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NED UNIVERSITY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF EARTHQUAKE ENGINEERING

Cowasjee Earthquake Study Centre
NED
NEWSLETTER

Commissioner Programme on Earthquake Safety

Mr. Shoaib Ahmad Siddiqui, Commissioner Karachi, (Figure 1), has launched a program entitled Commissioner Programme on Earthquake Safety. This Programme, which was initiated in November 2013, is aimed at strengthening the present level of earthquake awareness, preparation, response and rescue in Karachi so as to create better and safer built environment, and to reduce life and monetary losses during an earthquake. The objectives of the Programme as listed as under;

Figure 1: Mr. Shoaib Ahmad Siddiqui (seated center), Commissioner Karachi, presiding over a meeting with the stake holders.

1. Create awareness among people about earthquake mitigation and safety;
2. Develop coherent building regulations and bylaws for different building control authorities in Karachi; and
3. Strengthen the rescue and response agencies.

A committee has been formed in this regard to carry out the activities for the Programme and to assist the Commissioner. The committee is headed by the Commissioner and a wider representation has been made for the committee which includes representatives of civic agencies, such as building control authorities, cantonment authorities, Karachi Port Trust and other landowner agencies, Pakistan Metrological Department, Geological Survey of Pakistan and Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), academicians and researchers from NED University of Engineering and Technology and Sir Syed University of Engineering and Technology, rescue services (Figure 2), such as firefighting agencies, traffic police, Pakistan Civil Defense and NGOs.

Figure 2: Visit of Commissioner Karachi to Rescue 1299 Control Room on December 19, 2013.

The committee members have been divided into three sub-committees to take up different tasks to meet the objective of the programme. The committee meets after every four weeks and the heads of the sub-committees update the Commissioner on the progress of work. Mr Sajid Janjua, Adl. Director, Defence Housing Authority, and Mr. Tariq Moen, Deputy General Manager, Emergency Response Planning (ERP) at Pakistan International Airlines (PIA), are heading the sub-committee on the earthquake

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EDITORIAL

The first issue of volume 14 of CESNED NEWS LETTER is once again an endeavor towards improving awareness of earthquake engineering in Pakistan. All the published articles in this issue are taken from on-going research projects in the Department of Earthquake Engineering.

Readers across the globe are encouraged to contribute towards this newsletter — Editor

Inside this Issue:

Feasibility Study of National Disaster Management Information System (NDMIS)

The Department of Earthquake Engineering has recently been awarded a project related to carrying out a feasibility study for the development of National Disaster Management Information System (Figure 3), for National Disaster Management Authority (NDMA), Pakistan. The project is financially supported by National ICT R&D Fund, Pakistan. The selection of the Department of Earthquake Engineering for this project was done on the basis of a competitive bidding process for which call for proposals were advertised by National ICT R&D Fund in the local newspapers. The selection of Department of Earthquake Engineering for this study is a reflection of the trust by the national agencies on the capabilities of this Department.

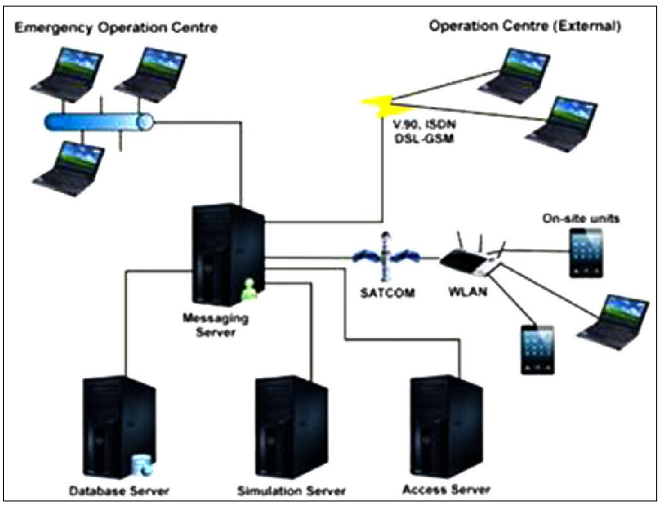

Figure 3: Scheme of operation of disaster management system

The study will consider hazards of earthquake, flood/tsunami, cyclone/wind, fire, and landslides in looking into aspects of integration of response and recovery operations by NDMA during any of these disasters. A complete framework for NDMIS will be proposed in this study to help NDMA to effectively carry out emergency response activities. The objectives of this study are listed as under,

- Study and assessment of existing resources and systems at disaster management authorities nationwide.
- Review of available major disaster management information systems worldwide.
- Gap analysis of required and existing resources.
- Roadmap for National Disaster Management Information System.

Commissioner Programme on Earthquake Safety

awareness on safety and mitigation. The work done by the committees is updated regularly on the Facebook page at http://www.facebook.com/EarthquakeSafetyPakistan.

The committee has printed brouchers and informational pamphlets. The printing cost is sponsored by PIA and these brochures and pamphlets are readily available in the airport lounges, and all the civic and rescue centers across Pakistan. All the major electronic media are also actively involved with this committee.

Figure 4: Earthquake Awareness & Rescue Techniques Session at Beacon House School (Gulshan Middle - 1) conducted in coordination with Pakistan International Airlines (PIA) and Fire Protection Association of Pakistan (FPAP).

Prof. Sarosh Lodi, Dean, Faculty of Civil Engineering and Architecture, NED University is the convener of the committee which has been given the task of studying the conditions of existing buildings in Karachi and suggest measures to strengthen the vulnerable buildings. The members of this team include Mr. Sohail Wareel, Prof. Noman Ahmad, Prof. Muhammad Masood Rafi, Prof Rashid A Khan, representatives from Association of Builders and Developers of Pakistan (ABAD), Sindh Building Control Authority (SBCA), architects and consultants. The committee will also develop standardized building bylaws and regulations to ensure that future construction complies with the earthquake safety requirements.

Mr. Salim Shahid, Assistant Professor, Sir Syed University of Engineering and Technology, is leading a group of NGO's and emergency responders towards strengthening the rescue and response efforts by providing trainings, workshops, rescue exercises and other activities in schools and communities (Figure 4).

Capacity Building for Pakistan in Fire Risk Management

The urbanisation of big cities has increased many folds in the developing countries owing to a rapid population influx. Various types of construction is carried out in order to cater for the needs of the population. The building infrastructure mainly consists of commercial, industrial and residential buildings which typically constitute a significant proportion of the overall construction. Historically, these are very vulnerable to several possible hazards like earthquakes, floods, high winds, fire, etc. However fire is considered one of the biggest threats to both the building occupants and its contents.

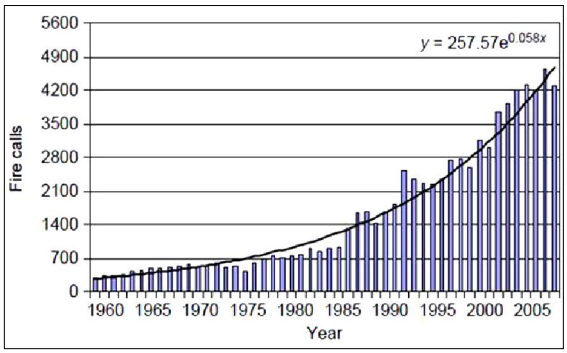

Figure 5: Data of fire incidents in Karachi during 1960-2009. (Rafi MM, Uddin W, Siddiqui SH. (2012). Assessment of fire hazard in Pakistan, Disaster Prevention and Management, Vol. 21-1, pp.71-84.)

The incidences of building fire have increased significantly in Pakistan (Figure 5) owing to a lack of fire safety provisions or their implementations in the building design. Civic agencies in Pakistan are inadequately equipped with the tools to assess fire hazard and lack any preparedness to deal with the aftermath of fire in a building. As a typical example, the cases of fires in Ali Enterprises (a garment factory) in Karachi (Figure 6) and a shoemaking factory in Lahore in September 2012 can be presented here. These factories caught fire on 11 September 2012; these are considered to be the worst incidents of industrial fires in Pakistan's history. More than 300 people died and 250 people were injured due to these incidents. One key challenge in mitigating fire hazard in Pakistan is the absence of studies related to fire risk management and necessary mechanisms for fire damage assessment of buildings.

A three year research project has been initiated by the Department of Earthquake Engineering with the financial assistance from the Pakistan-US Science and Technology Corporation Program. The projects aims at addressing this gap in order to determine the risk of fire in communities in urban areas and to build capacity in Pakistan in the area of fire risk management. Prof Muhammad Masood Rafi, Chairman, Department of Earthquake Engineering and Prof. Sarosh Lodi, Dean of Faculty of Civil Engineering and Architecture, NED University of Engineering and Technology, Pakistan will supervise the project along with Prof. Venkatesh Kodur, Director of SAFE-D Center, Department of Civil & Environmental Engineering, Michigan State University, USA. The main objectives of the project are listed as under,

Figure 6: Ali Enterprises Factory and dead victims at Edhi Center. (Coordinator of the Clean Clothes Campaign in Catalonia/Folha de São Paulo/fariskasim.wordpress.com

- Carryout a fire hazard and vulnerability analysis to evaluate risk to communities in Pakistan (Figure 7).
- Compilation of extensive literature of models related to post-fire assessment of building structures prevalent in the developed world and adapting these in an incremental fashion depending on the existing expertise. Implementation mechanisms of adapted models will be developed in order to get a complete picture of fire affected regions of the building.
- Establishment of thermal properties of local construction materials.
- Developing standards for monitoring thermal properties of materials at elevated temperatures.
- Development of a curriculum at post-graduate level for universities in Pakistan.

The project is designed to transfer knowledge and technology with the help of collaborative work in developing assessment models and generating fire hazard and vulnerability maps.

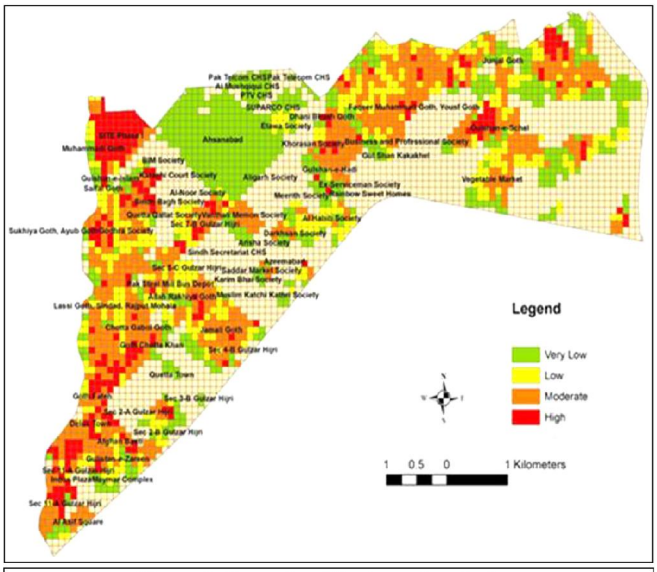

Figure 7: Example of fire hazard analysis

Department of Earthquake Engineering Participates in Pakistan Urban Forum 2014

South Asian cities share a colonial past. The post-colonial transformation that each of the major cities in South Asia went through also share common socio-economic identities in terms of population growth and migration, albeit taking different trajectories in their political development. This shared past coupled with the prominent role cities like Colombo, Dhaka, Karachi, Mumbai, Delhi and Lahore are projected to play in the world arena, merits a deeper look into understanding the contemporary South Asian cities.

Figure 8: Department stalls and visiting participants at the event.

The Pakistan Urban Forum aims to create a consensus in the process of city making and to bring together all stakeholders, such as government leaders, non-governmental and community based organizations, urban activists, corporate leadership, practitioners, academics, members of the civil society and students to discuss issues, challenges, opportunities of cooperation and research to improve the capabilities of cities, municipalities and concerned government agencies.

Pakistan Urban Forum recently organized a regional conference in Karachi on South Asian Cities from 9-12 January 2014. The Department of Earthquake Engineering and Department of Architecture and Planning, NED University of Engineering and Technology also participated in the Conference (Figure 8). The event was sponsored by the South Asia Institute, Harvard University, Planning & Development Department (Government of Sindh), Urban Unit (Government of Punjab) and the Institute of Architects, Pakistan.

Quasi-Static Lateral Load Test of RC Frame

Reinforced concrete structures with infill walls are very common in different parts of the world. Masonry infill walls play an important role in resisting the lateral loads due to high in-plane stiffness and strength. However, the in-plane contribution of stiffness and strength of infill walls is currently not incorporated in the design process of reinforced concrete (RC) frame structure buildings. Although, equivalent strut model technique has been suggested by the researchers to take into account the effect of infill masonry panels the data of behaviour of masonry used in Pakistan in not available. As a result, it is not possible to assess the effectiveness of suggested models for infill walls used in Pakistan.

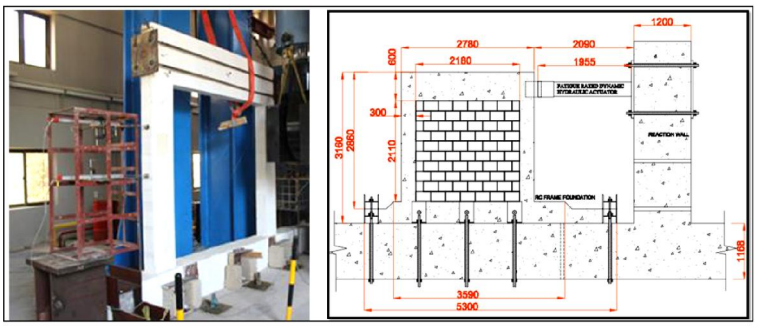

Figure 9: Test Setup of RC Frame and specimen in testing rig (left)

In view of this shortcoming, the Department of Earthquake Engineering has started a study so as to develop simplistic analytical modelling tools for infill walls which can be used by the design engineers in Pakistan. This study involves carrying out experimental testing of reinforced concrete frame (Table 1) with and without masonry infill and comparing the behaviours with the existing equivalent strut models. A full-scale 2.70 m x 2.80 m, single bay single storey reinforced concrete frame was tested in the Advance Material Testing Laboratory in the Department (Figure 9).

A fatigue rated dynamic hydraulic actuator was used for the lateral load testing, and the global displacements were monitored using string pots and displacement transducers. The numerical modelling of the frame was also carried out using the computer code entitled SeismoStrut prior to the experimental testing. The test of similar frames with masonry infill walls will also be conducted in future and the contribution of the infill walls will be evaluated. The work is expected to provide guidelines for the local engineers to include the infill walls in the design of frame structures.

Frame Size	2.71m Height x 2.78m width
Column Size longitudinal	0.15x0.3 m, 4-T12 bars (1% Steel) and 10@150c/c stirrups
Top Beam Size	0.15x0.6 m, 3-T12 steel bars in Top and Bottom each, and T10@150c/c stirrups
Bottom Beam Size	0.3x0.3/0.45 m, 3-T20 steel bars in Top and Bottom each, and T10@150c/c stirrups
Concrete Strength	15 MPa
Steel Strength	581 MPa

Table 1: Details of tested RCC frame

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- Prof. Muhammad Masood Rafi
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