SQUG Newsletter
Seismic Qualification Utility Group
June 2002

Welcome to the first SQUG Newsletter of 2002. We hope the year has started successfully for you and that you survived the spring outage season. Here are a number of updates on SQUG activities. As always, we encourage you to send in your comments and thoughts so that we can make the Newsletters as valuable as possible.

John Richards
SQUG Chairman

Highlights

NERP Update

The NERP team held their second meeting on March 21 to review the remaining example NARE evaluations. They made good progress and expect to have the first set of examples ready for posting on the SQUG web site this summer. (http://squgweb.mpr.com/)

The team continues to look for more examples so please contact Don Moore (dpmoore@southernco.com, 205-992-6672) if you have any to offer. In particular, they would like to have an example NARE evaluation for a part and an example cable tray evaluation.

A NARE workshop will be held in conjunction with the SQUG Winter meeting, which would be a good opportunity to discuss the examples with the NERP members.

NARE and 50.59 Guidelines

As a result of their reviews of NARE examples, the NERP Team has recommended a few minor changes and clarifications to the NARE Guidelines.

These changes will be incorporated into the Guidelines and the updated copies will be posted on the SQUG web site.

An update of the 50.59 guidance is also being prepared to better align with the new 50.59 requirements. This will also be posted on the web site. All of these updates are expected to be completed this summer.

NARE Training

You should have received an announcement (or perhaps even three announcements) for an upcoming session of the New and Replacement Equipment (NARE) training in July. This training is very helpful to utility engineers interested in successfully implementing NARE and you are encouraged to participate in this training prior to using the method to evaluate replacement equipment.

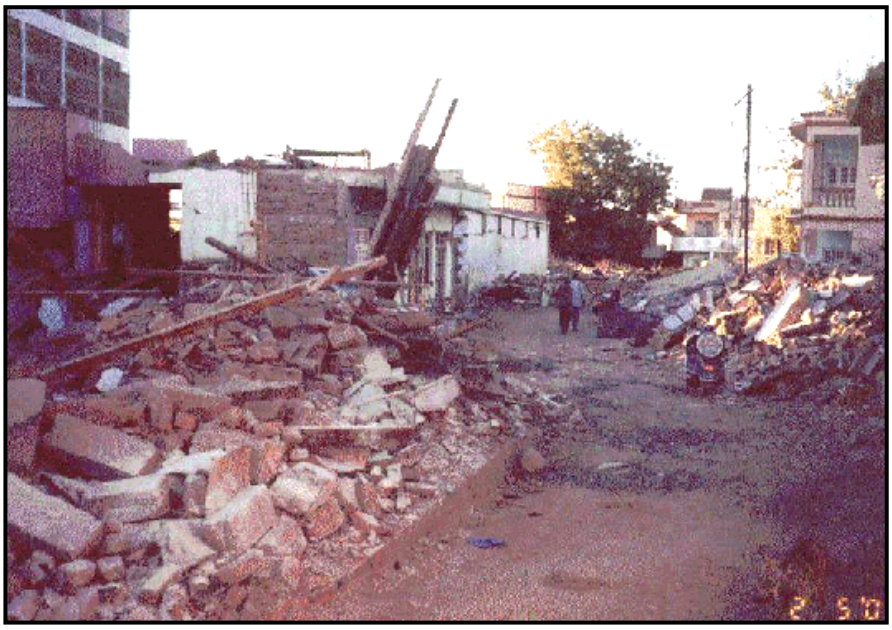
Please be sure to return the registration forms to Bob Kassawara at: 3412 Hillview Avenue, Palo Alto, CA, 94304 (rkassawa@epri.com or FAX: 650 855-1026)

If it turns out that interest in the summer training session is weak we may delay the course until early December.

Gujarat India EQ Investigation

You may recall that a very large earthquake (Magnitude 7.9) occurred near Bhuj in Gujarat, India, on January 26, 2001. There were thousands of causalities and extensive damage throughout the region.

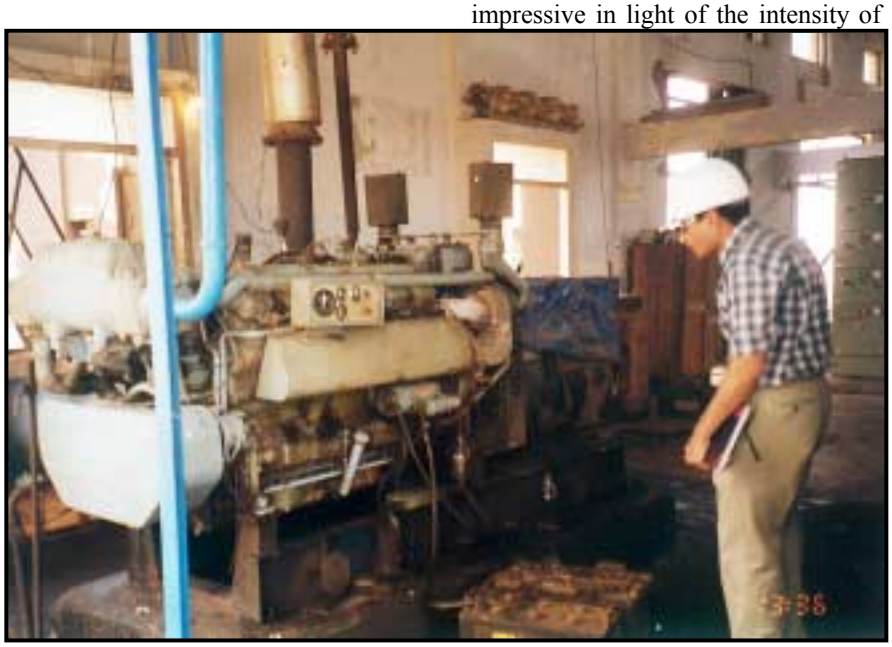
Initially, SQUG did not investigate the performance of equipment in this earthquake because accurate ground motion estimates were unavailable. The recording instruments in the epicentral area failed and the only available recordings of the main shock were in outlying areas. Fortunately, aftershocks were recorded in both the epicentral and outlying areas which enabled the development of attenuation models and estimates of ground motions for the main shock in the epicentral area. With this information available, it was possible to correlate equipment performance with accelerations levels so we planned an investigation for late January 2002.



Of course, about that time India and Pakistan started lining up troops along the border for a possible war over incursions in Kashmir, soooo … the trip was rescheduled for mid March. Upon arrival in Bombay in March, the team found out that religious riots between Hindus and Muslims were occurring in the Gujarat area. After reconsidering how badly they wanted to go into Gujarat, they decided to wait a few days in Bombay and see if tensions subsided. Fortunately, things settled down and they proceeded with the investigation.

They were able to visit nine sites including the Indian Farmers' Federation Coop fertilizer plant in the port of Kandla, a large cement plant in Jamnagar, two bromine plants on the Rann of Katchh, a salt refinery, a transformer factory, an electrical appliance factory, and two substations.

In general, equipment performance was very good. This was especially impressive in light of the intensity of shaking. About half of the facilities visited experienced Modified Mercalli intensity IX (*defined as "Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations"*.) Only a small portion of the sites studied in previous EPRI investigations experienced this level of shaking.



Most of the observed equipment failures were due to building collapses or unanchored equipment. Only two instances of equipment damage appear to require additional review; leaks in an 11kV vacuum-tight contactor and failure of two medium size (~65kW) diesel generators. The team is working to get follow-up data on this equipment although it has been difficult getting information from half way around the world from a region that continues to be turbulent.

Hopefully this investigation will yield a fair number of equipment items from high ground motion sites to add to the database. We'll provide a full update at the SQUG Winter meeting.

Petacalco Transformer Failure

In previous meetings we discussed the ground fault failure of a bus duct leading from a transformer at the Petacalco plant in Mexico. The report evaluating that failure will be published this year and a summary of the investigation will be included in the eSQUG database.

The transformer was identical to the one shown in the picture below. The failure occurred in the attached bus duct at the top of the picture where the duct goes through the wall.

The primary cause of the failure was differential displacement between the transformer and the wall. The transformer foundation was a small pad sitting on soil - independent of the building foundation. The bus duct formed the load path between the transformer and the adjacent wall and tried to resist the seismic induced differential displacements. This installation would violate the existing GIP criteria requiring flexibility of attached lines; therefore, no change to the current criteria is necessary.

This investigation also points out the value of involving various seismic and equipment experts familiar with the design of equipment being evaluated. In this case electrical engineers familiar with the bus duct design would be able to help the Seismic Capability Engineer evaluate the significance of the rigid bus duct spanning between the transformer and the adjacent wall.

eSQUG News

The QA version of eSQUG, the web based SQUG electronic database, is in beta testing and should be released this summer. This release will also include new data from the Manzanillo Power Plant in Mexico (October 1995 Manzanillo Earthquake, Magnitude 7.9) as well as the Olive View Hospital and Cogeneration Facilities (January 1994 Northridge Earthquake, Magnitude 6.7).

Another release is planned for the end of the year that will include data from the AES Placerita Cogeneration Facility (January 1994 Northridge Earthquake) and several sites from the September 1999 Chi Chi Taiwan Earthquake (Magnitude 7.6). This update will also incorporate the special damage evaluation reports (such as the Petacalco Transformer evaluation) into the database.

You may recall from previous meetings that our plan was to issue a QA version of the database, add the most valuable post 1985 data (biggest earthquakes with the greatest number of equipment samples) and include the special damage evaluations in the database. After doing a lot of work in the background, it sure is nice to be able to start rolling it out to the membership!

SCE Training

Several sessions of the SQUG Seismic Capability Engineer (SCE) Training have been taught recently. One class was provided in Washington last December for representatives from British Energy, Korea, and five representatives from US utilities. Another session was provided in England earlier this year for our newest members, Rolls-Royce. A third session was taught by Don Moore for students from Southern Company.

One of the conclusions from all this training (including feedback from Ron Knott at the Winter meeting on his training experience for CP&L folks) is that it is difficult to get your hands on the most current set of SQUG documents and guidelines. To correct that situation, we are going to create a link on the SQUG Web page that lists the current revisions of all the pertinent documents.

We are also investigating what it would cost to transfer the Training videos to DVD. Some of the tapes are getting old and the original master copies on are in a format (1" tapes created by ITC) that is quickly becoming obsolete. We should have more to report by the next SQUG meeting.

By the way, if you are offering a session of the SCE Training within your company, please let other SQUG members know through the list server (squglist@mpr.com). Perhaps a few other members would be interested in joining you.

The SQUG list server is also a great way to see if anyone is interested in other training (the Relay Evaluation Course for example). It is a wonderful tool for communicating with the SQUG community.

Combining SQUG and SEQUAL

By now you should have received a letter from John Richards, Greg Ferguson, and Bob Kassawara explaining the plan for combining SQUG and SEQUAL in 2003. This was a complicated issue but we believe we have arrived at a pretty good solution. We SURE DO HOPE you think so too! We welcome any feedback you'd like to offer and hope that you will continue your membership in the combined SQUG/SEQUAL organization by signing up on the EPRI Solicitation forms.

Recent Earthquakes In 2002

So far this year there have been 5 earthquakes greater than Magnitude 7 plus a Magnitude 6.1 earthquake that killed at least 1000 people in Afghanistan. Here are brief updates on the most significant earthquakes this year…

March 3, 2002, Hindu Kush Region, Afghanistan, Magnitude 7.4 and March 25, 2002, Magnitude 6.1: These were large magnitude earthquakes with significant damage and loss of life (~150 and ~1000 dead respectively). While these were large earthquakes, there weren't many industrial facilities in the area that would warrant SQUG's attention so we do not plan on investing the time and money to perform a detailed investigation. Besides, that little mix up with al-Qaida might make an investigation a little tricky, unless we could arrange for military escorts!

March 5, 2002, Mindanao, Philippines, Magnitude 7.5: This was a large earthquake but it was in the middle of nowhere so there wasn't extensive damage or loss of life.

March 31, 2002, Taiwan Region, Magnitude 7.1: This earthquake was off the east coast of northern Taiwan and only caused moderate damage.

April 20, 2002, 15 miles SW of Plattsburgh, New York, Magnitude 5.0: By most standards this was a very small earthquake of little significance. The only interesting thing about it is that it was one of the few noticeable earthquakes to occur in the eastern US in the last few years.

According to the web site of the Multidisciplinary Center for Earthquake Engineering Research (MCEER), "*shaking was felt throughout New England, and as far west as Cleveland, Ohio; as far south as Baltimore, Maryland; and as far north as Quebec, Canada. There were reports of minor damage in the epicentral area (a bridge was damaged in Jay, New York, road damage was reported in Keeseville, New York, a chimney was reported damaged in Lake Placid, and a window and foundation were cracked in Au Sable Forks, New York.)*"

All in all, a pretty typical eastern earthquake … trivial!

Additional information for all of these earthquakes as well as others is available at USGS's National Earthquake Information Center web site (www.neic.gov).

SQUG Winter Meeting

Just a quick reminder that the SQUG Winter meeting will be in Sanibel Island (near Ft Myers, Fl) on December 12 and 13 (Thursday and Friday). Bob was able to get a hotel right on the beach at a reasonable rate so we hope you'll plan on joining us. We'll send out an announcement when we get closer to December. As you can see there is a lot going on and your input and participation is critical to the success of the organization.

A NARE Workshop is also being planned in conjunction with the December meeting. We hope to spend some time discussing the NERP evaluations and offer support for members in using the NARE method.

That's all folks

Well that's it for now. We hope you find this Newsletter of value and that it helps to keep you up to date on our SQUG activities.

If you have any comments, thoughts, or contributions for the Newsletters, please let us know.

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