



**NATIONAL PROGRAMME FOR  
CAPACITY BUILDING OF ENGINEERS  
IN EARTHQUAKE RISK MANAGEMENT  
(NPCBEERM)**



**MINISTRY OF HOME AFFAIRS  
NATIONAL DISASTER MANAGEMENT DIVISION  
GOVERNMENT OF INDIA**

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PROGRAMME FOR  
CAPACITY  
BUILDING

OF

ENGINEERS IN  
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Ministry of Home Affairs

Government of India

National Programme for Capacity Building for Engineers in  
Earthquake Risk Management  
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1. Background:

1.1 On account of its geo-climatic conditions, the Indian sub-continent is highly prone to multiple natural disasters including earthquakes, which is one of the most destructive natural hazards with the potentiality of inflicting huge loss to lives and property. Earthquakes pose a real threat to India with 55% of its geographical area vulnerable to seismic disturbance of varying intensities including the capital city of the Country. Almost the entire northeast region, northern Bihar, Himachal Pradesh, Jammu & Kashmir and some parts of Kutch are in seismic zone V, while the entire Gangetic plain and some parts of Rajasthan are in seismic zone IV.

1.2 India has experienced some of the most intense earthquakes in the world and is also one of the most earthquake prone countries in the world. Data from 1897-1991 shows that an average of three earthquakes of magnitude 6.0 or more, occur in India every year and the high degree of seismic vulnerability of the country poses a real threat to the millions of its people.

1.3 In the span of last 15 years, India has experienced six earthquakes of moderate intensity. Although moderate in intensity, these earthquakes caused considerably high degree of losses to human life and property, which highlights the vulnerability of the population and infrastructure to earthquakes and the inadequacy of preparedness measures in the country. The Latur earthquake of 1993 and the Bhuj earthquake of 2001 which caused extensive damage to lives and properties further highlighted the need to focus upon long-term seismic mitigation and

preparedness in order to reduce the human and economic losses due to earthquakes.

2. Initiatives taken by the Ministry of Home Affairs (MHA):

2.1 The Ministry of Home Affairs is the nodal Ministry for Disaster Management in the country (except for disasters such as droughts and epidemics). After the transfer of the subject to MHA from Ministry of Agriculture, there has been a paradigm shift in focus from 'reactive' relief to 'proactive' mitigation and preparedness. MHA have taken a number of initiatives to strengthen disaster management systems in the country and the focus of MHA's efforts is basically to build up the capabilities at all levels necessary for preparing for and handling all types of disasters. With the above objectives in view, a National Disaster Management Framework (National Roadmap) was drawn up with the approval of Deputy Prime Minister listing the areas of cooperation/initiatives required to reduce our vulnerability to disasters and to upgrade capabilities at all levels for responding to disasters. The important sectors covered in the National Roadmap include institutional structures, disaster prevention/mitigation projects, early warning systems, preparedness, quick response and human resource development.

2.2 Considering the earthquake vulnerability of the country, MHA have advised the States and UTs to ensure that the following measures are put in place:

- (a) Review and, if necessary, amend building bye-laws to incorporate the BIS seismic codes for construction in the concerned zone. Similarly, it should be ensured that the plans/designs of the Government construction departments are in accordance with the BIS codes for these zones.
- (b) In the municipal areas, make it mandatory for the builders/buyers to submit building plans prepared by an architect and certified by an structural engineer to get

building construction permission and make the structural engineers who have prepared the building plan responsible for adherence to the BIS codes/building bye-laws.

- (c) Evaluate the seismic safety of the existing life-line buildings such as hospitals, water supply towers, fire stations, schools with a capacity of 1000 or more students, main administrative buildings etc. and take necessary steps for retrofitting.
- (d) Lay down mandates for private builders/developers to carry out retrofitting of all private hospitals, cinema halls, shopping malls and multi-storied residential and office complexes.
- (e) Carry out awareness generation campaigns through mass media, rallies, meetings, audio-visual shows, distribution of pamphlets, posters covering various aspects of earthquakes, their effects, Do's and Don'ts to create awareness among the people about vulnerability to earthquakes.

### 3. Problem Statement:

3.1 Most casualties during earthquakes are caused by the collapse of structures, both engineered and non-engineered, and structural mitigation measures are the key to make a significant impact towards earthquake safety in our country. These have to be dovetailed in the planning process at the developmental stage itself. For successful earthquake mitigation, it has to be ensured that all new constructions in the seismic zone are compliant with the BIS Codes and for this purpose a techno legal regime has to be put in place. Though Bureau of Indian Standards (BIS) has laid down the national standards for construction in seismically vulnerable areas, these are not mandatory in nature. In many States, building byelaws are non-existent, and even in states where there are byelaws, which have considerations for seismic safety, the enforcement mechanisms leave a lot to be desired. The regulatory agencies (Municipal Bodies, Development Authorities) Work Departments and other agencies and departments have not been able to

enforce/implement these standards/ codes in construction mainly due to lack of capabilities; both in terms of availability of manpower and technical competence. The structural Engineers/Architects practicing in the private sector do not have knowledge of seismic safe designing and construction.

3.2 The first step towards the implementation of an earthquake mitigation strategy will be to put in place an appropriate techno legal regime. Building byelaws have to be amended to incorporate the BIS codes for seismically safe construction. There is a need for institutions in the States, which will give technical advice to the urban local bodies in carrying out amendment of the building byelaws. Currently, civil engineering faculties of most of the engineering colleges do not have this expertise.

3.3 The Municipal Engineers need to be trained in BIS codes so that they are able to enforce these codes after these are included in byelaws. Institutional arrangements need to be made for training of the Municipal engineers.

3.4 Training will also be required to be given to engineers of the State Public Works Department (PWD) so that the construction undertaken by the Government agencies is seismically safe. Institutional arrangements need to be made for this training. Civil and structural Engineers practicing in the private sector also need to be trained so that the housing stock coming up in the private sector is compliant to the BIS codes. Ultimately, there is a need to move towards a certification system whereby civil/structural engineers can practice only after they have undergone a course in seismically safe construction. Institutional capacity needs to be built up and necessary arrangements for this purpose are required to be made.

3.5 Awareness generation is a key requirement. For awareness generation there will be need to develop information, education and communication materials keeping in view the specific structural practices in the rural areas of the relevant States so that the models which are suggested are in consonance with the traditional structural practices and are also in tune with the traditional construction materials. Institutions with appropriate technological competence need to be designated for this purpose.

Insofar as the existing stock of building is concerned, it will not be possible to retrofit all the buildings. However, it will be necessary to retrofit lifeline buildings and the buildings where people congregate like cinema halls shopping complexes, multi-storied buildings, etc. The difficulty is that even where States want to undertake retrofitting of the lifeline buildings, technical support is not available.

3.6 Any programme for earthquake mitigation will have to take care of these institutional aspects.

4. Goal:

4.1 The overall goal of the programme is sustainable earthquake risk reduction in the country.

5. Coverage:

5.1 All the States and Union Territories of the country will be covered under the programme.

6. Time duration:

6.1 The duration of the project will be of three years - from April 2004 to March 2007.

7. Objectives of the programme:

- (i) Putting in place an appropriate techno legal regime for ensuring seismically safe construction practices in every State/UT.
- (ii) Building up the capacity of the Municipal bodies/ Urban local bodies to implement this techno legal regime.
- (iii) To ensure seismically safe construction by training of the structural Engineers in the state PWDs.
- (iv) Putting in place a system of training and subsequently of certification of Civil and Structural Engineers practicing in the private sector.
- (v) Establishment of Hazard Safety Cells in each State/UT to ensure compliance to building byelaws and safe construction practices, creation of a framework to conduct certification courses for engineers and architects.
- (vi) Provide technical support to the State Governments in carrying out retrofiting of lifeline buildings and systems.

8. Project support activities:

8.1 The above objectives are proposed to be achieved as follows :-

8.2 In each State/UT, 2 to 4 State Resource Institutes (leading engineering colleges) will be identified by the State Government depending upon size of the States. These State Resource Institutes will work with the State Administrative to assist them to modify their building bylaws to make it compliant to the BIS codes for seismically safe construction. The State Resource Institutes will train Municipal Engineers in the BIS codes. These institutions will also be used for training of Engineers of State PWD as well as Engineers in the private



sector in seismically safe constructions. The State Resource Institutions will also provide technical expertise to the State Government for evaluating seismic safety of lifeline buildings and carrying out retrofitting of these buildings.

8.3 The first step would be to train the faculties of civil engineering of the Partner Institutions in earthquake engineering. Faculties from these State Resource Institutes will be trained by National Resource Institutes- by the Indian Institutes of Technology (IITs) Mumbai, Delhi, Guwahati, Kanpur, Kharagpur, Chennai, Roorkee, and Indian Institute of Science, Bangalore and few other leading institutes/colleges. Thereafter the State Resource Institutes will assist the urban local bodies in amending the byelaws to incorporate the BIS codes as also train the municipal engineers/ PWD Engineers as well as Engineers working in the private sector in the BIS codes. The Faculty Members from the State Resource Institutions will also provide consultancy/advice on retrofitting of lifeline buildings in the States.

8.4 For developing capacity of the States/UTs to undertake training of PWD/municipal engineers/Engineers in the private sector , a two-fold approach will be adopted. Four faculty members from each State Resource Institute will be trained for six weeks in Earthquake Engineering at the National Resource Institute. The services of these State Resource Institutes will be utilized for training of PWD/Municipal engineers and Engineers practicing with private sector in a phased manner. These institutions will also provide consultancy services for seismic safety and retrofitting of key lifeline buildings, review the building bye-laws and suggest amendments to incorporate BIS codes into the building bye-laws and support the States for developing a framework for mandatory registration/certification of civil engineers.

8.5 The activities envisaged under the programme are as follows: -

- (i) Identification of 2-4 State Resource Institutes in each State/UT (depending upon the size of the State/UT) to be developed into the focal points for providing technical assistance for the earthquake mitigation programme. A total of 105 State Resource Institutes (on an average 3 from each State/UT) will be identified for this purpose in consultation with State Govts./UT Administrations.
- (ii) Development and preparation of six weeks' special training module/materials for training of trainers from these State Resource Institutes.
- (iii) Training of faculty from State Resource Institutes/PWD engineers in special training module at National Resource Institutes. At the rate of 4 faculty members from each State Resource Institute, the total number of faculty members to be trained at National Resource Institutes will work out to 420.
- (iv) Meeting of urban local bodies to be convened by State government to review existing bye-laws/codes.
- (v) Suggest amendments with reference to earthquake safety issues.
- (vi) Recommendation of appropriate modalities to be pursued for ensuring compliance to seismic safety norms for construction.
- (vii) Development and printing of training modules by National Resource Institutes for training of PWD/municipal engineers as well as engineers in the private sector.
- (viii) Conduct training programmes for municipal/PWD/ private engineers in the BIS codes.

- (ix) Creation of framework for mandatory registration/ compulsory competency assessment of practicing engineers in private sector.
- (x) Identification of key life-line buildings for retrofitting by State Governments.
- (xi) Consultancy support by the State Resource Institutions.
- (xii) Establishment of Hazard Safety Cells in each State/UT to ensure compliance to building byelaws and safe construction practices, creation of a framework to conduct certification courses for engineers and architects. Assistance will be provided by the Govt of India to meet the traveling expenses & honoraria to be paid to non-official members (Retired senior engineers)
- (xiii) The 105 State Resource Institutions will undertake two weeks training programme for 10,000 engineers- 6,000 engineers in the public sector and 4,000 engineers in the private sector.
- (xiv) The training programme will consist of two modules of one week each (5 working days), one each in RCC construction and masonry construction.

## 9. Overall framework:

The programme will have the following framework

9.1 The National Core Group on Earthquake Mitigation constituted under the Ministry of Home Affairs, will designate IITs and IIS Bangalore and few other leading institutes/colleges (total 10) as National Resource Institutes to provide training in earthquake engineering to the faculty of engineering colleges.

9.2 Government of India will advise the States/UTs to nominate select Civil engineering colleges as State Resource Institutions. 2-4 numbers of institutions will be identified in each State/UT depending upon their size.

9.3 Faculty members in structural engineering from each State Resource Institution depending upon their size will be trained at National Resource Institutes in a six week special module to prepare potential faculty to be used for training of PWD/Municipal engineers and engineers practicing in the private sector at the State/UT level.

9.4 All together about 420-faculty members across the country will be trained in six weeks' special module in earthquake engineering components. These faculty members will undertake training of about 10,000 Municipal / PWD / private engineers in building byelaws/BIS codes and seismic safe constructions (6,000 in public sector and 4,000 in private sector).

9.5 Identified Towns/Cities will be attached with each State Resource Institute and the State Resource Institutes will work in conjunction with the Municipal bodies for modification of building bylaws.

9.6 State Resource Institutions will assist the State Government for creating a mandatory registration system/ certification system for engineers practicing in the private and public sector.

9.7 State Government will identify lifeline buildings, which will need to be examined from the point of view of vulnerability to earthquakes. State Resource Institutions will assist in the examination of as also in making recommendation for retrofitting where necessary.

9.8 In each State/UT, Hazard Safety Cells will be established to ensure compliance to building byelaws and safe construction practices and creation of a framework to conduct certification courses for engineers and architects.

9.9 Evaluation of the project on its conclusion in the last quarter of the project period of three years.

## 10. Terms of Reference (TOR) For the Institutions at different levels

The Institutions at different levels will have the following responsibilities;

### 10.1 National Resource Institutes

- Conduct of training programmes for 420 faculty members from State Resource Institutes in six weeks special module in seismically safe construction and retrofitting in a time span of one year.
- Development of course curriculum and training materials for the above course.
- Development and printing of course curriculum and training materials for two weeks' module for municipal/ PWD engineers and engineers in the private sector.

### 10.2 State Resource Institutes

- Conduct of training programme for 10,000 PWD/ Municipal engineers as well as engineers in private sector in building byelaws/BIS codes and seismic safe constructions over a period of three years.

- Assist Municipal bodies in review and amendment of building byelaws.
- Assist the State Government in creation of a framework for mandatory registration/ certification of engineers in private and public sector.
- Consultation services for the State to assess seismic vulnerability and suggest retrofitting of key lifeline buildings

### 10.3 State Hazard Safety Cells

In each State/UT, Hazard Safety Cells will be established to ensure compliance to building byelaws and safe construction practices, creation of a framework to conduct certification courses/ mandatory registration of engineers and architects, review of building byelaws, suggest necessary changes to incorporate BIS codes in building byelaws etc. The Cells may be constituted from selected members of various State Resource Institutes / retired senior Engineers across the State and specialists in the subject matter under the chairmanship of the State Relief Commissioner to take up the above activities. The Govt of India will provide financial support for one non-official member in each state for two years.

## 11. Programme Management:

11.1 National level arrangements: At the national level the Ministry of Home Affairs will be the Nodal agency for execution of the project. A Project Management Board (PMB) will be constituted under the Chairmanship of Secretary, Border Management to provide overall guidance to the programme. The project implementation will be overseen

by a Steering Committee (SC) consisting of the members of the Core Group on Earthquake Mitigation and representatives of various resource institutes across the country, under the chairmanship of the Joint Secretary, NDM. The SC will meet quarterly to review the progress of the programme.

11.2 State level arrangements: In each State/UT, a Steering Committee will be formed out of selected members of various resource institutes across the State and specialists in the subject matter under the chairmanship of the State Relief Commissioner to review the progress of the programme at the State level. The Steering Committee at the State level will meet quarterly to review the progress of the programme.

## 12. Execution arrangements:

12.1 Ministry of Home Affairs, Government of India will execute the programme in collaboration with States/ UT Administrations. The national nodal agency, MHA will provide support to strengthen the institutional, administrative, techno-legal system for earthquake vulnerability reduction. The State Government would provide support for the successful implementation of the programme.

12.2 The Resource Institutions at the National level will develop and print manuals, training modules, and earthquake risk management aids/ materials. The State level Resource Institutes will provide training to cadre of engineers from concerned agencies and departments in earthquake engineering. They would in-turn facilitate training of local masons in seismic safe constructions and retrofitting.

13. Financial Management and Accounting:

13.1 The total cost of the project works out to Rs.12.36 crores as indicated in the Annexure. The expenditure will be incurred by way of grants-in-aid to be given to National Resource Institutes and each State/UT. The States/UTs will then release funds to the State Resource Institutes where the faculty will be trained for carrying out project activities. The State Resource Institutes in each State will be the leading engineering colleges to be designated by the concerned State Governments.

14. Programme outcomes:

14.1 The building byelaws of the urban local bodies for seismic zones amended to include BIS codes for seismic safe construction.

14.2 Capacity building of the State Resource Institutes to carry out training of PWD/Municipal Engineers as well as engineers practicing in the private sector.

14.3 Establishment of Hazard Safety Cells in each State/UT to ensure compliance to building byelaws and safe construction practices, creation of a framework to conduct certification courses for engineers and architects.

14.4 Municipal/State PWD/private Engineers trained to implement the modified building byelaws and in BIS codes for seismic safe constructions.

14.5 Consultancy available to the States for retrofitting the lifeline buildings.

14.6 Frame work developed for compulsory registration /certification courses for engineers practicing in private and public sector.



Budget for the National Programme for Capacity Building of Engineers for Earthquake Risk Management (NPCBEERM)

Activity	Remarks	Numbers	Modules in which they will be trained	Duration	Unit Cost	Cost Implications
National level consultations/ workshops to launch and publicise the programme/ finalize the modalities of programme implementation/ and holding consultations for finalization of the training module	Participants will be faculty members from National and State level engineering colleges/ institutes, relief commissioners, directors of Technical Education from various States/ UTs etc.	Four workshops will be held with in the project period	N.A	1-2 days per workshop	2.5 lakhs	10.00 lakhs

<p>National Level TOT at the National Resource Institutes for faculty members of selected Civil Engineering Colleges and PWD engineers from all States/UTs</p>	<p>Faculty members will be nominated by each State/UT depending upon the size of the State/UT for the National TOT (4 from each State Resource Institute; on an average, 3 State Resource institutes from each State/UT (35X3X4)</p>	<p>420 (will be trained in 21 batches over a period of one year)</p>	<p>One special module in Earthquake engineering and retrofiting</p>	<p>6 weeks</p>	<p>#Training cost @ Rs 6 Lakhs for each module (6X21)=126.00 lakhs (including training materials, resource persons, field visit, hiring lecture hall, office expenses etc)</p> <p># misc. expenses 10% overhead of Rs.126.00 lakhs =12.6 lakhs</p> <p>#lodging and boarding @ Rs 350 per day. (Rs.250 for boarding and lodging including tea and breakfast and dinner and Rs.100 for two coffee/ tea breaks and lunch to be provided during training by the Resource Institutes (350X40X420)=58.80 lakhs</p> <p># Travel expenses @Rs. 10,000 per participant (10,000X420)=42 lakhs</p>	<p>239.40 lakhs</p>
<p>Development and printing of model Special Training Curricula, training materials and training guide book by the National Resource Institutes to be used for the TOTs and to be sent to 105 State Resource Institutes</p>	<p>Development of 6 weeks' course materials by a team of experts nominated by the National Resource Institutes plus two weeks material for training at State Resource Institutes</p>	<p>N.A</p>	<p>N.A</p>	<p>N.A</p>	<p>Training materials for State Resource Institutes for training of 10,000 engineers) @ 200 X 12000 copies= Rs 24.00 lakhs</p>	<p>24.00 lakhs</p>

Library and Equipment support to National Resource Institutes	Equipment for the purpose of demonstration to be provided to National Resource Institutes, besides library support	10	N.A	N.A	Rs.8 lakhs to each Institute	80.00 lakhs
Training of PWD engineers/ Municipal engineers and engineers in private sectors in Seismic Safe construction and Retrofitting by the faculty members of State Resource Institutes who have received training at National Resource Institutes	Training will be imparted to Government Civil engineers in Municipalities/ ULBs/ regulatory authorities , PWDs and engineers in the corporate sector in BIS and seismic safe construction and retrofitting (two modules of 5 day each)	10,000	1.RCC construction 2.Masonry structure	Five days per module	Lodging/Boarding for 12 days @350 /- per day (Rs.250 for boarding and lodging including tea and breakfast and dinner and Rs.100 for two coffee/ tea breaks and lunch to be provided during training by the Resource Institutes (350X12X10,000)	420.00 lakhs
Support to the State Resource Institutes for conducting 2 weeks' module	Support will be given to the State Resource Institutes for conducting training modules	A total of 250 batches will be held across all States/UTs to train 10,000 PWD/ Municipal /private engineers	1.RCC construction 2.Masonry structure	Five days per module	Rs 25,000/- per module (25,000X2X250)=Rs 125.00 lakhs  Misc. expenses overheads @10% of 125.00 lakhs= 12.5 lakhs	137.50 lakhs
Library and equipment support to State Resource Institutes	Elementary equipments for the purpose of demonstration, besides library support	105	N.A	N.A	Rs.2 lakhs	210.00 lakhs

<p>Support to State Governments/UT Administrations to meet the traveling and honoraria cost of one non official member in each State on the Hazard Safety Cells to be constituted by the concern State Governments. The Hazard safety Cells will assisting the compliance of BIS Codes/ Seismic safety norms in construction as well as provide support for review of existing byelaws and suggest amendments with reference to earthquake safety issues and make recommendation for ensuring compliance to seismic safety .</p>	<p>The Hazard Safety Cells will scrutinize the Type Plans of the State Departments to ensure that earthquake resistance features have been incorporated. The Cells will also audit the construction with a view to ensuring that required earthquake safety measures have been incorporated.</p>	<p>One Hazard Safety Panel will be set up by each State/UT , Government.(Total 35)</p>	<p>N.A</p>	<p>2 years</p>	<p>30 man-days per annum @ Rs.2500/- per day for two years for 35 state/UTs. (30*2500*2*35)</p>	<p>Rs 52.50 lakhs</p>
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Support to States/UTs for creation of a system for mandatory registration of Civil Engineers both in Private and Public sector	Support will be provided to each State/UT for creation of a system for compulsory certification whereby civil/ structural engineers can practice only after they have passed the certification examination in seismically safe construction.	N.A	N.A	N.A	A lump sum amount of Rs. 1.5 Lakhs will be provided to each State/UT	52.50 Lakhs
Consultancy support for evaluating seismic safety of lifeline buildings	Consultancy services by State Resource Institutes for seismic vulnerability analysis of key life line buildings in States/ UTs	N.A	N.A	N.A	The consultancy fee will be paid by the concerned departments of State Govt./UT administration	Nil
Evaluation of the Programme	Evaluation to be carried out during the last quarter of two years period to assess the impact of the programme	N.A.	N.A.	N.A.	N.A.	10.00 lakhs
Total Cost						Rs. 12.35.90 lakhs (Approximately Rs 12.36 crores)