EERI STUDENT CHAPTER
AT THE UNIVERSITY OF NOTRE DAME

ANNUAL REPORT
2002-2003 SCHOOL YEAR
1.0 Mission Statement

In light of the recent disasters that have claimed so many lives and destroyed so much property, it is essential that engineers become aware of the increasing threats of natural hazards and techniques to mitigate them. While research at the University of Notre Dame focuses in many of these areas, a vast majority of the undergraduate population is unaware of such efforts. Thus, EERI at UND was established to provide the next generation of practicing engineers with a venue to discuss the latest developments in the areas of Earthquake Engineering to better prepare them for the challenges which will await them in their careers.

Awareness, however, should not be limited solely to engineers as earthquakes affect every aspect of human life. Thus EERI at UND will also extend its mission to educate and increase awareness of natural disasters and techniques to mitigate against them across this campus and the wider community.

The EERI student chapter at Notre Dame prides itself in the outreach activities it sponsors, helping to make a difference in the lives of young people and spreading earthquake awareness in the greater South Bend area.

2.0 Chapter Roster

Faculty Advisor: Dr. Lynn Salvati (2003-present)  [lsalvati@nd.edu]
Past Faculty Advisor: Dr. Yahya Kurama (2000-2003)

Current Chapter Contact: Brian Morgen [bmorgen@nd.edu]

Officers for 2002-2003 School Year:

Brian Morgen, President
Brad Weldon, Vice President
Tiphaine Williams, Secretary
Devin Brown, Treasurer
Hua Jiang, Webmaster

Officers for 2002-2003 School Year (Elected in May 2003):

Brian Morgen, President
Brad Weldon, Vice President
Tiphaine Williams, Secretary
Devin Brown, Treasurer
Hua Jiang, Webmaster

Chapter Members for 2002-2003 School Year:

Devin Brown
Tracy Kijewski-Correa, Past President
3.0 Chapter Activities (August 2002-May 2003)

SHAKES & QUAKES: K-12 Outreach Program

'Shakes & Quakes' is an outreach program designed to stimulate young minds and allow them to better understand the way in which civil engineering structures respond to severe earthquakes. EERI@UND visits local area classrooms and demonstrates building responses to earthquakes through the use of a portable shaking table. Students are asked to build LEGO and K’NEX models and these student-designed buildings are tested on the shaking table to see how they respond under “real” earthquake ground motions.

For the EERI@UND members who participated, it was an excellent opportunity to share with students the advances being made in Earthquake Engineering for the betterment of society. This past year we were able to visit two schools: Granger Christian School (February – March 2003) in Granger, Indiana and Stanley Clark School (April 2003) in South Bend, Indiana.

Continuing an annual tradition, EERI members returned to Stanley Clark School to challenge its students in the design of LEGO "masonry" buildings and K’NEX "steel" buildings. As always, the students were incredibly enthusiastic and willing to accept the challenge. This year, approximately forty (40) 5th grade students participated in the program, forming ten (10) construction companies.
imagination and ingenuity to come up with designs that could beat the deadliest earthquakes known to man.

In each group, students had to choose their individual roles. One person was the owner of the building, one the architect, another an engineer, and the last person was the builder. They would have to learn to work together to fulfill their respective duties without compromising any of their teammates’ goals.

They had some rules for designing and constructing their building in order to make the exercise as realistic as possible (see [www.nd.edu/~eeriund/shakes.html](http://www.nd.edu/~eeriund/shakes.html) to view and download documentation and rules for the program). These regulations helped them to understand how important efficiency, cost, strength, appearance, and constructability are to any project.

More importantly, the students were also exposed to new life-saving technologies, emphasizing the concepts of energy dissipation and base isolation, a concept even few adults understand, made simple through the use of Lego’s on wheels. Some students even incorporated, albeit unknowingly, friction damping in their designs.

The day was great fun not only for the students involved but also for the EERI@UND members and raised overall awareness in the community through coverage on local television and in local newspapers. Additional information including photos is available on our chapter website: [www.nd.edu/~eeriund](http://www.nd.edu/~eeriund).

**Ms. Wizard Day 2003 - Taking the Mystery out of Math, Science, and Engineering:**

The EERI Notre Dame Student Chapter was one of the many student organizations that participated in Ms. Wizard Day on February 1, 2003 on the campus of the University of Notre
Dame. The program, funded by a number of local businesses, brings elementary school girls from the South Bend area together for a day of math and science activities.

After a special seminar and a visit to campus dorms for lunch, the girls began three hours of lab activities, including a one-hour adaptation of the chapter’s existing Quakes and Shakes outreach program. Coordinated by EERI’s Vice President Brad Weldon and Secretary Tiphaine Williams, the activity encouraged teams of three to play the roles of architect, owner and engineer and construct a building of LEGO blocks. Following a presentation by EERI President Brian Morgen, the teams were assisted by EERI members and began designing their buildings, faced with the competing objectives of aesthetics, rental profits and structural safety under earthquakes. The teams developed a number of impressive designs with towering spires, balconies and even a helipad!

The LEGO buildings were then tested in the Shake Off competition using a portable earthquake table mimicking a gradually intensifying earthquake. The surviving building was deemed the most earthquake-proof, earning that team honorary degrees in structural engineering. The team responsible for the most beautiful building similarly warranted an honorary architecture degree, and the design that maximized the available rental space for the most profits was presented with an owner’s achievement award. The winners were able to share with their families elegant certificates marking these achievements.
At the end of the day, it became evident that the activity had made a lasting impact not only on the young students, who voted this particular lab activity one of the favorites in an exit survey, but also on the participating EERI members.

**High School Math and Engineering Challenge**

The EERI Student Chapter at the university of Notre Dame continued the second annual high school bridge activity. In the previous school year, EERI was contacted by a local high school calculus teacher whose students were interested in learning more about how engineers use integration and other math tools in their professions. At that time, EERI developed an activity that allowed the students to use concepts of moment area methods to determine the deflections of a simple beam model being used to approximate a simply supported arch bridge. In total the activity explored the use of basic calculus and algebra in engineering calculations and to overview the different levels of modeling available to engineers in the design process. Though the activity was not explicitly concerned with seismic behavior, it served as an important service program for the chapter and a way to promote science and specifically structural engineering among high school seniors heading off to college.

Students from a local high school (Clay High School) arrived on the campus of the University of Notre Dame on the afternoon of November 19, 2002 to begin the two hour activity. In order to simulate a realistic engineering design office, the students were divided into groups of three and presented with the following problem statement:

“Determine the deflection of an arch bridge at its midspan due to a point load at three different locations using hand calculations based on simple beam assumptions and using more complicated structural analysis software model. Compare your results with measured data.”

EERI President Brian Morgen (left) assists students during the Clay High School math and engineering challenge.
Following a brief welcome by EERI President Brian Morgen and an overview of the tasks involved by EERI Past President Tracy Kijewski-Correa, the students were allowed to work on their own through the various phases of the activity, with the participating EERI members on hand to assist them one-on-one with any problems they may have with the calculations.

The integration of this first phase was most challenging for the students as their basic integration skills would be tested by more complex expression in terms of a number of variables. After deriving the expression for the deflection of the simple beam approximation for the bridge, the students evaluated the expression using the given properties and dimensions of the bridge. They compared their result with those they calculated from a standard expression available in a number of structural analysis texts and found they matched identically, proving the accuracy of the students' calculations.

The students then used RISA-3D structural analysis software to model the bridge, load it and record the deflections. This type of analysis allowed the students to readily visualize what was happening to the bridge as it was loaded and also gave them an opportunity to utilize realistic structural analysis software to illustrate the tools structural engineers have at their disposal to avoid having to do such complicated integration repeatedly in their analysis of large and complex structures.

As the final phase of the activity, each team of students had the opportunity to apply weights to a scale arch bridge model and measure its actual displacements. The students were then able to compare their findings from each of these three analyses and were pleased to find that their predictions via the computer programs and their hand calculations compared well with what they actually measured. More importantly, they got a feel for the types of predictive modeling tools engineers have at their disposal to predict the displacement of a structure they may be designing some day.

Though the activity only spanned two hours, the students were able to see an analysis from start to finish and experience some basic structural engineering first hand. For some, the concepts came naturally and today's activity served as a calling for a future profession. Even for those who did not feel this way, the activity at least provided perspective to the students that most beginning a career in mathematics and engineering do not have. The students caught a glimpse of the big picture -- the application of mathematical principles for practical problem solving.
EERI Website

More information about all of these activities can be found on our chapter website: www.nd.edu/~eeriund which serves as portal for current and prospective members, industry leaders, educators and other EERI student chapters to keep track of current EERI@UND events. As our activities continue to grow and gain more publicity in the South Bend area and surrounding community, our website has been expanded to house program information and archive press coverage in local newspapers and on local television news programs.

4.0 EERI Friedman Family Visiting Professional Program

John Hooper, Magnusson Klemencic Associates, Seattle, WA

John Hooper’s visit to Notre Dame was made possible by EERI’s Friedman Family Visiting Professionals Program. Mr. Hooper delivered his lecture to Notre Dame undergraduate and graduate students, post-docs, and faculty, summarizing the issues regarding engineering design for disasters, whether natural or man-made. Since the tragedy of 9-11, these issues have come more to the forefront of society. His presentation highlighted the performance objectives for the natural and man-made disasters that can affect a building structure, including the following: high winds, hurricanes, and tornadoes; floods and tsunamis; earthquakes; and terrorist attacks.

VISIT SUMMARY

The University of Notre Dame’s EERI Student Chapter was fortunate to have Mr. John Hooper, SE of Magnusson Klemencic Associates (formerly Skilling Ward Magnusson Barkshire, Inc.) in Seattle, WA as part of the EERI Friedman Family Visiting Professionals Program.

Mr. Hooper was kept extremely busy throughout his visit at Notre Dame, arriving late in South Bend the evening before his scheduled seminars.

On the day of his lectures, Mr. Hooper started his morning off with a breakfast with EERI@UND President, Brian Morgen and Vice-President, Brad Weldon. Following that breakfast, John spent the remainder of the morning and much of the afternoon speaking with members of the Notre Dame structural engineering faculty and visiting the numerous structural engineering research labs and facilities in the department.

Shortly before lunch, Mr. Hooper gave a lecture entitled “Seahawk Stadium Design” to a senior-level structural steel design course. The presentation highlighted the unique challenges faced in the design of the new football stadium in Seattle, including the unique challenges of the site which supported the former Kingdome facility. Most importantly, the talk gave the undergraduate students a chance to see consulting engineering in practice and also gave them an opportunity to have an open discussion with a member of one of the top engineering consulting companies in the United States.
For lunch, Mr. Hooper sat down with the entire EERI student chapter membership for an informal gathering. During this time, the students discussed with him the major activities of the Notre Dame chapter of EERI, particularly in the areas of community outreach programs, and had an opportunity to learn more about John’s personal experiences, both academic and personal. In addition, Mr. Hooper had the opportunity to learn more about the individuals that make up the membership of the EERI@UND student chapter.

Later that afternoon, Mr. Hooper delivered a lecture entitled “Engineering Design For Disaster” to Notre Dame undergraduate and graduate students, post-doctoral researchers, faculty, and other interested parties. The talk discussed that how in the wake of 9-11, the issues regarding engineering design for disasters, whether natural or man-made, have come to the forefront of society. The presentation highlighted the performance objectives for the natural and man-made disasters that can affect building structure performance and safety. The lecture proved to be extremely informative, thorough, and interesting given the fact that 9-11 is still fresh in the minds of many. Immediately following the late afternoon talk, there was a small reception held for Mr. Hooper. Later that evening, John had an opportunity to meet with the entire structural engineering faculty for a nice dinner.

The following day, John spent a sunny, but cold fall Saturday afternoon enjoying the tradition of Notre Dame Football with EERI@UND chapter president, Brian Morgen and witnessed the demolishing of Rutgers University 42 to 0. The following morning Mr. Hooper departed South Bend for Seattle.

In addition to this summary, a summary of John Hooper’s visit is available on our chapter website. [www.nd.edu/~eeriund].

**Farzad Naeim, John A. Martin & Associates, Los Angeles, CA**

In addition to the visit from John Hooper as part of the EERI Friedman Family Visiting Professional Program, the University of Notre Dame was also approved for a second sponsored visit by Farzad Naeim of John A. Martin & Associates in Los Angeles, CA and current Earthquake Spectra Editor.

Unfortunately, a few days prior to Mr. Naeim’s visit, a family emergency forced Farzad to cancel his visit to Notre Dame. Hopefully, the visit by Farzad to the University of Notre Dame can be arranged for the 2003-2004 school year as part of the EERI Friedman Family Visiting Professional Program.
Engineering Design for Disasters
A seminar by John Hooper, S.E.
Skilling Ward Magnusson Barkshire Inc.
Seattle, Washington

Friday, November 21, 2002 at 4:00 pm
214 Debartelo Hall

ABSTRACT

In the wake of the tragedy of 9-11, the issues regarding engineering design for disasters, whether natural or man-made, has come more to the forefront of society. The average citizen generally has little knowledge regarding the anticipated performance of building structures in the event of high winds, tornadoes, earthquakes, or bomb blasts. In reality, not every building design professional, including engineers, architects and contractors, are aware of the performance targets that are assumed in the requisite codes and standards.

This presentation will highlight the performance objectives for the natural and man-made disasters that can affect a building structure, including the following:

- High winds, hurricanes and tornadoes
- Floods and tsunamis
- Earthquakes
- Terrorist acts

Specific methods of designing for earthquake demands will be presented and will include a detailed description of anticipated building performance. A brief design example will also be presented. A discussion regarding man-made disasters and the associated anticipated performance will be presented along with new methods for safe-guarding the public in the event of a bomb blast.