



SOME RECENT CAPACITY BUILDING ACTIVITIES IN INDIA TOWARDS SEISMIC RISK REDUCTION

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ABSTRACT

Large parts of India are prone to damaging earthquakes and a substantial percentage of Indian constructions, both in urban and in rural areas, leave much to be desired in terms of seismic safety. Until recent years, seismic codes in the country were not mandatory and most professionals considered earthquake engineering as a super-specialty. This article describes some of the capacity building activities in the country in last about two decades. These include development of better seismic codes, training of professional engineers, creation of National Information Centre of Earthquake Engineering (NICEE), intervention in the academic world through the National Programme on Earthquake Engineering Education (NPEEE), etc. Some of these experiences may be valuable for capacity building in many other earthquake-prone developing countries.

Introduction

India's earthquake problem needs no introduction. Huge parts of the country are prone to devastating earthquakes, including the great earthquakes in the Himalaya. And, India has a huge stock of unsafe buildings, and continues to add to the unsafe building inventory in the absence of mechanisms for enforcement of the codes. The large number of deaths in some recent earthquakes has put focus on seismic safety in the country and there is a far better awareness and concern today than was the case two decades back. Nevertheless, awareness and concern for the problem are not enough to address the earthquake problem considering it requires significant expertise at all levels. Hence, it is of utmost importance to develop capacity for undertaking safety programmes at various levels.

This article discusses some of the significant capacity building activities undertaken in the last about two decades. The focus of these activities has been to develop better knowledge base within the country in earthquake resistant constructions, and to remove the myth that earthquake engineering is a super-specialty with which the average engineer or academic should not be concerned.

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Development of Codes and Training of Professional Engineers

The first seismic codes in India were developed and enforced after the 1935 Quetta earthquake in Baluchistan (Jain 2002). However, this was confined to a small geographical area affected by the earthquake. First formal seismic code meant for the entire country was published in 1962 (IS1893-1962) which specified the seismic design forces. The first seismic code specifying construction and detailing features came in the 1966 (IS4326-1967). Its 1976 version had some provisions for seismic detailing of RC frame buildings but those were considered quite inadequate. Hence, in the late 1980's and early 1990's efforts were made (Medhekar et al. 1992) to develop a more detailed code on ductile detailing of RC structures which resulted in publication of IS13920-1993. This code provided for the first time in India fairly detailed provisions on ductile detailing of RC frame and shear wall structures.

Starting in 1992, a massive continuing education programme was launched by IIT Kanpur to train professional engineers on "seismic design of RC buildings" (Jain and Murty 2003). Over the next about ten years, a huge number of engineers underwent these one-week courses where they learnt the principles of earthquake engineering and correct implementation of the codes, including some of the new concepts that were introduced in the codes. These courses were conducted in numerous cities in India (and in Nepal and Bhutan), and at times attracted 200 participants in the same class.

The result of the new code on ductile detailing and the training of professional engineers ensured that by the time 2001 Bhuj earthquake occurred, there were a significant number (not a sufficient number considering India is a very large country) of engineers that knew about earthquake engineering of buildings.

Under the reconstruction programme post-2001 earthquake, the Gujarat State Disaster Management Authority (GSDMA) sponsored a major project to IIT Kanpur towards development of codes, commentaries and handbooks on earthquake, wind and fire disasters. This resulted in development of a huge number of documents. An interesting aspect of the project was that all the documents were placed on the internet and a substantial number of persons in the country (and overseas) benefiting from these documents. Just as an example, the guidelines developed under this project for seismic design of buried pipelines has now been specified as a standard for several oil pipeline projects in India.

National Information Centre of Earthquake Engineering

The National Information Centre of Earthquake Engineering (NICEE) was set up at IIT Kanpur in 1999 with the mandate to empower all stakeholders in the building industry in seismic safety towards ensuring an earthquake resistant built environment (Jain 2002; Jain 2008). NICEE maintains and disseminates information resources on Earthquake Engineering and undertakes community outreach activities aimed at mitigation of earthquake disasters. Some of the activities undertaken by NICEE in the last several years include (a) annual literature survey workshops wherein graduate students from across the country spend about a week at NICEE to carry out state of the art review on the topic of their dissertation, (b) publication (Figure 1) and dissemination (Figure 2) (often free-of-charge) of monographs (many are reprints of reputed publications, with

permission from the original publishers), (c) translations into local languages, and (d) workshops, seminars and short courses wherein international experts are brought into the country to help improve state-of-the-practice in India in a specific narrow area.



Figure 1: A large number of publications on earthquake engineering are available through NICEE at IIT Kanpur

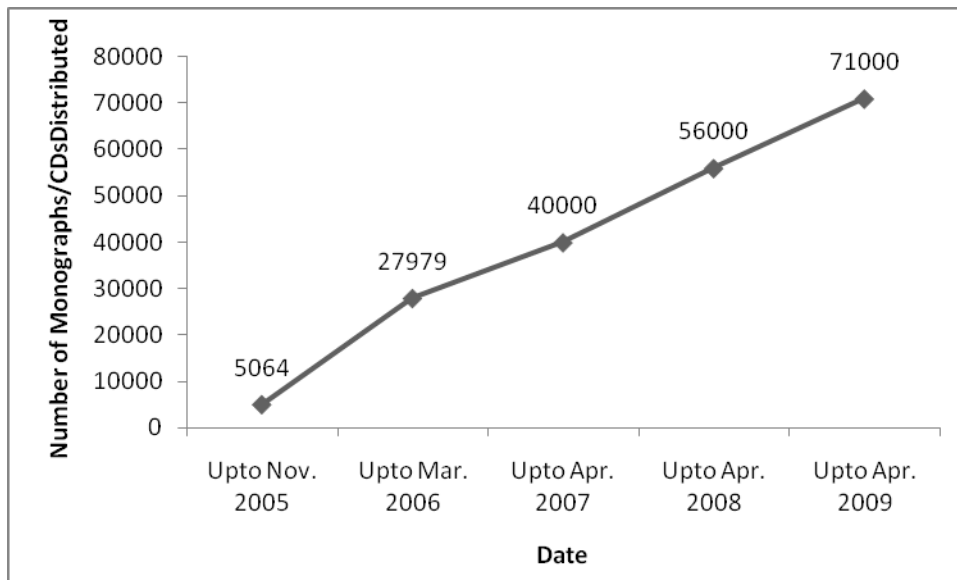


Figure 2: Number of monographs and CDs distributed by NICEE over the years

A major initiative of NICEE is towards sensitizing the architectural students on seismic safety issues. An annual 6-day workshop on earthquake resistant practices for students of architecture was started in July 2009. The objective of this Workshop is to sensitize students of architecture in earthquake resistant design practices through technical lectures followed by design studios where they are given hands-on guidance in earthquake resistant design by working on an architectural design project. NICEE participates in major events of architectural students, such as the National Association of Students of Architecture (NASA), where in copies of Earthquake Tips (Murty 2005) are distributed free-of-charge to the future architects and a quiz is conducted with cash awards based on the Tips.

An interesting aspect of NICEE is its funding and operations. NICEE was set up with an initial endowment of Rs 5 million (about US\$ 110,000) raised from four organizations. The Centre operates through income driven from sales of its publications, donations, specific projects (including organization of conferences and activities), and endowment interest. No assured source of income from either the government sources or the membership fee, implies that the Centre must remain efficient and effective for its survival. Also, it must remain responsive to its beneficiaries in order to continue to receive their donations. As of March 2009, a total of 370 individuals and organizations had donated (once or more than once) a sum of Rs 4.3 million (~US\$ 100,000) to the Centre with an average of Rs 11,800 (US\$ 260) and a median of Rs 2,500/- (US\$ 55), indicating a huge level of confidence in the Centre amongst the beneficiaries. Currently, the Centre's endowment stands at about Rs 10 million and its spending of the order of Rs 4 million per year.

National Programme on Earthquake Engineering Education

The National Programme on Earthquake Engineering Education (NPEEE) has been responsible for tremendous capacity building in the colleges of engineering and architecture in India (Jain 2008). It was supported by the Ministry of Human Resource Development of the Government of India during 2003-07, and managed by the seven Indian Institutes of Technology (Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras, Roorkee) and Indian Institute of Science Bangalore, with IIT Kanpur being the coordinating institute. The objective was to build capacity of the educational institutions in the area of earthquake engineering. NPEEE included components such as short- and medium-term training programmes for faculty members, international exposure to faculty members, development of resource materials and teaching aids, development of library and laboratory resources, and organisation of conferences and workshops. More than 1,400 faculty members of the colleges of engineering and architecture underwent one or more training under the programme, and a large number of colleges now teach earthquake engineering as a result of NPEEE. The NICEE at IIT Kanpur and the NPEEE had a mutually supportive role, wherein NPEEE executed several of the activities through NICEE.

Other Activities

In January 2003, a group of structural engineers launched a website Structural Engineering Forum of India (SEFI, www.sefindia.org) with a view to provide a platform to structural engineers and others to discuss and debate issues connected with the profession. Motivation for establishing the Forum emerged out of two e-Conferences conducted by NICEE

in 2002. Seeing the vigorous discussions amongst those interested in seismic safety during these e-conferences a need was felt for a regular discussion forum. Over the years, SEFI has emerged as a very vibrant community and is contributing enormously to the capacity building of structural engineers in India and overseas.

A series of one-day seminars for practicing architects in different cities has been very effective in making the professional architects appreciate their own role in seismic safety. The seminar series was sponsored by the Ministry of Home Affairs and the project was executed by the Indian Institute of Architects. Genesis of the series was in a single one-day seminar organized by the Govt of Delhi and UNDP with the assistance of IIT Kanpur. The concept in this series was that one architect and one structural engineer should deliver lectures on seismic safety as applicable to the practice of architecture and hold panel discussion.

Concluding Remarks

The last two decades in India have seen a significant revival of earthquake engineering, both in terms of academic as well as professional colleagues taking up seismic issues in their work. Many colleges are now teaching the subject in the curriculum and a large number of civil engineering/structural engineering graduates coming out of Indian universities now know something about earthquake engineering. This has been possible partly because of the capacity building activities discussed in this article and partly due to the awareness created by several damaging earthquakes in the country.

While a lot has been done, it is miniscule considering needs of a large country like India. There is a need to learn from the capacity-building experiences of the recent years and launch more systematic and bigger initiatives. Finally, even though capacity building is an essential condition for seismic safety, it is not a sufficient condition. One must ensure that the constructions on the ground improve and the trained manpower is able to put its knowledge to useful purpose. India needs a lot of work towards finding an effective way to implement seismic codes.

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