

A MINISTRY OF HRD INITIATIVE

NATIONAL PROGRAMME ON EARTHQUAKE ENGINEERING EDUCATION



EXECUTED BY
INDIAN INSTITUTES OF TECHNOLOGY
(*Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras and Roorkee*) and
INDIAN INSTITUTE OF SCIENCE, BANGALORE

Project Implementation Plan



DEPARTMENT OF SECONDARY AND HIGHER EDUCATION
MINISTRY OF HUMAN RESOURCE DEVELOPMENT
GOVERNMENT OF INDIA, NEW DELHI

August 2003



2001 Bhuj Earthquake

Contact NPEEE ...

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First Published March 2003
Revised August 2003

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SECTION I: Background

1. Earthquake Risk in India

Indian earthquake problem cannot be overemphasized. As per current seismic zone map of the country (*See Annex A*), more than 60% of the land area is considered prone to shaking of intensity VII and above (MMI scale). In fact, the entire Himalayan belt is considered prone to great earthquakes of magnitude exceeding 8.0, and in a short span of about 50 years, four such earthquakes have occurred: 1897 Assam (M8.7), 1905 Kangra (M8.0), 1934 Bihar-Nepal (M8.3), and 1950 Assam-Tibet (M8.6). A recent scientific publication by Bilham et al (2001)¹ warns of very severe earthquakes likely in the Himalayan region anytime now which could endanger large populations in India.

Earthquake engineering developments started rather early in India. For instance, development of the first seismic zone map and of the earthquake resistant features for masonry buildings took place in 1930's, and formal teaching and research in earthquake engineering started in late 1950's. Despite an early start, the seismic risk in the country has been increasing rapidly in the recent years. Many recent earthquakes (*See Annex B*) have clearly underlined the inadequate preparedness of the country to face damaging earthquakes.

Most deaths during an earthquake are caused by collapse of man-made structures. Moreover, current scientific knowledge is nowhere close to being able to make successful short- or medium-term predictions of damaging earthquakes. Hence, the most important step towards a earthquake-resilient India is to build capacity in our civil engineering and architectural professionals for ensuring earthquake resistant constructions.

Prior to the Bhuj earthquake of 2001, common concerns regarding earthquake safety in India included: (a) Indian codes, developed by the Bureau of Indian Standards (BIS), are not mandatory and are only in the nature of guidelines; (b) The construction of structures as such is governed by the municipal bye-laws, which are in the jurisdiction of the state governments; and (c) The code provisions for seismic design, detailing and construction have not yet been incorporated into the building bye-laws. However, the situation has changed since the Bhuj earthquake of 2001. Seeing the vast devastation in Gujarat, particularly the collapse of modern multistorey residential buildings, many state governments have taken steps to require compliance of earthquake codes. However, merely passing a law or issuing an order does not ensure earthquake safety. *Intention* is only one of the necessary aspects; *capability* to execute an earthquake-resistant building is also needed. Earthquake-resistant design has its own sophistication that cannot be transferred to an engineer through training for a few hours or a few days. Thus, a sustained long-term effort is needed to make a significant impact towards earthquake safety in our country.

¹ Bilham R, Gaur V K, and Molnar P, "Himalayan Seismic Hazard," *Science*, Vol. 293, 24 August 2001, pp. 1442-1444.

2. Earthquake Engineering Education in India

Formal activities in the field of Earthquake Engineering in the country were started in the late 1950s at the University of Roorkee (UOR). The first Indian seismic code was published by the Bureau of Indian Standards in 1962. Since then, Indian earthquake engineers have handled numerous prestigious and challenging projects in high seismic regions of the country. However, an average civil engineer in the country has not been systematically brought into the agenda of earthquake safety yet. Our engineering curricula did not incorporate components related to earthquake resistant constructions, and we did not make serious systematic efforts to ensure that the practicing professional engineers are trained in this subject. As a result, a typical engineer even today looks at earthquake engineering as an area of *super-specialty* to be handled only by *researchers* and *professors*. The cause of earthquake-disaster mitigation through constructions that can appropriately withstand earthquakes can be achieved only when the professional civil engineers in India are able to ensure earthquake-resistant constructions.

A typical undergraduate civil engineering curriculum in the county does not include any coverage of earthquake engineering. Even at the post-graduate level, only a small fraction of structural engineering students gets a chance to study earthquake engineering and design. This results in most civil engineers not receiving any formal training in earthquake engineering during the undergraduate or post-graduate studies. This anomaly needs to be corrected for a country like ours with an enormous earthquake problem.

Even if we were to implement revised curricula in our institutions with adequate coverage of earthquake engineering principles, it may not be effective till we have sufficient number of qualified teachers of the subject, course materials, manuals, text books, etc. Hence, the entire issue of earthquake engineering education in India is fairly involved.

3. Genesis of NPEEE

In view of the large losses during the Bhuj earthquake of 26 January 2001, Cabinet Secretariat wrote to the Ministry of Human Resource Development (HRD) regarding training of teachers in this subject. The Honourable Minister of Urban Affairs too discussed the matter with the Honourable Minister of HRD. A meeting was called by the MHRD with representatives of IITs, IISc, AICTE, *etc.*, to discuss the matter. In the meeting, it was decided to develop a national initiative towards this, called the *National Programme on Earthquake Engineering Education (NPEEE)*.

4. Other Stakeholders

Earthquake safety is a very complex task and requires participation of numerous stakeholders; academic institutions are just one of these. In order to achieve earthquake safety, the government bureaucracy, engineering organisations (such as CPWD, state PWD's, Housing Boards and Electricity Boards), local governments and general public must work proactively in this direction. It is expected that the limited scope and objectives of NPEEE will act as catalysts for the other stakeholders to develop parallel initiatives relevant to their role in earthquake disaster mitigation (*See Annex C*).

SECTION II: The Programme

1. Objectives

The National Programme on Earthquake Engineering Education (NPEEE) supported by the Ministry of Human Resource Development (MHRD) aims at developing better teaching capabilities within the country in the crucial area of Earthquake Engineering. The country is prone to unacceptably large earthquake risk that needs to be reduced by a variety of means. However, in any endeavour towards seismic risk reduction, the lack of adequate quality and quantity of manpower is a major bottleneck in our country. NPEEE is meant for developing capacity within the engineering and architectural institutions of the country in this subject. The main vehicle of this change is the *training of teachers and curriculum development*.

Capacity building of teaching institutions will enable them to: (a) teach the principles of earthquake engineering to their students, (b) provide training to the professional engineers in this subject since most professional engineers have not studied this subject during their college days, (c) conduct research and development on problems of relevance to our country, (d) provide consulting services to important civil engineering projects, and (e) from time to time, provide the government with intellectual inputs towards technical and policy issues for earthquake safety.

India is a large country and has more than one thousand technical institutes, including the National Institutes of Technology/Regional Engineering Colleges, which teach civil engineering¹ or architecture at diploma, undergraduate or postgraduate levels. Thus, capacity building of our technical education system is an ambitious project by any yardstick. The present three-year project is a modest attempt to get the process of capacity building started. It is hoped that this phase of the project will lay down sound foundation for a more ambitious and longer-term initiative for the next 10 to 20 years.

This project is significant not just because of its potential towards seismic risk reduction, but has wider implications for the technical education in India. This is the first project wherein the eight premier institutions, namely the seven IITs and the IISc, will work together for a common and focused national cause of developing capacity in other technical institutions. It will lead to very valuable lessons on their working together and could help evolve a viable model for more such future projects in diverse areas of science and technology crucial for the country. It is therefore very important that NPEEE should strive to become a role model for future such endeavours by setting exemplary mechanisms of inter-institutional understanding and cooperation.

¹ For the purposes of NPEEE, Civil Engineering Department will mean to include appropriate departments such as Structural Engineering, Applied Mechanics, Construction Engineering, Architectural Engineering, etc.

2. Strategy

The main strategy of developing earthquake engineering education in a large number of academic institutes in the country is through training of teachers and curriculum changes. This will be done through following specific activities:

- (a) Train teachers of engineering colleges, polytechnics and architecture colleges in the subject of earthquake engineering
- (b) Provide international exposure to teachers by encouraging them to attend international conferences
- (c) Provide training opportunities to a select number of teachers in international environment
- (d) Develop teaching aids and printed material in the subject of earthquake engineering
- (e) Develop library resources in the subject of earthquake engineering in a large number of academic institutes
- (f) Develop basic teaching laboratories in the subject of earthquake engineering in a number of engineering colleges
- (g) Build strong academic programmes in the subject of earthquake engineering in the premier institutes (IITs and IISc)
- (h) Develop advanced teaching and research laboratories in the subject of earthquake engineering in the premier institutes (IITs and IISc), that can also be accessed by students and teachers of other institutes / colleges for academic purposes
- (i) Facilitate medium-term visit of international experts in earthquake engineering to the eight resource institutes
- (j) Sensitise faculty members of engineering and architecture institutes on earthquake engineering, and different stakeholders towards Earthquake Disaster Mitigation by sharing ideas through workshops and conferences

3. Scope

This project is focused on training of trainers and on curriculum development, and hence has a fairly limited scope. For instance, it does not provide resources for taking up research and development by the academic institutions in the area of Earthquake Engineering. It is hoped that other concerned ministries such as the Department of Science and Technology and the Ministry of Urban Development may develop similar initiatives in Earthquake Engineering.

NPEEE is also intended to act as an agent for motivating the eight resource institutes to develop strong teaching and research base in Earthquake Engineering. In addition, it is expected that the eight resource institutes will give higher priority to Earthquake Engineering and related subjects in their post-graduate programmes. Even though the focus of NPEEE is on training of teachers, this opportunity may be used to a reasonable extent to train personnel from the industry also. It is of course expected that the cost on industry participants will be met by the industry.

At present, there are very few scholars pursuing M.Tech or Ph.D. in Earthquake Engineering under the Quality Improvement Programme (QIP). It is important that the QIP mechanism be used effectively towards the objective of training of teachers in Earthquake Engineering. This can best be done by additional number of seats under QIP for Earthquake Engineering.

4. Activities

The following activities are included in the present phase of the NPEEE:

(a) Training:

Short-term (1-4 weeks) and *medium-term* (1 semester) training of teachers of engineering colleges, polytechnics and architecture colleges will be undertaken at the eight resource institutes.

- In the *one-semester certificate programme*, 100 trainees are to be trained per year for 3 years. The duration of training is 5 months for each teacher.
- In the *short term training courses*, every year 350 teachers are to be trained for one week each (or a smaller number of teachers for more weeks each).

(b) Library Resources:

- About 100 institutes will be provided *books and publications* in earthquake engineering.
- Some *library support* will be provided to the eight resource institutes .

(c) Laboratory Enhancement:

- Modest *laboratory enhancement* will be taken up at ten institutes. Different colleges may choose to enhance their equipment in different ways depending on the infrastructure currently available with them and their long-term vision.
- Modest *enhancement of the advanced teaching and research laboratories* will be financially supported at the eight resource institutes.

(d) International Exposure:

- A limited number of young and deserving teachers will be deputed for *international training*, up to a total of 50 man-months over a period of 3 years, in the form of working for up to six months in an international environment, attending established courses, or research assignments abroad.
- 50 Indian teachers will be provided partial travel grants each year to attend international conferences to seek exposure to international state-of-the-art in this subject.
- A few *international experts* on the subject will be invited to the eight resource institutes for teaching, research and long-term collaborations. A provision of about 20 man-months over a 3-year period has been made.

(e) Development of Curricula:

A concerted effort will be taken up to develop curricula, teaching aids, course materials, textbooks, manuals, and commentaries to codes.

(f) Dissemination of Knowledge:

Workshops and conferences will be organized to share ideas and sensitize different stakeholders in Earthquake Disaster Mitigation.

5. Financial Plan

The total financial outlay for this 3-year phase of the NPEEE is Rs.13.76 Crores. Budgetary allocations for the various activities of the project are presented in *Annex D*.

SECTION III: Programme Management

1. National Level Structures

The *National Committee on Earthquake Engineering Education (NCEEE)* has been formed as per Table III.1. The NCEEE is responsible for overall monitoring of NPEEE, and coordination with other Ministries / Departments and AICTE. It also recommends allocation of funds to participating institutes.

The NPEEE will be steered through a Programme Implementation Committee (PIC), which is chaired by Professor Prem Vrat, Director, I.I.T.Roorkee. Professor Sudhir K. Jain, the *National Coordinator* of the NPEEE, will be the *Convenor* of the PIC. The details of the membership of the PIC are given in Table III.2.

2. Activity Level Structures

The PIC has formed three sub-committees for *Library Support*, *Laboratory Development*, and *Partial Travel Grant for International Conferences*. Details of these committees are given in Tables III.3 to III.5. In due course, more sub-committees may be appointed by the NPEEE.

Table III.1: Constitution of the *National Level Committee on Earthquake Engineering Education (NCEEE)*

Shri V. S. Pandey Joint Secretary (Technical Education), Ministry of HRD, GoI, New Delhi	Chairman
Shri Pawan Agarwal Director, Ministry of HRD, GoI, New Delhi	Convenor
1. Two Institute Coordinators of Resource Institutes (7 IITs and IISc) by rotation. For the year 2003: Professor R. N. Iyengar, Department of Civil Engineering, I.I.Sc. Bangalore Professor Ravi Sinha, Department of Civil Engineering, I.I.T.Bombay 2. Representative of the Ministry of Urban Development 3. Representative of the Ministry of Home Affairs (NDM) 4. Representative of the Ministry of Science and Technology 5. Nominee of the Chairman, AICTE 6. Professor Sudhir K. Jain, Department of Civil Engineering, I.I.T.Kanpur 7. FA (HRD) or his Nominee	<i>National Coordinator</i>

Table III.2: Constitution of the *Programme Implementation Committee (PIC)*

Professor Prem Vrat Director, I.I.T.Roorkee	Chairman
Professor Sudhir K. Jain, National Coordinator, NPEEE Department of Civil Engineering, I.I.T.Kanpur	Convener
1. <i>Institute Coordinators of Resource Institutions</i> Professor Ravi Sinha, Department of Civil Engineering, I.I.T. Bombay Professor T. K. Datta, Department of Civil Engineering, I.I.T. Delhi Professor S. K. Deb, Department of Civil Engineering, I.I.T. Guwahati Professor C. V. R. Murty, Department of Civil Engineering, I.I.T. Kanpur Professor S. K. Nath, Department of Geology and Geophysics, I.I.T. Kharagpur Professor A. Meher Prasad, Department of Civil Engineering, I.I.T. Madras Professor S. Basu, Department of Earthquake Engineering, I.I.T. Roorkee Professor R. N. Iyengar, Department of Civil Engineering, I.I.Sc. Bangalore 2. <i>Three representatives from Other Institutions</i> Professor Madhavan Pillai, Department of Civil Engineering, NIT, Calicut Professor Subir Saha, School of Planning and Architecture, New Delhi Professor K.K.Soni, Principal-In-charge, Government Polytechnic, Ahmedabad	

Table III.3: Sub-committee on *Library Support*

Professor A. K. Jain, Department of Civil Engineering, I.I.T. Delhi	<i>Chairman</i>
Professor S. K. Deb, Department of Civil Engineering, I.I.T. Guwahati	
Professor C. V. R. Murty, Department of Civil Engineering, I.I.T. Kanpur	

Table III.4: Sub-committee on *Laboratories Development*

Professor D. K. Paul, Department of Earthquake Engineering, I.I.T. Roorkee	<i>Chairman</i>
Professor Alok Goyal, Department of Civil Engineering, I.I.T. Bombay	
Professor S. K. Nath, Department of Geology and Geophysics, I.I.T. Kharagpur	

Table III.5: Sub-committee on *Partial Travel Grant for International Conferences*

Professor Prem Vrat, Director, I.I.T. Roorkee	<i>Chairman</i>
Professor Sudhir K. Jain, Department of Civil Engineering, I.I.T. Kanpur	<i>Convener</i>
Professor T. K. Datta, Department of Civil Engineering, I.I.T. Delhi	

SECTION IV: Implementation Plan

1. Overall Framework

Eight premier institutes (seven IITs and IISc) will be the lead resource institutes to provide the technical know how and training to the teachers of engineering colleges/polytechnics and schools of architecture. The programme will be open to all recognized engineering colleges/polytechnics and schools of architecture having related academic degree/diploma programme. A small number of teachers will also be sent abroad for training/exposure.

It is recognized that the eight resource institutes do not have the same strengths in the area of Earthquake Engineering. Hence, these institutes may share different activities in different proportions. Moreover, the present proposal should enable the resource institutes to at least partially enhance their own expertise and facilities in this subject. Depending on the need and the participation of different resource institutions, NPEEE will allocate funds to these institutions for activities under this scheme.

The NPEEE will be kick-started with a workshop consisting of teachers from all over the country to discuss the issues of Earthquake Engineering education. Workshops of smaller group of teachers will discuss the model curricula and related issues.

The resource institutes will organize a number of short-term courses ranging from one week to four weeks for the teachers of engineering colleges/ polytechnics and schools of architecture. These courses will also allow participation of a limited number of working professionals. However, the cost on training of professionals will not be borne out of the MHRD funds.

Some of the resource institutions (depending on their own manpower) will develop one-semester certificate course in Earthquake Engineering for teachers. These courses, not leading to degrees or diplomas, will be treated as the continuing education programmes, and a certificate will be awarded to teachers on successful completion of this programme. Many teachers already have Masters'/Doctoral degree and they may find it very suitable to go through this one-semester programme. Moreover, it will enable colleges to develop teaching manpower in this subject in a reasonably short period. Again, some participants from the industry will be permitted to attend the one-semester programme, but the cost on their education is not to be covered by the NPEEE funds.

As of now, there are many competent Earthquake Engineering experts working with some of the resource institutes. However, the number of such experts is too small for needs of a large country such as India. This situation is particularly alarming with respect to areas of Geotechnical Earthquake Engineering, Engineering Seismology, and Earthquake Geology. The project will encourage the resource institutes to strengthen their faculty resources so that each of the institutes has the required critical mass to be able to play a vital role in building up the human resource and R&D in Earthquake Engineering commensurate with needs of the country. It is expected that each of these institutions will strive to have at least the following numbers of faculty members:

- : 4 to 8 faculty in Structural Earthquake Engineering
- : 2 to 4 faculty in Geotechnical Earthquake Engineering, and
- : 3 to 6 faculty in Earthquake Geology / Engineering Seismology

Barring IIT Roorkee, no other institute has such a number of faculty members in earthquake engineering. They may gradually build up the faculty in these areas, considering that it will not be easy to find outstanding candidates for faculty positions in the immediate future. The present proposal does not incorporate budgets for these positions and it is expected that the Institutes would develop this faculty strength from within their own resources.

To maintain quality and international standards in our system, it is important that adequate exchange of ideas takes place with top international institutions. Hence, the programme also provides support for international visitors to the resource institutions for short and medium terms, and for travel grants for Indian academics to attend international conferences abroad. In addition, a small number of young teachers will be sent abroad to premier international institutions for training. This training could be in the form of established courses, or as research assignments of six-months duration.

The programme will support development of basic teaching laboratories at about 10 colleges. The colleges will be selected based on open competition depending on their current infrastructure (research and otherwise), past work, and faculty resources. The programme also has a modest provision to strengthen teaching and research laboratories at the resource institutes.

The programme will provide Earthquake Engineering books to about 100 engineering colleges. Again, the selection will be based on open competition. The resource institutes also will be provided library grants to develop a strong resource base in earthquake engineering with the understanding that the same will be extended to other institutes.

The resource institutes may require additional infrastructure in terms of hostels, guesthouse, office space, laboratory space, etc in order to effectively execute this project. However, it is expected that the normal MHRD Plan Grants to these institutions will be used for this purpose, and hence, no separate budget is being provided for in the NPEEE budgets.

The initial project proposal is for the duration of three years. However, it is expected that such an initiative has to run for 10 to 20 years to be fully effective. After two years, the programme will be reviewed and a proposal will be submitted for extension after incorporating changes considered appropriate in view of experience gained.

2. Challenges

By its very nature, the NPEEE poses a number of challenges in its implementation. The project envisages numerous training programmes to be conducted by the eight resource institutes for the teachers of several hundred engineering institutes. The resource institutes themselves have limited number of faculty members in the area of Earthquake Engineering. After the Gujarat earthquake of 2001, there is a significantly higher level of activity in this subject area and hence most such academics currently have too much work at their hand. These training programmes will

be yet another additional work for them. Hence, it is important that these resource persons feel inspired and enthused for the NPEEE and develop ownership for it.

Most engineering institutes in the country are facing a huge shortage of faculty members. Therefore, sending the faculty members for trainings is not always convenient to the college administrators for academic reasons. Thus, the college administrators too need to fully appreciate the importance of this project and be enthused to have their institutes participate.

The trainees need to be highly motivated to undergo intense training. For instance, the semester programme envisaged in the project is not only demanding in academic requirements, but also requires the trainees to be away from their families for about five months.

In general, there can be a large variation in the quality of training. Hence, it is very important to have suitable mechanisms for ensuring quality of the training programmes under the NPEEE.

The NPEEE is based on numerous separate activities related to training, resource development, laboratory development, international exposure, etc. This not only involves a tremendous effort in administering and steering this project but also requires careful coordination and monitoring for successful implementation.

The grant is to be spent by the eight different resource institutes, which sometimes have variation in their internal norms for financial matters. Similarly, the programme envisages that ten colleges will receive support towards laboratory development and 100 colleges towards library resource enhancement. The financial management in this scenario will have its own difficulties such as timely collection of utilization certificates.

3. Activity-wise Details

3.1 Communications

Since a large number of colleges and college teachers may be interested in the programme, a good communication system is essential for the NPEEE. The colleges should be requested to name one individual for receiving official communications from NPEEE. An email listing of all colleges and potential trainee faculty members needs to be developed. A web site should announce the different activities from time to time. The website of National Information Center of Earthquake Engineering (NICEE) (www.nicee.org) will be used for this purpose to save the efforts for developing and maintaining a new website. An attempt should be made to develop a directory of technical institutes in the country with brief information about their academic programme, faculty and other resources, and other activities connected with earthquake engineering. Such a directory can be extremely helpful in the implementation of the NPEEE.

The PIC should meet as frequently as needed, but at least once in three months. It is expected that initially, PIC may need to meet more often. As far as practicable, the PIC meetings should be rotated among the eight resource institutes. This will give PIC members an opportunity to view the Earthquake Engineering facilities and activities in different resource institutes.

3.2 Launch Workshop

The NPEEE was formally launched by conducting a one-day National Workshop on *Earthquake Engineering Curriculum: Challenges and Road Ahead* held at IIT Delhi on 5 April 2003.

3.3 Short-Term Training

Short-term training is defined as that of one-week to four-week duration for which the college administrators may not have to relieve the trainee from his semester teaching responsibilities. These courses can be very useful to give a first exposure to the teachers in Earthquake Engineering, as well as for higher-end specialized topics. Engineering college teachers are often required to complete a given number of short courses before they can get a higher pay-scale. Hence, an effective mechanism is needed to ensure that only seriously interested teachers undergo training under the NPEEE. A common application form will be used by all the eight institutes for inviting applications for seeking admission to the short-term trainings under NPEEE.

To ensure highest quality of training, the resource institutes needs to be cautious in volunteering to undertake training projects keeping in view their faculty expertise. For this, the Institute Coordinators need to use utmost discrimination in forwarding the course proposals from their respective institutes.

At the end of all short courses, a test will be conducted to evaluate value addition of the training and to evaluate the suitability of the trainees. For trainings conducted under NPEEE, a standard *Course Evaluation Form* will be filled by each participant. Further, within a month of completion of short-term training course, the course coordinator will send the following to the National Coordinator for consideration of the PIC:

- (i) A complete list of all participants in the course along with their complete address and affiliation
- (ii) A summary of course evaluation responses
- (iii) List of assessment scores in the test at the end of the course by the course participants
- (iv) A copy of the question paper for the test to develop a database
- (v) Two sets of course materials used in the course

The short courses may be divided into two categories: those at the basic level (*e.g.*, structural dynamics, basics of earthquake engineering, and earthquake resistant design of RC structures), and those at the advanced level (*e.g.*, seismic analysis of dams, and seismic hazard assessment). Both types of course are needed, but in this phase of the NPEEE, more focus needs to be placed on the basic level courses.

In general, the background and needs of the teachers from (a) polytechnics, (b) degree institutes in engineering, and (c) colleges of architecture are different. Hence, separate courses will be developed for teachers from these three types of colleges. However, a deserving and highly motivated polytechnic teacher with adequate academic background will be allowed to participate in a course meant for degree teachers.

In training programmes, some participation from the industry can be very beneficial. It will not only help capacity building of the professional engineers, but also will add diversity to the class and contribute to better training of teachers. Hence, the host institutes should be encouraged

to have some industry participants in the short and medium term trainings under this project. Needless to say, the NPEEE funds should not be used to support the industry participants.

There tends to be wide variation in funds requirements under different budget heads by different resource institutes and for different courses. Hence, a lump sum per trainee has been provided to the eight resource institutes, and the institutes are to manage the course within this total budget. This is subject to the following limitations:

- (i) The lecture honorarium paid from the NPEEE funds to faculty members is not to exceed Rs.1,000 per lecture hour.
- (ii) The honorarium paid to the course coordinator towards coordination is not to exceed Rs 3,000/- from the NPEEE funds.
- (iii) If necessary, an overhead of not exceeding 10% may be payable to the resource institute out of the given per man-week budget.

A typical short course is to have a minimum of 20 and a maximum of 30 participants from the academic institutes. Some additional industry participants may be allowed at discretion of the course coordinator. Periodically, PIC should invite the course proposals from the eight resource institutes and centrally decide the courses to be conducted.

3.4 Medium-Term Training (Certificate Programme)

Many teachers already have Masters'/Doctoral degree and may now like to develop expertise in Earthquake Engineering. A certificate programme of one-semester duration is expected to give them an opportunity to develop in-depth knowledge of the subject. The semester-long training is a special feature of the NPEEE. If done right, it may contribute enormously to the capacity building in technical education system. Besides giving training in Earthquake Engineering, this programme will enable the participating teachers to be exposed to various facets of academic governance and to develop perspective on technical education as a whole. The selection of candidates to undergo the semester training will be done on the basis of merit in a centralized manner by the participating institutes.

Only those of the eight resource institutes are to undertake this component that have sufficient number of faculty with the required expertise. Considering duration of the programme, it is important that the resource institutes provide on-campus accommodation to the trainees. The programme will run concurrent with the regular semester in the resource institute with a minimum of 14 weeks of teaching.

The training programme will include post-graduate level courses to be taught in the usual manner plus a self-study project. The courses will include the usual homework assignments, quizzes, mid-semester examinations and the end-semester examination. At the end of the semester, the usual grades will be awarded in different courses.

The Certificate Programme class will have a minimum of 15 and a maximum of 30 teacher trainees. A limited number of industry participants may be included in the semester-programme to give it diversity. The participants are to provide a feedback on prescribed form to the PIC on the course. Efforts should be made to track their professional activities and profile subsequent to the training.

There is a good possibility that the Certificate Programme may emerge into a modular Master's programme. This issue needs to be examined by the concerned resource institutes after gaining some experience with the Certificate Programme.

3.5 Laboratory Development

Teaching and research in Earthquake Engineering requires significant resources in terms of laboratories, and our institutes are not well equipped with the same. NPEEE has a very modest budget for the same. It is expected that additional grants for developing laboratory resources in Earthquake Engineering can be made available through other established programmes such as the Thrust Area/R&D/MODROBS schemes of MHRD and AICTE, and the sponsored research programmes of national agencies such as DST and CSIR.

The teaching laboratory grants meant for ten colleges will be decided strictly on merit. Since only ten colleges are to be chosen, only engineering colleges with post-graduate level programmes will be considered for this grant. It should be recognized that the equipment grant is meant for hardware support to the laboratories and not for setting up computer labs. Hence, procurements of laptops, computers, softwares, etc, should be avoided from this grant.

A sub-committee of the NPEEE will evaluate the proposals from the colleges and short-list the same before these are considered by PIC. The sub-committee will consist of: Professor D. K. Paul of IIT Roorkee (Chairman), Professor Alok Goyal of IIT Bombay, and Professor S. K. Nath of IIT Kharagpur.

3.6 Library Support

Currently, the library resources in Earthquake Engineering are quite inadequate in the teaching institutes in India. Current books and other publications are absolutely essential for developing a viable programme of teaching in the country. Hence, NPEEE has a modest budget for upgradation of library resources in the subject.

The amount available for library resources for 100 colleges is at the rate of one-time Rs.1.0 Lakhs per college in three years. This is a relatively small amount to be managed by the colleges. Further, it will be too tedious to manage the utilization certificates from so many colleges. It is best to centrally purchase the books and provide copies to the concerned colleges. It has been decided to entrust IIT Delhi with the responsibility of centrally procuring and sending the books to 100 institutes.

The library grant of Rs.3.0 Lakhs each to the eight institutes will be released in the first instance and they will be allowed a period of three years to spend the amount on books and journals in Earthquake Engineering. Information on books procured under this scheme by the eight institutes should be placed on the website periodically so that other colleges may also benefit from these.

A sub-committee of the NPEEE will help PIC on matters related to the library support. The sub-committee has been formed to (a) evaluate the proposals from the colleges and short-list the same, and (b) decide on the books to be centrally purchased for the colleges. The sub-committee will consist of: Professor A. K. Jain of IIT Delhi (Chairman), Professor C. V. R. Murty of IIT Kanpur, and Professor S. K. Deb of IIT Guwahati. The books sub-committee will make efforts to request

different national earthquake engineering societies and other organizations to donate some of their important publications to the colleges or to provide them at nominal or low cost. Selection of institutes for the library support will be done strictly on merit.

3.7 International Training

The project provides for 50 man-months of international training to the teachers, and this is quite nominal for a large country. The duration of training will be limited to six months per trainee. The conditions on teachers to be eligible for international training are:

- (i) Should be a permanent full-time faculty of a recognized college/polytechnic other than the eight resource institutes.
- (ii) Should be currently pursuing a Ph.D. in one of the eight resource institutes in India in the area related to Earthquake Engineering, or has completed Ph.D. and has shown some interest in earthquake engineering in the past; preference is to be given to the former.
- (iii) Should be below 45 years of age, and
- (iv) Has not studied or worked abroad for six months or more.

Details on this scheme are being developed by the PIC.

3.8 International Visitors

Currently, there are hardly any international experts visiting Indian academic institutes except for very short durations. To encourage visitors for medium term, a provision has been made in the project for 20 man-months of international visitors to the eight resource institutes.

Under this head, support will be provided for visitors for duration ranging from one month to six months. It is best to leverage the available money to maximize such visitors. For instance, the host institutes are also expected to contribute a part of the visitor's expenses. Payment to such visitors will have to be negotiated on a case-by-case basis by the host institute. Hence, specific guidelines for this component are not possible.

It is not going to be an easy task to attract outstanding international experts to spend a month to six months in India. The eight resource institutes will make a proposal whenever a possibility exists for getting an international visitor. The Chairman of PIC may accord his approval for the funds requirements to all reasonable proposals till the funds last. It is expected that the international visitors under this scheme will not require clearance from MHRD.

3.9 Participation in International Conferences

The international conferences provide a very important avenue to the teachers to (i) become aware of latest developments in the subject internationally, (ii) widen their perspective for the subject, (iii) exchange ideas and information with their peers elsewhere, and (iv) develop long-term professional relationships. Currently, international conferences in Earthquake Engineering have poor participation from India.

The NPEEE has a provision to provide partial travel grant of Rs 50,000 each for participation in the international conferences/workshops/short-term trainings. The teachers are required to raise the balance amount from elsewhere, and timely sanction from NPEEE can be helpful to them in obtaining funds from other sources. Hence, it is important to quickly approve the contribution of NPEEE. All reasonable requests for participation in international conferences will generally be

approved and rejection will only happen in exceptional cases.

The conditions on teachers to be eligible for the partial travel grant for participating in an international conference include:

- (i) Conferences must have *Earthquake Engineering or its sub-areas* as a main theme or as one of the themes of the conference, and
- (ii) Workshops and short-term trainings in a field related to earthquake engineering.
- (iii) The person needs to be a presenting author of a paper accepted in the conference.

A faculty member may be supported by NPEEE for international conference not more than once in a calendar year.

A sub-committee of the PIC has been formed to quickly finalise the partial travel grants for international conferences. The sub-committee will consist of: Professor Prem Vrat of IIT Roorkee (Chairman), Professor Sudhir K. Jain of IIT Kanpur (Convener), and Professor T. K. Datta of IIT Delhi.

3.10 Workshops, Conferences and Meetings

NPEEE also has provisions for conducting workshops, conferences and meetings in India. For workshops and conferences to be organized by the resource institutes, norms for financial support will be as per *Annex E*. As of now, NPEEE funds may not be used to support conferences and workshops that are not organized by the eight resource institutes.

3.11 Curriculum Changes

It is important for NPEEE that the human resource development and curriculum changes take place hand-in-glove. Curriculum changes are quite tedious and require proactive approach. It is expected that on an average, one national workshop per year will be organized by the resource institutes to discuss issues related to curriculum.

All polytechnics in a state usually follow the same curriculum and hence it is that much simpler to bring about changes in the curriculum at that level. It is suggested that efforts be made to develop state-specific workshops to discuss curriculum at diploma level. The participants are to include teachers of polytechnics, Director of Technical Education (or his/her representatives), etc., along with a few teachers from engineering colleges of the state. The workshops are to evolve revisions to the curriculum with appropriate coverage of Earthquake Engineering. These curriculum workshops will later be followed up with one or more short-term training programmes for the polytechnic teachers of that state so that they can do justice with the new contents of Earthquake Engineering in the curriculum.

3.12 Administrative Issues

NPEEE funds have a lump-sum provision to the resource institutes for miscellaneous costs. The amount to resource institutes will be used for travel to attend meetings, communication costs, and other contingent expenses. Travel expenses of the three members of PIC from the other institutes will be covered by contingency grant of IIT Kanpur.

SECTION V: Programme Monitoring AND Evaluation

1. Programme Monitoring and Evaluation

At the end of the three years of the phase I project of the NPEEE, results alone will count towards the success of the project. Hence, the focus is placed on achieving results and the project implementation is planned to be flexible enough to be fine-tuned from time to time to maximize the results. A rigid plan for project implementation will adversely limit the success of NPEEE. Therefore, the Programme Implementation Committee (PIC) will play a crucial role in this project.

The NPEEE is to remain innovative in approach and open to new ideas and initiatives that may add to the capacity building in technical institutions. For instance, (a) final year students of other technical institutes could be given exposure in Earthquake Engineering at the resource institutes, and (b) modular programme leading to PG Diploma in Earthquake Engineering may be conceived. Hence, the PIC and NCEEE is expected to be open to adding any appropriate activities to the project even though such an activity may not appear in the original project proposal. The approved budget of NPEEE of Rs.13.76 Crores envisages expenditure under different activities. Some adjustments may be needed in these from time to time.

The PIC is expected not to get involved in micro-management of different activities. Since the eight resource institutes have adequate accounts and audit systems, it is best to leave the details of funds management to the eight resource institutes.

2. Procedures for Monitoring

For effective implementation and monitoring, NPEEE has a provision for the *National Committee on Earthquake Engineering Education (NCEEE)* and *Program Implementation Committee (PIC)*. NCEEE is expected to provide a vital link and coordination with other Ministries and AICTE so as to leverage the work of NPEEE. The PIC will meet regularly to ensure effective monitoring and mid-course corrections.

The main activity under NPEEE is the training of teachers. To ensure highest quality of training, firstly, the resource institutes will be cautious in volunteering to undertake training projects keeping in view their faculty expertise; the Institute Coordinators will use utmost discrimination in forwarding the course proposals from their respective institutes. Secondly, at the end of all short courses, a test will be conducted to evaluate value addition of the training and to evaluate the suitability of the trainees. Thirdly, to measure the quality of the training courses conducted under NPEEE, a standard *Course Evaluation Form* will be filled by each participant. Fourthly, within a month of completion of short-term training course, the *Course Coordinator* will send the following to the *National Coordinator* for the consideration of the PIC:

- (j) A complete list of all participants in the course along with their complete address and affiliation
- (ii) A summary of course evaluation responses

- (iii) List of assessment scores in the test at the end of the course by the course participants
- (iv) A copy of the question paper for the test to develop a database
- (v) Two sets of course materials used in the course

The PIC will evaluate the above information and effect necessary changes for the subsequent activities.

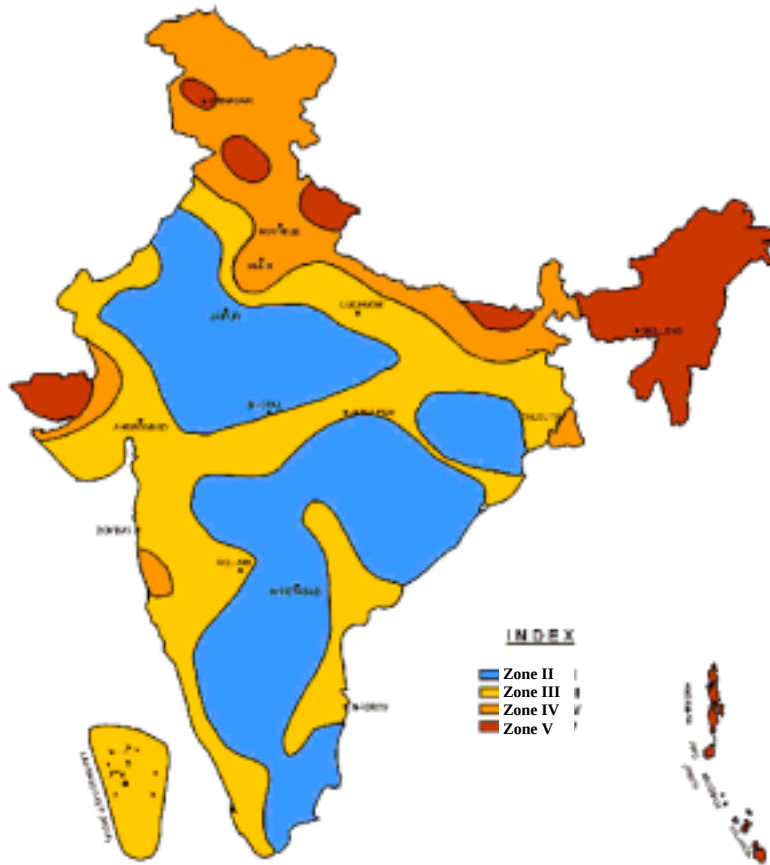
The PIC will also track the careers of the teachers undergoing medium-term training under the NPEEE; this will be an important indicator of the effectiveness of the programme.

The progress of activities under NPEEE till the date of printing of this document is listed in *Annex F*.

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Annexures

ANNEX A: Seismic Zone Map of India from IS:1893 (Part 1) - 2002



ANNEX B: SOME Significant Earth quakes in India *

Date	Event	Time	Magnitude	Max. Intensity	Deaths
16 June 1819	Kutch	11:00	8.3	IX	1,500
12 June 1897	Assam	17:11	8.7	XII	1,500
8 February 1900	Coimbatore	03:11	6.0	VII	Not Known
4 April 1905	Kangra	06:20	8.0	X	19,000
15 January 1934	Bihar-Nepal	14:13	8.3	X	11,000
15 August 1950	Assam	19:31	8.6	XII	1,530
21 July 1956	Anjar	21:02	6.1	IX	115
10 December 1967	Koyna	04:30	6.5	VIII	200
23 March 1970	Bharuch	20:56	5.2	VII	30
21 August 1988	Bihar-Nepal	04:39	6.6	IX	1,004
20 October 1991	Uttarkashi	02:53	6.4	IX	768
30 September 1993	Killari (Latur)	03:53	6.2	VIII	7,928
22 May 1997	Jabalpur	04:22	6.0	VIII	38
29 March 1999	Chamoli	00:35	6.6	VIII	63
26 January 2001	Bhuj	08:46	7.7	X	13,805

*The list is not complete

ANNEX C: Some Important Contacts in India for Earthquake Engineering Related Issues (Other Than Academic Institutes)

1. All India Council of Technical Education, New Delhi

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All India Council for Technical Education
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Professor (Mrs.) Maitreyi Chandra
Advisor (Planning, Coordination & Dev.)
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Email: drmchandra@yahoo.co.uk

2. Building Materials and Technology Promotion Council, New Delhi

Shri T. N. Gupta
Executive Director
Building Materials & Technology Promotion Council
Ministry of Urban Development & Poverty Alleviation
'G' Wing, Nirman Bhawan
New Delhi 110011
Tel: (011) 2301 9367; Fax: (011) 2301 0145
E-mail: bmtpc@del2.vsnl.net.in

3. Central Building Research Institute, Roorkee

Shri V. K. Mathur
Director
Central Building Research Institute
Roorkee 247667
Tel: (01332) 27 2243; Fax: (01332) 27 2272, 27 2543
Email: ykm@cscbri.ren.nic.in

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Email: dstsec@alpha.nic.in

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5. India Meteorological Department, New Delhi

Dr. H. V. Gupta
Deputy Director General (Seismology)
India Meteorological Department
Mausam Bhavan, Lodhi Road
New Delhi 110003
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Email: hvg@hotmail.com

6. **Ministry of Human Resource Development, Government of India**
Shri V. S. Pandey
Joint Secretary (TE)
Department of Secondary & Higher Education
Ministry on Human Resource Development
Shastri Bhavan
New Delhi 110001
Tel: (011) 2338 2298; Fax: (011) 2338 2298
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- Shri Pawan Aggarwal*
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Ministry of HRD
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7. **Ministry of Home Affairs, Government of India**
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8. **National Geophysical Research Institute, Hyderabad**
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9. **Structural Engineering Research Center, Madras**
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10. **United Nations Development Programme, New Delhi**
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ANNEX D: Item-wise Budget

Item	Detail	Units	Years	Time of Activity	Unit Cost (Rs.)	Total Cost (Rs.)
1.	One-semester Certificate Programme 100 teachers/year x 3 years x 5 months each @ (Rs.10,000/man-month to host institutions and Rs.10,000/man-month on stipend, travel and contingency to the candidates)	100 Teachers	3	5 Months	20,000 per month	3,00,00,000
2.	Short Term Course Training 350 teachers for 1 week each (or smaller number of teachers for more weeks each) x 3 years @ (Rs.4,000/man-week to host institutes to cover costs + Rs.3,000/man-week to teachers to cover travel, boarding and lodging)	350 Teachers	3	1 Week	7,000 per week	73,50,000
3.	International Training 50 man-months @ US\$ 2,000 per man-month in 3 years	50 Man months	1	—	1,00,000	50,00,000
4.	International Visitors to Resource Institutes in India 20 man-months @ US\$ 5,000 per man-month in 3 years	20 Man months	1	—	2,50,000	50,00,000
5.	Library/Book Support to Colleges 100 colleges @ Rs.1.0 lakhs / college in 3 years	100 Colleges	1 time	—	1,00,000	100,00,000
6.	Library/Book Support to Resource Institutions 8 institutes @ Rs.3.0 lakhs in 3 years	8 Institutes	1 time	—	3,00,000	24,00,000
7.	Laboratory Enhancement at Colleges 10 colleges @ Rs.15 lakhs / college	10 Colleges	1 time	—	15,00,000	150,00,000
8.	Laboratory Enhancement at Resource Institutes 8 institutes @ Rs.50 lakhs / institute	8 Institutes	1 time	—	50,00,000	400,00,000
9.	Organization of Workshops, Conferences, and Meetings Rs 15 lakhs / year x 3 years	—	3	—	15,00,000	45,00,000
10.	Development of Teaching Resource Materials Rs 20 lakhs / year x 3 years	—	3	—	20,00,000	60,00,000
11.	Partial Travel Grants for International Conferences 50 teachers / year x 3 years x @ Rs.50,000	50 Teachers	3	—	50,000	75,00,000
12.	Miscellaneous Costs of Resource Institutes 8 institutes @ Rs 2 lakhs per year x 3 years	8 Institutes	3	—	2,00,000	48,00,000
Total						13,75,50,000
~ Rs 13.76 Crores						

Annex E: Norms for Support of Workshops and Conferences

Item	Activity	Number of Participants	Support from NPEEE (Rs.)
1.	National Workshop/ Conference	Up to 50	50,000
2.		More than 50	1,00,000
3.	International Workshop/Conference <i>(At least 4 participants from abroad required to qualify for international status)</i>	Up to 50	75,000
4.		More than 50	1,50,000

Annex F: NPEEE Progress Report (till August 2003)

1. Inception

August 2001	Meeting at MHRD of representatives of IITs, IISc, AICTE, BMTPC, Ministry of Agriculture, CBRI, etc., to discuss issues of Earthquake Engineering. It was decided to develop a <i>National Programme</i> to be executed by MHRD.
August 2002	NPEEE Proposal cleared by Standing Finance Committee of MHRD
September 2002	Office Memorandum issued by MHRD conveying approval of GOI for the NPEEE
October 2002	Office Memorandums issued by MHRD constituting <i>National Committee on Earthquake Engineering Education (NCEEE)</i> and <i>Programme Implementation Committee (PIC)</i>
December 2002	<i>First Meeting of PIC</i> at MHRD, New Delhi, on 03 December 2002 <i>First Meeting of NCEEE</i> at MHRD, New Delhi, on 03 December 2002
March 2003	First and second installments of funds released by MHRD <i>Project Implementation Plan (PIP)</i> printed
April 2003	NPEEE formally launched at IIT Delhi on 05 April 2003 <i>Second Meeting of PIC</i> at IIT Delhi on 06 April 2003

2. Workshops and Curricula

- Workshop on *Earthquake Engineering Review* for Masters' Students held at IIT Kanpur during 25-31, March 2003. Sixty M.Tech. students from 24 different engineering colleges across the country participated in this review workshop.
- National Workshop on *Earthquake Engineering Curricula: Challenges and Road Ahead* held at IIT Delhi on 05 April 2003. About 100 participants from all over the country participated in this workshop.
- Workshop on *Earthquake Engineering Curriculum for UP Polytechnics* held during 29-30 July 2003 at IIT Kanpur. About 20 participants included teachers from different polytechnics and engineering colleges from Uttar Pradesh and Uttaranchal, Institute of Research, Development and Training (IRDT), and Directorate of Technical Education, UP. Curricula changes recommended by the Workshop formally approved by the concerned bodies in August 2003.
- National Workshop on *Introducing Earthquake Engineering in Civil Engineering Curriculum* is to be held at IIT Kanpur during 22-23 August 2003.
- Review Workshop for *Resource Materials in Earthquake Engineering Education* is to be held at IIT Kanpur during 25-29 August 2003. About twenty faculty members from different engineering colleges of Gujarat are expected to participate.

3. Short Courses

- *Structural Dynamics – Application to Earthquake Engineering*
01-05 July 2003, IIT Madras
- *Earthquake Resistant Design of Reinforced Concrete Buildings*
7-11 July 2003, IIT Bombay
- *Earthquake Resistant Structural Design*
7-12 July 2003, IIT Madras
- *Analysis and Design of Earthquake Resistant Reinforced Concrete Buildings*
7-13 July 2003, IIT Guwahati
- *Earthquake Resistant Design and Retrofitting of Reinforced Concrete Buildings*
07-18 July 2003, IIT Roorkee
- *Earthquake Geotechnical Engineering - Module 1 (Basic)*
14-19 July 2003, IIT Madras
- *Engineering Seismology*
04-08 August 2003, IIT Kharagpur
- *Introduction to Earthquake Engineering*
04-09 August 2003, IIT Kanpur

4. One Semester Course

One-semester certificate programme on *Earthquake Resistant Design* commenced on 31 July 2003 at IIT Kanpur. Eighteen (18) faculty members from different engineering colleges across the country are participating in the same.

5. International Travel Support

Applications received till August 2003	4
Number of Grants Sanctioned	4
Number of Grants Claimed	Nil

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