

# 2018-2019 ANNUAL REPORT

## Purdue University Student Chapter of the Earthquake Engineering Research Institute



Report Date: May 30, 2019

This report summarizes the membership and activities conducted by the Purdue University Student Chapter of the Earthquake Engineering Research Institute during the 2018-2019 academic year.

### MISSION & GOALS

The EERI/PU student chapter was established to extend the mission of EERI to the Purdue campus and to encourage involvement from students interested in earthquake engineering. EERI/PU not only endeavors to engage students in earthquake engineering, but also provide context for earthquake engineering research and education and afford students networking opportunities with earthquake engineering professionals.

### MEMBERSHIP

The Purdue University Student Chapter had a total of 10 members in 2018-2019.

### OFFICERS

The Board consisted of the following members:

Role	Name	EERI Member Number	Email	Student Status
President	Jonathan Monical	18935	jmonica@purdue.edu	Graduate student
Treasurer	Dimos Vogdanos		dvogdano@purdue.edu	Graduate student

Board meetings were held in September 2018.

### FACULTY & INDUSTRYADVISORS

- Santiago Pujol, PhD, Professor of Civil Engineering, spujol@purdue.edu
- Ayhan Irfanoglu, PhD, Associate Professor of Civil Engineering, ayhan@purdue.edu

### MEMBERS

A complete list of members is shown below:

Name	Email	Student Status
Jonathan Monical	jmonica@purdue.edu	Member/President
Dimos Vogdanos	dvogdano@purdue.edu	Member/Treasurer
Derek Carpenter	carpe103@purdue.edu	Member
Chintan Hitesh Patel	patel714@purdue.edu	Member
Alana Lund	alund15@purdue.edu	Member

Kinsey Skillen	kskillen@purdue.edu	Member
Ryan Whelchel	rwhelch@purdue.edu	Member
Yunlan Zhang	zhan1337@purdue.edu	Member
William Pollalis	wpollali@purdue.edu	Member
Ayhan Irfanoglu	ayhan@purdue.edu	Member

## BUDGET & FINANCIALS

Briefly describe the chapter budget and financials, with text description or any tables and charts as needed.

List any financial sponsors of your chapter:

Sponsor Name/Organization	Contact Person	Amount
BOSO/COOL -> "EARTHQUAKE ENGINEERING RESEARCH"	jmonica@purdue.edu	\$1530.62

## CHAPTER ACTIVITIES

Describe chapter meeting activities including, at a minimum, a summary statement of the meetings held during academic year, giving the date of each, the attendance, the principal meeting activity, the invited speaker (if there is one) and his or her subject, and any other pertinent information about the meeting activity. Consider including images for each activity in this section, and consider adding any fliers, documents or other supporting information in an appendix as needed. The section headers below are intended to be a guide to help you organize information about your activities, however feel free to edit them as necessary to best reflect your chapter's activities.

### REGULAR CHAPTER MEETINGS

Regular chapter meetings took the form of presentations. Each meeting, there would be a student, faculty or visitor who would give a lecture about an earthquake-related problem.

### FRIEDMAN FAMILY VISITING PROFESSIONAL or DISTINGUISHED LECTURE VISIT

Annie Kammerer came to Purdue on April 16, 2019 as part of the EERI Friedman Family Visiting Professionals Program. She toured Bowen Laboratory to see ongoing structural engineering research, led an open discussion for Purdue EERI student members, and gave the distinguished lecture to structural engineering graduate students and faculty.

### Masonry Infill Walls Add Lateral Stiffness to RC Frames

Purdue EERI Student Chapter president Jonathan Monical presented a lecture about his PhD thesis. Adding masonry infill walls to "older" construction style RC frames with non-ductile columns may help reduce damage to the building during strong ground motions.

### RC Infill Wall Retrofit Project

Former Purdue EERI Student Chapter president Lucas Laughery presented a lecture about RC infill walls. Dr. Laughery was a visiting professor at NIT in Japan and helped with an investigation about appropriate detailing of the anchorage of RC infill walls into RC frame.

## Technical Consulting: The Intersection of Mythbusters, CSI, and Civil Engineering

Exponent Principal Engineer, Troy Morgan, specializes in analyzing risk of structures in earthquakes and floods. He gave a lecture about sensors on generators in a nuclear power plant designed to shut-off the system if there is excessive motion from an earthquake. He also described some post-earthquake reconnaissance surveys on the US's east coast and in Australia.

## SEISMIC DESIGN COMPETITION TEAM

The SDC at Purdue is an undergraduate design team led by motivated undergraduates.

### SDC Team Members

A complete list of members is shown below.

<b>Name</b>	<b>EERI Member Number</b>	<b>Email</b>	<b>Role</b>
<b>Casey Rodgers</b>		<b>rodger12@purdue.edu</b>	<b>Captain</b>
<b>Elizabeth Hacker</b>	<b>30382</b>	<b>hackere@purdue.edu</b>	<b>Team Member</b>
<b>Ana Zanza</b>	<b>30421</b>	<b>azanza@purdue.edu</b>	<b>Team Member</b>
<b>Safuan Zainal</b>	<b>30342</b>	<b>mzainal@purdue.edu</b>	<b>Team Member</b>
<b>Audrey Murray</b>	<b>30343</b>	<b>murra136@purdue.edu</b>	<b>Officer</b>
<b>Tyler Rist</b>		<b>trist@purdue.edu</b>	<b>Officer</b>

### SDC Team Financial Sponsors

A list of financial sponsors for the SDC team.

<b>Name</b>	<b>Email</b>	<b>Amount</b>	<b>Note</b>
Magnusson Klemencic Foundation		\$2500	
Magnusson Klemencic Associates		\$2500	
Purdue University ASCE Student Chapter		\$250	

### Team results and lessons learned

As for individual scores, the proposal got 6th out of the original 44 schools, and the proposal, presentation, and architectural raw scores increased compared to last year!

The tower was one of the few towers to take zero damage during both ground motions, and the team captain was able to sit on top of it without it collapsing again, even though it was only 0.85 pounds of balsa wood and glue!

The team took two major score killers this year: 1.) Most of the gusset plates were touching which resulted in a heavy score penalty, and 2.) All of the balconies did not fulfill the "doorway" rule, which requires that the floor area be able to fit two doors of size 2.25" tall and 1" wide each. Due to the unique T-shaped floor plan that the tower must fit into, this would require no cross-bracing in the balcony area, which would have required a

complex design and therefore, more complicated construction. More complicated construction would result in a lower construction quality because all the members were cut by hand, and it's extremely difficult to cut exact angles with a razor blade.

A future improvement that the team can do to help avoid these issues in the future is to use the laser cutter to cut all the members. This would allow for more complicated construction and therefore, more complex designs, without compromising on construction quality. The laser cutter would cut the member ends more precisely, which would reduce human errors.

Another improvement is to have multiple team members read the rules to make sure that no small rules are skipped over by accident.

With these improvements, the team is positive that they can do even better next season! The team has also grown with more phenomenal people and fresh ideas.

## ELECTION & ELECTION RESULTS

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

<b>Role</b>	<b>Name</b>	<b>EERI Member Number</b>	<b>Email</b>	<b>Student Status</b>
President	Jonathan Monical	18935	jmonica@purdue.edu	Graduate student
Treasurer	Dimos Vogdanos		dvogdano@purdue.edu	Graduate student

## FEEDBACK FOR EERI

This section is for questions, requests, and/or feedback directed toward EERI or EERI staff.

## LIST OF ATTACHMENTS

Included at the end of this report are various attachments to supplement the information included above. A list of the attachments is included below:

- Item 1, flier for Annie Kammerer lecture (FRIEDMAN FAMILY VISITING PROFESSIONALS PROGRAM)

# Seismic Design and Risk Evaluation of Nuclear Plants

## **Abstract:**

Since the beginning of the nuclear power industry, the framework and methods used in the seismic design and risk evaluation of the fleet of nuclear power plants in the US has gone through significant change and advancement. This presentation—targeted to the technically-inclined layperson—will cover a wide variety of topics including:

- Basic nuclear plant design concepts (how they work and what can go wrong)
- Why the engineering of nuclear plants is unique and challenging
- Brief history of seismic regulations, design approaches, and reevaluation efforts
- The performance-based and risk-informed methods used in the industry today,
- The impact of the Fukushima Daiichi accident, including current and future NRC efforts
- The NRC, IAEA, and the new global nuclear picture

## **Bio:**

Dr. Annie Kammerer is owner of Annie Kammerer Consulting, a firm specializing in seismic hazard and risk consulting for the nuclear energy sector. She is also the executive director of the Consortium of Organizations of Strong Motion Observation Systems (COSMOS), an applied research organization out of at UC Berkeley.

Her work is principally focused on analysis and regulatory processes associated with probabilistic seismic and tsunami hazard and risk assessments for nuclear plants and other critical facilities.

Prior to starting her own firm, she was Principal Seismologist for the Bechtel Corporation in San Francisco. Prior to that, she spent 7 years at the US Nuclear Regulatory Commission, where she coordinated the NRC Seismic Research Program. At the NRC, she developed the current US guidance on performing seismic hazard assessments and seismic margin analysis for nuclear facilities. Starting in 2011, Dr. Kammerer was a member of the NRC's seismic technical team developing post-Fukushima response and re-evaluation guidance. From 2012 to 2013, she was also the NRC's technical lead for a special program conducting Seismic Walkdowns of all 104 operating US nuclear plants in response to the Fukushima Daiichi accident. Dr. Kammerer is active internationally and has chaired IAEA Working Groups on seismic re-evaluation of operating reactors, tsunami, and seismic isolation.

She holds three degrees from UC Berkeley, including a PhD in geotechnical engineering with minors in strong motion seismology and structural engineering.

Visit [www.anniekammerer.com](http://www.anniekammerer.com) for more information



The below are figures I recently made for an IAEA safety report providing guidance on performing tsunami probabilistic safety assessment:



