FRIEDMAN FAMILY VISITING PROFESIONALS PROGRAM

Visit to Virginia Tech: May 1, 2015

This report summarizes the visit of **Faiz Makdisi** from Sage Engineers that took place at Virginia Tech on May 1, 2015,

ITINERARY OR AGENDA

Time	Activity Description
8:00 am – 9:00 am	Breakfast with VT-EERI officer (s)
9:00 am – 11:00 am	Geotechnical and Structural Eng. lab tours
11:00 – 11:30 am	Meeting with Faculty
11:30 am – 12:30 pm	**Lunch with graduate students and faculty**
12:30 pm – 12:50 pm	Meeting with Faculty
12:50 pm – 1:10 pm	Meeting with Faculty
1:10 pm – 1:30 pm	Meeting with Faculty
1:30 pm – 2:00 pm	Prep for seminar
2:00 pm – 3:00 pm	**Technical Presentation**
3:00 pm – 4:00 pm	Q/A + Reception (coffee + cookies)
4:00 pm – 4:20 pm	Meeting with Faculty
4:20 pm – 4:50 pm	Meeting with Faculty
4:50 pm – 5:20 pm	Meeting with Faculty
5:20 – 5:40 pm	Meeting with Faculty
7:00 pm	Dinner with Faculty

STUDENT CHAPTER VISIT PLANNING COMMITTEE

LEAD ORGANIZER(S): Ashly Cabas, President, amcabas@vt.edu

- Trevor Walker, Secretary, taw151@vt.edu
- Marcus Freeman, Vice-President, marcusf9@vt.edu
- Adam Phillips, Treasurer, arp12@vt.edu
- Ioannis Koutromanos, Faculty Advisor, ikoutrom@vt.edu

VISITING PROFESSIONAL LECTURE OVERVIEW

Lecture Abstract

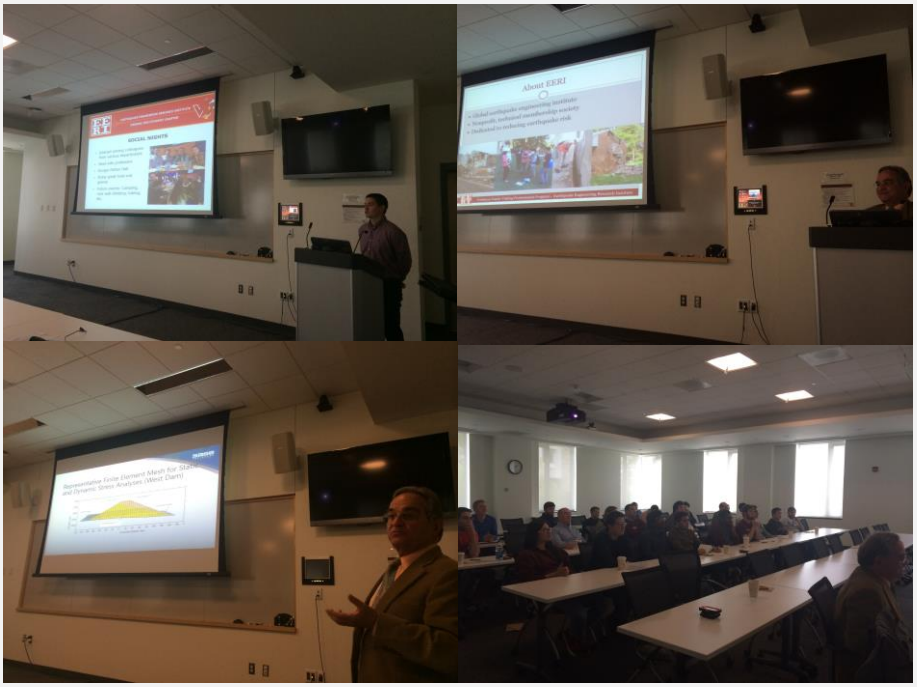
Crane Valley Dam is located on the North Fork of Willow Creek, a tributary of the San Joaquin River, in Madera County, California. Built between 1901 and 1911, the dam is composed of a 145-foot-high, earth and rockfill embankment, with a thin, central concrete core wall. The dam varies in cross-section, and includes full hydraulic fill sections near the west and east ends of the dam. In the mid-section of the dam, where the maximum height occurs, the embankment on the upstream side of the core wall was constructed of hydraulic fill, and the embankment on the downstream side of the core wall was constructed of dumped rockfill. An aerial view of the dam in presented below.

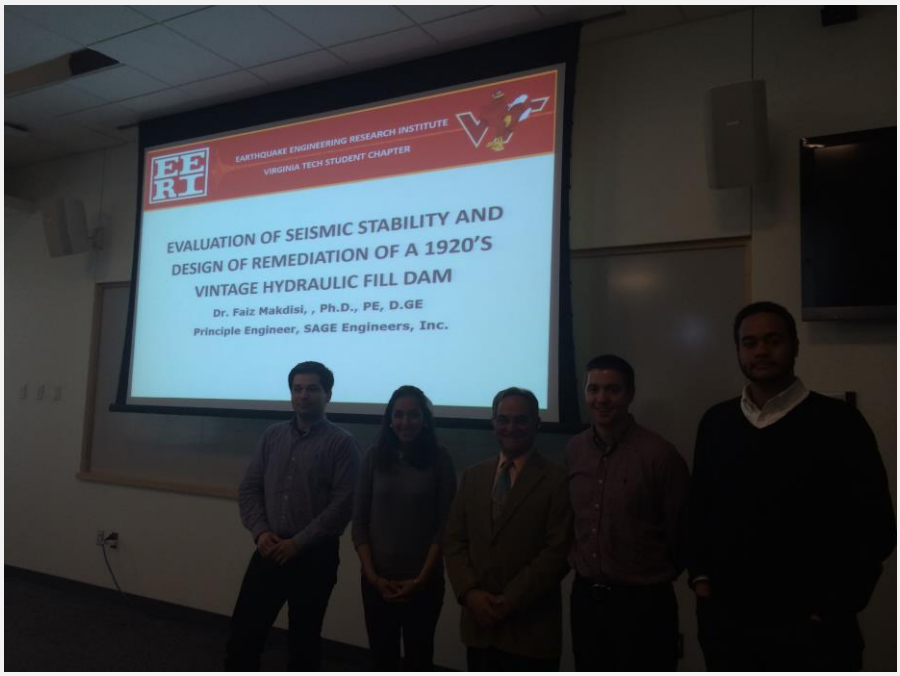
Because of changes in the state-of-practice in seismic stability analyses since the dam was last evaluated in the mid 1970s, and because of the increase in seismic hazard in the dam vicinity, a re-evaluation of the seismic stability of the dam was performed. The dam was re-evaluated for earthquake ground shaking caused by a local (random) earthquake with moment magnitude, Mw, of 6¼, and a distant magnitude 8.0 earthquake on the San Andreas fault. Results of these analyses showed that the dam's hydraulic fill embankments would experience large deformations during and after the earthquake shaking postulated for the site. The magnitude of the deformations was found to be excessive and would likely cause an uncontrolled release of the reservoir water at the current normal maximum operating level. Accordingly, it was concluded that measures are needed to improve the seismic stability and performance of the dam.

This presentation describes the ground motion studies, field investigations, engineering analyses, and the design of seismic retrofits to improve the seismic performance of the dam. The field investigations included onshore and offshore in situ testing and geophysical measurements. The engineering analyses included static, seepage, and dynamic finite element analyses to evaluate the potential for liquefaction of the hydraulic fill embankment and its post-earthquake stability. Non-linear finite difference (FLAC) analyses were also performed to estimate the permanent deformation of the liquefied upstream hydraulic fill slopes, to aid in the design of retrofit of the concrete core wall. Construction of the retrofit was completed in 2012.Include an abstract of the topic(s) covered during lecture/seminar.

Professional Bio

Faiz I. Makdisi is Principal Engineer with SAGE Engineers in Oakland, California. He received his M.Sc. and Ph.D. degrees in Geotechnical Engineering from the University of California at Berkeley. He has over 38 years of specialized experience in geotechnical and earthquake engineering. Dr. Makdisi has been actively involved in studies of the seismic behavior of earth and rock fill dams and embankments. He developed and published (with the late Professor H.B. Seed) widely used simplified procedures for estimating the dynamic response and permanent deformations in earth and rock fill dams. Recently, Dr. Makdisi has been involved in the development of seismic design criteria, evaluation of seismic stability, and design of alternative remedial measures for more than 25 embankment dams. Dr. Makdisi has received several honors and awards, including the 1977 Norman Medal award of the American Society of Civil Engineers (ASCE) and the U.S. Army Corps of Engineers, Chief of Engineers "Design and Environmental Honor Award for 2002."





SUPPLEMENTAL ACTIVITES

Geotechnical and Structural Eng. lab tours

Following breakfast Friday morning, Dr. Makdisi was given tours around the W. C. English Geotechnical Research Lab and the Thomas M. Murray Structural Engineering Lab. The goal of this activity was to show Dr. Makdisi the experimental work taking place at Virginia Tech. One of the PhD Candidates working at the Geotechnical Lab discussed the ongoing geotechnical research projects. The tour of the Structures Lab was given by the lab director, Dr. David Mokarem, and highlighted the capabilities of the lab. Dr. Mokarem explained the many Earthquake Engineering structural systems being tested there. After approximately 90

minutes, Dr. Makdisi was picked up from the Structures Laboratory and brought to his meeting with the faculty involved in Earthquake Engineering.

Lunch with graduate students and faculty

After meeting with a group of faculty involved in Earthquake Engineering research, Dr. Makdisi had lunch with several graduate students and other faculty from the Civil and Environmental Department. This event gave students an informal time to meet and talk with Dr. Makdisi before his lecture later in the day. During lunch many things were discussed including participation in EERI, his professional practice, and his favorite sport; soccer.

RESULTS, FEEDBACK AND LESSONS LEARNED

Survey Questions and Answers

1. Please describe the most beneficial aspect of the visit. What went well?

   Dr. Makdisi's visit aided our Chapters goal of becoming more diverse. His presentation covered an array of subtopics that related to various fields, including geotechnical engineering, structural engineering, and geology. To begin his presentation, Dr. Makdisi encouraged the audience members to become involved with EERI and explained the benefits of EERI that included joining a network of professional from dozens of backgrounds.

2. Did the visit and interactions with your Visiting Professional meet your expectations? Were there any topics you would like to see covered in the future?

   Dr. Makdisi was very excited to be back at Virginia Tech for the second time in his career. He was very humble and offered a wealth of knowledge. Much of his time went to meeting with faculty and touring the geotechnical and structural engineering labs. During his presentation Dr. Makdisi was very clear and concise while covering a large range of material. Following the presentation, the audience took advantage of the opportunity to ask questions.

   Hosting Dr. Makdisi met all the expectations of the Virginia Tech EERI Chapter. We were very honoured to host such a distinguished guest and hope to host additional practicing engineers in the future. In a future presentation, it would be beneficial to hear more about how the ground motions for Dr. Makdisi's specific project were developed. Site response is an interesting and critical topic for earthquake engineering and is one of the areas the Virginia Tech Chapter wants to explore more in the future.

3. Please describe the most challenging aspect of the visit. How can we help make future visits more successful?

   Applying for a Freedman Family Visitor and the process leading up to the visit was not complex or overly challenging. The Virginia Tech Chapter officers were all actively involved in preparing for Dr. Makdisi's visit by organizing the event schedule, reserving presentation and meeting rooms, ordering food, and preparing publicity flyers. Dr. Makdisi's transportation and lodging was provided by EERI with help from the Virginia Tech faculty. EERI's support during the entire process was good and the Chapter was very grateful to host the event. The Virginia Tech Chapter encourages EERI to continue to facilitate visiting professional lectures that cover a diverse range of Earthquake Engineering topics.

ACKNOWLEDGEMENTS

The Virginia Tech EERI Student Chapter gratefully acknowledges the support of the Friedman Family for sponsoring the travel of Dr. Faiz Makdisi through their Friedman Family Visiting Professional Program endowment.

LIST OF ATTACHMENTS

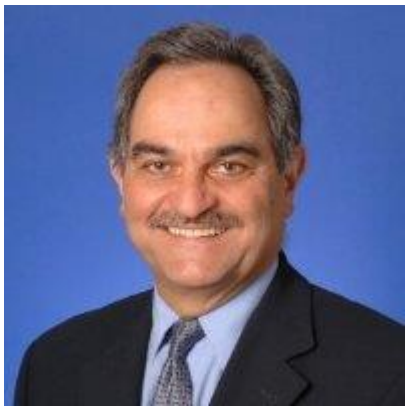
Included at the end of this report are various attachments to supplement the information included above. A list of the attachments is included below:

- Flyer for event

THE VT EERI STUDENT CHAPTER PRESENTS:
EVALUATION OF SEISMIC STABILITY AND DESIGN OF REMEDIATION OF A 1920'S VINTAGE HYDRAULIC FILL DAM

Dr. Faiz I. Makdisi, Ph.D., PE, D.GE
Principle Engineer, SAGE Engineers, Inc.

Friday, 1 May 2015; 2:00-3:00 p.m.
310 Kelly Hall, Virginia Tech



ABSTRACT: Crane Valley Dam is located on the North Fork of Willow Creek, a tributary of the San Joaquin River, in Madera County, California. Built between 1901 and 1911, the dam is composed of a 145-foot-high, earth and rock-fill embankment, with a thin, central concrete core wall. Because of changes in the state-of-practice in seismic stability analyses since the dam was last evaluated in the mid-1970s, and because of the increase in seismic hazard in the dam vicinity, a re-evaluation of the seismic stability of the dam was performed. The dam was re-evaluated for earthquake ground shaking caused by a local (random) earthquake with moment magnitude, M_w, of 6¼, and a distant magnitude 8.0 earthquake on the San Andreas fault. Results of these analyses showed that the dam's hydraulic fill embankments would experience large deformations during and after the earthquake shaking postulated for the site. The magnitude of the deformations was found to be excessive and would likely cause an uncontrolled release of the reservoir water at the current normal maximum operating level. Accordingly, it was concluded that measures are needed to improve the seismic stability and performance of the dam. This presentation describes the ground motion studies, field investigations, engineering analyses, and the design of seismic retrofits to improve the seismic performance of the dam. The field investigations included onshore and offshore in situ testing and geophysical measurements. The engineering analyses included static, seepage, and dynamic finite element analyses to evaluate the potential for liquefaction of the hydraulic fill embankment and its post-earthquake stability. Non-linear finite difference (FLAC) analyses were also performed to estimate the permanent deformation of the liquefied upstream hydraulic fill slopes, to aid in the design of retrofit of the concrete core wall.

BIOGRAPHICAL SKETCH: Faiz I. Makdisi is Principal Engineer with SAGE Engineers in Oakland, California. He received his M.Sc. and Ph.D. degrees in Geotechnical Engineering from the University of California at Berkeley. He has over 38 years of specialized experience in geotechnical and earthquake engineering. Dr. Makdisi has been actively involved in studies of the seismic behavior of earth and rock fill dams and embankments. He developed and published (with the late Professor H.B. Seed) widely used simplified procedures for estimating the dynamic response and permanent deformations in earth and rock fill dams. Recently, Dr. Makdisi has been involved in the development of seismic design criteria, evaluation of seismic stability, and design of alternative remedial measures for more than 25 embankment dams. Dr. Makdisi has received several honors and awards, including the 1977 Norman Medal award of the American Society of Civil Engineers (ASCE) and the U.S. Army Corps of Engineers, Chief of Engineers "Design and Environmental Honor Award for 2002."