GoI-UNDP Disaster Risk Management Programme

A SEMINAR ON

ROLE OF ARCHITECTS TOWARDS SEISMECALLY SAFE BUILT ENVIRONMENT

(JANUARY 06, 2004)

PROGRAMME REPORT

A report by:

STATE PROJECT OFFICER
Office of the Divisional Commissioner
(State Nodal Agency for GoI-UNDP DRM Programme)
Government of National Capital Territory of Delhi
5, Shamnath Marg, Delhi-110054

ROLE OF ARCHITECTS TOWARDS SEISMECALLY SAFE BUILT ENVIRONMENT

BACKGROUND

The *GoI–UNDP Disaster Risk Management Programme* is a national initiative to reduce vulnerability of communities in some of the most hazards prone districts of India (169 Districts and 17 States). The Programme aims to enable State Government's to minimize losses to developmental gains and to reduce a vulnerability to various disasters. The programme relies upon a community based approach to disaster management and seeks to mobilize capacity of community and Government functionaries at all level and other stake holders in an organized manner. This Project envisages the broad components as awareness generation, development of preparedness and response plans at the community and administrative levels, development of a techno-legal regime for the states, capacity building at all levels and knowledge networking on international and national best-practices among all the cities and urban centres in the programme.

NEED OF THE PROGRAMME

Increasing vulnerability of Delhi to various man made and natural hazards calls for greater attention of all for mitigation and preventive aspects of disaster risk management and to build partnerships and alliances at all levels. The need for greater preparedness at all levels has prompted many stakeholders to be constantly working towards multi-hazard preparedness and mitigation at different levels. For better coordination and management, the disaster risk management programme, initiated by the State Government necessitates partnerships at different levels. In the event of calamities, the local community happens to be the first responder, for which strengthening of their coping mechanism has envisaged as one of the priority area for all stakeholders such as government, corporate houses, civil society organizations including engineers and architects.

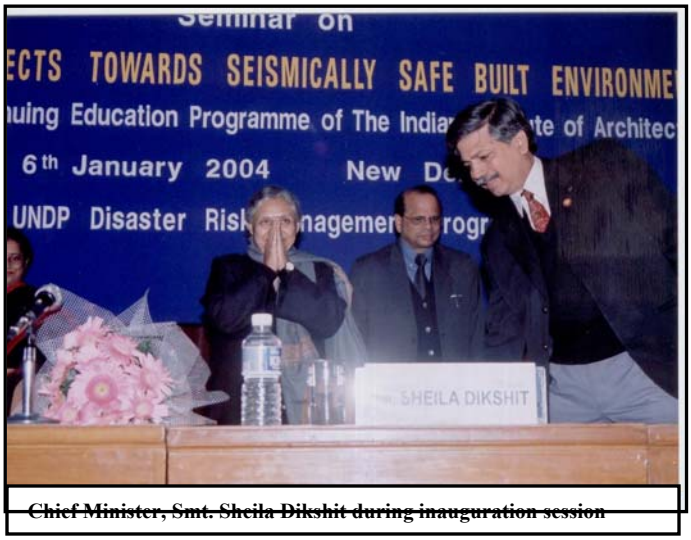
CONTEXT

Delhi is extremely vulnerable to disasters. The entire region of Delhi is in seismic zone IV, at high risk to earthquakes. Its densely populated areas with large amounts of unsafe building stock, non-engineered structures, the sizeable number of unauthorized colonies and urban slums compound vulnerabilities in Delhi. An earthquake can cause

unprecedented and colossal damage to Delhi. Further, on a day-to-day basis, Delhi is at risk to numerous hazards, such as bomb-blasts, other acts of terrorism, fires, industrial and chemical hazards, floods, building collapses, road accidents, water logging, etc.

WHY PROGRAMME FOR ARCHITECTS

Role of architects in earthquake disaster mitigation has been long recognized in countries, like USA and Japan, that are prone to strong earthquakes shaking. In those countries, the various levels at which the architects can intervene in the process of making constructions earthquake resistant is constantly emphasized through continuing education, legislation, and curriculum changes at architecture colleges. These initiatives spearheaded by the community of architects itself has led to improved understanding earthquake behavior of structures, identifying suitable materials and structural systems of buildings, strong partnership between architects and engineers towards the common goal of making structures earthquake-resistant, and thereby greater seismic safety of their built environment.



Chief Minister, Smt. Sheila Dikshit during inauguration session

PROGRAMME OBJECTIVES

- To provide a general understanding of various types of seismic hazards.
- To sensitize the architects community regarding the importance of seismic resistant construction.
- To provide a conceptual framework and understanding of an organizational structure to combat disasters within the existing available human and other resources at the national and State level.
- To strengthen partnership between architects, engineers and policy makers towards attaining ultimate aim of safer built habitat.

PROGRAMME VENUE

The programme has been organised at the conference hall of PHD Chamber of Commerce and Industry on January 06,2004 from 09:00 AM to 06:00 PM.

PARTNERS IN PROGRAMME

The *Bhagidars* of Delhi who have been an excellent example of community empowerment and partnership between government and communities or citizens has paved the way for furthering dialogue with important stakeholders. With this programme, Government of Delhi was successfully able to establish partnership with Indian Institute of Architects and PHD-Chamber of Commerce & Industry. Reliance Industries Limited was also one of the valuable supporters of the programme. This unique partnership initiative has urged the other state's to explore similar partnerships.

METHODOLOGY

The State Nodal Agency i. e. the office of the Divisional Commissioner has first requested all the agencies, government & private to provide the data base of the architects serving in various capacities. After analyzing the comprehensive database, the State Project Office has exercised detailed expectation analysis with individual department / agency and finally a training module was designed consultation with the expert resource faculties.

DPOs at registration desk assisting participants

RESOURCE PERSONS

Distinguished faculties and experts in the field of earthquake engineering Prof. C. V. R. Murty, Department of Civil Engineering, Indian Institute of Technology, Kanpur and Prof. Amit Bose, Former Professor, Department of Architecture and Planning, Indian Institute of Technology, Roorkee were invited as resource persons. The renowned

faculties took highly informative yet interactive sessions covering the Indian and international experience in seismically safe built environment.

PARTICIPANTS

Over 250 architects from both central and state government organizations as well as private practicing had participated in the programme, which includes experienced member architects from IIA, faculty and students from Colleges of Architecture, DDA, MCD, PWD, NDMC, MES, BSF, AIR, Post, BSNL, NBCC, AAI, ITPI, NTPC, IIT, BIS, BMTPC, DGHS, MHA, HUDCO, HSMI, NHB, CII, NIDM, DUAC, AICTE, TCPO, NCR Planning Board among others.

THE REFERENCE MATERIAL

A comprehensive study material has been prepared in association with resource faculties and issued to all participants. All the participants appreciated very useful & thoroughly researched reference material. Some of the important contents of the reference material are as follows:

- "*Bridging Architects and Seismic Design through Education*" by Prof. C. V. R. Murty, Department of Civil Engineering, Indian Institute of Technology, Kanpur
- "*Architectural Considerations*" by Farzad Naeim, Van Nostrant Reinhold, USA, 2001.
- "*Seismic Design within Architectural Education*" by A. W. Charleson from Bulletin of the New Zealand National Society for Earthquake Engineering, Vol. 30, No. 1, March 1977.
- List of Codes and Manuals on *seismic resistant construction and design*
- List of Books on *seismic resistant construction and design*
- List of e-Books (available through internet) on *seismic resistant construction and design*
- *Guidelines for Earthquake Resistant Buildings* by D. K. Paul, Yogendra Singh and Mukesh Kumar Ruhela from the Department of Earthquake Engineering, IIT, Roorkee.
- CD containing 2001 Bhuj (India) *Earthquake Reconnaissance Report* from National Information Centre of Earthquake Engineering (NICEE) IIT, Kanpur with permission Earthquake Engineering Research Institute (EERI), USA.
- CD containing *IAEE Guidelines for Earthquake-Resistant Nonengineered Constructions*,

- CD containing *IITK-BMTPC series on Earthquake Tips*
- CD containing *The Reconnaissance Report of the "North Andaman (Deglipur) Earthquake"*

INAUGURAL SESSION

State Project Officer Mr. Sanjay Kumar Jha has welcomed all the distinguished guests and participants. Seminar was inaugurated by lighting of traditional lamp by Chief Guest Hon'ble Chief Minister of Delhi Smt. Sheila Dixit.

CM inaugurating the programme by lighting traditional lamp, also seen Divisional Commissioner Smt. Sidhushree Khullar

In her Inaugural address Chief Minister acknowledged the fact that Delhi being at second most high risk (zone-4) to earthquakes. Its densely populated areas with many that have unsafe building stock with non-engineered structures compound our vulnerabilities. The problem is aggravated with the large number of structures built without involvement of any professional. In the context of Disaster Risk Management, she also announced the notification of the **Delhi Disaster Management Authority**, under the leadership of the LG of Delhi, with the CM and all ministers as members. As a part of awareness built-up program, the Chief Minister has said that the Government is planning for courses to be conducted for the officers responsible for disaster management with Delhi Government. Demonstrations for public awareness related to disasters will also be organized throughout Delhi. CM reiterated her concern to take up public awareness at a large–scale. She has suggested showing films of Gujarat Earthquakes in order to convey the message of preparedness among masses. She expressed her concern about the role of untrained builders who are the major

Chief Minister Smt. Sheila Dikshit delivering inaugural address

instrument behind construction of unsafe habitats. She called upon the Indian Institute of Architects to workout a system with the government, of training and certifying builders to ensure their technical competence. She assured that the government will do everything within its power to ensure the implementation of such guidelines.

PSO greeting Chief Minister Smt. Sheila Dikshit with Flowers

Honourable Chief Minister called upon architects to apply in-built safety measures in the buildings without spoiling their aesthetics and functionality. She has also suggested to come up with architectural responses of immediate temporary shelters to be used as hospitals and necessary utility during disasters. She urged the local self-government to implement building bye-laws so as the new constructions will adhere to safety standards and norms.

CM congratulated the Office of the Divisional Commissioner and Indian Institute of Architects in setting about this difficult task of ensuring a safe built environment in Delhi. She assured best in achieving objectives of the programme to Ministry of Home Affairs and UNDP in initiating the Disaster Risk Management Programme in Delhi. She mentioned that Delhi is equipped and is been able to manage flood and fire hazards satisfactorily. The need of the hour is to prepare Delhi equally well for earthquakes.

DPO greeting Mr. R. K. Singh with flowers

While presenting an overview of Disaster Risk Management Programme. Shri R.K.Singh, Central Relief Commissioner, Ministry of Home Affairs, Govt. of India, mentioned that finance commission is advised and guided on the Disaster Risk Management to help State's for the preparedness and mitigation measures.

Similarly, Planning commission has also included a chapter on disaster management hence, mitigation measures will be the priority in all development projects. He also said that response system will be strengthened to become stronger and speedy. He also stressed the need for developing Incident Commandant System. He also briefed about the IDRN, control room, national crises group and its use at the time of emergency. He also briefed about the new development with ISRO of the mobile terminals, which will have around 40 mobiles attached to it and will be helpful at the time of search and rescue. In part of earthquake mitigation he said that there is a need to review the building by-laws. There should be awareness in regard to implement them while constructing their buildings. A curriculum of earthquake engineering will be included as a part of bachelors course in civil engineering. All the public buildings and lifelines buildings like govt. structure, hospitals, schools etc will be retrofitted. DRM at school level is also started with inclusion in CBSE syllabi.

Smt. Sindhushree Khullar, Divisional Commissioner, Government of Delhi, dwelt upon the initiatives of the State Government in furthering the programme .

Ar. Balbir Verma, President, The Indian Institute of Architects, welcomed the initiatives taken by the Govt. of India and the Govt of NCT of Delhi. He said that this is the first program of the collaboration with the government on this issue and the IIA, as part of its continuing education program will take this message throughout India and ensure the architects are sensitized towards their role critical towards safe built environment. He also assured that the IIA will start working on the system that will help in identifying competent builders.

The program was coordinated by Mr. Sanjay Kumar Jha, Delhi State Project officer, Disaster Risk Management Programme and vote of thanks was given by Ar. Abhijit Ray, Chairman, Northern Chapter of IIA.

Prof. CVR Murty addressing participating architects

TECHNICAL SESSION – I

Prof. CVR Murty began this session with sharing international experiences. He said that architects, eventually need to develop a synergy across the country to build earthquake resistant structures. He mentioned that India has taken a big

leap (he showed a slide of colonial British India Versus The modern multi storied constructions built in Kolkata city) He opined that "this leap was possible by the architects and architecture of great expressions (Showed some modern buildings). Architects in the structure have produced lot of meanings that challenges structural engineers to apply number of technologies. Architects have built safe, suitable and special building for seismic conditions."

He mentioned that "there are 4 seismic zones and 60% of country's landmass falls under severe seismic hazards. This prompted that 3 out of 5 architects must have working knowledge of seismic practices. The society that we are surrounded by is full of myths about earthquakes, but architects can prove earthquake is not myth but it is a reality because they are going to decide the people's fate by casting the roof on their head."

He further stressed that "earthquake design is very special and unique. Civil engineering structures are very large in size and every structure is unique and expensive (he established a comparison between cars & aircrafts with Taj Mahal in order to underline the uniqueness of the construction activities). If we will make pyramid like structure that will not be affected in earthquake but that is not possible. We also have limited money and limited time (an additional complication)."

He said that "an earthquake depends upon the mass of the building which shakes with the base of the structure. Every building structure is like an inverted pendulum with hinges below. Earthquake gives different types of energy to different building structures and that's why damages vary. Similarly, small design structures will receive small earthquake forces whereas the bigger ones receive large earthquake forces."

He dwelt on the aspect of Soil condition and said that "clay makes a difference to the behaviour of structures at the time of earthquake. Flexibility of the soil participates in the swinging of the building. Earthquake Induced Force: F = ma (m- mass, a-acceleration)"

He had shown some graphs mentioning do's & don'ts in the architectural design along with examples containing illustrations of damaged structures of Bhuj earthquake and advised not to make the open ground storey in the buildings but with adequate shear force considerations.

He said that building must contain 4 virtues viz. strength, stiffness, ductility and configuration respectively. He has emphasized to maintain relative distance between two buildings and also described the importance of building configuration. He has discussed about the important cities falling under Zone-III,IV,V and concluded his presentation showing a slide with quotation " Learn to love the sea . . . . . you can learn to make the boats any time"

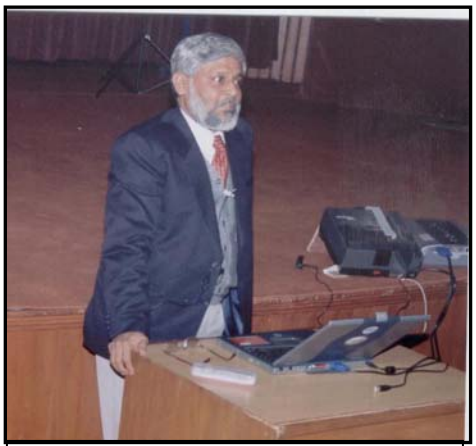
He also informed the participants about National Information Centre for Earthquake Engineering (website www.nicee.org) and extended further information through this centre regarding the building details, guidelines for architects, study materials, etc.

Impact: The participants appreciated the highly informative yet seminal session. Prof. A. S. Arya congratulated Prof. Murty a wonderful session. He told Delhi is under seismic zone–IV and reinforced concrete a building with seismic consideration does not cost more than 4% extra. He appealed the architecture friends to adopt the earthquake measures without worrying about the cost factor.

TECHNICAL SESSION – II

Professor Amit Bose begin this session with presenting some facts about global urban scenario as:

- By the year 2010, more than 55% of the population will live in the urban areas which comprises of 3% of earth's land area and more than 2.5 Billion people are living in the cities.
- 17 out of 20 largest cities in the world will be in developing countries and 80% of world's urban residents will be in developing countries by 2025.
- Cities and Towns are: reservoir of skills, centres for hope for millions of migrants, and engines of productivity and economic growth.
- Estimated per capita productivity ratio Urban: Rural i.e.7:2, prompted need to sustain and augment high urban productivity for the country's economic growth.
- Indian Scenario: a major natural hazard prone country (Earthquakes, Cyclones, Floods, Landslides, Droughts etc.) and more than 60% of area exposed to natural hazards.



Prof. Amit Bose addressing participants

- Magnitudes of disaster depends on :
    - Population density
    - Housing quality
    - Health & Nutrition status
    - Economic resilience of the community
    - Welfare infrastructure
    - Degree of Preparedness

He shared with the participants the cost of buildings damaged in the Gujurat earthquake and also gave idea about pre disaster planning and post disaster reconstruction. He said that spectrum of work includes:

- Hazard Mapping
- Risk Assessment
- Early Warning
- Structural and Non-structural Mitigation
- Public awareness programme

He also added that the disaster prevention is a development issue. As per the National Housing and Habitat Policy of the Government, 20 lacs housing units will be added per year. On the other hand the country losses on an average 13-15 lacs unit due to natural disaster per year hence net national housing stock creation suffred significantly. He also showed some damaged structures of Gujurat earthquake and gave technical tips to construct earthquake resistance buildings.

SESSION – III : THE ROAD AHEAD

This was an interactive session. Some of the important questions and answers are as follows:

Prof. CVR Murty interacting with participants

Question: - What is the percentage of engineered structure and non-engineered structures in urban India?

Answer: - Urban non-engineered structures were shaken after 2001. Earlier there were no such situations. Right now we don't have figure to point out.

Question: - What are the measures should be taken for implementation of building byelaws?
Answer: - Government is planning to certify engineers for the implementation of building bye laws. But we have to incorporate all the formalities with statuary bodies and municipal bodies. We have to prepare check list for the RCC frame structures. We have good design skills but knowledge of building bye laws are the problems. Checking at the site is fine but what to check is also a critical area of concern.

Question: - Do we have any city that has implemented the building codes judicially?
Answer: - Not yet. We need to build capacities and overall education about the codes when owner and contractor start working for the buildings. BIS codes are under revision although lots of controversies are also going on. On the other hand, we don't have sufficient trained personals for the enforcement of BIS codes.

Question: - What will happen to illegal construction in Delhi during earthquake?
Answer: - Govt. of Delhi is gearing up for massive community level awareness programmes and mass media campaign though television and newspaper. UN volunteers have already started working at grass route level in association with district administration. People encouraging illegal construction are not the one running short of money, but are the people lacking attitude of true Indians. Professor CVR Murthy quoted "India is not a poor country but Indians are poor".

Participating experienced architects

Question: - What can be done in Uttarkashi region to reduce vulnerability?
Answer: - The State government already started implementing Disaster Risk Management Programme. In housing, problem is with masonry buildings. These structures do not work upon calculations, hence need more consideration and awareness.

Question: - What can be done with the existing heritage?
Answer: - Retrofitting is an important technology which is needed to increase the strength of the buildings. It is a specialized technique, requires detailed guidelines to implement. But it is not an very cost

effective affair. If more than 40% of buildings need retrofitting than it is better to reconstruct the building.

Question: - How to retrofit old Delhi?
Answer: - We can do group/combine retrofitting for a couple of buildings. Government and community together should take decision about it. If retrofitting is not possible than Government might think of arrangements to rehabilitate them. Such areas need to be identified carefully.

Question: - What about the old monuments structures?
Answer: - Most of them are stronger enough hence surviving for decades.

Question: - Architecture design generally considers the direction of wind, soil, etc. In earthquake, most of the architects don't know about zones, epicenter and the direction etc. How can they design?
Answer: - Consider the two directions and design the structure. It has worked. Zone maps has not prepared yet. The existing one is based upon the past experiences. Our Geo-scientists should develop futuristic maps.

Question: - If we consider the directions, it means shape of the building should be considered as rectangle, whereas site conditions will permit designer building. This will lead to contrast on architects thinking?
Answer: - No, we do not mean that way. Because we are not in system therefore we feel like this. In foreign countries architects also practices in similar manner and come up with the beautiful buildings.

Question: - Is it not that you discourage building design and shapes?
Answer: - If you are an architect, do come up with the shape, but how to make it possible to build has to be done by structural engineer. So you have to pressurize for an engineer who know earthquake engineering as well. MCD and CPWD also have to follow that system. Without certification of structural engineer plan should not pass.

Question: - Is all the open story buildings and multiple storied buildings are vulnerable?
Answer: - Well, you can solve the vulnerability problems from basics. All the buildings having open story act like inverted pendulum. You should not leave the entire wall open. Structure should consider incorporation of earthquake resistant features.

Question: - What about the basement parking?
Answer: - It is ok with RCC structure. But ½ of the stairs below plinth level are also dangerous, hence need consideration.

Question: - How safe are glass buildings?
Answer: - Much consideration is not needed but if cheap quality construction, it can fall down.

Question: - RCC walls & stiff basements are ok?
Answer: - Buildings should start at the top of the basement.

Question: - If architect have to give certificate then his power get limited. Syllabus is becoming a shopping bag. We are increasing syllabus but time is limited. At teaching level training is not there. Even certificates and clearance will become liability?
Answer: - Syllabus will be changed as per time and new architects should practice with their seniors. In that manner certification will not remain a liability, and we have to move with time. Growing community has to be open minded. If there is something important, students have to learn that. It is a matter of practice and participation and demarcation of regime.

Question: - Is it not a pain to certification of architects, because then they have to spare more time in checking etc ?
Answer: - Better qualified architects are sitting in government offices as well as private practicing firms. There is a huge cottage industry of architects and engineers. The industry will not survive without a smaller group of aware professionals. It is better to change ourselves and join us. IIA is working hard rationally and more professionally. IIA and professional architects are also rethinking of professional group of earthquake resistant buildings.

OVERALL PROGRAMME OUTCOME

This one-day program for architects has exposed participating architects to international architecture practices. A detailed analysis of the Indian architectural practice is also presented with a view to understand the road ahead for the community of architects. The program also initiated discussion on how the community of Indian architects can take advantage of the earthquake-disaster mitigation initiatives of national and state governments, and also take advantage of the available information base on earthquake-resistant constructions.

ANNEXURE I PRESS COVERAGE

Rashtriya Sahara
Dt: 7th January 2004, Wednesday

दिल्ली आपदा प्रबंधन प्राधिकरण का गठन शीघ्र

सहारा समाचार
नयी दिल्ली, 6 जनवरी

उपराज्यपाल विजय कपूर की अध्यक्षता में शीघ्र ही दिल्ली आपदा प्रबंधन प्राधिकरण की स्थापना की जाएगी। मुख्यमंत्री और दिल्ली सरकार के मंत्री इसके सदस्य होंगे। दिल्ली सरकार आपदा प्रबंधन कार्यक्रमों को केंद्र सरकार और संयुक्त राष्ट्र विकास कार्यक्रम के दिशा-निर्देशों के मुताबिक अंजाम देगी।

दिल्ली सरकार और भारतीय वास्तुकार संस्थान द्वारा संयुक्त रूप से मंगलवार को आयोजित कार्यशाला में उक्त जानकारी मुख्यमंत्री शीला दीक्षित ने दी। इस एकदिवसीय कार्यशाला में सरकारी एवं निजी क्षेत्रों में कार्यरत 250 से अधिक वास्तुकारों ने भाग लिया। मुख्यमंत्री ने कहा कि राजधानी की भौगोलिक स्थिति ऐसी है कि यहां भूकंप का लगातार खतरा बना रहता है। ऐसे में यह जरूरी है कि प्राकृतिक आपदा प्रबंधन के क्षेत्र में ठोस कदम उठाये जाएं।

Disaster management authority for Delhi announced

Statesman News Service

NEW DELHI, Jan. 6. — Announcing the setting up of a disaster management authority for the Capital, the Delhi chief minister, Ms Sheila Dikshit, today stressed the need for sensitisation of people about the issue.

The authority will be headed by the Lieutenant-Governor and will have Delhi cabinet ministers as its members. Speaking at a seminar on the issue, the chief minister said the Capital was at a high risk of earthquakes and it was necessary to take cautionary steps in the direction of disaster mitigation.

Stressing on the need for creating awareness about disaster management among people as one of the best ways of mitigating disaster, Ms Dikshit called for a more active and visible role by the departments concerned, agencies, non-governmental organisations and professionals in this direction.

The chief minister said the Disaster Risk Management Programme would be taken up in the Capital on the lines of the Government of India-UNDP Disaster Management Programme to reduce the vulnerability of the city to disasters.

The chief minister said the government was planning to conduct training and sensitisation workshops for officials of the Delhi government over the issue.

"Similarly, the government will undertake sustained awareness generation campaigns to create public awareness about disasters and their management," the chief minister added.

Ms Dikshit also stressed on the need for local and civic bodies to formulate and implement building by-laws in a manner that new constructions adhered to safety standards and norms.

The Statesman
Dt: 7th January 2004, Wednesday

The Hindu

Dt: 7th January 2004, Wednesday

Sheila's call to architects

NEW DELHI, JAN. 6. The Delhi Chief Minister, Sheila Dikshit, today urged architects to apply in-built safety measures in buildings without spoiling their aesthetics. She also suggested an immediate architectural response to temporary shelters that could be used as hospitals and necessary utilities during disasters.

Ms. Dikshit was speaking at a seminar on "Role of Architects in Seismically Safe Built Environment", organised by the Indian Institute of Architects in association with Delhi Government. Her Government was planning for training and sensitisation workshops in the coming days, she said.

पचास फीसदी भवन भूकंप की दृष्टि से असुरक्षित

नई दिल्ली (का.सं.)। भूकंप के मुहाने पर खड़ी राजधानी के करीब पचास फीसदी भवन तेज भूकंप का झटका नहीं झेल सकते हैं। वास्तुविदों का कहना है कि दिल्ली में जिन अनाधिकृत कालोनियों, गांवों आदि पर खतरा मंडराता है वहां बड़ी आबादी निवास करती है। वहीं बड़ी संख्या में दुकान खोल कर बैठे झोलाछाप आर्किटेक्ट और बिल्डर सांठ-गांठ कर भवनों के लिए आवश्यक भूकंप रोधी उपाय नहीं कर रहे हैं। भूकंप को लेकर यह चिंता मंगलवार को दिल्ली सरकार और इंडियन इंस्टीट्यूट ऑफ आर्किटेक्ट की ओर से आयोजित सेमिनार में जताई गयी। इसका उद्घाटन मुख्यमंत्री शीला दीक्षित ने किया।

मुख्यमंत्री ने अपने सम्बोधन में कहा कि वह इस विधा की विशेषज्ञ नहीं हैं लेकिन एक नागरिक की हैसियत से वह चाहती हैं कि वास्तुविद भूकंप से बचाने की जिम्मेदारी लें। उन्होंने कहा कि हमें गुजरात से सबक लेना चाहिए। जिस तरह से भवनों में आग से बचने के उपाय किए जाने लगे हैं उसी प्रकार भूकंपरोधी उपाय भी जरूरी हो गए हैं। भूकंप के खतरों से जनता को आगाह कर उन्हें जागरूक करने की आवश्कता है। उन्होंने कहा कि जनता को भूकंप के प्रति जागरूक बनाने के लिए उन्हें भूकंप से सम्बंधित फिल्में और ऐसे वर्कशाप आयोजित करने की आवश्यकता है। उन्होंने पुरानी दिल्ली और भूकंप की अनदेखी कर बन रहे बहुमंजिलें मकानों पर चिंता जताई। उन्होंने स्थानीय निकायों से बिल्डरों को भूकंपरोधी उपाय कड़ाई से पालन कराने की

- **दिल्ली सरकार और इंडियन इंस्टीट्यूट ऑफ आर्किटेक्ट की ओर से सेमिनार आयोजित**
- **'अर्थक्वेक' में नुकसान के जिम्मेदार 'क्वेक' आर्किटेक्ट**

'मिट्टी-भूसा' मार्डन तकनीक में शामिल

नई दिल्ली (का.सं.)। ग्रामीण इलाकों में जिस तरह मिट्टी में भूसा मिलाकर मकान बनाए जाते हैं उसी तकनीक को रिलायंस समूह ने आधुनिक बना दिया है। रिक्रॉन 3एस नामक फाइबर भूसे का काम करता है और इसे निर्माण सामग्री में मिलाने से वह दरार को बचाता है।

रिक्रॉन के निदेशक आदित्य गुप्ता का कहना है कि फाइबर के छोटे-छोटे धागे निर्माण सामग्री में मिलाने से उसे एक धागे में बांध देता है। इससे भवन में दरार नहीं पड़ती जो भूकंप के लिए महत्वपूर्ण है। रिलायंस समूह ने रिक्रॉन 3एस का प्रदर्शन मंगलवार को आर्किटेक्ट सम्मेलन में किया।

बात कही। उन्होंने सुझाव दिया कि वास्तुकारों को अस्थाई शेल्टरों को निर्माण करना चाहिए ताकि प्राकृतिक आपदा पर उनका इस्तेमाल हो सके।

गृह मंत्रालय के संयुक्त सचिव आर.के.सिंह ने कहा कि भूकंप संभावित इलाकों में अस्पताल व स्कूल बनाते समय उपाय अति आवश्यक हैं। क्योंकि आपदा के बाद लोगों को बसाने और इलाज प्राथमिकता होती है। भवनों के निर्माण में भारतीय मानक ब्यूरो के निर्देशों का पालन आवश्यक है। हमें ईरान के भूकंप से सबक लेने की आवश्यकता है।

दि इंडियन इंस्टीट्यूट ऑफ आर्किटेक्ट के अध्यक्ष बलबीर वर्मा ने अपने सम्बोधन में कहा कि दिल्ली ने इस तरह के सेमिनार की पहल की है जो पूरे देश में जारी रहेगी। उन्होंने कहा कि इस सम्बंध में गृह मंत्रालय का भी सहयोग मिल रहा है।

श्री वर्मा ने बताया कि दिल्ली के करीब आधे भवन जिसमें सर्वाधिक अनाधिकृत कालोनियां, गांव और झुग्गियों के मकान शामिल हैं भूकंप के हिसाब से खतरनाक हैं। और शहर की बड़ी आबादी इन्हीं स्थानों में रहती है। उनका है कि आर्किटेक्ट के क्षेत्र में घुसे झोलाछाप (क्वेक) अर्थक्वेक से होने वाले नुकसान के लिए सबसे अधिक जिम्मेदार होंगे, क्योंकि न तो यह भवन स्वामी को भूकंप के खतरों के प्रति आगाह करते हैं और इनके बनाए नक्शे नुकसान का सबसे बड़ा कारण बनते हैं।

Hindustan

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Gearing up for disasters

Gradually disaster preparedness is gaining priority among construction professionals, finds Mukta Naik

Ever since the twin disasters of the Orissa Cyclone and the Gujarat Earthquake, the word disaster has acquired a whole new meaning for Indians. Besides highlighting the need to prepare ourselves for future disasters, these events placed a serious responsibility on the shoulders of construction professionals in the country. Seen in the light of the new knowledge that was coming to us after these sad events, architects and engineers, for the first time, are being seen as guardians of life and property.

Besides safety, the inability to save buildings from collapsing during disasters exacerbates the housing shortage within the country. While the 1998 Housing and Habitat Policy aims to add 20 lakh housing units a year, a whopping 13-15 lakh units are destroyed in natural disasters every year, making a mockery of the government's efforts to tackle the housing problem.

A number of government and non-government initiatives have been set up in the past few years with the aim of developing policies that would ensure disaster preparedness and relief. Further, they aim to create a framework within which these policies would be carried out in the event of a disaster. Indian professionals and bureaucrats have become increasingly active in international forums on disaster mitigation.

Today building bye-laws are being revised and new construction codes are being put in place to ensure safe practices. The responsibility for building better structures that would not fail in the event of disasters has been placed squarely on the shoulders of construction professionals.

Though fine in theory, there are snags in this approach. Neither civil engineers nor architects are exposed to the concepts of disaster resistant design and construction during their training. Also, the development of norms and codes is time-consuming while the need to address these issues is urgent. Moreover, architects and engineers tend to pass the responsibility on to each other, and are often unaware of how effective their efforts can be.

"Architects and engineers can work hand-in-glove to create earthquake resistant structures. While structural safety is the main focus of engineers, the structural configuration chosen by architects controls the overall behaviour of structures during earthquakes," revealed Dr. C.V.R. Murthy, an eminent civil engineer and expert on disaster resistant construction at a seminar on "Role of Architects towards seismically safe-built environment" organized by the Indian Institute of Architects and the GOI-UNDP Disaster Risk Management Programme last week. Using a wide range of illustrations and examples, the seminar focused on equipping architects with the basic principles that could be used while designing buildings in earthquake prone zones, while respecting the need for creativity and architectural expression.

Information regarding precautions that should be taken while designing a building in an earthquake zone has been developed internationally as well as adapted to Indian conditions by experts. With about 60 percent of land area in the country under the threat of moderate to severe seismic actions, there is a need for developing a strong movement urging professionals to learn and practise seismic safety.

While complex structural calculations may be the purview of the structural engineer, architects can ensure the safety of the buildings they design by keeping in mind some basic thumb rules. Essentially, there are four factors that affect the earthquake resistance of a structure - strength, stiffness, ductility and configuration. While the first three can be addressed by the engineer through seismic design provisions, the architect decides the most vital of them all - the configuration of the building, i.e. its size, shape and geometry, and the location and size of the structural and non-structural elements.

The architect needs to conceive a stable shape with elements that are knitted together properly. Convex forms, where a line between any two points within the structure passes through the mass of the building itself, are the most stable. On the other hand, alphabet-shaped configurations are unstable. Similarly, structural elements that form a tight box are stable. Hence the size and placement of openings becomes critical. And buildings on stilts should be avoided.

In addition, construction materials should be as light as possible. Architects need to be educated that the incorporation of the principles of seismic safety into buildings is essential and not necessarily harmful to the creative process. The concern that seismic consideration will inhibit architectural design is common.

"Design considerations for seismic safety will become a part of the set of variables considered for site planning and design, just as you consider building bye-laws and climate factors, once architects accept the danger of earthquakes as a reality," assures architect Amit Bose, former Professor of Architect at IIT Roorkee.

Another major hurdle faced by professionals who wish to practice seismic safety is the perception that the cost may be prohibitive. Statistics show that the additional cost of making a building seismically safe is a mere 4 per cent for almost all types of construction.

The architect also needs to take on the role of educating clients and pushing the cause of seismic safety. Insurance policies and new building codes will, in time, aid the process of enforcing safer construction.

Educating professionals is a coin with two sides: these are knowledge and sensitivity. Whereas knowledge can be provided through seminars and easy access to databases and resource materials, sensitizing architects towards the reality of disasters is the second, more crucial part. Effective sensitization of professionals will automatically drive the acquisition of knowledge, production of necessary equipment and materials, training in super-specialized areas of disaster mitigation, and the inclusion of disaster preparedness in the curriculum at bachelor level, among many other moves.

Various organizations of construction professionals all over the country, agencies like the UNDP, various NGOs and forums are beginning to take the issue of sensitization seriously. The aim of making India prepared for disasters by 2020 is slowly and surely taking shape.

The author is an architect and urban planner. She consults with CCPS

ANNEXURE II LIST OF PARTICIPANTS

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Enclosed as invitation card.doc

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=====end of the report=====