Topic 1	Presenter 2	Topic 2
1	06/22/17	Gemma Cremen	Quantifying the benefits of building instrumentation using FEMA P-58 consequence prediction	Ethan Thomson	Overview of Physics-Based Ground Motion Simulations
2	06/29/17	Anne Hulsey	Quantifying post-EQ downtime due to safety cordons		
3	07/06/17	Luis Ceferino	Space and time interaction modeling of earthquake rupture occurrence (ICOSSAR Prep)		
4	07/13/17	Emma Lejeune	USNCCM Practice Talk	Xiaoxuan	USNCCM Practice Talk
5	07/20/17	Amory Martin	Topology Optimization of Articulated Hinges and Elastic Spine in Self-Centering Rocking Systems	Mary Mark	PBEE and investment analysis/ICOSSAR practice
6	07/27/17	Sabine Loos	Rapid Analysis of Damage by the Crowd	Masao Terashima	Ultra-Low Cyclic Fatigue simulation of BRBs
7	08/03/17	Mariano Balbi	Floor Risk Assessment for Ecosystem Services Evaluation	Dave Welch	Model Development and Collapse Analysis of Wood Frame Cripple Wall Dwellings
8	08/10/17	Andi Ziccarelli	Simulating Crack Propagation in Steel Structures under Ultra Low Cycle Fatigue	Isa Rosa	Multiscale Modeling and Testing of Protein Bound Soils

9	08/17/17	Scott Swenson	Exponent Information Session	Morgan	
10	08/24/17	Alomir Favero	Debris Flow Modeling with SPH Method	Julia Camargo	Enhanced FE in Poromechanics

SPLASH – INTRODUCTION TO EARTHQUAKE ENGINEERING

The EERI Stanford Student Chapter taught Intro to Earthquake Engineering to students from 7th – 12th grade on November 11, 2017 and again on May 5th 2018. The lecture broken down into four main sections: (1) what causes earthquakes? (2) how do earthquakes affect buildings? and (3) how do engineers design buildings to withstand shaking? These topics were complimented with videos, animations, hands-on activities and interactive exercises. In addition, the Seismic Design Competition tower was showcased. Approximately 30 students participated in the Fall and 10 in the Spring. The low turnout in the Spring was due to a conflict with another Splash class: Introduction to Engineering.

Participants: Amory Martin, Bo Peng, Cristian Acevedo, Cristine Pang

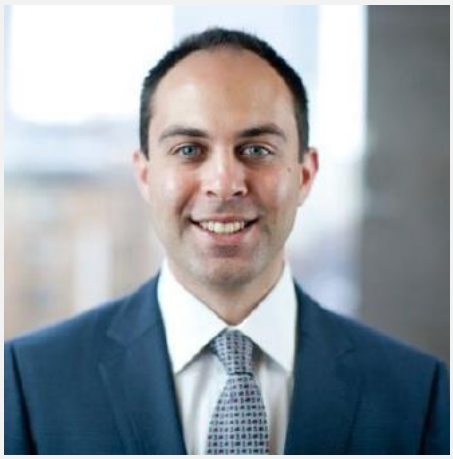
CalOES safety assessment program and ATC-20 post-earthquake safety assessment of buildings training - November 11th, 2017

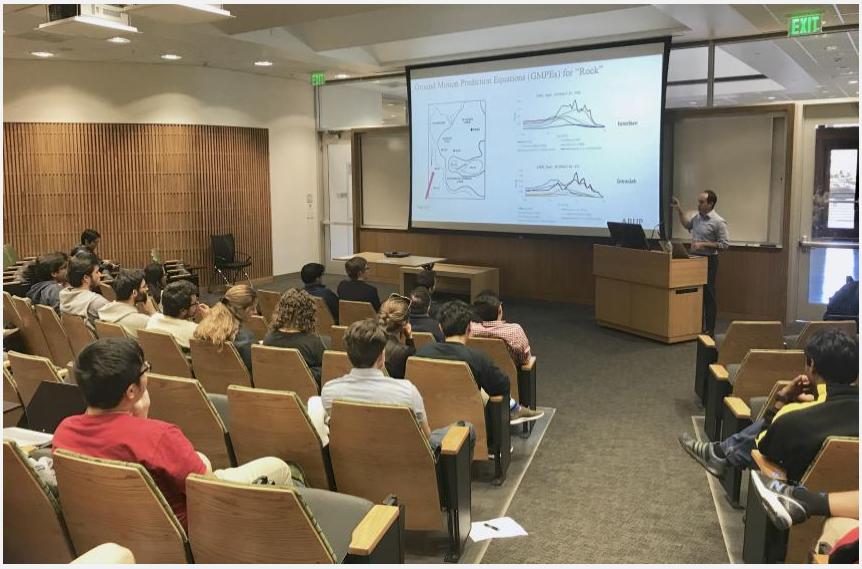
This year EERI joined the professional SEAONC training for post-earthquake safety assessment of buildings, hosted at Santa Clara University. The workshop aims to train students on how to perform rapid evaluation of buildings for post-earthquake damage using the ATC-20 procedures. In addition, it is a unique opportunity to interact with students from other universities and to network with professional structural engineers in Northern California. The workshop was conducted by industry professionals and members of CalOES, who went over the procedures for post-earthquake safety evaluation of buildings and provided excellent case studies. Each participating student received an ATC-20 Manual donated by ATC. The workshop was broken down into three parts: **1) Classroom training**: The classroom training was divided in two phases, first CalOEs showed their work in previous disasters such as Katrina and the importance of help that engineers can provide. Second, there was a presentation that aimed to explain how to tag buildings according to their damage state. **2) Field exercise:** students formed groups and assessed buildings around campus mocked with earthquake damage. During the field exercise, students not only interacted with one another to assess the damage, but they also filled out the required forms. **3) Final presentations**: Members of the organization showed what they would expect out of the field work, emphasizing the mistakes that they observed and how the interaction between engineers and local people should be done. Students that participated in this workshop received a certificate, which will allow them to receive a Disaster Service Worker ID upon licensure.

ATC-20 Manual

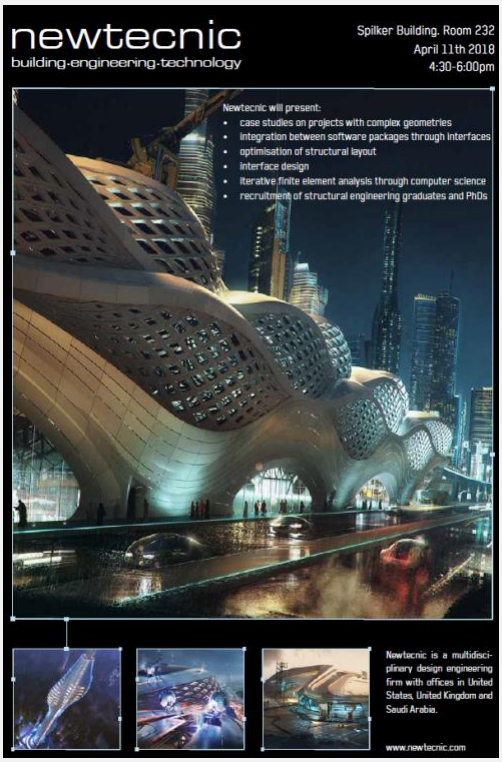
TECHNICAL SEMINARS BY ARUP AND NEWTECNIC

Arup engineer Ibbi Almufti came on March 7th to talk to our members about the design of the Air Traffic Control Tower of the New Airport in Mexico City. The main challenge of this project was dealing with the static and dynamics effects of very soft soils located at the lake-zone of the city where the new airport is being built. These unique soils are responsible for a sinking rate of the entire city of around 10" per year and contribute to significant amplification of ground shaking from earthquakes hundreds of kilometers away. To overcome these challenges, ARUP engineers proposed an interesting base isolation solution that seems questionable at first glance since this is a tall structure in a soft soil. Nevertheless, the clever design of the isolation allowed an enormous shift of the fundamental period to very large values (~6 sec) where the seismic demands were accurately minimized. In addition, the project included state of the art Geoseismic analysis that was key for the performance-based seismic design of the Tower.





The second technical seminar was offered by Newtecnic, a multidisciplinary design engineering firm with offices in United States, United Kingdom and Saudi Arabia. Two of the chief-engineers and the lead architect presented several case studies on projects with complex geometries, showed examples of the integration between software packages through interfaces developed inside the company, demonstrate the application of structural optimization to better reach their projects objectives using iterative finite element analysis through computer science.



WINTER STRUCTURAL ENGINEERING, SUSTAINABLE DESIGN, & CONSTRUCTION CAREER FAIR – FEBRUARY 5th, 2018

Stanford EERI Chapter helped BEAM, Stanford Career Education promote a successful career fair in the Winter quarter for the Structural Engineering and Geomechanics (SEG) and Sustainable Design and Construction

(SDC) programs. A large representation of 30 companies in the field of structural engineering and construction attended.

STUDENT RESEARCH SEMINARS – WINTER 2018 and SPRING 2018

The EERI Stanford Student Chapter, in collaboration with the Stanford Geosciences Department, hosted a bi-weekly student research forum during lunch in the winter and spring quarters. Students had the opportunity to present their latest research to fellow students in a non-pressure environment with constructive feedback. It also served as a platform to discuss new developments in the field and topics of common interest. In addition, the forum gave the opportunity to new students to present their undergraduate research related to earthquake engineering. Each forum featured two 15-minute presentations with 10 minutes for questions each and lunch for all attendees.

Winter Student Seminar:

	Date	Presenter 1	Topic 1	Presenter 2	Topic 2
1	*02/06/18*	***Amory Martin***	*Topology Optimization of Elastic Spines in Self-Centering Rocking Braced Frames*	***Rodrigo Lopez***	*Synthetic Ground Motions Applied to the Tohoku and Chilean Earthquakes*
2	*02/16/18*	***Francisco Galvis***	*An Overview of Highway Bridges under Construction in Columbia*	***Max Ferguson***	*A Real-Time Building Information Model for Safe Operation of Mobile Robots in Modern Buildings*
3	*03/02/18*	***Bo Peng***	*Building seismic life cycle cost optimization*	***Cristian Acevedo***	*Numerical Modeling Unibody Wood Structures*

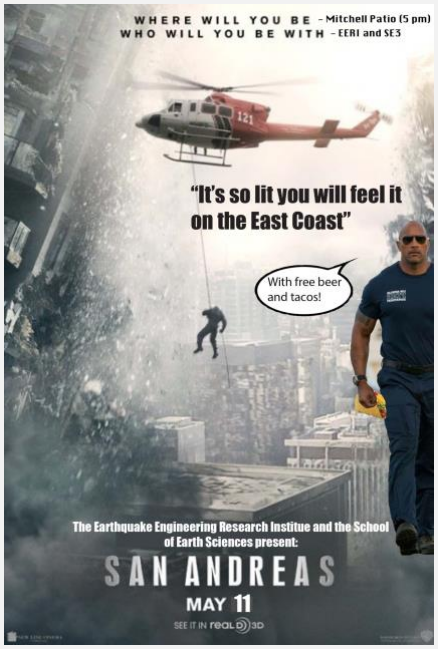
4	*03/09/18*	***Wen-Yi Yen***	*Hualien Earthquake in Taiwan*	***Jens-Erik Lund Snee (Geophysics)***	*Stress mapping and fault slip potential in the Permian Basin, Texas and New Mexico*
5	*03/16/18*	***Sabine Loos***	*Rapid Post-Earthquake Impact Measures*	***Cornelius Langenbruch (Geophysics)***	*Induced Seismicity in Oklahoma*

Spring Student Seminar:

	Date	Presenter 1	Topic 1	Presenter 2	Topic 2
1	*04/13/18*	***Dave Welch***	Quantifying the Seismic Performance of Retrofitted Cripple Wall Dwellings: Loss Modeling Issues Related to Building-Specific Assessment	***Cristian Acevedo***	Comparative Performance Assessment between Unibody and Conventional Construction
2	*04/27/18*	***Masao***	Collapse risk assessment of BRBFs including fracture of BRBs	***Jackson (Geophysics)***	*Understanding the durability of ancient materials – A case study on ancient Roman marine concrete*
3	*05/11/18*	***Armando***	*Characterization of friction in steel-polymer interfaces for seismic isolation applications*	***Gemma***	*Sensitivity analysis and uncertainty quantification in seismic performance asssessment*
4	*05/25/18*	***Anne***	*Developing a building inventory for earthquake prediction*	***Jeremy Maurer (Geophysics)***	*Uncertainty in earthquake prediction*

EERI-SE3 joint Happy Hour – May 11th

The EERI Stanford Student Chapter and the School of Earth, Energy and Environmental Sciences held a joint happy hour to encourage collaboration and discussion. While many of the students are familiar through classes and the Student Research Forums, the happy hour provided a more informal discussion between students about research interests, career paths, and other topics. The happy hour was a great opportunity for students from various fields to talk about the consequences of natural disasters from both an earth science and engineering perspective. Estimated turnout was approximately 60 students.



SESI High School Lectures – May 21st, 23th, & 26th, 2017

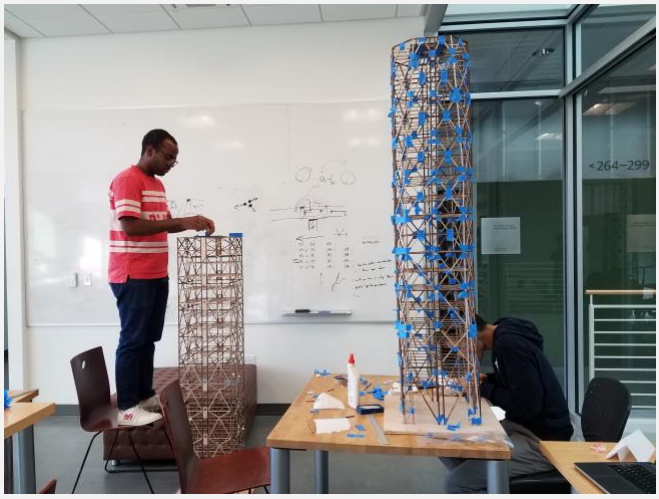
In May of 2018, the Earthquake Engineering Research Institute (EERI) Stanford Chapter had its second School Earthquake Safety Initiative (SESI) program at the local Sequoia High School. Over the course of three visits, Stanford graduate students taught the IB Physics class of Allison Honold about earthquake safety and current engineering research. Lectures focused on physical principles, seismology and engineering featuring demonstrations, videos and current Stanford research. The 35 students then participated in a group exercise to build a two-story wood house and retrofit it using earthquake-resistant systems. On the final day, the buildings from all six teams were tested on a shake-table simulating a wide range of earthquakes. Winners were announced at the end along with closing thoughts about civil engineering.

Partipants: Anne Hulsey, Bo Peng, Rodrigo Silva, Francisco Galvis, Shannon Spiers, Amory Martin, Armando Messina (Stanford University) and Eddie Vega (Holmes Structures, Stanford University M.S. 2015).

SEISMIC DESIGN COMPETITION TEAM

The Stanford Seismic Design team is a student organized group dedicated to promoting interest in structural and earthquake engineering on campus. They are a small team that designs, builds and tests full scale balsa wood towers. Stanford students have been participating in the annual Seismic Design Competition for the past 8 years.

The 15th annual EERI Undergraduate Seismic Design Competition took place June 25-29, 2018 in Los Angeles, California, held in conjunction with the EERI Annual Meeting. Thirty-nine teams, both national and international, were invited to participate.



The design prompt was to design and model a multi-use high rise in Los Angeles' downtown center capable of withstanding earthquakes as strong as those that the nearby San Andreas fault can produce. The design challenges included increasing the story heights and reducing the building footprint. The teams constructed 5-ft tall model towers out of balsa wood, seeking to produce the most efficient, seismically sound, and architecturally appealing designs. During the competition, teams gave presentations describing their towers' key structural features and integration into the Los Angeles cityscape, displayed posters promoting the tower, and--the main event--tested the structures. After being loaded with about 25 lbs of dead load, the towers were put on a shake table and subjected to two simulated earthquakes of increasing intensity, prepared by the EERI SLC. Tower performance during the ground motions was judged based on peak roof acceleration and drift.

SDC Team Members

A complete list of members is shown below.

Name	EERI Member Number	Email	Role
Evelyn Li	19212	evelynli@stanford.edu	Captain
Tim Ngo	18768	ngotm@stanford.edu	Member
Nikhil Chaudhuri	19203	nikhilc@stanford.edu	Member
Aubrey Kingston	19327	Aubreyk1@stanford.edu	Member
Joel White	20028	jwhite56@stanford.edu	Member
Paul Calderon	20892	pfc@stanford.edu	Member

Junha Hwang	NA	junha@stanford.edu	Member
Jeffrey Valdespino Leal	NA	jvaldespino@stanford.edu	Member
Gabi Palavecino	20344	glps@stanford.edu	Member

SDC Team Financial Sponsors

A list of financial sponsors for the SDC team:

Name	Email	Amount	Note
John A. Blume Earthquake Engineering Center	ggd@stanford.edu	5000,00	

Team's lessons learned

SDC Team members at the competition

As the Stanford Seismic Design team continues to grow and develop, we have incorporated greater rigor into our designs and processes. We took advantage of the longer competition season this year to engage all team members in a thorough design phase, in which team members developed structural concepts and modeled their ideas in ETABS. From these we chose two designs to construct as prototype towers, which we then tested on the Blume Center shake table. The shake test results then informed a final round of optimization before we constructed our final tower. This year, our final design was developed using evolutionary topology optimization software, leading to a unique tower geometry that tapered from a square base to an octagonal roof. Stanford's Tower survived both ground motions, and the team is eager to learn the full competition rankings. They did not place in the top three teams this year. The competition will take place in early March, giving less preparation time compared to last year.

Election & Election Results

An election for officers for the 2018-2019 academic year was held in June 2018. The table below shows the new officers appointed to the Chapter board who will take office in July 2018.

Role	Name	EERI Member Number	Email	Student Status

President	Andres Acosta	NA	aacostav@stanford.edu	Graduate student
Vice-President	Rodrigo Silva	NA	rsilval@stanford.edu	Graduate student
Treasurer	Francisco Galvis	23568	galvisf@stanford.edu	Graduate student
Secretary	Nick Burton	NA	ngburton@stanford.edu	Graduate student
SLC Representative	Shannon Spiers	16655	sspiers@stanford.edu	Graduate Student
Geophysics Group Representative	Jackson McFarlane	NA	jmacfarl@stanford.edu	Graduate student

ACKNOWLEDGMENTS

The EERI Stanford Student Chapter would like to thank its advisers Prof. Gregory Deierlein and John Osteraas, the John A. Blume Earthquake Engineering Center, Exponent, and its undergraduate and graduate members for their support and dedication to the chapter. Also, the Chapter would like to specially thank Racquel Hagen for her help coordinating events throughout the year and Kyle Douglas for helping with the shake table tests for the Seismic Design Competition.