2017-2018 ANNUAL REPORT

University of Wisconsin-Madison Student Chapter
of the Earthquake Engineering Research Institute

Report Date: MAY 1, 2018

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

MISSION & GOALS

- Increasing awareness within the University of Wisconsin-Madison community about earthquake risk and the role engineers, scientists, and other members of the community may play to mitigate the impact of earthquakes on society.

- Educating University of Wisconsin-Madison students and faculty about recent events and developments in the field of Earthquake Engineering.

- Fostering interaction between University of Wisconsin-Madison students interested in Earthquake Engineering and students, faculty and professionals with similar interests from other universities and institutions within and outside the USA.

- Year Goals:

1. Invite professionals and faculty to give lectures and presentations.
2. Organize presentation seminars for graduate students to share their research.
3. Apply to the Friedman Family Visiting Professionals Program.
4. Recruit undergraduate students to join the student chapter

MEMBERSHIP

The University of Wisconsin Madison Student Chapter had a total of 8 members in 2017-2018.

OFFICERS

The Board consisted of the following members:

Title	Name	EERI Member Number	Email	Student Status
President	Ángel Pérez-Irizarry	13663	angel.perez@wisc.edu	Graduate student
Vice-President	Mohamed Al-Tameemi	19542	altameemi@wisc.edu	Graduate student
Secretary	Han Xiao	18459	hxiao29@wisc.edu	Graduate student
Treasurer	Vinay Damodaran	19590	vdamodaran@wisc.edu	Graduate student

Angel Perez-Irizarry
President

Mohamed Al-Tameemi
Vice President

Han Xiao
Secretary

Vinay Damodaran
Treasurer

FACULTY & INDUSTRY ADVISORS

Faculty Advisor: Gustavo Parra-Montesinos Email: gustavo.parra@wisc.edu

Industry Advisor: Dr. S. K. Ghosh Email: skghoshinc@gmail.com

MEMBERS

A complete list of members is shown below.

Title	Name	EERI Member Number	Email	Student Status
President	Angel Perez-Irizarry	13663	angel.perez@wisc.edu	Graduate Student
Vice-President	Mohamed Al-Tameemi	19542	altameemi@wisc.edu	Graduate student
Secretary	Han Xiao	18459	hxiao29@wisc.edu	Graduate student
Treasurer	Vinay Damodaran	19590	vdamodaran@wisc.edu	Graduate student
Member	Le Pham	18467	le.pham@wisc.edu	Graduate Student
Member	Ryan O'Connell	19615	roconnell3@wisc.edu	Undergraduate Student
Member	Henry Nuckles	19616	hnuckles@wisc.edu	Undergraduate Student
Member	Ivan Farias	19659	ifarias@wisc.edu	Graduate Student

BUDGET & FINANCIALS

We are currently in the process of setting up university accounts designated for funding chapter activities and events. In the upcoming year we will be looking to receive donations and secure sponsorships for the chapter. To date, Chapter activities have been funded primarily by the Civil and Environmental Engineering Department and through the C.K. Wang endowed professorship at the University of Wisconsin-Madison.

CHAPTER ACTIVITIES

FIRST CHAPTER MEETING

A presentation about the EERI student chapter was given to graduate students and undergraduate students to encourage them to join the Chapter. The new officers were selected for the academic year 2017-2018. After the general meeting was concluded, the four officers met to set goals for the academic year and exchange ideas to promote the student chapter. The minutes from this meeting are shown in **Table 1**.

Table 1. Minutes from Kickstart Meeting, October 2017

10.02.2017	**1:00pm**	**UW- Madison Engineering Campus**
Meeting called by	Angel Pérez	
Type of meeting	Student Chapter Organization and Introduction	
Facilitator	Han Xiao	
Note taker	Angel Pérez Irizarry	
Attendees	Angel Perez-Irizarry, Mohamed Al-Tameemi, Han Xiao, Vinay Damodaran, Le Pham, Ryan O'Connell, Henry Nuckles, Ivan Farias, Jonah Leurquin	
Topics Discussed	Introduction of EERI: Organization, objectives, chapter activities and the Student Leadership Council.	
	Introduction of EERI's Undergraduate Seismic Design Competition (SDC).	
	How to be part of the 2018 SDC.	
	Direction board elections: Chapter Officers Officer Candidates: -Angel Perez Irizarry, President -Mohamed Al-Tameemi, Vice-President -Han Xiao, Secretary -Vinay Damodaran, Treasurer	
	Eight attendees provided proof of membership. No further candidates for officer positions, thus a motion for electing the candidates for each of the four positions was made and approved unanimously by all EERI members.	

SECOND CHAPTER MEETING

Details of the finances and establishing an account, future visiting scholars, and preparation of annual report were discussed. The minutes from this meeting are shown in **Table 2**.

Table 2. Minutes from Second Chapter Meeting, March 2018

03.22.2018	**2:00pm**	**UW- Madison Engineering Campus**
Meeting called by	Angel Pérez	
Type of meeting	Student Chapter Objectives	
Facilitator	Han Xiao	
Note taker	Angel Pérez Irizarry	
Attendees	Angel Perez-Irizarry, Mohamed Al-Tameemi, Han Xiao, Vinay Damodaran.	
Topics Discussed	Finances Summary: - Follow up on Associated Students of Madison Event grants that may be applied in the future. - Contact ASCE Student Chapter officers for guidelines and help setting up an account for our registered student organization; ask about EIN or Tax ID. - According to the Student Organization Resource & Policy guide from UW-Madison, it seems like we can have an outside organizational account, preferably with two signature checks. - Prof. Parra should be the main contact for the account.	
	Chapter Report Summary: - Han will be leading the chapter year report. - For now, use flyers of the events for the report.	
	Visiting Lecturer Summary: - Visit is scheduled for May 1, 2018. - Topic still to be determined, but will likely be one of the following: 1. ASCE 7-16 Seismic Requirements 2. Performance-based Seismic Design, today and tomorrow 3. Research collaborations between academics and practitioners	

INVITED LECTURER

Professor Brock Hedegaard from University of Wisconsin-Madison was invited to present his research on *Civil Structural Health Monitoring* on November 17, 2017. This lecture was held in conference room 2342 in Engineering Hall. Three officers and five other students attended the presentation. The abstract for this lecture is provided in **Table 3**.

Table 3. Summary of the Faculty Lecture, Brock Hedegaard, November 2017

11.17.2017	**1:00 - 2:15pm**	**Engineering Hall 2342**
Activity called by	Angel Pérez Irizarry	
Type of Activity	Faculty Presentation: Prof. Brock Hedegaard	
Facilitator	Gustavo Parra-Montesinos	
Note taker	Angel Pérez Irizarry	
Attendees	Angel Pérez Irizarry, Henry Nuckles, Sianna de la Cruz, Brittany Shotwell, Le Pham, Mohamed Al-Tameemi, Han Xiao, Yu Xia, and Gustavo Parra-Montesinos.	
Presentation:	Civil Structural Health Monitoring – Overcoming Challenges Within the Data	
Abstract:	Identifying degradation for in situ structures has still proven challenging, given the uniqueness of individual civil structures, the dependence of monitoring data on the ambient environmental conditions of the structure, and the insensitivity of global monitoring techniques for identifying damage localized to small portions of the structure. This presentation focuses on overcoming these challenges of in situ structural monitoring. A framework in which the components of a structural health monitoring system is defined. The case is made for developing a data analysis plan for structural monitoring that meets the reporting and rehabilitation needs of the original structure.	

GRADUATE STUDENT SEMINAR

Two graduate students at UW-Madison, Iván M. Farías and Alejandra Castellanos, were invited to give presentations of their research. The seminar was held in Engineering Hall 2421 on February 28, 2018. Three officers and four other students attended the presentation. The abstracts for the presentations in this event are provided in **Table 4**.

Table 4. Summary of the graduate student seminar, February 2018

02.28.2018	**1:30 - 2:45pm**	**Engineering Hall 2421**
Activity called by	Angel Pérez Irizarry	
Type of Activity	Graduate student seminar	
Facilitator	Mohamed Al-Tameemi	
Note taker	Angel Pérez Irizarry	
Attendees	Mohamed Al-Tameemi, Angel Perez Irizarry, Brittany Shotwell, Henry Nuckles, Le Pham, Vinay Damodaran, Sianna de la Cruz.	
Presentations:	A Review of Reinforced Concrete Walls with Lap Splices Subjected to Cyclic loads, by Iván M. Farías. Failure mechanics of sandwich composites under quasi-static and dynamic load, by Alejandra Castellanos.	
Abstracts:	Reinforced Concrete walls are structural elements commonly used as a part of the lateral resisting system of buildings. The main purpose of the walls is to provide lateral strength and sufficient stiffness to maintain deformations within acceptable limits. To assure continuity in vertical reinforcement, the bars must be spliced over height. When walls are subjected to cyclic loads or seismic motion, they must undergo large displacement, and inelastic deformations are usually concentrated at the base of the wall. On the other hand, lap splices are generally placed within the first floor of the building where these plastic regions are expected. This study is a review of the experimental data of reinforced concrete walls tested with lap splices within the plastic hinge region. The objective is to analyze the influence in the response of walls with lap splices versus walls with continuous reinforcement in terms of strength and deformation capacity.	
	Sandwich structures have gained popularity for use in aerospace vehicles wind energy, turbine blades, rockets marine structures and automobiles. They consist of a pair of face sheets and a lightweight core material sandwiched between the face sheets that are bonded together by an adhesive. The face sheets are usually made of fiber reinforced composite materials and the core made of polymer foams. The key advantages of these structures are their low weight, high-stiffness, high-strength and fatigue resistance. Despite several advantages, a major disadvantage of sandwich structures is their low resistance to impact damage due to the layered nature of the face sheets (composite materials) as well as weak adhesion between the face sheets and core material. Composite materials that constitute the face sheets consist of layers of woven carbon fibers that are reinforced in polymer matrix. Although, the in-plane mechanical properties along the fibers are strong and stiff, the region between the woven carbon fiber layers of the composite are weak. This resin-rich region known as interlaminar region is highly susceptible to damage and can result in premature failure of the composite. The objective of my research is to investigate the different failure mechanisms of sandwich composites and how to improve their damage tolerance under quasi-static and dynamic load.	

INVITED LECTURE

Professor James M. LaFave from University of Illinois at Urbana-Champaign was invited to present his research on *Bridge Resilience through Economical Seismic "Quasi Isolation" Design using Common Bearing Components* on APRIL 10, 2018. This lecture was held in classroom 2305 in Engineering Hall. Ten students (including the four Chapter officers) and three professors attended the presentation. The abstract of this lecture is provided in **Table 5**. Photos of the presentation are provided in Appendix 2.

Table 5. Summary of the Faculty Lecture, James M. LaFave, April 2018

04.10.2018	**1:00 - 2:15pm**	**Engineering Hall 2305**
Activity called by	Angel Pérez Irizarry	
Type of Activity	Invited Lecture: James M. LaFave	
Facilitator	Gustavo Parra-Montesinos	
Note taker	Han Xiao	
Attendees	Angel Perez Irizarry, Sai Samanth Anuma, Sianna de la Cruz, Brittany Shotwell, Jacob Zeuske, Mohamed Altameemi, Han Xiao, Ivan Farias, Vinay Damodaran, Luis Fargier Gabaldon, Professor Jose Pincheira, Professor Pavana Prabhakar, Professor Gustavo Parra.	
Presentation:	Bridge Resilience through Economical Seismic "Quasi Isolation" Design using Common Bearing	
Overview:	Professor Parra introduced Professor LaFave.	
	Prof LaFave introduced his experience with EERI when he was a student and introduced the topic of his presentation.	
	Introduce the range of earthquakes in Illinois, build earthquake resisting system for bridges to prevent span loss.	
	A collaborative effort between the Illinois Department of Transportation and CEE at UIUC is addressing the need for ensuring seismic bridge resilience in regions where significant earthquakes are only expected at long recurrence intervals. The overarching structural engineering philosophy can be considered as seismic "quasi-isolation". This design and construction approach for earthquake resistance seeks to allow controlled damage in well-proportioned common bridge bearing components, such that a superstructure can eventually slide on its substructure, as necessary, while other damage in the bridge will be limited. Various aspects related to this design philosophy have been studied, through full-scale laboratory bearing tests and parametric sets of simulations for overall bridge behavior and response, both of which will be presented in this talk. The experiments demonstrate that elastomeric and fixed steel bearings can be designed to "fuse" at predictable force levels and then provide robust sliding response. The numerical simulations document different potential sequences of damage that could occur, depending on the relative strengths of the bridge components. Current and future research directions, as well as design implementation for appropriate proportioning of bearing components, will also be briefly presented.	

Friedman Family Visiting Professionals Program – Invited Lecture

John Hooper, Director of Earthquake Engineering at Magnusson Klemencic Associates, was invited, as part of the Friedman Family Visiting Professionals Program, to present on Performance-Based Seismic Design. The Visiting professional was hosted in the UW-Madison Campus on May 1, 2018. This lecture was held in classroom 3418 in Engineering Hall. Four officers, twenty other students and four professors attended to the presentation. The abstract of this lecture is provided in **Table 6**. Photos of this presentation are provided in Appendix 2.

Table 6. Summary of the Invited Lecture, John Hooper, May 2018

05.01.2018	**11:00 – 11:50am**	**Engineering Hall 3418**
Activity called by	Angel Pérez Irizarry	
Type of Activity	Invited Lecture: John Hooper	
Facilitator	Gustavo Parra-Montesinos	
Note taker	Han Xiao	
Attendees	Chapter Officers Angel Perez Irizarry, Mohamed Altameemi, Han Xiao, and Vinay Damodaran; Professors Brock Hedegaard, Luis Fargier-Gabaldon, Gustavo Parra, and Dante Fratta; and twenty other students.	
Presentation:	Performance-Based Seismic Design: Today's Approaches and a Vision for the Future	
Overview:	Performance-Based Seismic Design (PBSD) has been used for decades for the seismic retrofit of existing buildings and the design of new structures. Today's PBSD approaches focus on providing a design that typically targets one of the following performance levels for a one of several ground shaking hazard levels: 1) Operational, 2) Immediate Occupancy, 3) Life Safety and 4) Collapse Prevention. The building code performance objective for new, ordinary (Risk Category II) buildings is to provide Life Safety for Design Earthquake (DE) ground shaking and Collapse Prevention for Maximum Considered Earthquake (MCE) ground shaking. PBSD for new buildings is typically targets performance equivalent to a code-prescriptive design. An example will be presented: used nonlinear response history analysis to fine-tune the seismic design and reduce construction costs. The example evaluated whether the building meets in the intended performance objective of a low likelihood of collapse given MCE ground shaking. Moving beyond solely using collapse as the metric for whether a design is acceptable is the vision for the future. A FEMA-sponsored, Applied Technology Council-managed research effort has been underway for over 15 years developing the methodology. The results of this effort have been published in FEMA P-58 Seismic Performance Assessment of Buildings. The final portion of the presentation will focus on this new approach, which will allow engineers to estimate the loss information for their buildings, including repair costs, repair time, unsafe placards, embodied energy and carbon and casualties.	

SEISMIC DESIGN COMPETITION TEAM

The university has not yet established a team for the seismic design competition. This is one of our goals as the student chapter grows over the upcoming years.

ELECTION & ELECTION RESULTS

An election for officers for the 2017-2018 academic year was held in October 2017. The table below shows the new officers appointed to the Chapter board who takes office in October 2017. There was no more than one candidate for each officer position, and the membership unanimously confirmed the officers.

Title	Name	EERI Member Number	Email	Student Status
President	Angel Perez-Irizarry	13663	angel.perez@wisc.edu	Graduate student
Vice-President	Mohamed Al-Tameemi	19542	altameemi@wisc.edu	Graduate student
Secretary	Han Xiao	18459	hxiao29@wisc.edu	Graduate student
Treasurer	Vinay Damodaran	19590	vdamodaran@wisc.edu	Graduate student

APPENDIX 1 – ACTIVITY FLYERS

EARTHQUAKE ENGINEERING RESEARCH INSTITUTE

STUDENT CHAPTER

FALL 2017 INVITED LECTURE

Brock Hedegaard

ASSISTANT PROFESSOR OF CIVIL & ENVIRONMENTAL ENGINEERING

UW-MADISON

TOPIC: Civil Structural Health Monitoring – Overcoming Challenges Within the Data

"Identifying degradation for in situ structures has still proven challenging, given the uniqueness of individual civil structures, the dependence of monitoring data on the ambient environmental conditions of the structure, and the insensitivity of global monitoring techniques for identifying damage localized to small portions of the structure. This presentation focuses on overcoming these challenges of in situ structural monitoring. A framework in which the components of a structural health monitoring system is defined. The case is made for developing a data analysis plan for structural monitoring that meets the reporting and rehabilitation needs of the original structure."

FRIDAY, NOVEMBER 17, 2017 @ 1:00 PM

Engineering Hall-2342

EARTHQUAKE ENGINEERING RESEARCH INSTITUTE

STUDENT CHAPTER

EERI 2018 GRADUATE STUDENT SEMINAR

Iván M. Farías

MS STUDENT OF CIVIL & ENVIRONMENTAL ENGINEERING

UW-MADISON

TOPIC: A Review of Reinforced Concrete Walls with Lap Splices Subjected to Cyclic loads

"Reinforced Concrete walls are structural elements commonly used as a part of the lateral resisting system of buildings. The main purpose of the walls is to provide lateral strength and sufficient stiffness to maintain deformations within acceptable limits. To assure continuity in vertical reinforcement, the bars must be spliced over height. When walls are subjected to cyclic loads or seismic motion, they must undergo large displacement, and inelastic deformations are usually concentrated at the base of the wall. On the other hand, lap splices are generally placed within the first floor of the building where these plastic regions are expected.

This study is a review of the experimental data of reinforced concrete walls tested with lap splices within the plastic hinge region. The objective is to analyze the influence in the response of walls with lap splices versus walls with continuous reinforcement in terms of strength and deformation capacity."

WEDNESDAY, February 28, 2018 @ 1:30 PM

Engineering Hall-2421

EARTHQUAKE ENGINEERING RESEARCH INSTITUTE

STUDENT CHAPTER

SPRING 2018 GUEST LECTURE

James M. LaFave, Ph.D., P.E.

Professor and *CEE Excellence Faculty Scholar*
Associate Head and Director of Undergraduate Studies
Department of Civil and Environmental Engineering
University of Illinois at Urbana-Champaign

TOPIC: Bridge Resilience through Economical Seismic "Quasi Isolation" Design using Common Bearing Components

"A collaborative effort between the Illinois Department of Transportation and CEE at UIUC is addressing the need for ensuring seismic bridge resilience in regions where significant earthquakes are only expected at long recurrence intervals. The overarching structural engineering philosophy can be considered as seismic "quasi-isolation". This design and construction approach for earthquake resistance seeks to allow controlled damage in well-proportioned common bridge bearing components, such that a superstructure can eventually slide on its substructure, as necessary, while other damage in the bridge will be limited. Various aspects related to this design philosophy have been studied, through full-scale laboratory bearing tests and also parametric sets of simulations for overall bridge behavior and response, both of which will be presented in this talk. The experiments demonstrate that elastomeric and fixed steel bearings can be designed to "fuse" at predictable force levels and then provide robust sliding response. The numerical simulations document different potential sequences of damage that could occur, depending on the relative strengths of the bridge components. Current and future research directions, as well as design implementation for appropriate proportioning of bearing components, will also be briefly presented."

TUESDAY, APRIL 10, 2018 @ 2:45 PM

Engineering Hall-2305

EARTHQUAKE ENGINEERING RESEARCH INSTITUTE

STUDENT CHAPTER

FRIEDMAN FAMILY VISITING PROFESSIONALS PROGRAM INVITED LECTURE

John Hooper, P.E, S.E.

Senior Principal/Director of Earthquake Engineering
Magnusson Klemencic Associates

Performance-Based Seismic Design: Today's Approaches and a Vision for the Future

"Performance-Based Seismic Design (PBSD) has been used for decades for the seismic retrofit of existing buildings and the design of new structures. Today's PBSD approaches focus on providing a design that typically targets one of the following performance levels for a one of several ground shaking hazard levels: 1) Operational, 2) Immediate Occupancy, 3) Life Safety and 4) Collapse Prevention.
The building code performance objective for new, ordinary (Risk Category II) buildings is to provide Life Safety for Design Earthquake (DE) ground shaking and Collapse Prevention for Maximum Considered Earthquake (MCE) ground shaking. PBSD for new buildings is typically targets performance equivalent to a code-prescriptive design. An example will be presented: using nonlinear response history analysis to fine-tune the seismic design and reduce construction costs.
The example evaluated whether the building meets in the intended performance objective of a low likelihood of collapse given MCE ground shaking. Moving beyond solely using collapse as the metric for whether a design is acceptable is the vision for the future. A FEMA-sponsored, Applied Technology Council-managed research effort has been underway for over 15 years developing the methodology. The results of this effort have been published in FEMA P-58 Seismic Performance Assessment of Buildings. The final portion of the presentation will focus on this new approach, which will allow engineers to estimate the loss information for their buildings including repair costs, repair time, unsafe placards, embodied energy and carbon, and casualties."

TUESDAY, MAY 1, 2018 @ 11:00 AM
3418 Engineering Hall

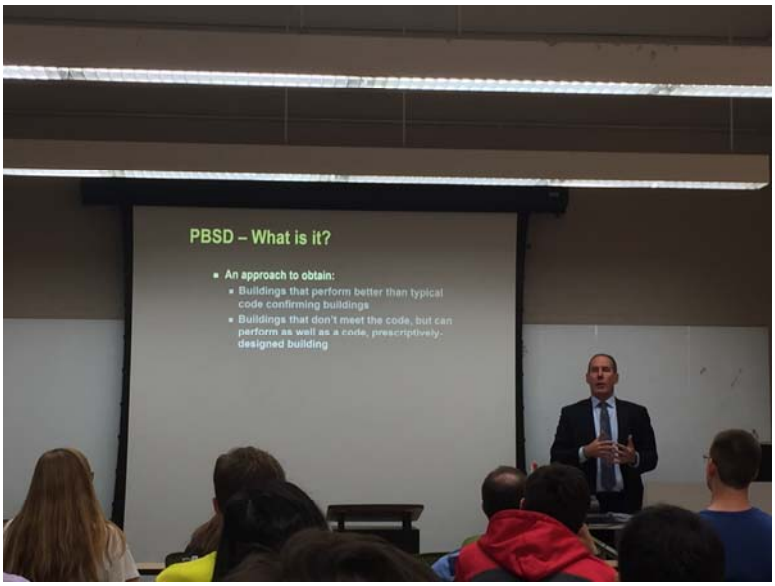
Attachment 1. Activity Flyers.

APPENDIX 2 – ACTIVITY PHOTOS

Attachment 2. Students with Professor James M. LaFave, April 2018.

Attachment 3. Professor James M. LaFave presenting on *the Bridge Resilience through Economical Seismic "Quasi Isolation" Design using Common Bearing,* April 2018.

Attachment 4. Student Chapter President Angel Perez-Irizarry with Professor James M. LaFave, April 2018



Attachment 5. John Hooper during presentation, May 2018

Attachment 6. John Hooper during his lecture, May 2018

Attachment 7. John Hooper with Professor Parra and EERI student chapter officers, May 2018