AEES NEWSLETTER

October 2009

Contents

President's Report

Welcome to the third AEES Newsletter of 2009. In the June Bulletin I omitted to mention that I had attended a meeting of the Engineers Australia Consultative Chairs on 4th May in Melbourne. This was a useful exercise which brought together the heads of most of the EA technical societies and College Chairs. At the meeting I was approached by the Chair of the Risk Society to see whether they could either add a session to AEES2010 in Perth or have a joint conference. This will be considered by the AEES2010 organising committee headed by Hong Hao. As a result of the meeting you will find AEES2009 mentioned in the Conference section of the Engineers Australia website and we have been offered assistance with the Perth Conference.

We are pleased to announce that the AEES 2009 scholarship award is to Lawrence Anton, a post-graduate student at Monash University who will be working on a new earthquake hazard map for PNG. With the deaths of several old members it is incumbent on the Society to help educate our leaders of the future so the scholarship system introduced by former President Bill Boyce is a valuable contribution to our profession.

Planning for the Newcastle Conference is well in hand according to Bill Jordan and more than 60 abstracts have been accepted with five invited speakers. Speakers are urged to get their papers in on time so the organisers do not have to chase them for copy for the Proceedings. We will add information to the AEES website soon. I am looking forward to it and to meeting up with you there.

Kevin McCue, President AEES

Vale – Professor Tom Paulay 1932 - 2009

It is with great sadness that I report the death of one of NZSEE's most highly regarded members, Emeritus Professor Thomas Paulay, on Sunday 28 June, after a long illness.

Photo – 2004 with portrait by Sally Hope

Over much of his career, Tom was active in the management of NZSEE, having served on the Management Committee and as the Society President from 1979 to 1981. Tom was also a prolific contributor to the Bulletin, reporting on the findings of his research and that conducted in conjunction with his post graduate students. Most notable of Tom's contributions was the introduction of capacity design procedures for reinforced concrete structures; a methodology adopted internationally. He was also well known for his 'displacement focused seismic design' philosophy for asymmetric, ductile, reinforced concrete buildings.
He has co-authored several books, including " Seismic Design of Reinforced Concrete and Masonry Buildings" and "Reinforced Concrete Structures"; more affectionately known as "Park & Paulay".

Tom was a Life member of the Society, and has received recognition for his major contribution to earthquake engineering from within New Zealand and around the world. This recognition includes Fellowship of the Royal Society of New Zealand, honorary membership of the American Concrete

Institute, receipt of the Order of the British Empire and the Order of Merit of the Republic of Hungary; his country of birth. He was a Past President and Honorary Member of the International Association of Earthquake Engineering (IAEE).

Tom will be sadly missed by his many friends, previous students and colleagues in the Society.

Kind Regards

Graeme Beattie
President NZSEE

Extra notes (Ed.) Born in Hungary, Professor Paulay served in the Royal Hungarian Army. Wartime injuries left him somewhat deaf, but didn't have a detrimental affect on his sense of humour (At the University of Canterbury he claims he lectured in Hungarian with a strong NZ accent)..

After his discharge from the army in 1946 he studied one year of civil engineering at the Technical University of Budapest.. In 1948 he fled to Austria and West Germany where he enrolled at the Technical University of Munich but lacked the financial resources to complete his studies in civil engineering. He spent three years in Germany but in 1951 was granted a scholarship by a group of Catholic students at Victoria University in Wellington and immigrated to New Zealand with his wife and oldest daughter.

He resumed his studies in civil engineering at the then Canterbury University College under the guidance of Professor Harry Hopkins. In 1969 he completed his PhD on the coupling of shear walls, under his supervision.

Vale – Professor Carl Kisslinger 1926 – 2008

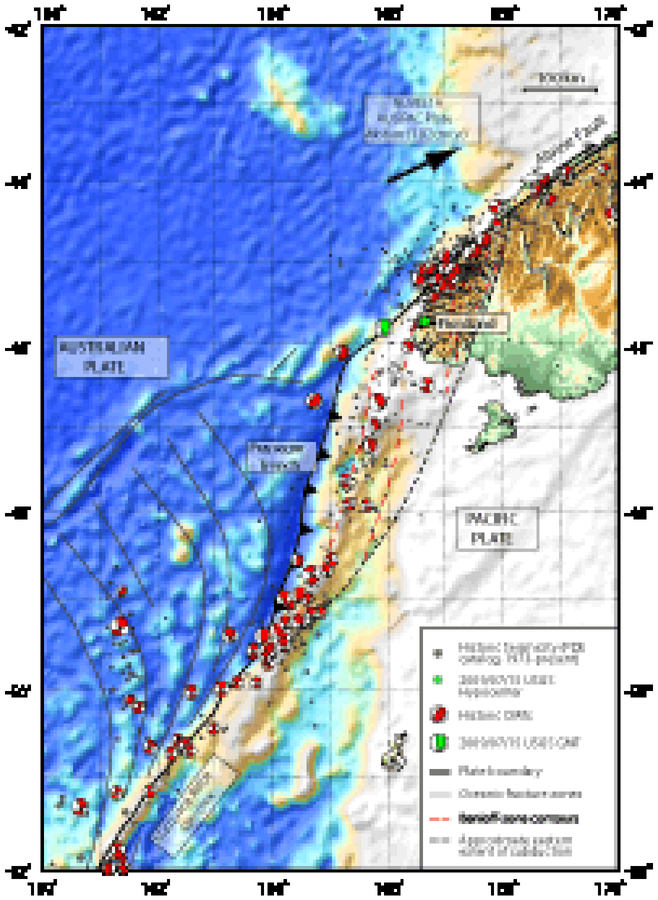
Carl Kisslinger was Professor of geophysics at St Louis University, a world renowned seismologist and co-author of the International Handbook of Earthquake and Engineering Seismology amongst many other publications. He served in a wide variety of organizations, Secretary of AGU, Chairman of the US National Committee for IUGG and president of the Seismological Society of America.

Major New Zealand earthquake 15 July 2009

A shallow undersea earthquake, magnitude 7.8, occurred at 07:22 pm EST on Wednesday 15 July 2009 at 45.96S , 166.47E off the West coast of the South Island of New Zealand. The earthquake caused no damage in NZ but was felt throughout the South Island.

New Zealand straddles the boundary between the Australian and Pacific plates. Along this boundary through southern New Zealand, the Australian Plate moves to the northeast at a rate of 35-45 mm/yr relative to the Pacific plate. In the south-western South Island, this motion is accommodated by oblique convergence at the Puysegur Trench, where the Australian Plate subducts beneath the Pacific Plate (ie NZ)..

The earthquake, a thrust-type event in Fiordland, was in a complex area of transition from Puysegur subduction to Alpine fault strike-slip motion. The location, depth, and estimate of fault orientation of this event are consistent with the earthquake having resulted from slip on the subduction thrust interface between the Pacific and Australian plates. The deformed Australian plate beneath Fiordland is highly active both along its interface with the Pacific plate and internal to the subducted Australian plate.



A summary of the operation of the ATWS during the recent NZ earthquake and tsunami can be found at: http://www.bom.gov.au/quarterly-focus/index.shtml According to BOM: *the overall performance was very satisfactory. It is worth recording that the ATWS is shortly going to be significantly upgraded. There will be a new tsunami scenario database with domain more than doubled to the whole of the Indian and Pacific Oceans basins, run time more than doubled from 10 hours to 24 hours, improved earthquake rupture description, improved coastal tsunami threat determination technique, and streamlined texts for tsunami watch and warning bulletins.*

The largest tsunami was at Southport in southern Tasmania which recorded a 55-centimetre wave above the tide level.

One complaint came from residents of Port Kembla who evacuated the caravan park when warned but weren't told that the tsunami warning had been cancelled until late the following day.

Wednesday 15 July

7.22pm	Earthquake detected off the SW tip of NZ.
7.30pm	Geoscience Australia locates the earthquake and activates the tsunami warning.
7.46pm	BOM issues a Tsunami Watch.
7.50pm	Deep-ocean buoy in the southern Tasman Sea confirms the existence of a tsunami.
8.05pm	Tsunami Warning (Land Threat) issued for Lord Howe Island.
8.17pm	Tsunami Warning (Marine Threat) issued for the mainland, Tasmania and Norfolk Island.
10.30pm	Tsunami waves of about 30cm are recorded at Port Kembla.

Thursday 16 July 2009

1.00am	Tsunami Warnings progressively cancelled as sea-level observations showed that the waves were diminishing.

(The BOM report was sent in by Col Lynam.)

Historic bridge restoration, ACT

The ACT Government will spend $11 million to improve the safety of the historic Tharwa Bridge on top of the $14.7 million already committed to restoration works, Chief Minister and Minister for the Arts and Heritage Jon Stanhope announced today.

Mr Stanhope said the government would take the opportunity to strengthen the foundations of the bridge as a part of restoration works scheduled to commence in 2010.

"The ACT Government remains committed to restoring the historic Tharwa Bridge because of its significant heritage value to the Territory and most particularly to the residents of Tharwa," Mr Stanhope said.

"Today I have committed to fund structural works, at a cost of $11 million, on top of the $14.7 million previously committed for remedial works.

"The works will strengthen the foundations - extending the Bridge's life for at least 50 years - and ensure it can withstand a one in 100 year flood.

"The ACT Government is committed to preserving the built heritage of our region and few examples of this heritage are more iconic or have a higher value than the Tharwa Bridge," Mr Stanhope said.

Tenders have already been called for the structural works. Construction will commence in July and is expected to take 6 months to complete.

Tharwa Bridge crosses the Murrumbidgee River at Tharwa. The 181.5 metre bridge was first opened for use in 1895. It is the oldest surviving bridge in the ACT.

Ground Motion models for Australian earthquakes

By Paul Somerville, URS Corporation and Risk Frontiers

Introduction

This article summarizes a report prepared for Geoscience Australia by Paul Somerville, Robert Graves, Nancy Collins, Seok Goo Song and Sidao Ni of URS Corporation. The report was completed on June 30, 2009. It is anticipated that the ground motion models developed in this project may be used in the generation of future probabilistic ground motion maps for Australia.

The objective of this project was to develop ground motion models for Australian earthquakes. Given the sparsity of recorded strong motion data in Australia, we used a broadband strong motion simulation procedure that can account for the known earthquake source and crustal structure properties of this region. The strong motion simulations used earthquake source scaling relations that are consistent with the source parameters of Australian earthquakes, and Green's functions that are calculated from known crustal structure models of Australia.

Crustal Structure Models

Crustal structure models for the Perth Basin/Yilgarn Craton in southwestern Australia and the Sydney Basin/Lachlan Fold Belt were investigated by reviewing the work of Collins et al. (2003) and modeling teleseismic receiver functions, short period surface wave dispersion and local waveforms. We determined crustal thickness and Vp/Vs for selected regions by applying an *h-k* stacking algorithm. For the Perth Basin/Yilgarn Craton area, the Moho is about 36 km deep and Vp/Vs is about 1.73. For the Sydney Basin /Lachlan Fold Belt, the Moho is about 40 km deep and Vp/Vs is about 1.75. With Vp/Vs resolved, shear velocity profiles were approximated based on P velocity profiles from various seismic refraction/reflection studies.

For the Yilgarn Craton, we took advantage of abundant shallow seismicity in the southwest seismic zone (SWSZ) which excites strong short period Rayleigh waves (Rg), and we used surface wave dispersion (0.5s-5s) to constrain the shallow structure of this region. A 1 km thick low velocity zone (Vs 3.15km/s) overlying crystalline basement (Vs ~3.5km/s) is required to explain the strongly dispersed Rg wave. By modeling the details of receiver functions, we found that the mid-crustal discontinuity is shallower than indicated in previous studies, i.e., at a depth of 12-15km instead of 20-25km. Also, the Moho seems to be fairly sharp. We also resolved the source mechanism and depth of the 2007/10/09 Katanning Mw 4.7 earthquake, whose Mw value was obtained from long period waves in this study, and, which is the largest earthquake in that region for 40 years. This event is also very shallow (depth <3km) with a mostly dip-slip mechanism with some strike slip, consistent with other major earthquakes in the Yilgarn Craton.

For the Sydney/Lachlan Fold Belt, we studied broadband waveforms of the 2003/12/11 Mw 3.8 Moss Vale earthquake, whose Mw value was obtained from long period waves in this study. We constructed synthetic seismograms based on a Vp model from seismic refraction and a Vs model from teleseismic modeling of Vp/Vs. By modeling the sPmP phase, we were able to determine the focal depth to be 6-8 km.

Earthquake Source Models

We generated finite fault rupture models of large Australian earthquakes, specifically the 1968 Meckering and 1988 Tennant Creek earthquakes. The rupture models were derived through the inversion of teleseismic waves, and, in the case of the Meckering earthquake, geodetic and surface faulting data. Finite fault rupture models have not previously been derived from any Australian earthquakes, although analyses of surface geology and teleseismic waves have been used to infer the extent of the fault ruptures that generated these earthquakes. We used the rupture models of these earthquakes and other data to derive earthquake source models for use in strong motion simulations. The scaling relation used to represent the Cratonic Australian earthquakes was chosen to be consistent with the largest earthquake of the Tennant Creek sequence and with the Meckering earthquake. This scaling relation has a rupture area that is half that of earthquakes in the tectonically active Western North America. This is similar to a scaling relation for Stable Continental Region (SCR) earthquakes developed by Leonard (2008b).

For Non-Cratonic Australia, we do not have large enough earthquakes to derive finite fault rupture models, so the scaling relations of these earthquakes are uncertain. Accordingly, we used two scaling relations. The first assumes that the scaling relations of earthquakes are the same as those in Western North America. The second assumes that the scaling relations of earthquakes are the same as those in Cratonic Australia.

Ground Motion Models

Ground motions were simulated for six combinations of earthquake source and crustal structure. One of these consisted of the Cratonic source model and the Yilgarn Craton crustal structure. The other five consisted of the Cratonic source model in the Perth Basin, and both the Cratonic and Non-Cratonic source models in both the Lachlan Fold Belt and the Sydney Basin crustal structure models. The Yilgarn Craton ground motion model is quite different from the other five models, which are all quite similar to each other.

The similarity in ground motions obtained in the same crustal structure using the two different source models is attributable to a trade-off between the effects of the different source dimensions and rise times. The Cratonic earthquake source models have rupture areas that are half those of the Non-Cratonic source models, which causes them to have higher ground motions. However, the Cratonic earthquake source models also have rise times that 1.86 times longer than those of the Non-Cratonic source models, equivalent to a subfault corner frequency scaling factor that is 1.86 times lower, which causes them to have lower ground motions. These two source effects approximately offset each other for all distances and magnitudes. Using a stochastic ground motion simulation model, Risk Engineering Inc. similarly found that, except for the effects of differences in kappa, the ground motions for eastern North America (cratonic model) and western North America (non-cratonic model) are similar for a given reference site condition.

Accordingly, we developed a model for non-cratonic Australia by combining the ground motion simulations of the five non-cratonic cases whose ground motion models we found to be similar. The crustal structures contained in the non-cratonic model, which include the Lachlan Fold Belt, the Sydney Basin, and the Perth Basin, are considered to be representative of non-cratonic Australia, especially its coastal margins. Both the Cratonic and Non-Cratonic earthquake source models were used in conjunction with the Lachlan Fold Belt and Sydney Basin, while only the Cratonic source model was used in conjunction with the Perth Basin. Thus the relative weights of the Cratonic and Non-Cratonic source models in the combined Non-Cratonic ground motion model are 60% and 40% respectively. It is considered that the Yilgarn Craton model is, to first order, applicable to the Yilgarn Craton and other cratonic regions of Australia. It is considered that the non-cratonic model is, to first order, applicable in all non-cratonic regions of Australia. In particular, it is considered to be applicable to non-cratonic coastal regions, including all of the state capitals of Australia.

The Cratonic ground motion model is quite similar to the model developed using Yilgarn Craton data by Liang et al. (2008) model, and less similar to the models for stable regions of eastern North America by Toro et al (1997) and Atkinson and Boore (2006), as shown on the left side of Figure 1. The Non-Cratonic ground motion model is more similar to models for tectonically active regions such as Boore and Atkinson (2008) than the Toro et al. (1997) model for tectonically stable eastern North America, as shown on the right side of Figure 2, mainly due to the higher value of kappa used in the Non-Cratonic model than in Toro et al. (1997).

The predictions of the Non-Cratonic ground motion model were compared with ground motion recordings of the Mw 4.47 Thomson Reservoir earthquake of 26 September 1996 (Allen et al., 2000) that occurred about 135 km east of Melbourne (Figure 2). This earthquake has a large number of recordings that span the distance range of interest. The ground motion model was developed from simulations in the magnitude range of 5.0 to 7.5, so its use for a magnitude 4.47 earthquake involves some extrapolation. The shape of the decrease in predicted ground motion levels with distance is generally consistent with that of the data. The flattening in slope that occurs at 50 km in the model is consistent with a flattening that is evident in the data, especially at periods of 1 second and longer. In general, the level of the model predictions is consistent with that of the data, although the model tends to overpredict the data for periods of 0.2 to 0.4 seconds. Overall, the agreement between the model and the recorded data of this earthquake is quite good.

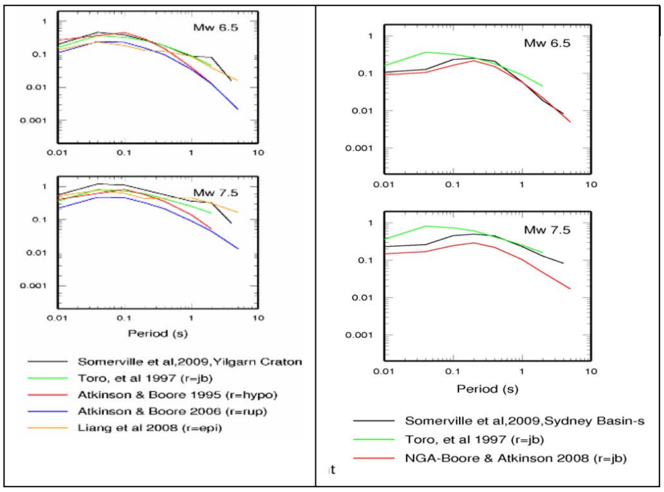


Figure 1. Comparison of Cratonic Model response spectrum (blackline, left) and Non-Cratonic Model response spectrum (black line, right) with other ground motion models for magnitude 6.5 and 7.5 earthquakes at a distance of 30 km. The vertical axis shows response spectral acceleration in g's as a function of period on the horizontal axis.

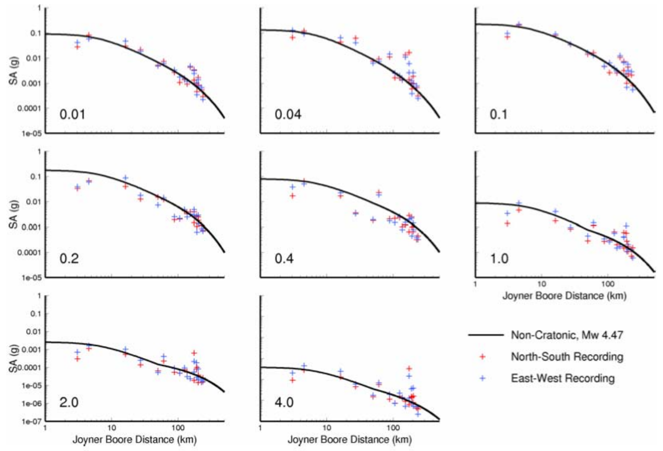


Figure 2. Comparison of recorded spectral accelerations of the September 25, 1996 Thompson Reservoir earthquake with the predictions of the Non-Cratonic model. The vertical axis shows response spectral acceleration in g's as a function of distance on the horizontal axis.

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THE ABRUZZO (ITALY) EARTHQUAKE

Michael C. Griffith[1] and Claudio Oyarzo-Vera[2]

[1] *Associate Professor, School of Civil, Environmental & Mining Engineering, University of Adelaide, AUSTRALIA.* mcgrif@civeng.adelaide.edu.au

[2] *Lecturer, Departamento de IngenierIa Civil, Universidad Católica de la SantIsima Concepción, Concepción, CHILE. PhD Student, Department of Civil and Environmental Engineering, University of Auckland, Auckland, NEW ZEALAND* coyaOO1@aucklanduni.ac.nz

INTRODUCTION

A magnitude (Mw) 6.3 earthquake struck the Abruzzo region in Italy on April 6th, 2009, at 3:32 am local time killing over 300 people, injuring 1500 people and damaging approximately 15000 buildings. Many buildings of significant historical and architectural value were destroyed and several modern buildings were also severely damaged or fully collapsed.

The authors visited the disaster zone one month after the earthquake. The most badly affected areas ('red zones') in the historical centre of L'Aquila and three other villages – San Gregorio, Pagánica and Onna – were inspected.

The main observations made during this reconnaissance trip are briefly summarised here. A more detailed description and reporting of our observations will appear in a report to be published in the Bulletin of the New Zealand Society for Earthquake Engineering later this year.

EFFECTS ON HISTORIC BUILDINGS

Typical unreinforced masonry construction in the region consisted of stone or clay masonry walls, 300 – 500 mm thick, with floor systems constructed of timber or light concrete/masonry and timber roofs with clay tiles.

The most commonly observed failure modes were out-of- plane failure of walls (Figures 1 and 2). In-plane failure modes, such as shear cracking and failure of panels adjacent to door or window openings and shear failure of spandrel beam sections above openings (Figures 3 and 4), were also widely observed, but in most cases did not lead to complete building collapse. There were a number of churches and/or cathedrals that suffered spectacular roof collapses (Figure 18). This was most likely due to the out-of-plane movement of the supporting walls leading to a loss of support or, in the case of arched roof systems, to excessive tensile stress in the arch intrados.

It was noted that in some cases, masonry buildings with good horizontal diaphragm action performed poorly (Figure 5). This was thought to be due to the large concentration of inertia force at the floor/roof levels exceeding the capacity of the diaphragm's connections to the vertical in-plane supporting walls, resulting in large deformations being imposed on the out-of-plane walls. Damage was also observed in some buildings that had concrete ring beams (Figure 6) at floor and roof levels installed to 'tie the building together', suggesting that the seismic forces were simply too large for the connections in the enhanced structural system.

EFFECTS IN MODERN BUILDINGS

The most common failure mode in more modern buildings (post-WWII for example) was failure of exterior masonry veneer panels and failure of masonry infill panels.

The widespread damage to external masonry veneer was believed to be due to a lack of fasteners to the structure (Figure 7). Failures in infill panels were due to deformation incompatibility between the stiff masonry infill and the more flexible building frame, typically concrete (Figure 8). In several cases the failure of infill masonry walls was accompanied by shear/flexural failure of concrete columns, leading to a soft-storey collapse (Figure 9). Infill walls were commonly constructed with hollow clay block units with the hollow cores running horizontally (refer Figure 8), where the masonry infill was not supporting any vertical gravity load.

There were several examples of complete collapse in L'Aquila, such as the building shown in Figure 10, where the cause was due to shear and/or flexural failure of columns in the lower storeys. Plain round reinforcement bars with poor detailing were found in the collapsed and many of the other heavily damaged concrete frames (Figure 11).

Many of the collapsed or partially collapsed buildings had hollow-core floor and/or roofing systems. These systems feature hollow clay masonry units which are topped with concrete and supported by inverted concrete T-beams that span between the primary concrete or steel girders (Figure 12). The ability of these systems to provide good diaphragm action is questionable.

It was also alarming to see column damage in one new concrete frame building under construction in Onna, even though the masonry infill and cladding was not yet in place (Figure 13). Figure 14 shows a horizontal failure plane that occurred at construction joints at the top and bottom of every column in the bottom storey, leading to spalling of concrete cover and subsequent buckling of the reinforcement.

ENGINEERING ASSISTANCE RECOVERY OPERATIONS

While the search and rescue operations were well and truly over by the time of our visit, there was much evidence of propping and shoring of damaged structures by the emergency services personnel. Some of this work was still ongoing during the visit. For Example, fire brigades ("Vigili del Fuoco") from throughout Italy assisted with the initial search and rescue and subsequent recovery operations. In each of the four townships that we visited, there were many examples of walls that had been shored/propped (Figure 15), columns that had been stabilized (Figure 16), and churches that were being secured (Figures 17 and 18). The presence of structural engineering expertise within the regular fire brigade personnel meant that this work was of a consistently high standard.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the financial support of the New Zealand Society for Earthquake Engineering for this technical visit. In addition, the assistance of local authorities and colleagues that collaborated with us during this site inspection is greatly appreciated: Prof. Francesco Benedettini (University of L'Aquila); Prof. Giorgo Monti (University La Sapienza of Rome) who facilitated our visit and access to L'Aquila; Ms Livia de Andreis (PhD Student, University La Sapienza of Rome), who acted as our guide and interpreter (Figure 19); and the various fire brigades (VF Firenze, VF Roma, VF L'Aquila) that escorted us during our visits into the "red zones" (Figure 20).

LESSONS FOR AUSTRALIA AND NEW ZEALAND

The most significant problems observed in reinforced concrete frame construction were attributable to poor detailing. This situation is very common in buildings designed and constructed prior to 1970, and observed details appeared to be very similar to those found in buildings of comparable vintage in Australia and New Zealand.

Steel and concrete frame construction with clay brick and/or concrete block masonry infill walls is routinely encountered in both Australia and New Zealand. As mentioned previously, this type of construction demonstrated a systematic damage pattern associated with in-plane shear failure due to deformation incompatibility between the building frame and infill, which did not necessarily compromise the structural stability of the building. Even though this damage mode typically did not lead to loss of structural integrity, it is expected that it will be expensive to repair.

Although masonry veneer walls do not contribute to the structural resistance of the system, damage to neighbouring structures because of falling bricks was widely observed. This is a significant issue, considering that in many older buildings the construction details did not include mechanical fasteners between the structure and the brick veneer, and in other situations, the mechanical fasteners may have corroded with time as observed during the 1989 Newcastle earthquake in Australia. Similar injury and damage due to falling brickwork from the masonry veneer of older buildings would be anticipated in Australia and New Zealand.

While some masonry buildings with reinforced concrete ring beams or stiff floor diaphragms were observed to fail, it was noted that this was most likely due to inadequate strength of the connection between the in-plane walls and floor diaphragms. Nevertheless, it appeared that the strength and corresponding failure mode was still much improved over the many out-of-plane wall failures where little connection or diaphragm action was present. Hence, it was concluded that masonry buildings which were well connected (at wall intersections and between walls and horizontal elements such as floors and roof) performed much better than those having poor connections between structural elements.

Figure 1: Out-of-plane failure of walls (San Gregorio).

Figure 2: Out-of-plane failure of walls (Onna).

Figure 3: *Damage adjacent to openings (Onna).*

Figure 4: *Damage in spandrel above / below openings (l'Aquila).*

Figure 5: Damage concentration at diaphragm level (Onna).

Figure 6: *Collapse of walls with RIC ring beam at roof level (l'Aquila).*

Figure 7: *Veneer out-of-plane failure (Pagánica).*

Figure 8: Masonry infill out-of-plane failure (L'Aquila).

Figure 9: Soft-Storey Collapse of masonry infilled RIC frame building (L'Aquila).

Figure 10: Collapsed RIC frame building (L'Aquila).

Figure 11: Poor reinforcement details found in collapsed building (L'Aquila).

Figure 12: Photo of hollow core masonry flooring system

Figure 13: RC frame building under construction with damage in all column ends (Onna).

Figure 14: Close-up of typical column damage (Onna).

Figure 15: Propped structure to prevent the collapse of front wall of church (Onna).

Figure 16: Damaged column stabilized with belts (L'Aquila).

Figure 17: Firemen securing the Dome of "Chiesa di San Bernardino" (L'Aquila).

Figure 18: Firemen securing the "Suffragio Basilica" (L'Aquila).

Figure 19: Reconnaissance team visiting L'Aquila centre. From left: Michael Griffith, Livia de Andreis and Claudio Oyarzo-Vera.

Figure 20: VF Firenze Brigade based in San Gregorio.

From our Members (Cvetan Sinadinovski)

2009-05-19 17:35:02 (Mw 5.7) Western Saudi Arabia Location 25.4 N, 37.7E, Depth 2 km.

At least seven were people injured in Al Madinah. Shaking was felt at Al `Ula, Al Wajh, Medina, Umm Lajj, Yanbu` al Bahr and in other parts of Al Madinah. Several large ground cracks and landslides were observed in Al Madinah.

This is an interesting earthquake, intraplate like Australia, the mechanism a normal fault. Such earthquakes are relatively uncommon in Australia. This is the first known case of surface faulting in the Arabian Plate, examples of faulting are shown in the following photographs.

Children in disasters

COGSS and DPE Newsletter, Vol. 1, Issue 16. Article by Carrie Wells, McClatchy Newspapers Washington USA

Most of the country is poorly prepared to help children if disaster strikes, Federal Emergency Management Agency Director Craig Fugate told a Senate committee Tuesday. "We've historically looked at special populations as an afterthought," Fugate said. "Children are not small adults."

Mark Shriver, the chairman of the National Commission on Children and Disasters and managing director of advocacy group Save the Children, was more pointed: "Children are 25 percent of the population," he said, "but we've spent more time, energy and money on pets than we have on kids. That's absolutely outrageous."

And Irwin Redlener, the president of the Children's Health Fund, said that FEMA was too often "flailing around" on certain children's disaster issues.

Fugate told the Senate Ad Hoc Committee on Disaster Recovery that plans are in the works to address the problems. A FEMA working group will address the unique needs of children and create plans for how to reunite children with their families, make sure child care centers are rebuilt quickly, and evacuate children and house them.

Experts said Tuesday the help is needed urgently. Save the Children detailed its report card showing how prepared states were to protect children in a disaster and presented it at the hearing.

California, New York, North Carolina, South Carolina, Alaska and Texas are considered well-prepared, with most having an evacuation plan for child care centers, reunification plans, plans for children with special needs and a K-12 plan for multiple kinds of disasters.

The worst-prepared states, which had few or none of those plans, include Florida, Georgia, Illinois, Idaho, Kansas, Louisiana and Missouri, as well as the District of Columbia.

Cynthia Bascetta, the director of health care for the Government Accountability Office, discussed with the subcommittee a July GAO report on the mental health needs of children after a disaster.

Many young victims of Hurricane Katrina in 2005 aren't getting the mental health help they need due to lack of funding and psychiatrists, the report said.

Making matters worse, more than two-thirds of children who were displaced by Katrina have emotional or behavioral issues, Redlener said. His group conducted a study of how children cope with disasters.

Redlener blasted FEMA for not developing a national disaster recovery strategy three years after it was told to do so by Congress, and urged the agency to keep better track of disaster victims. "If not we're still going to be flailing around," he said. "Those children we ignore at their peril and at our peril."

Sen. Mary Landrieu, D-La., was particularly bothered by how slowly child care centers rebuild after disasters. In St. Bernard Parish in Louisiana, the number of child care centers dropped from 26 before Katrina to only two by 2007, she said. "There's got to be safe places for children for the parents to come back," she said, calling the centers essential to economic recovery.

Seismic performance of engineering systems in buildings – revised NZ Standard

Standards NZ recently published a revised Standard NZS 4219:2009 which supersedes NZS 4219:1983. It is consistent with the new Loading Standard NZS 1170.5.

This is perhaps the only standard worldwide that specifies seismic performance requirements for engineering systems and their components.

Conferences

2009 September 24, Adelaide SA
Seismology and Earthquake Engineering

The first part of the seminar will deal with why we get earthquakes in South Australia, probabilistic seismic hazard analysis and the earthquake hazard in the state.

Later speakers will deal with the revised earthquake loading code and various aspects of earthquake engineering including the performance of masonry structures, site amplification and seismic design, pile design for liquefaction, seismic deformation of earth dams and earthquake induced landslides.

2009 December 9-11, San Francisco, California
Improving the Seismic Performance of Existing Buildings and Other Structures

The challenges to improving the seismic performance of existing buildings and other structures are as broad and varied as the individual structures themselves. How should they be evaluated and strengthened? What assumptions were made? Were they built as designed, and if not, what modifications were made but possibly (probably) not documented?

This inaugural conference, organized by the Applied Technology Council and the Structural Engineering Institute of the American Society of Civil Engineers, is dedicated solely to improving the seismic performance of existing buildings and other structures and includes:

Four concurrent tracks of Technical Sessions include papers on:

- Improvements to Guidelines, Standards and Analysis Procedures
- Seismic Performance and Rehabilitation of Non-Building Structures
- Seismic Performance of Nonstructural Components
- New Materials and Innovative Approaches for Seismic Rehabilitation
- Innovative Approaches to Rehabilitation
- Mitigation Policy Issues, Strategies and on Going Programs
- Case Studies on Analysis and Rehabilitation

STOP PRESS! Announcement

Following the recent major earthquakes in our region, thousands of people have once again been killed or had their lives thrown into chaos. Our condolences go out to the families of all those who have lost family members or their homes and livelihood.

The Australian and New Zealand Governments are making plans to send a reconnaissance team to Sumatra. Two NZSEE members visited Samoa in the days after the great earthquake there and verified that major infrastructure including the dam and power station were not visibly damaged. The US government is in the process of sending a team of engineers and seismologists to Sumatra as I write.

AEES hopes that the Australian Government will table long term plans for assistance before the next earthquake strikes in our region at a meeting of SOPAC members in Vanuatu in coming weeks. Basic educational resources on what to do following a large earthquake for teachers and students in local languages such as Pidgin would be very useful. Upgrading of national building codes should be a high priority focusing on hospitals, schools and post-disaster facilities.

We encourage the Joint Australian Tsunami Warning Centre to update their website at regular intervals for the public and media following major earthquakes and tsunamis in the region and make reports publicly available on the earthquake and tsunami with tide gauge information for example. Plans for reconnaissance missions also should be made readily available. The need for a register of professional engineers and other technical experts able to participate in such missions is obvious.

Notes on AEES 2009

Friday 11th December to Sunday 13th December.
Crowne Plaza Newcastle NSW

Referees are currently reviewing the 60 plus papers submitted so far. Please get your paper in as soon as possible.

Key note speakers

Professor Rob Melchers, Newcastle University, will document his analysis of the structural failure mechanism of the Newcastle Workers Club as a result of the 1989 earthquake.

Rod Caldwell will review the failure of electricity systems following the 1989 earthquake.

Dr Paul Somerville from Macquarie University and URS will discuss the development of the next generation of ground motion models including spectra for Australia.

Dr Mark Stirling, GNS NZ, will address the issue of comparative earthquake risk, getting the loading code demands right.

Dr John Adams, Geological Survey of Canada, will talk about the evolution of the latest Canadian loading code which has lessons for Australia.

On the Saturday afternoon AEES will host a public forum on the Newcastle earthquake facilitated by the Chancellor of Newcastle University, Professor Trevor Waring. The panel will include John McNaughton (Lord Mayor NCC in 1989) and Col Sandeman (Chief Building Inspector in Newcastle in 1989), Bob Hawes (Property Council) and Professor Mike Griffith (Search & Rescue).

AEES Contact Details

PO Box 4014
McKinnon P.O. VIC 3204
Email: srj@bigpond.net.au
Tel: 0414 492 210
Website: www.aees.org.au

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