

## NHERI Council- Meeting No. 3 (videoconference)

February 13, 2017 2:00 to 3:30 PM ET

### Minutes

#### 1. Attendance and Welcome

In attendance for the Council: Arindam Chowdhuri (FIU), Ross Boulanger (UC Davis), Tim Cockerill (Texas, DesignSafe-CI), Joel Conte (UCSD), Dan Cox (Chair-OSU), Steve Mahin (UC Berkeley- SimCenter), Farn-Yuh Menq (Texas), Julio Ramirez (Secretary- Purdue, NCO), Jim Ricles (Lehigh), and Joe Wartman (UW); Absent: U. of Florida. Guests: Dr. Joy Pauschke (NSF-ENH & NHERI Program Director); Matt Schoettler (UC Berkeley)

#### 2. Review and Approval of Minutes (attached) of Meeting No. 2 (12-20-2016) (All)

Minutes approved as distributed without abstentions or negatives.

#### 3. Status of NHERI policies:

##### a. Data Sharing and Archiving (Tim C.)

Tim led the discussion. He went over guidelines document previously distributed to the Council for review addressing the comments received. The comments received focused on: (i) Guidelines vs Policies: Joy commented that either was fine, that the main objective was to insure that there would be sufficient information to support re-use of those data. Tim indicated that the data models put in place by designsafe after consultation with the facilities should insure quality to support data re-use, and noted that curation was the responsibility of the researcher; (ii) Publishing data: Tim indicated that DOIs would be available to users when they publish. Publishing is a responsibility of the researcher; and (iii) Recommended Publishing Timeline: the deadlines in the guidelines were discussed extensively, in particular the 3-month timeline for RAPID. It was noted that owing to the nature of possible projects under this category more than one recommended timeline could be needed. Also for experimental projects, it was important to define when the clock starts towards the 12 months.

After receiving the feedback, Tim indicated that the topic of metadata also needed more elaboration. He will digest the feedback received and prepare a new draft for review by the Council, with the aim to have it ready before the next Council meeting.

##### b. Scheduling Protocol (Julio)

He reported that the dashboard v1 was now available in DesignSafe-CI. The rollout includes a webinar for potential users, which will be recorded and posted at the NHERI website. The tentative date for the webinar is towards the end of February. Dan Zehner, NCO Facility Scheduler, has been demonstrating the dashboard to the various facilities. The final product was arrived after in-person visits to all the facilities and virtual input sessions.

##### c. Cybersecurity (Tim)

Tim updated the Council on the implementation of the NHERI Cybersecurity Plan. He indicated that significant progress has been made working with all the NHERI awardees, but more work remains to be done. In particular, more uniformity was needed and the

various facilities are working with DesignSafe-CI to achieve this. An update on the implementation status will be given at the next Council meeting.

- d. NSF proposal submissions, requirement to have contacted NHERI facility before submission (Dan)

Dan briefed the Council on the need to require the individuals writing proposals to contact the EF if planning to use that NHERI facility. Joy indicated that NSF was moving away from solicitations; thus, it was not possible to include such requirement in the current ENH CMMI call for proposals. She noted that nothing prevented each facility to put such a statement in its web page.

#### 4. NSF Items (Dr. Joy Pauschke)

- a. Thank you for the NHERI newsletter in December! Nice work!
- b. Thanks to everyone for getting the data sharing/archiving and scheduling protocol/dashboard developed/implemented.
- c. NSF Large Facility Workshop – May 1-3, 2017, LIGO Livingston and Baton Rouge, LA. Sign-up for the listserv mentioned at end of link

[https://www.acpt.nsf.gov/events/event\\_summ.jsp?preview=y&cntn\\_id=190458](https://www.acpt.nsf.gov/events/event_summ.jsp?preview=y&cntn_id=190458)

- d. Tentative NSF Cyberinfrastructure for Large Facilities Workshop (different from Cybersecurity workshop held in August). Tentative September 6-7, 2017 in DC area?
- e. Unobligated year one funds – please contact Program Director (jpauschk@nsf.gov) to discuss use (per cooperative agreement, cannot be used without Program Director approval)

Some other cooperative agreement issues:

- Check cooperative agreement section 1.5 – email equipment inventory (due every December 31) to Program Director ([jpauschk@nsf.gov](mailto:jpauschk@nsf.gov))
- Quarterly and annual report narratives – should include substantial narrative text to justify funding (e.g., project highlights, what projects/users used the facility, what did they do, what preventive maintenance and calibration was done, what software was developed, what education and community outreach was done and what was outcomes from assessment, etc).
- Quarterly and annual report narratives - helpful to include narrative and tables from prior quarters in a given year, e.g., keep a running total, such as Q3 report also includes Q1 and Q2 narratives and tables, identified by quarter.
- Web sites – see cooperative agreement for what should be on NHERI web site for your facility.
- User workshops are important; institution needs to ensure that costs are reasonable, allocable and allowable.
- Council annual work plan – need by April 30; Program Director would like to see draft(s) before submittal.

- Cybersecurity plans – need more uniformity among all sites and coordination with the NHERI CI awardee (reach closure by Dec 2017).
- Possible committee structures? - IT, Safety, etc.

5. NCO Items (Julio):

a. Governance: population of NIAC and User Forum

**NIAC:** A document containing the role/charge and nominations for the NIAC is under consideration by the Council comments are due on February 17. The NIAC membership is to be appointed by the NCO with input from the Council.

**User Forum:** The election to populate the User Forum has been conducted. The results of the election were received after the Council meeting had adjourned and are shown below. The elected members are responding to a poll to find a time to convene in the next few weeks.

**Earthquake Engineering**

Erik A Johnson

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**Wind Engineering**

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Mohamed Elsharawy

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**Coastal Engineering**

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**Wood Construction**

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**Geotechnical Engineering**

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**Russell Green**

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**Social Sciences & Policy**

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b. Science Plan: Update

The Task Group has been meeting regularly and is in the process of developing the first full draft for review by the Council. The target is still to publish on DesignSafe-CI for public comment in May after addressing comments received from the Council. Another review of the plan will be conducted during the Summer Institute scheduled in San Antonio, TX for July 24-28 of this year.

c. Council Annual Work Plan due on April 30th: Sample draft request submitted to NSF on January 31, 2017 with NCO QPR 2.

Council was reminded that items are due next month to the NCO. A plan will be compiled and discussed at the April meeting of the Council before submitting it to NSF for review prior to final submission on April 30<sup>th</sup>.

d. International Partnerships: status

Discussions are ongoing with E-Defense, NCREE (see description attached), and a visit to WindEEE is planned for April 4.

6. Facility Items:

Arindam shared with the Council an outcome of the FIU visit had been the recommendation to consider reducing the reliance on physical testing by leveraging more computational simulation. Steve Mahin offered to prepare a webinar to introduce the SimCenter facility to the Council. Another suggestion received was to combine the SimCenter and the RAPID facilities in one webinar to introduce both. Joe Wartman was in favor of the request. The Council suggested sending a doodle or whenisgood poll to find a convenient time for a 1-hour webinar with 30 minutes for each of the two facilities. Julio will send the poll by the end of this week to find a time for the webinar in late February or early March.

7. Other items: in person meeting, next meeting (Dan)

The Council discussed the next meeting and the need for one in person meeting. It was decided to hold a virtual meeting in April (poll will be sent to find the date and time), and plan for an in person meeting during the Summer Institute days (July 24-28) in San Antonio.

8. Adjourn

Meeting adjourned at 3:25 PM ET



## **National Center for Research on Earthquake Engineering, National Applied Research Laboratories**

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<http://www.ncree.org/>

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### **Outline**

Through a joint effort of the Ministry of Science and Technology (MOST) and the National Taiwan University (NTU), the National Center for Research on Earthquake Engineering (NCREE) was officially established in 1990. In order to enhance the efficiency and performance of the national research laboratories which belong to MOST, the National Applied Research Laboratories (NAR Labs) was established in June, 2003. Since then, NCREE has become a non-profit organization and is one of the ten laboratory members of NAR Labs.

The NCREE has a faculty of about 183 divided into ten divisions including: Administration Division, Planning & Dissemination Division, Experimental Technology Division, Information Management Division, Geotechnical & Strong Ground Motion Division, Building Engineering Division, Bridge Engineering Division, Structural Control Division, Earthquake Disaster Simulation Division, and Branch Laboratory in Southern Taiwan.

The core technologies of NCREE:

- Seismic Testing and Numerical Simulation Technologies.
- Seismic Resistant Design, Evaluation and Retrofit Technologies.
- Earthquake Loss Estimation Technologies.

The mission of NCREE:

- Pre-quake preparation, emergency response and post-quake recovery.
- Integrate research capacities of various earthquake engineering research institutes in Taiwan to enhance the research capability of the nation.
- Promote international research cooperation for earthquake hazard mitigation.



**3D earthquake simulator  
(5m x 5m)**



**L-shape reaction wall and  
strong floor**



**Multi-Axial Testing System  
(MATS)**



## Research Achievements and Challenges

The major Research and Contributions of NCREE are:

- Development of seismic design, evaluation and retrofit technologies
- Development of innovative seismic technologies and systems
- Development and application of earthquake loss estimation technologies
- Advancement of experimental and numerical simulation technologies
- Development of geotechnical and strong ground motion research
- Dissemination of earthquake engineering knowledge to enhance earthquake awareness

Many seismic design and retrofit codes have been proposed in the past years, and the scope includes building structures, highway bridges, railway bridges, seismic isolation and energy dissipation design, qualification for seismic isolation and energy dissipation devices. These codes are used to guarantee the minimum requirement of seismic safety of structures, hence reduce seismic loss in Taiwan. Moreover, NCREE has also devoted to perform seismic evaluation and retrofit of school buildings in Taiwan. A comprehensive strategy was proposed. A series of methods for simple survey, preliminary evaluation, detailed evaluation and retrofit design for school buildings have been well developed. Based on the well-prepared technology and document, the ministry of education has allocated US\$ 587 million for seismic upgrading of elementary and secondary school buildings in four years, from 2009 to 2011.



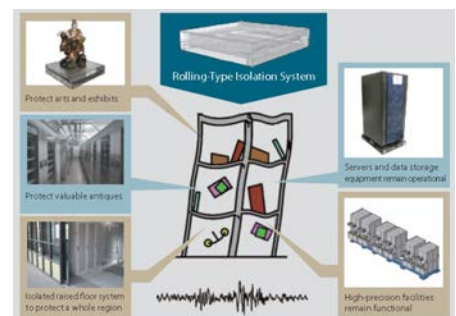
**In-situ pushover test to verify the proposed technology for seismic evaluation and retrofit of school buildings**

NCREE have also developed many innovative seismic technologies and systems. Among them, the Buckling Restrained Brace (BRB) has been widely applied to the industry. More than 10000 pieces of Double-Core BRBs have been used in seismic retrofit and new construction projects in Taiwan. A Multi-Function Rolling-Type Isolation System with reduced and constant acceleration responses, excellent energy dissipation and self-centering capabilities has been applied as a seismic protection for high-precision equipment in high-tech factories, telecommunication industries, and valuable antiques, arts and exhibits in museums. The technology of precast segmental post-tensioned concrete bridge columns which can reduce environmental impact and traffic disruption has also been applied to Taichung Area Expressway No. 4. A comprehensive full-bridge fiber optic monitoring system are applying to various transportation systems with verdict bridges, such as the high-speed railway, the highways, the Metro, the railways.



**The Buckling Restrained Brace applied to Taichung City Government Building**

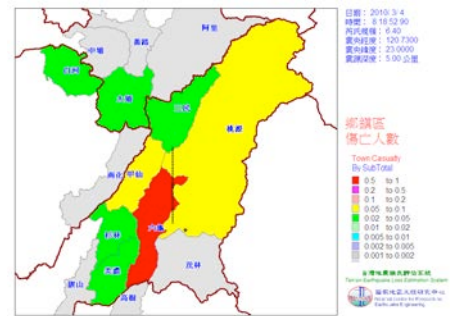
The use of isolation technology is currently the most feasible and effective means of increasing the seismic resistance of important equipment and facilities. The rolling base isolation system developed at NCREE offers an excellent energy-dissipation mechanism and self-centering ability, and can effectively reduce the transmission of seismic forces to upper-level structures. The system is also able to meet the seismic performance design requirements of various equipment and facilities; it can be applied to data storage and communications equipment in the high-tech, communications, and financial industries,



**Applications of rolling-type isolation systems**

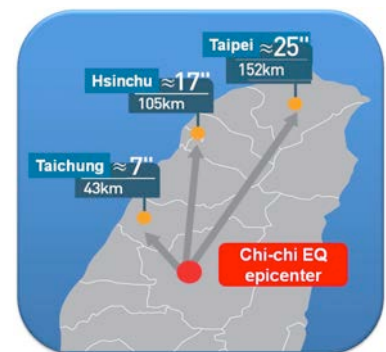
communications facilities in hospitals, disaster relief units, and the energy industry, and important art works at museums and galleries.

The Taiwan Earthquake Loss Estimation System (TELES) developed by NCREE can estimate complete seismic loss automatically within short time after receiving e-mail from the Central Weather Bureau, and the send messages to emergency response personnel of Central Emergency Operation Center to assist in casualty and loss control. The TELES can provide informative estimates (damages, injuries, casualties, rescue & medical-caring demands, etc.) for disaster reduction plans. It has also been applied to Taiwan Residential Earthquake Insurance Fund for improving residential earthquake insurance scheme in Taiwan, as well as applied to the prioritization of seismic retrofit scheme of highway bridges.



**Typical casualty estimation results of TELES**

A On-site Earthquake Early Warning System (EES) has been developed by NCREE. The On-site EES extracts some P-wave features from the first few seconds of vertical ground acceleration of a single station to predict the coming seismic intensity of the earthquake. Therefore, the system can provide more lead-time at the region close to an epicenter since only the seismic information on the target site is required. The system has been verified as reliable and efficient for seismic emergency response, especially with the support of automatic control devices and systems. This technology has also been applied to some schools, train stations, and Taiwan SECOM building in Taiwan, and is going to be implemented to about 3,000 elementary and junior high schools in Taiwan, and also some buildings in the high-tech science park.



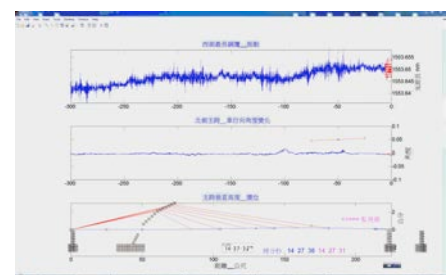
**Typical lead-time of On-site EES of the Chi-chi earthquake**

The flooding that occurred on August 8, 2009 caused the destruction of more than 100 bridges, which cut off numerous mountain communities from the outside world and prevented emergency disaster relief supplies and personnel from reaching these areas. In this type of situation, the "lightweight composite bridge for emergency disaster relief" can facilitate evacuation operations, enable the transport of foodstuffs to stricken areas, and minimize loss of life and property losses, and take advantage of the golden period for relief work. NCREE developed a lightweight composite bridge system for emergency disaster relief. The proposed bridge can be assembled within 6 hours, and possesses the advantages of (1) quick assembly, (2) do-it-yourself use by residents, and (3) reusability.



**A lightweight transportable emergency bridge made of composite materials**

NCREE has originated an "all-round full-bridge fiber-optic monitoring system" that is economically efficient and suitable for most long river bridges in Taiwan. This system is capable of performing 24-hour all-round bridge monitoring during both ordinary times and natural disasters; monitoring items include key parameters that may indicate damage to the bridge, such as the gaps between bridge plate expansion joints, tilting and settling of bridge columns, the water level below the bridge, and the tension in the cables of cable-stayed bridges. Once any abnormality is detected, the system can immediately notify the bridge management unit of the location and cause of the



**The system could monitor the real-time vertical deflection of bridge**

problem by means of computer or smartphone via the cloud, allowing emergency measures can be taken. The system has been applied to cable-stayed bridges and Taiwan High-Speed Railway bridges.

Since 2001, NCREE host the Introducing and Demonstrating Earthquake Engineering Research in Schools (IDEERS) every year. This international educational program is designed for high school, undergraduate and graduate students. Approximately 500 participants from Taiwan and other countries join the program each year. Besides, the International Training Program (ITP) for Seismic Design of Structures has been host by NCREE annually since 2002. Approximately 28 percipients from 13 countries attend the ITP each year. These programs distribute the developed seismic disaster prevention technology and knowledge to both engineering and students from the countries under seismic threat, and hence help reduce seismic loss.



**Shaking table competition of IDEERS**

The major research challenges for the future are how to improve the resilience of the whole community to ensure a sustainable country. In recent decades, the NCREE mainly focus on how to improve the seismic capacity in a reasonable and economic way for existing and new structures, and most of them are buildings and bridges individually. Recent years, the NCREE started to spend more efforts on the research relating to critical facilities such as hospital and nuclear power plants, as well as lifeline systems such as water system, electric system, and traffic system. The NCREE aims to provide a total solution for seismic disaster prevention of the whole community in the future. For this purpose, the NCREE needs to cooperate with other research domains to enhance the ability to counter more complex and challenging research topics.

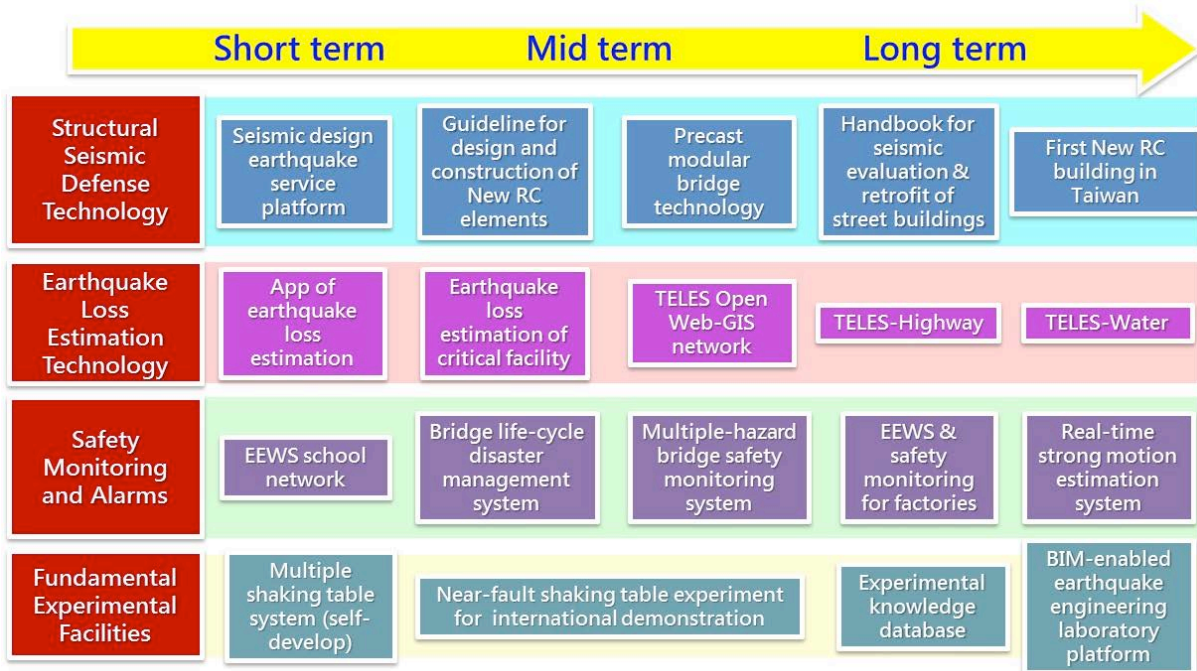
Moreover, due to the structures could be damaged not only by earthquakes but also by the interaction of scouring. For example, bridges with scoured foundation is expected to collapse due to loss of strength of the structure member or bearing capacity of soil when subjected to large seismic excitations. Therefore, research topics dealing with multiple disasters are also considered as a challenging issue by the NCREE.

The high density of both seismic faults and human activities in Taiwan is a problem to be solved, and this probable is also quite unique in the whole world. More than 8 million people living within 10 km distance from the active faults in Taiwan are suffering the threat of near-fault earthquakes. Due to the large displacement and velocity of near-fault earthquakes, the existing shaking table of NCREE cannot simulate the earthquake properly. The research for technology to cope with near-fault earthquakes is also a challenging in the future for NCREE.

## **Suggestions for the Disaster Research Roadmap**

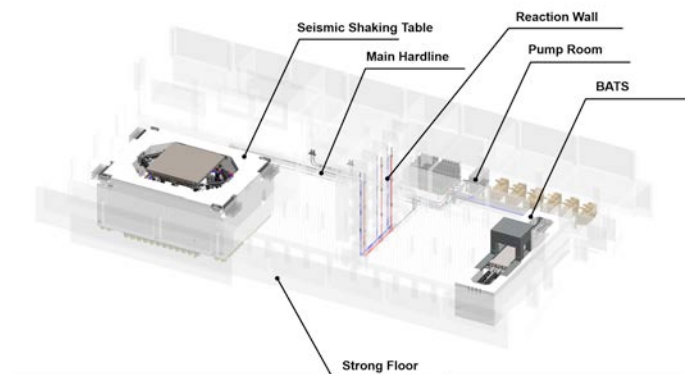
The roadmap of seismic disaster research in NCREE consists of four parts: (1) structural seismic defense technology; (2) earthquake loss estimation technology; (3) safety monitoring and alarms; and (4) fundamental experimental facilities, as shown in the figure below. The main goals of the structural seismic defense technology is to develop the New RC building technology for Taiwan structures, the precast modular bridge technology, and seismic evaluation and retrofit of street buildings in Taiwan. The earthquake loss estimation technology will develop Taiwan Loss Estimation System for highway systems, water systems, and critical facilities. In case of safety monitoring and alarms, Earthquake Early Warning Systems for school network and factories will be developed. The disaster management system and multi-hazard safety system will also be constructed for bridges. Fundamental experimental facilities will be constructed and the efficiency of laboratories will be improved in order to support the research topics on the above-mentioned roadmap.





### Roadmap of NCREE

In order to develop necessary technologies to withstand near-fault earthquakes, the NCREE started at 2014 to construct a high-speed long-stroke shaking table system in a new laboratory located at the campus of National Chen-Kung University in Tainan. The specification of the shaking table system is summarized in the table below. The horizontal one-side maximum displacement of the shaking table is almost 2 meter if the shaking table move to the other side in the beginning of a test, with a maximum velocity 2 meter per second and a maximum payload 100 ton. The new shaking table system and the new laboratory will start to operate in August 2017. Special conferences to demonstrate the capability of the new shaking table system and to cooperate with international specialists about the research on novel near-fault seismic technologies will be host by NCREE.



Appearance of the new shaking table system and the new laboratory

### Specification of the new shaking table system

Item	Specification				
	Size (m)	Max. Displacement (mm)	Max. Velocity (mm/sec)	Max. Acceleration (g)	Max. Payload (ton)
High-speed long-stroke shaking table system	8 x 8	H±1000 V±400	H±2000 V±1000	H±1.2 V±0.8	100

In accordance with the national need for pre-earthquake preparedness, emergency response, and post-earthquake recovery, NCREE brings together academic resources and researchers to carry out joint projects to upgrade seismic technologies and to reduce life and property losses resulting from earthquakes. NCREE also encourages international collaborations in selected fields, especially the near-fault topic, to initiate consolidation and innovation in academic research and engineering practice; thus promoting Taiwan's academic reputation in the related fields all over the world.