



**REPORT ON**

**International Symposium on “Reducing Earthquake Losses”**  
**and 4<sup>th</sup> Annual Convention on Earthquake Science**  
**January 5-7, 2015**

**Organised by**

**Institute of Seismological Research (ISR),**  
**Department of Science and Technology (DST),**  
**Gujarat State Disaster Management Authority (GSDMA)**  
**and Indian Society of Earthquake Science (ISES)**

**Sponsored by**

**Ministry Earth Sciences, New Delhi**

## ANNOUNCEMENT

Institute of Seismological Research (ISR), Department of Science and Technology (DST), Gujarat State Disaster Management Authority (GSDMA) and Indian Society of Earthquake Science (ISES) are jointly organizing **International Symposium on ‘Reducing Earthquake Losses and Advances in Earthquake Science-2015’** during 5-6 January 2015 at Ahmedabad Management Association (AMA), Ahmedabad and on 7<sup>th</sup> January at Institute of Seismological Research (ISR), as an event of Vibrant Gujarat Summit - 2015. The purpose of the symposium was to propagate new knowledge on earthquake resistant constructions and develop synergy between seismologists, civil engineers, structural engineers, architects, nuclear engineers, builders and various agencies involved in earthquake research.

## SYMPOSIUM THEME

Due to Bhuj earthquake of 2001 it was realized that damage due to large earthquakes could be up to 300km distance. It was also realized that some buildings collapsed but not others. This is found to be primarily due to improper structural designing. In some areas geotechnical conditions and geological basin structure could be additional contributory factors. The studies done in over a decade have shed important light which will be highlighted for better earthquake resistant designing.

The new Seismic Hazard and Microzonation studies indicate higher hazard than the national code for 1-4 storey buildings. Buildings near the fault zones need to be assigned importance factor of 1.5-2. New detail seismic hazard map and shear-wave velocity map for Gujarat will be presented. It is found that it is safer to build sky scrapers in Ahmadabad but not in Kachchh. Such aspects will be discussed. The results of new studies of soil-structure interaction, structural dynamics and seismic design philosophy vis-a vis BIS codes will be highlighted. Now, the techniques are available to measure the natural period of high rise buildings. Temporal change in natural period reflects deterioration of the building strength. Such aspects will be illustrated.

The municipal laws of structural designing are old and not enforced. Scheme to frame new laws and mechanism to enforce them will be discussed.

# BROCHURE

## Invitation

It is a great pleasure for the organizers to invite you to attend and contribute to the International Symposium on Advances in Earthquake Science: Reducing Earthquake Losses during 05 – 06 January 2015 in Gandhinagar. Purpose of the Symposium is to propagate new knowledge on earthquake resistant constructions and develop synergy between seismologists, civil engineers, structural engineers, architects, builders and various agencies involved in earthquake research. Following Topics will be covered during the Symposium:

### Seismology

1. Observational Seismology (Introduction to Earthquakes, past earthquakes and its effects)
2. Site characterizations and Site amplification
3. Seismic Hazard assessment, Earthquake Ground motion modeling, New findings in seismic hazard assessment, Seismic Coefficient and Response spectra, Design Spectra, Seismic Microzonation
4. Geotechnical Engineering, Soil response to earthquakes, Liquefaction and remedial measures

### Engineering Seismology

1. Tall structures and Earthquakes
2. Behavior on Confined masonry
3. Earthquake behavior on vernacular buildings
4. Seismic Design Philosophy and BIS code requirements
5. Construction best practices for earthquake resistant structures
6. Structural Health Assessment & Retrofitting
7. Industrial approach case studies

## Symposium Theme

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The new seismic Hazard and Microzonation studies indicate higher hazard than the national code for 1-3 storey buildings. Buildings near the fault zones need to be assigned importance factor of 1.5-2. New detail seismic hazard map and shear wave velocity map for Gujarat will be presented. It is found that it is safer to build sky scrapers in Ahmedabad but not in Kachchh. Such aspects will be discussed. The results of new studies of soil structure interaction, structural dynamics and seismic design philosophy vis-a-vis BIS codes will be highlighted. Now the techniques are available to measure the natural period of high rise buildings. Temporal change in natural period reflects deterioration of the building strength. Such aspects will be illustrated.

The municipal laws of structural designing are old and not enforced. Scheme to frame new laws and mechanism to enforce them will be discussed

## Gandhinagar

Gandhinagar is the capital city of Gujarat. The city is quiet, spacious and green. Gandhinagar is located on the west central point of the Industrial corridor between Delhi, the Capital of India and Mumbai, the capital of Maharashtra. Gandhinagar has an average elevation of 81 metres. The city sits on the banks of the Sabarmati River, in the north-central-east Gujarat. From November to February, the average maximum temperature is around 29°C (85°F), the average minimum is 14°C (57°F) and the climate is dry.

Department of Science & Technology  
Government of Gujarat




## International Symposium on "Reducing Earthquake Losses"

and Advances in Earthquake Science-2015

January 5-7, 2015

Venue for 5-6 Jan: Ahmedabad Management Association (opp. IIM)

Venue for 7 Jan: ISR Auditorium, Gandhinagar



ORGANIZED BY:



## About ISR

The Institute of Seismological Research (ISR) under the Science and Technology Department, Government of Gujarat is functioning from 2006. ISR is the only Institute in India fully dedicated to seismological research and is considered as a premier International Institute. The ISR is engaged in the following Programs:

- Earthquake monitoring program
- Crustal Deformation Study by GPS Measurements
- Microzonation Program
- Earthquake Prediction Research
- Earthquake Hazard Assessment
- Tsunami Modeling
- Geophysical Surveys

ISR has carried out investigations for various societal concerns.

## Organizers

Organizer: Institute Seismological Research, Rajkot, Gandhinagar and In Soc. Earthq. Sc.  
Co-Organizer: GSDMA

### Knowledge Partners:

>SVBIT, MoSS, CRED, GISED, GICEngineers Association

LD Engg. College, IIIT-Hyderabad, Nirma Uni., CEPT

>Department of Mathematics and Geosciences (DMG), University of Trieste, Italy

> Geophysikaliches Institut (GPI), Karlsruhe Institut für Technologie, Karlsruhe, Germany

## Invited Speakers

Dr. Susan Hough, USGS, USA  
Prof. Antonella Panzeri, Trieste, Italy  
Dr. Gian Paolo Cimellaro, Italy  
Prof. Friedemann Wenzel, Karlsruhe, Germany  
Dr. Eng. Matsutaro SRO, Bldg. Res. Inst., Tokyo, Japan  
Dr. Anand Mani Dixit, Nepal

Dr. Shaleeh Nayak, Secretary, MoSS, New Delhi  
Prof. A.S. Aya, member, GSDMA, Patna  
Prof. DK Paul, IITR  
Prof. K.S. Vaidya, Bengaluru  
Prof. C.V.R. Murthy, IIT Jodhpur  
Prof. V.M. Patel, SVBIT, Gandhinagar  
Prof. C.S. Sanghi, L.D. Engg. College  
Prof. R. Pradeep Kumar, IIIT, Hyderabad  
Dr. K.S. Parikh, SAC-ISRO  
Mr. A.G. Chhabra, Former Executive Dir., Nuc. Power Corp. In.  
M. RK Mehra, Dept. Atomic Energy, Mumbai  
Prof. TG Stharam, IISc, Bengaluru  
Mr. Anand Tatu, President Guj Inst Civil Engg and Architects  
Prof. Abul Dejal, SVNIT, Surat  
Prof. Indrajit Patel, Anand

## Important Deadlines

Abstract Submission Deadline: 20-11-2014

Circular : 01-09-2014

Registration Deadline : 15-12-2014

## Registration Form

### International Symposium on "Reducing Earthquake Losses" and Advances in Earthquake Science-2015

Name: \_\_\_\_\_  
Organization: \_\_\_\_\_  
Designation: \_\_\_\_\_  
Qualification: \_\_\_\_\_  
Experience: \_\_\_\_\_  
Contact No.: \_\_\_\_\_  
Email ID: \_\_\_\_\_  
Address: \_\_\_\_\_

Registration Fee: Delegate : Rs. 8000/-

Student / Rs. 2000, Foreign Delegate: US\$100

Do you require accommodation through organizers

Tentative arrival Date: \_\_\_\_\_

Tentative departure Date: \_\_\_\_\_

Payment Details: \_\_\_\_\_

Check/ DD no.: \_\_\_\_\_

Date: \_\_\_\_\_

Bank: \_\_\_\_\_

Event: \_\_\_\_\_

### For foreign delegates

Passport Details: \_\_\_\_\_

Passport No.: \_\_\_\_\_

Place of Birth: \_\_\_\_\_

Date of Birth: \_\_\_\_\_

Valid till: \_\_\_\_\_

No. of Previous visits to India: \_\_\_\_\_

Name and Details of accompanying person: \_\_\_\_\_

Certified that the above information is true to the best of my knowledge.

Signature: \_\_\_\_\_

## Patrons

➤ Hon'ble Chief Minister, Government of Gujarat

## Advisors

Shri. S.J Haider, Secretary, DST, GoG  
Ms. Anju Sharma, CEO, GSDMA

## National Advisory Committee

**Prof. C.V.R Murty**  
Director, Indian Institute of Technology, Jodhpur  
**Prof. T.G. Sitharam**  
Professor, Indian Institute of Science, Bangalore  
**Dr. D.K. Paul**  
Professor (Retd.) IIT Roorkee  
**Dr. V. P. Dimri**  
Distinguished Scientist, National Geophysical Research Institute, Hyderabad  
**Prof. J.R. Kayal**  
Visiting Professor, Institute of Seismological Research, Gandhinagar  
**Dr. A. K. Singhvi**  
Outstanding Scientist & Dean, Physical Research Laboratory  
**Dr. B.K. Bansal**  
Scientist-G, Ministry of Earth Science, New Delhi

## International Advisory Committee

**Dr. G.F. Panza**  
Professor at DMG - University of Trieste, Abdus Salam International Center for Theoretical Physics (ICTP) - SAND group Trieste  
**Dr. Friedemann Wenzel**  
Professor, Karlsruhe Institute of Technology  
**Dr. Walter Mooney**  
Research Geophysicist, United States Geological Survey (USGS)  
**Dr. Susan Hough**  
Seismologist, United States Geological Survey (USGS)

## Participants

- 100 - Students
- 50 - Faculty
- 10 - Foreign Delegates
- 50 - ISR
- 100 - Govt. Officials
- 100 - Civil Engineers
- 100 - Real Estate Industry
- 100 - Structural Engineers
- 100 - Architects

## Invited Abstracts

The invited abstracts should be typed in A4 size page in MS Word, Times New Roman, Font 12, line spacing 1.5. The title of the abstract should be in Times New Roman, font 14, bold, centered aligned followed by authors' name, affiliations, and email of corresponding author. Figures, if necessary, should be accommodated on the same page. The abstract should be sent on the email [vibrantaes2015@gmail.com](mailto:vibrantaes2015@gmail.com) on or before 15<sup>th</sup> December 2014.

## Contact Details

Director General,  
Institute of Seismological Research (ISR),  
Near Pt. Deendayal Petroleum University,  
Raisan, Gandhinagar-382009. Gujarat, India  
Phone No. : +91-79-66739001(O)  
Fax No. : +91-79-66739015.  
E-mail : [dgisrgad@gmail.com](mailto:dgisrgad@gmail.com)

Dr. K. M. Rao  
Scientist- D, ISR  
Phone No. : +91-9978406331 (M)  
E-mail : [madhusp08@gmail.com](mailto:madhusp08@gmail.com)

Mr. Santosh Kumar  
Scientist- D, ISR  
Phone No. : +91-9925243646 (M)  
E-mail : [sundriyal007@gmail.com](mailto:sundriyal007@gmail.com)

[Mr. Vasu Pancholi](mailto:Mr.VasuPancholi9428219626@yaho.com)  
[94282\\_19626\\_vasu\\_pancholi@yahoo.com](mailto:94282_19626_vasu_pancholi@yahoo.com)

## Inauguration

### Following are Expected to Grace the Inaugural Function

Sri Govind Bhai Patel, Hon'ble Minister (S&T), GoG  
Dr. P.K. Mishra, Principal Secretary to PM  
Sri DJ Pandian, Chief Secretary, GoG  
Ms. Anju Sharma, IAS, CEO, GSDMA  
Mr. S.J. Haider, IAS, Secretary, DST, GoG

### Following are Expected to Grace the Concluding Session

Dr. Shailesh Nayak, Secretary, MoES as Chief Guest

## Scientific Program

### January 5 (Ahmadabad Management Assn.)

08:00-09:30 Registration  
09:30-11:00 Inauguration  
11:30-13:15 Keynote Lectures  
14:00-15:00 Keynote Lectures  
15:00-16:00 Panel Discussions  
16:15-17:30 Panel Discussions

### January 6 (Ahmadabad Management Assn.)

09:30-11:00 Invited Lectures  
11:15-13:00 Panel Discussions  
14:00-16:00 Panel Discussions  
16:15-17:30 Panel Discussions

### January 7 (ISR)

09:00-11:00 Presentations by Awardees  
11:30-13:00 Invited Lectures  
14:00-16:00 Invited Lectures/Poster Session  
16:00-17:30 Concluding Session and Awards Ceremony

# INVITATION CARD

**INVITATION**  
from  
**Institute of Seismological Research**  
Department of Science & Technology  
Government of Gujarat  
for  
**International Symposium on Reducing Earthquake Losses**  
and 4<sup>th</sup> Annual Convention on Advances in Earthquake Science-2015  
**5<sup>th</sup>-6<sup>th</sup> January 2015**  
VENUE : Auditorium  
Ahmedabad Management Association (Opp. IIM),  
AHMEDABAD

**VENUE LOCATION**

VENUE Distance from  
Railway Station - 10km  
Airport - 16km

Contact for Details of the Symposium  
**Dr. B.K. Rastogi**  
Director General  
Institute of Seismological Research, Raisan, Gandhinagar  
Email: dg-isr@gujarat.gov.in  
Ph: 66739 001

**ISR**  
Institute of Seismological Research

**PROGRAMME**

Welcome Address by Secretary, DST  
Introduction to the Symposium by DG-ISR  
Address by CEO, GSDMA  
Address by Chief Secretary  
Address by Guest of Honour  
Release of Abstract Volume & Address by Chief Guest  
Vote of Thanks  
Tea & Interaction with Delegates

Institute of Seismological Research  
Department of Science and Technology  
Gujarat State Disaster Management Authority  
and Indian Society of Earthquake Science  
are pleased to invite you to the

Inaugural Function of  
International Symposium on  
**"Reducing Earthquake Losses"**  
And  
**4<sup>th</sup> Annual Convention on  
"Advances in Earthquake Science"**

:: Chief Guest ::  
**Sri Govindbhai Patel**  
Hon'ble Minister of Science and Technology  
Government of Gujarat

**Date** : January 5, 2015 | **Time** : 9:30 AM  
**Venue** : Ahmedabad Management Association  
(Opp. IIM) Ahmedabad

**Ms. Anju Sharma, IAS**  
CEO,  
Gujarat State Disaster Management Authority

**Sri S.J. Haider, IAS**  
Secretary,  
Dept. of Science and Technology

**Dr. B. K. Rastogi**  
DG, ISR



# GSDMA



## International Symposium on “Reducing Earthquake Losses” and 4<sup>th</sup> Annual Convention of “Advances in Earthquake Science”

### INAUGURATION

on

5<sup>th</sup> January 2015, Monday at 9:30 hrs

At

Ahmedabad Management Association Auditorium (opp. IIM)

### INAUGURAL FUNCTION:

- 09:30 hrs Welcome of the Dignitaries to the Dais and presentation of bouquet to Dignitaries  
09:32 hrs Invocation & Lighting of the lamp by Chief Guest and other Dignitaries  
09:37 hrs Welcome Address: Mr. S.J. Haider, Secretary DST, GoG.  
09:47 hrs Introduction of the Symposium: Prof. B.K. Rastogi, DG, ISR & President ISES  
10:00 hrs Address by Prof. Gian Paolo Cimellaro, Italy, Guest of honor  
10:05 hrs Address by Dr. Eng. Matsutaro SEKI, Japan **Guest of Honor**  
10:10 hrs Address by Ms. Anju Sharma, CEO, GSDMA  
10:15 hrs Address by Ms. Reeta Teotia, Spl. Secy, Dept Telecommunication, GoI,  
Guest of Honor  
10:20 hrs Release of Abstract Volume and Address by Dr. Susan Hough, USGS, USA,  
Chief Guest  
10:30 hrs Interaction with delegates

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### Dais Plan

Sri SJ Haider Sec- DST	Dr. Eng. Matsutaro SEKI, Japan Guest of Honor	Prof. Gian Paolo Cimellaro, Italy, Guest of honor	Dr. Susan Hough USGS, USA Guest of Honor	Ms. Reeta Teotia, Spl. Secy, Dept Telecommunication, GoI	Ms. Anju Sharma CEO-GSDMA	Prof. B. K. Rastogi DG, ISR
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## **Welcome Address by Secretary, Department of Science & Tech., GoG during the Inaugural Function**

Madam Reeta Teotia, Special Secretary, Department of Telecommunication, GoI, Dr. Susan Hough from US Geological Survey, Dr. M. Seki from Japan, Prof. Cimellaro from Italy, Ms. Anju Sharma, Dr. Rastogi, delegates and guests, on behalf of the Department of Sc. & Tech. and on my own behalf I welcome you all for the 3 - day International Symposium on “Reducing Earthquake Losses” and Convention on Advances in Earthquake Science. Gujarat is having Vibrant Gujarat Summit during January 2015. This event is part of the Vibrant Gujarat Summit 2015.

Besides ISR, the Dept. Sc. & Tech. looks after 5 other Departments or Institutes like Bhaskaracharya Institute of Space Applications and Geoinformatics (BISG), Science City, Gujarat Council on Science and Technology (GUJCOST), Biotechnology Mission and Gujarat Informatics Limited. All these agencies are carrying out important functions for the society. The SATCOM is broadcasting programs for education and health care etc. Biotechnology Mission is promoting Biotechnology Research and Industry. GUJCOST and Science City are popularizing Science. GIL is promoting IT and e-Governance bagging nationwide highest number of Awards.

Gujarat is prone to damaging earthquakes. After the devastating 2001 Bhuj earthquake the Gujarat Government established Institute of Seismological Research to understand the earthquake hazard in Gujarat and to assure sustainable development of rapidly growing State by suggesting earthquake-resistant designs of buildings and important structures.

The Institute has developed into one of the finest such Institutes in the World. It informs earthquake magnitude and location within minutes and explains to public the expected hazard. It has helped in removing unnecessary panic among the people. The Institute also advices on seismic safety factor for different heights of buildings and also to industry, new railway stations, ports, nuclear power plants and LNG storage terminals. It has assessed geotechnical nature of soil in different parts of Gujarat. Maps have been prepared giving details of earthquake effect on different heights of buildings from different levels of earthquakes in different earthquake zones. The symposium is the right forum to propagate all these new findings to the society for their benefit.

Seismologists of the Institute and other parts of the country, engineers from industry, engineering faculty and large number of students from different engineering colleges of Gujarat will be benefitted by discussion with several experts from India and abroad. It will be good to share worldwide experiences, which is necessary for understanding earthquake effects.

I wish you have fruitful deliberations and pleasant stay in Ahmedabad. Jai Bharat, Jai-Jai Garvi Gujarat.

## SPEECH OF BK RASTOGI DURING INAUGURATION

**About the International Symposium on “Reducing Earthquake Losses”** and 5<sup>th</sup> Annual Convention on Earthquake Science, January 5-7, 2015, Director General, ISR and President, Indian Society of Earthquake Science.

Chief Guest Dr. Susan Hough world renowned seismologist from US Geological Survey

Guests of Honor: Ms Rita Teotia, Special Secretary Telecommunication, GoI, Prof. Gian Paolo Cimellaro, Earthquake Engineer from Italy, Dr. M. Seki, Structural Engineer from Japan who has designed many tall buildings,

Ms. Anju Sharma, CEO, Gujarat State Disaster Management Authority,

Sri S.J. Haider, Secretary, Dept. S&T.

Dignitaries off the dais: to name some of them, the 4 other foreign delegates: Prof. Friedemann Wenzel, Director Karlsruhe Institute of Technology, he was with me in 2002 when I learnt from him site response, later he had taken me to Romania where I saw his initiatives for Earthquake Loss assessment and setting up of Earthquake Early Warning System; Prof. Antonella Peresan of Trieste Univ. Italy, our collaborator on new method of Deterministic Hazard Assessment, Dr. Amod Mani Dixit, General Secretary, Nepal Society of Earthquake Technology, Dr. Minesh Ratna Tamrakar of NSET, Nepal, Prof. DK Paul of IIT Roorkee who is also Chairman of BIS Committee on Earthquakes, Mr. Anil Sinha who as Secretary had managed disasters in India for many years and is now Vice-Chairman, Bihar State Disaster Management Authority, Prof. Atul Desai of Surat, Mr. Anand Tatu, President Guj. Inst. of Civil Engineers and Architects,

on behalf of ISR and Indian Society of Earthquake Science, I welcome you and the delegates as well as invitees to the 3- days International Symposium on **“Reducing Earthquake Losses”**. Two-days deliberations will be here and third day at ISR.

I am happy that the community has shown interest in the topic of “Reducing Earthquake Losses”, that is why over 400 delegates are attending. Delegates include about 50 from outside Gujarat, engineers, architects and builders. There more than 65% students who are the hope for future. There will be some 30 oral presentations and 5 panel discussions during the 2 days.

Builders for their sale pitch are displaying my statement covered in Times of India that High-rise buildings are safe in Gujarat. There is also fine print that they are safe but after proper designing according to the national code. The national code also says that each important project should have specific investigations which are a must near the faults. The areas of Ahmedabad, Bharuch and Kutch etc. are near the faults and ISR has several new findings which will be explained in the Symposium.

During the preparation of the symposium, I was told that in any construction project most of the cost goes for land ie. 80%. Hence, builders sometimes may tend to do cost-cutting affecting



earthquake safety. The society needs to check escalating land-cost and Govt. should regulate the cost.

Purpose of the symposium is to inform new findings of ISR and others on earthquake hazard to buildings and how to safeguard them. Experiences worldwide will be shared by experts from different countries. Buildings considered are not only high rise but also of mass housing projects. Ideas on earthquake resistant features like dampers or base isolators and new designs as well as new inexpensive but earthquake-resistant materials will also be discussed. Retrofitting of important structures will be described. ISR investigations like seismic Microzonation, geotechnical work, geological studies and geophysical surveys as well as Seismic hazard assessment for tall buildings, LNG storage terminals and nuclear power plants will be highlighted. Expertise for 'Performance-based Designs' including 'soil- structure interaction' and 'dynamic analysis of building designs' is available at ISR in collaboration with IIT Hyderabad.

Some of ISR new findings are:

1. Near the geological faults there is 50-100% higher hazard than recommended in the national code. Hence, national code needs to be modified.
2. Geotechnical investigations are required to know soil/rock layers which amplify the seismic waves and if there is any weak layer that can cause large amplification.
3. In Kachchh special investigations and care is needed due to possibility of great earthquakes of Magnitude 8. Along Narmada also moderate earthquakes of Magnitude up to 6.5 are expected.
4. In rest of Gujarat the earthquakes are of Magnitude 6 or less. Such earthquakes do not generate seismic waves close to natural periods of high rise buildings. Hence damage is more to low-rise buildings. Greater than 10 storey buildings may not collapse if built as per national code. They may be rattled badly and different floors may shake differently. Details can be worked out by dynamic analysis.

GSDMA, co-organizer of the symposium has helped establishment of ISR, Guj. Inst. Disaster Management and the State set up for Disaster Management. The Disaster Management plan of the country has been followed by the National plan.

Indian Society of Earthquake Science, co-organizer of the symposium was started in 2009 to create synergy between Seismology and Engineering and also to facilitate the seismologists from outside the state to work in Gujarat. It publishes newsletters and a journal.

Once again wish you fruitful deliberations which may go a long way for saving lives and property from earthquakes and a pleasant stay in Gandhinagar. Thank you.



International Symposium on “Reducing Earthquake Losses” and  
5<sup>th</sup> Annual Convention of “Advances in Earthquake Science”

**CONCLUDING SESSION**

Chief Guest

**Dr. Shailesh Nayak, Secretary, Ministry of Earth Sciences and Chairman ISRO**

on

**7<sup>th</sup> January 2015, Wednesday at 16:00 hrs**

At

**Institute of Seismological Research, Gandhinagar**

**INAUGURAL FUNCTION:**

15:55 hrs	Arrival of Chief Guest
16:00 hrs	Welcome of the Dignitaries to the Dais and presentation
16:05 hrs	Welcome Address and Highlights of the Symposium: Prof. B.K. Rastogi, DG, ISR
16:20 hrs	Address by Guest of Honor
16:25 hrs	Address by Guest of Honor
16:30 hrs	Remarks of some of the delegates
16:45 hrs	Presentation of ISES Awards and Address by Chief Guest
17:15 hrs	Interaction with delegates
17:30hrs	Departure of Chief Guest

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**Dais Plan**

<b>Guest of honor</b>	<b>Chief Guest</b>	<b>Guest of honor</b>	<b>DG, ISR</b>
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**Welcome Address for the Concluding Session of the International Symposium on “Reducing Earthquake Losses” January 5-7, 2015 by Dr. B.K. Rastogi, Director General, ISR and President, Indian Society of Earthquake Science**

On behalf of ISR and Indian Society of Earthquake Science, I welcome the Chief Guest, Dr. Shailesh Nayak, Secretary Ministry of Earth Sciences and Chairman ISRO, Guests of Honor: Dr. Susan Hough of US Geol. Survey Pasadena (LA), California and Dr. Amod Mani Dixit, Secretary General Nepal Society of Earthquake Technology and the delegates to the Concluding Session of the 3- day International Symposium on **“Reducing Earthquake Losses”**.

I am happy that the community had shown interest in the topic of “Reducing Earthquake Losses”, that is why over 400 delegates attended. Delegates included about 50 from outside Gujarat, 8 from abroad, engineers, architects and builders and many other sections of the society from construction industry and Disaster management. There more than 65% students who are the hope for future. There were some 30 oral and 15 poster presentations and 5 panel discussions during the 3 days.

The foreign delegates include Dr. Susan Hough, a world renowned seismologist from US Geological Survey, Prof. Gian Paolo Cimellaro, Earthquake Engineer from Italy, Dr. M. Seki, Structural Engineer from Japan who has designed many tall buildings, Prof. Friedemann Wenzel, Director Karlsruhe Institute of Technology, he was with me in 2002 when I learnt from him site response, later he had taken me to Romania where I saw his initiatives for Earthquake Loss assessment and setting up of Earthquake Early Warning System; Prof. Antonella Peresan of Trieste Univ. Italy, our collaborator on new method of Deterministic Hazard Assessment, Dr. Amod mani Dixit, General Secretary, Nepal Society of Earthquake Technology, Dr. Minesh Ratna Tamrakar of NSET, Nepal.

Ms. Rita Teotia, special Secretary Telecommunication, GoI attended. To name some of the senior Indian delegates: Prof. Valdia gave a profound address, Prof. DK Paul of IIT Roorkee who is also Chairman of BIS Committee on Earthquakes, Mr. Anil Sinha who as Secretary had managed disasters in India for many years and is now Vice-Chairman, Bihar State Disaster Management Authority, Prof. Atul Desai of Surat, Mr. Anand Tatu, President Guj. Inst. of Civil Engineers,

Purpose of the symposium was to inform new findings of ISR and others on earthquake hazard to buildings and how to safeguard them. Experiences worldwide were shared by experts from different countries. Buildings considered are not only high rise but also of mass housing projects. Ideas on earthquake resistant features like dampers or base isolators and new designs as well as new inexpensive but earthquake-resistant materials were discussed. Retrofitting of important structures was also discussed. ISR investigations like seismic Microzonation, geotechnical work, geological studies and geophysical surveys as well as Seismic hazard assessment for tall buildings, LNG storage terminals and nuclear power plants were highlighted. Expertise for ‘Performance-based Designs’ including ‘soil- structure interaction’ and ‘dynamic analysis of building designs’ is available at ISR in collaboration with IIT Hyderabad.

Some of the ISR new findings were informed include:

1. Near the geological faults there is 50-100% higher hazard than recommended in the national code. Hence, national code needs to be modified.
2. Geotechnical investigations are required to know soil/rock layers which amplify the seismic waves and if there is any weak layer that can cause large amplification.
3. In Kachchh special investigations and care is needed due to possibility of great earthquakes of Magnitude 8. Along Narmada also moderate earthquakes of Magnitude up to 6.5 are expected.
4. In rest of Gujarat the earthquakes are of Magnitude 6 or less. Such earthquakes do not generate seismic waves close to natural periods of high rise buildings. Hence damage is more to low-rise buildings. Greater than 10 storey buildings may not collapse if built as per national code. They may be rattled badly and different floors may shake differently. Details can be worked out by dynamic analysis.

GSDMA, co-organizer of the symposium has helped establishment of ISR, Guj. Inst. Disaster Management and the State set up for Disaster Management. The Disaster Management plan of the country has been followed by the National plan.

Indian Society of Earthquake Science, co-organizer of the symposium was started in 2009 to create synergy between Seismology and Engineering and also to facilitate the seismologists from outside the state to work in Gujarat. There are over 150 life members. It publishes newsletters and a journal. We seek help of Patron Dr. Shailesh Nayak to generate a Corpus of about Rs. 1 crore for smooth functioning of the society.

The arrangements of the symposium made by ISR team were appreciated by all the delegates. All the arrangements about the transport, stay, food, auditorium, were highly appreciated. Scientific program of talks, posters and Panel discussions were lively. The symposium was well covered by print and electronic media.

## **Announcement about ISES Order of Merit Awards 2015**

**Indian Society Earthquake Science** plans to honor outstanding works in different fields of Earthquake Science (barring earthquake engineering) in India. The awards will be in two categories of Young Scientists (40 yr or less) and Senior Scientists.

Nominations are invited on plain paper mentioning details of the nominee (name, DoB, Affiliation) and contribution(s) made in the enlisted fields during the years 2013-2014. Write up should be limited to 2 pages. Nominations are to be forwarded by Head of Department/Institute. No self-nomination will be entertained. Shortlisted nominees (to be announced on Jan 5, 2015) will make short presentation limited to 10 minutes each at AES2015 during January 5-7, 2015 at Ahmadabad/Gandhinagar.

Nominations should reach Secretary ISES, Institute of Seismological Research, Gandhinagar-382 009 ([kapil\\_geo@yahoo.co.in](mailto:kapil_geo@yahoo.co.in)) by email / hard copy by November 30, 2014.

Fields considered for the award include:

- Observational Seismology, Seismotectonics, Earthquake Process
- Active Fault Study and Neotectonics
- Seismic Hazard and Risk Assessment including Engg. Geoph & Geotech. Investigations
- Geodetic Deformation (GPS and InSAR)
- Seismological, Geophysical and Geological Investigations for Delineating Faults, Basement and Crustal Structure

### **Selected for ISES Order of Merit Award**

Young: Dr. Panzamani Anbazhagan, Dr. Devajit Hazarika, Dr. Bhaskar Kundu, Dr. Kapil Mohan

Senior: Dr. V.K. Gahalaut, Dr. K. Madhusudhana Rao, Mr. G. Suresh

Awards were presented during the concluding session

Intl Symp. Reducing Earthquake Losses and Advances in Earthquake Science  
SCIENTIFIC PROGRAM  
**January 5, 2015 (Venue: Ahmedabad Management Association)**

08:00 – 9:30 Registration

09:30 - 10:45 Inaugural Function

10:45 – 11:00 Tea

11:00 - 13:15 KEYNOTE LECTURES

Chairman: Sri Anil Sinha

Co-Chairman: Dr. Amod Mani Dixit

Rapporteur: Dr. Kapil Mohan, ISR

1. Presentation of Prof. AS Arya “Reducing Earthquake Losses- A Lesson from Kutch Experience”, 15 minutes by BK Rastogi
2. Ms. Rita Teotia, Special Secretary (IT), Dept. Telecommunication, GoI, 15 minutes
3. Prof. B.K. Rastogi, ISR “New results from geotechnical investigations, seismic hazard assessment and microzonation in Gujarat” 35 minutes
4. Dr. Eng. Matsutaro SEKI, Japan "Current State on Seismic Evaluation, Seismic Isolation and Vibration control of Buildings in Japan" 40 minutes
5. Dr. C.S. Sanghvi, LD Engg College “Challenges in good earthquake engineering practice” 15 minutes

13:15-14:00 Lunch

14:00-15:45 KEYNOTE LECTURES

Chairman: Prof. Friedemann WENZEL

Co-Chairman: Prof. D.K. Paul

Rapporteur: Mr. Santosh Kumar, ISR

1. Mr. Anil Sinha, Vice Chairman, Bihar State Disaster Management Authority “Initiatives for Earthquake Mitigation in Bihar” 15 minutes
2. Prof. Gian Paolo Cimellaro “Introduction to Resilience- Based Design (RBD) of structures and Infrastructures” 30 minutes
3. Dr. Susan Hough, USGS, California “Damages due to Haiti earthquake and lessons for India” 30 minutes
4. A. Peresan, G.F. Panza, F. Vaccari, F. Romanelli, A. Magrin, From Trieste Univ., Italy "Neo-deterministic Seismic Hazard Scenarios as Preventive Tools for a Disaster Resilient Society" 15 minutes
5. Prof. Friedemann WENZEL, Karlsruhe, Germany “Options for Risk Modelling” 15 minutes

15:45-16:30 **Panel Discussions**

**Panel 1: New findings on seismic hazard assessment and seismic microzonation**

Topics: Geotechnical investigations, soil strength, Expected accelerations, seismic coefficients, characteristic frequencies, amplifications, attenuation relations

Moderator: Prof. B.K. Rastogi

Panelists:

- (1) Dr. H.B. Raghvendra, Director General, PDPU
- (2) Prof. Friedemann Wenzel, Karlsruhe

- (3) Prof. Antonella Peresan, Trieste, Italy
- (4) Dr. Susan Hough, USGS
- (5) Prof. Indrajit Ghosh, IIT, Gandhinagar

16:00-16:45: Tea

16:45-17:45 Panel Discussions

**Panel 2: Challenges in earthquake engineering & earthquake resistant as well as cost effective new materials**

Topics: Structural designing and new methods for earthquake-resistant constructions, Dynamic Response and soil-structure interaction

Moderator: Prof. C.S. Sanghvi, LD Engg. College

Panelists:

- (1) Dr. M. Seki
- (2) Prof. N.K. Arora, Structural Engg.
- (3) Prof. Paresh Patel, Nirma Univ.
- (4) Prof. Gian Paolo Cimellaro
- (5) Mr. Anil K. Sinha
- (6) Mr. Minesh Ratna Tamrakar

**January 6, 2015 (Venue: Ahmedabad Management Association)**

9:30-11:00 Keynote Lectures

Chairperson: Dr. Susan Hough,

Co-Chairman: Dr. M. Seki

Rapporteur: Mr. Vasu Pancholi, ISR

1. Dr. Amod Mani Dixit "Seismic Hazard Assessment, Disaster Risk Management in Nepal, Challenges faced and Lessons learned" 15 minutes
2. Dr. Susan Hough, USGS, California "New Initiatives on coping with Earthquake Hazard in USA" 30 minutes
3. Prof. Vikram Patel, SVBIT "Design parameters and construction practices in masonry construction " 15 minutes

11:00-11:15 Tea

11:15-13:00 Invited Lectures

Chairman: Prof. Atul Desai, SVNIT

Co-Chairman: Mr. Anand Tatu

Rapporteur: Prof. Vikram Patel

4. Prof. Pradeep Kumar Ramancharla, IIIT, Hyd "Soil-structure interaction and dynamic analysis of buildings" 15 minutes
5. Mr. Anand Tatu, President, GICEA, "Construction Best practices for Earthquake Resistant Structures" 15 minutes
6. Prof. (Dr.) Indrajit Patel, Anand "Best practices towards earthquake resistant construction addressing Mass housing Projects" 15 minutes
7. Prof. (Dr.) Atul Desai, Surat "Seismic Response of Different Types of Cable Stayed Bridges" 15 minutes

8. Mr. Minesh Ratna Tamrakar “Vulnerability assessment of residential Buildings in Kathmandu Valley and exploration for seismic retrofitting options” 15 minutes
9. Dr. AJ Shah, SVNIT, Surat, “Earthquake Disaster Management Performance Evaluation Using Data Envelopment Analysis”, 15 minutes

13:00-14:00 Lunch

14:00-16:00 Panel Discussions

**Panel 3: Construction best practices: Earthquake resistant structures, Design parameters, Structural Health Assessment & Retrofitting**

Topics for discussions: Common mistakes in structural designing, codes in different countries, Methods of Structural Health Assessment & Retrofitting

Moderator: **Prof. (Dr.) Atul Desai**

Panel Members:

- (1) Prof. Vikram M. Patel
- (2) Mr. Mehul Shah, Structural Consultant
- (3) Prof. Iyer, Architect
- (4) Mr. Minesh Tamrakar
- (5) Prof. (Dr.) Indrajit Patel
- (6) Mr. Smith Vyas, Architect

**Panel 4: Seismic Design Philosophies, BIS code requirements and Framing of municipal laws for Certification of earthquake resistant designing**

Topics for discussions: New ideas on seismic design philosophies, Modifications required in national codes, framing of municipal laws, certification of earthquake resistant designing.

Moderator: Prof. D. K. Paul

Panelists:

1. Dr. B.K. Rastogi, DG, ISR
2. Mr. Anand Tatu, President, GECIA.
3. Prof. V.R. Shah, Structural Engg
4. Prof. CS Sanghvi
5. Prof. BJ Shah, LD Engg. College

16:00-16:15 Tea

16:15-17:15 Panel Discussions

**Panel 5: Issues on Disaster Management**

Topics for discussions: Preparedness for rescue of trapped persons, Communication, Coordination, responsibilities, Chain of command, coping with fire hazards

Moderator: Ms. Anju Sharma, CEO-GSDMA

Panel Members:

- (1) Dy. Commandant G.S. Negi, Nat. Disaster Relief Force
- (2) Dr. KS Parikh, Space Application Center, ISRO, Communication Expert
- (3) Wing Commander Dinesh Vaswani
- (4) Dr. Amod Mani Dixit

**January 7, 2015 (Venue: ISR auditorium)**



9:00-10:45 Presentations by ISES Awardees

Chairman: Dr. Prabhas Pande

Co-Chairman: Dr. JR Kayal

10:45-11:00 Dr. Prabhas Pande "Active faults and liquefiable zones of Kachchh District: Their importance in the planning and design of structures"

11:00-12:00 Tea and Poster session

12:00-13:00 Invited Lectures

Chairperson: Prof. A. Peresan

Co-Chairman: Mr. AG Chhatre

Rapporteur: Dr. Sumer Chopra

1. Prof. K.S. Valdiya "Seismicity in Indian Peninsula: Geodynamic Perspective" 45 minutes

2. Dr. Sumer Chopra, MoES, New Delhi "Amplification, frequency and attenuation characteristics of the Gujarat region- Implications towards seismic hazard", 15 minutes

3. Mr. A.G. Chhatre "Performance based design of piping systems, cable trays, ducting and mechanical, electrical, instrumentation & control equipment in Indian industries based on good and bad performance of the equipment from the industries which Experienced Earthquake in India" 30 minutes

13:00-14:00 Lunch

14:00-15:00 Invited Lectures/Poster Session

Chairman: Prof. Gian Paolo Cimellaro

Co-Chairman: Mr. RK Mishra

1. Mr. R.K. Mishra, Dept. Atomic Energy, Mumbai, "Development of Engineering Guidelines Based on Lessons Learnt from Real Life Performances of Industrial Structures, Systems, and Equipment" 15 minutes

2. Wing Commander Dinesh Vaswani "Role of Indian Air Force in Disaster Management" 15 minutes

3. Commandant Devansh Trivedi, Coast Guard, Gandhinagar, Delivery of Assistance/Relief Materials to Tsunami Affected Areas - Coast Guard Perspective

15:00-16:00 Tea and Poster session

16:00-17:30 **Concluding Session and Award Ceremony**

Chief Guest: Dr. Shailesh Nayak, Secretary, MoES, New Delhi

Guests of Honor: Dr. Susan Hough, Dr. Amod Mani Dixit

## **Recommendations of the International Symposium on “Reducing Earthquake Losses” and 4<sup>th</sup> Annual Convention on Earthquake Science, January 5-7, 2015**

1. Consider 50-100% higher acceleration than that recommended in national code for a distance of 20 km from the geological fault lines in Cambay and Narmada and 40 km from fault lines in Kachchh.
2. National codes have to be changed (i) Codes are needed for non-structural elements (ii) Increase of seismic hazard is needed near fault. Codes are required for transmission. Codes have to be made for chemical industry to avoid Bhopal type tragedy. Also manufacturers of equipments need to be told about the safety requirements. Various other codes need to be modernized. Last modification was done in 2000.
3. Geotechnical investigations need to be done in detail up to 50m depth. These need to be done for high rise buildings. Geotechnical investigations need to be done for Government Mass housing projects also.
4. Base isolation and vibration controlling dampers are recommended. These have been proved highly effective worldwide.
5. Structural engineers need to be given licenses in different Categories depending upon experience.
6. Research on Vernacular buildings needs to be done and propagated.
7. e- engineering service needs to be started for general/ common guidance for Vernacular and the residential houses.
8. Earthquake safety clinics need to start.
9. In any building project 80% cost is of land. This leads to shady practices compromising earthquake- resistant features. Government price control is required for land cost.
10. Municipal laws need to be made for earthquake- resistant constructions and need to be enforced.
11. Collaborative study with USA is very much needed for comparative investigations of Kachchh and New Madrid, Missouri region.
12. Disaster preparedness drills are required frequently and at least once a year. In many countries “drop- hide-stay” like drills are carried out. Safety precautions of practiced help forming safe habits at the time of emergency. Otherwise people freeze mentally.
13. Professors of several engineer colleges mentioned that “Earthquake resistant designing” is not taught, it has been removed. It needs to be taught. Students are not aware of codes.

## 12. Recommendations for Municipal Authorities and Housing Projects:

- \* Codes need to be followed for mass housing projects. There should also be geotechnical studies.
- \* G+10 are not needed for mass housing projects. In absence of safety precautions, these become risky. The G+3 are proven and should be preferred.
- \* The government should not go for lowest bid. Quality construction should be ensured.
- \* The municipal authorities need to have “Design Basis Report” as per the Performa prepared by Prof. A.S. Arya for GSDMA.

### **Important points made by delegates during the AES2015**

**Dr. Gian Paolo Cimellaro of Turin, Italy & Dr. M. Seki of Building Res. Inst., Tokyo:** - Recommendation to use base isolation and dampers.

**Dr. M. Seki:** - In a NPP in Japan one reactor with base isolator not affected but three others, not base isolated, damaged.

**Susan Hough** of US Geol. Sur, Pasadena:

1. Seismogenesis of intraplate earthquake is difficult to understand. In new Madrid three large earthquakes occurred in quick succession. In both areas aftershocks have occurred for many years. It is difficult to differentiate between aftershocks and fresh shocks. Comparative study needs to be done of Kachchh and new Madrid earthquakes.
2. Earthq. Early Warning System is important for India. In shield area the waves travel to large distances, hence, useful. In California damage is confined to close distance, hence, not much useful.
3. In 2010 Haiti earthquake shaking was less but damage more due to shabby constructions. Buildings collapsed even where  $MMI = V$ . However well-built buildings did not collapse.

**Mr. Anil Sinha**, Vice-Chairman, BSDMA:- 1. 1934 Bihar-Nepal earthquakes had duration of 3 minutes.

2. An earthquakes safety clinic and centre (EqSC) is being started in Patna that will give advice in earthquake resistant construction to people.

3. BSDMA has four safety weeks for four types of disasters:

- i. January 11-17: Road safety week.

ii. January 15-21: Earthquake safety Week (based on Jan 15 date for 1934) earthquake, though Japan and other countries have different date.

iii. April 14-20: Fire safety week.

iv. June 01—07: Flood safety week.

**Prof. Antonella Peresan:**-PSHA maps (10% probability in 50 years) have been found to be inadequate to predict the earthquakes of magnitude which have happened in Italy and many other countries. Use of Deterministic or Neo-deterministic method is recommended

Prof. Friedemann Wenzel, Director Karlsruhe Inst. Tech: Reconstruction programme should have holistic approach as done for 2001 Kachchh earthquake and as shown in AS Arya's presentation.

**Prof. N.K Arora:**

1 Thousands of buildings in Ahmedabad are unsafe as these were not designed. Epoxy is weak and breaks. There is jointing problem. Though these survived in 2001 earthquake, but may not in the next one.

2. It is better to promote steel structure.

3. After 2001 earthquake the buildings being reconstructed were checked to see which ones were following earthquake resistance designing. Out of 120 buildings surveyed only the 3 govt. buildings followed earthquake resistant designing. On paper they showed that codes are followed but implementation was missing.

**Prof. Paresh Patel, HoD Civil Engg., Nirma:-**

1. Through ISR we have learnt many things on earthquakes and how damage is caused to buildings.

2. Students need to be involved with more practical work as experiencing of the things yields faster learning.

3. Earthquake clinic type facility is required where people can see what can happen and then they will apply earthquake resistant features.

**Prof D.K Paul former HoD Earthquake Engineering and currently Chairman Earthquake Safety Committee of Bureau of Indian Standards:** Though old buildings need to be retrofitted, it is necessary to focus on new constructions as the no. is growing fast. In 2005 the country had 250 M houses, in 2014 the no. stands at 3005 M.

**Dr.Vineet Gahlaut:** 1. Koyna area has given 2 mm/y horizontal deformation through GPS. Just outside of it there is no deformation. Hence in intraplate regions even a 2mm/y is large deformation.

2. There is no partitioning or difference in deformation north and south of Narmada.

**K.S.Valdiya:** Off-coast Hazira artifacts have been found at water depth of 30-40m. A 9km long belt has subsided by 30-40m.

**Anand Tatu, President Guj. Inst. of Civil Engg. and Architects:** In absence of national code for any aspect European code may be used. Codes need to be followed for man housing projects.

2. Training of different levels of persons involved in construction is needed. Training should be for design engineers, structural engineers, architects, civil executive engineers and masons.

3. Most of the cost (80%) of any project is for land. Hence, land sale price needs to be regulated by Govt.

#Government should enforce maintenance charges. In absence of maintenance buildings may fail in earthquake.

#Government should ensure good quality construction and not go for lowest bid.

#G+10 are not needed for mass housing projects. These are risky. The G+3 are proven and should be preferred.

**Ms. Anju Sharma, CEO, and GSDMA:** The Gujarat state District Management Act defines which event could be taken is a “Disaster” .It also clearly defines chain of commands and responsibilities. There are district levels “Disaster Management Cells”. Each district the collector is responsible.

**Prof. Atul Desai of Surat NIT:** Monolithic pre-fabricated construction is better and construction is rapid.

## Comments by Some of the delegates about the Symposium

1. Owner of a consultant engineering firm said "(i) we did not know so much facility is available at Gandhinagar and (ii) many practicing engineers will be interested to know all this, I will bring many to such a symposium, please arrange one more soon."
2. One other engineer said whatever little we understand it is useful.
3. One engineer said it was good you arranged the symposium in Ahmedabad so that many engineers and students could attend.
4. Prof. Wenzel, Director Karlsruhe Institute of Tech. said "It was great to see gathering of so many different types of professionals gathered together for a common cause, engineers, disaster management experts and so many students including girls. So much participation of girls is nowhere seen, the lectures were good and discussions meaningful".
5. Dr. JR Kayal, former Addl. DG, Geol. Sur. Ind. mentioned that bringing together so many different varieties of professionals is great. There were different types of engineers: Civil engineers, structural engineers, architects, disaster management persons, Air Force Wing Commander, Commandant Coast Guard, Dy Commandant NDRF, Government Officials, Professors, and many-many engineering students.
6. I was really very happy to have interacted with you and several other scientists during the AES meet. I have perused the CD given by you. I would like to express my most sincere thanks to your and the efficient team of ISR for making all arrangements in perfect order. Dr. Arun Bapat, Seismologist and Former Dy Director, Central Water and Power Station, Pune
7. I appreciate your warm hospitality at ISR and I was very impressed by your institute's activity. I am sure this is due to your long-term efforts. I would like to visit again if possible. I wish you will be able to continue this good situation in the future.  
Sincerely yours,  
M. Seki
8. I just wish to thank for inviting us to participate to the Conference and for the great time we had in Ahmedabad. The AES2015 conference was excellent and the stay very comfortable. Every time I come back from India I feel "reinvigorated" by a lot of new ideas, this time particularly by the constructive feedback from engineers.  
With best regards,  
Antonella
9. Thank you very much for the warm hospitality while in India.  
Regards  
Gian Paolo
10. I wanted to express my gratitude for the invitation to AES2015 and the opportunity to participate and learn many things. I was very impressed by the style of the meeting with the involvement of so many stakeholders, who actively contributed and openly addressed issues and problems.

I was equally impressed by the audience with so many young people and so many women.

Congratulations and many thanks again.

With best regards  
Friedemann Wenzel

### **Excerpts from a Report of International Seismic Safety Organization (ISSO)**

#### **International Symposium on Reducing Earthquake Losses and Advance in Earthquake Science conducted by the Institute of Seismological Research (ISR), Gandhinagar, Gujarat, India, Jan 5-7, 2015**

[Prepared by Liana Mualchin, Gen. Secy., ISSO from email dt. Jan 9 from Indrajit Ghosh]

Indrajit Ghosh, member of ISSO and a faculty member of the Indian Institute of Technology, Gandhinagar (IIT-GN) attended the above just concluded Symposium. The Director of ISR, Dr. B.K. Rastogi, who has recently become an ISSO member, is the main organizer of the Symposium. Dr. Peresan an ISSO member made an excellent impact by talking about NDSHA.

Some 400 academicians, practitioners and students attended the Symposium. Foreign participants were also there (not too many) - amongst them were Prof. Matsutaro Seki from Japan, Dr. Susan Hough with USGS, Prof. Antonella Peresan from Italy (ISSO member), and others. There were many technical papers and several panel discussions on seismology, microzonation, policies, structural design, construction, and emergency preparedness & response.

As expected it was a great symposium. It reflected Dr. Rastogi's open character and friendly nature - humorous, confident, very informal but to some extent formal, free spirit, "anyone can ask any question", and setting an avenue for young students for future scope in earthquake engineering. As a faculty member from the Indian Institute of Technology, Gandhinagar (IIT-GN), Indrajit's admission was free, and he also took 16 students from his institute. He did not present any paper, but Dr. Rastogi put him on a panel discussion where he mentioned that since the anomalies in the development of PSHA methodology had been recognized, and deterministic method had proven to be a better method, should we not divert all our energies on the adaptation of deterministic as a standard method.

A tremendous impetus on deterministic method in India was noticed. All the researchers Indrajit talked to believed that PSHA was not a correct method. Prof. Peresan talked about NDSHA a lot in her presentations giving some examples including the Emilia Earthquake in Italy where PSHA (0.125-0.15g) could not predict the observed (0.25g) acceleration, but NDSHA (0.2 - 0.35g) did.

Indrajit was very happy to report that in one of the panel discussions, Dr. Rastogi mentioned that an organization called International Seismic Safety Organization (ISSO) has been created in support of deterministic approach.

Dr. Susan Hough mentioned PSHA is still the standard method in the USA, but she also described, in a nut shell, the differences between PSHA and DSHA.

It is good to know that earthquake awareness is gaining momentum in India. Dr. D.K. Paul, head of earthquake-related codes in the Bureau of Indian Codes, also attended the Symposium, and informed

the audience that the existing Indian seismic code IS1893-2002 would be revised soon. The code will have a PSHA map, and not any more a zonal map. For those interested to improve the proposed code, Indrajit has secured a copy and is available for the asking. He is willing to forward any constructive comments you may have to Dr. D.K. Paul.

The sooner we zero-in to a safer, easier, sensible, and uniform method for seismic hazard assessment for application, the sooner losses will be reduced from earthquakes in seismic-prone regions of the world. Since we care for public safety, we must follow up and see that all seismic codes have included our recommended method of hazard assessment.

## News Paper Cuttings

Date: 04/01/2015

**‘રિશ્યુસિંગ અર્થક્વેક લોસિસ’ વિષય પર પરિસંવાદ**  
અમદાવાદ: ઇન્સ્ટિટ્યુટ ઓફ સિસ્મોલોજિકલ રિસર્ચ (આઈએસઆર) દ્વારા ‘રિશ્યુસિંગ અર્થક્વેક લોસિસ’ વિષય પર ત્રીદિવસીય પરિસંવાદનું આયોજન કરવામાં આવ્યું છે. સોમવાર અને મંગળવારના રોજ અમદાવાદ મેનેજમેન્ટ એસોસિએશન ખાતે આ પરિસંવાદ યોજાશે. જ્યારે કે સાતમી જાન્યુઆરીના રોજ આઈએસઆર ગાંધીનગર ખાતે વાર્ષિક સમિટના ભાગરૂપે રાજ્યના વિજ્ઞાન અને ટેકનોલોજી મંત્રી ગોવિંદ પટેલ પરિસંવાદનું ઉદ્ઘાટન કરશે. કચ્છ-ભૂજના ભૂકંપના ૧૪ વર્ષ પૂર્ણ થઈ રહ્યાં છે, ત્યારે ભૂકંપ પ્રતિરોધક બાંધકામ અને વિકાસ ઉપરાંત સિસ્મોલોજિસ્ટ, એન્જિનિયર્સ, આર્કિટેક્ટ, બિલ્ડર્સ અને બાંધકામ ક્ષેત્ર સાથે સંકળાયેલી અન્ય સંસ્થાઓ વચ્ચે સુમેળ સઘાય તેવો આશય આ પરિસંવાદનો છે. જેમાં સાત વિદેશી વૈજ્ઞાનિકો અને ૫૦થી વધુ નિષ્ણાંતો હાજર રહેશે.



# લોકો ઓછા ખર્ચે ભૂકંપપ્રુફ બિલ્ડિંગ બનાવવાની જાણકારી મેળવી શકશે

● સિસ્મોલોજી ઈન્સ્ટિટ્યૂટ દ્વારા પાંચથી સાત જાન્યુઆરીએ અમદાવાદ-ગાંધીનગરમાં સેમિનાર

નવગુજરાત સમય > ગાંધીનગર

રાજ્યમાં ભૂકંપની શક્યતા ધરાવતા જુદા જુદા વિસ્તારોમાં ભૂકંપ સામે રક્ષણ મેળવવા ક્યા વિસ્તારમાં બિલ્ડિંગની ઊંચાઈ કેટલી હોવી જોઈએ અને બિલ્ડિંગ બનાવવામાં કેવા પ્રકારનું મટિરિયલ્સ વાપરવું જોઈએ તેની વિસ્તૃત વિગતો આગામી ટૂંક સમયમાં નાગરિકો અને બિલ્ડરો મેળવી-જાણી શકશે. રાજ્યની ઈન્સ્ટિટ્યૂટ ઓફ સિસ્મોલોજીકલ રિસર્ચ(આઈએસઆર) દ્વારા રાજ્યમાં ૨૦૦૧માં આવેલા ભયાનક ભૂકંપ બાદ વ્યાપક રીતે સરવે હાથ ધરવામાં આવ્યો હતો અને હવે આ સરવેની વિગતોથી લોકો-બિલ્ડરોને



અવગત કરાવવામાં આવશે. વાઈબ્રન્ટ સમિટ અંતર્ગત ભૂકંપપ્રુફ બિલ્ડિંગ બનાવીને જાન-માલનું નુકસાન અટકાવતા પગલાં અંગેની લોકોપયોગી ચર્ચા માટે દેશના ૫૦ અને આંતરરાષ્ટ્રીય સ્તરના પ્રસિદ્ધ ટોચના સાત તજજ્ઞો ગુજરાત આવી રહ્યા હોવાનું આઈએસઆરના ડાયરેક્ટર જનરલ ડો. બી.કે.રસ્તોગીએ જણાવ્યું છે. ઈન્સ્ટિટ્યૂટના ડાયરેક્ટર જનરલે જણાવ્યું કે, અમદાવાદ એએમએ ખાતે ૫-૬ જાન્યુઆરી અને ૭મીએ રાયસણ ખાતેની ઈન્સ્ટિટ્યૂટમાં 'રિઝ્યુસિંગ અર્થક્વેક લોસીસ' વિષય પર સેમિનાર યોજવામાં આવ્યા છે. જેમાં બિલ્ડર-ડેવલપર, આર્કિટેક્ટ, સ્ટ્રક્ચર એન્જિનિયરોને બાંધકામ ખર્ચ ઘટાડીને ભૂકંપપ્રુફ બહુમાળી ઈમારત બનાવી શકે તેનું માર્ગદર્શન આપવામાં આવશે. આ સેમિનારનું ઉદ્ઘાટન રાજ્યકક્ષાના વિજ્ઞાન અને પ્રોધોગિકી પ્રધાન ગોવિંદભાઈ પટેલ કરશે.

પાછી પહેલા પાળ...

ભૂકંપની વોર્નિંગ મેળવવા કચ્છમાં હાલની રપ ઉપરાંત નવી ૫૦ મળી કુલ ૭૫ સિસ્ટમ્સ કાર્યરત થશે

# ભૂકંપ આવવાના ૩૦ સેકન્ડ પહેલાં વોર્નિંગ મળશે

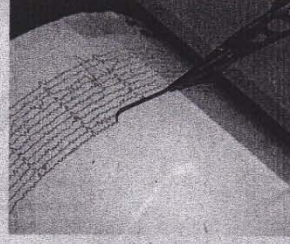
● ભૂકંપ કે સુનામીમાં  
'સેટેલાઈટ ગેટવે'  
ટેકનોલોજીના ઉપયોગથી  
સતત કનેક્ટ રહી શકશે

નવગુજરાત સમય > અમદાવાદ

'રિડ્યુસિંગ અર્થકલેક લોસિસ' વિષય પર આયોજિત પરિસંવાદમાં ઇન્સ્ટિટ્યુટ ઓફ સિસ્મોલોજીકલ રિસર્ચના ડાયરેક્ટર ડો. બી.કે. રસ્તોગીએ કહ્યું હતું કે, 'કચ્છના ભૂકંપને અમદાવાદ પહોંચતાં ૪૦ સેકન્ડ થાય, પરંતુ ભૂકંપ માટેની 'અર્લી વોર્નિંગ સિસ્ટમ'થી પહેલાં ૧૦ સેકન્ડમાં જ ભૂકંપની માહિતી અમદાવાદ સુધી પહોંચાડી શકાય. જેથી ૩૦ સેકન્ડનો સમય બચતાં મલ્ટિસ્ટોરી બિલ્ડિંગ્સ, ન્યુક્લિયર પ્લાન્ટ બંધ કરવા જેવા

મહત્વના સ્થળોએ આગોતરા પગલાં લઈ શકાય. અત્યારે કચ્છમાં ૨૫ સિસ્ટમ છે અને વધારાની ૫૦ સિસ્ટમ લગાવવાનું આયોજન છે. જેથી આગામી સમયમાં કચ્છમાં ભૂકંપની વોર્નિંગ આપતાં ૭૫ સ્ટેશન હશે.'

આ વોર્નિંગ સિસ્ટમ માટેના હાર્ડવેર કચ્છમાં જુદાજુદા સેન્ટર્સ ખાતે લગાવવામાં આવી રહ્યાં છે, બે વર્ષ સુધીમાં આ તમામ સિસ્ટમ કાર્યરત થઈ જશે. અમદાવાદ મેનેજમેન્ટ એસોસિયેશન ખાતે શરૂ થયેલા આ આંતરરાષ્ટ્રીય પરિસંવાદના મુખ્ય અતિથિ પદેથી બોલતાં જાપાનના ડો. માત્સુતારે સેકીએ નવા બાંધકામોમાં ઈનોવેશનને પ્રાધાન્ય આપવાની બાબત ઉપર ભાર આપ્યો હતો. જ્યારે કે કેન્દ્ર સરકારના ટેલિકોમ્યુનિકેશન વિભાગના વિશેષ સચિવ રીટા તિઓટિયાએ કહ્યું હતું કે, 'ભૂકંપ કે સુનામી જેવા ડિઝાસ્ટર્સમાં સેટેલાઈટ ક્રોમ્યુનિકેશન સૌથી વધુ મદદરૂપ થાય છે. તેથી આ ક્ષેત્ર ઉપર વિશેષ ભાર આપવામાં આવી રહ્યું છે અને બીએસએનએલને 'સેટેલાઈટ ગેટવે' માટેનો પરવાનો પણ અપાયો છે. ઓગસ્ટ ૨૦૧૫ સુધી સેટેલાઈટ ગેટવે સિસ્ટમ શરૂ થવાની શક્યતા છે. જે કુદરતી અને કૃત્રીમ આપદામાં મદદરૂપ બનશે.'



કેલિફોર્નિયાના ડો. સુસાન હોગ અનેક વર્ષથી ભૂકંપ અને સુનામી પર સંશોધન કરી રહ્યાં છે. તેમણે કહ્યું હતું કે, 'કુદરતી આપદાઓના ડેટા ખૂબ જ સીમિત હોવાથી સંશોધન પડકારજનક બની રહે છે. તેમ છતાંય ગુજરાત આ દિશામાં સંશોધનો કરી પડકારનો સામનો કરી રહ્યું છે.' જ્યારે કે ઈટાલીના પ્રો. જીઆન પાઓલો સિમેલારોએ હવે પછીના બાંધકામને ઈકોનોમિકલ અને ઝડપથી રિપેર કરી શકાય એ પ્રકારના બનાવવાની બાબત ઉપર વિશેષ ભાર આપ્યું હતું. કાર્યક્રમમાં રાજ્યના વિજ્ઞાન અને ટેકનોલોજી વિભાગના સચિવ એસ.જે. હેદર અને આપત્તિ વ્યવસ્થાપન સત્તામંડળના મુખ્ય કારોબારી અધિકારી અંજુ શર્મા પણ ઉપસ્થિત રહ્યાં હતાં.

કચ્છમાં ૮ અને નર્મદા  
નજીક ૬.૫ મેગિનિટ્યુડના  
ભૂકંપની શક્યતા

ડો. રસ્તોગીએ જણાવ્યું હતું કે, 'કચ્છમાં ૮ મેગિનિટ્યુડ વાળા મોટા ભૂકંપ અને નર્મદામાં ૬.૫ મેગિનિટ્યુડના મધ્યમ ભૂકંપની શક્યતા છે. કચ્છની નજીકના ૪૦ કિમીમાં લો અને હાઈ રાઈઝ ઇમારતોને જોખમ છે. નર્મદાના ૨૦ કિમી નજીકના વિસ્તારમાં લો રાઈઝ ઇમારતો ભૂકંપમાં જોખમી થઈ શકે છે. અલગ અલગ ઉંચાઈની ઇમારતોને થતાં નુકસાનો વિશે તેમણે કહ્યું કે 'સૌથી ઉપરની ૬થી ૬ મીટરના સ્તરો એક માળની ઇમારતોને અને ૨૫થી ૩૦ મીટરના સ્તરો બેથી ત્રણ માળની ઇમારતોને અસર કરે છે. એવી જ રીતે એના નીચે ૫૦થી ૮૦ મીટરના સ્તરો ચારથી છ માળ અને સૌથી નીચે ૩૦૦થી ૩૬૦ મીટરના સ્તરો બારથી વીસ માળની ઇમારતોને અસર કરતી હોય છે. જો પાંચથી વધુ માળની ઇમારતો નેશનલ કોડ પ્રમાણે બનાવાય તો તે પડી જવાની શક્યતા રાહી રહે છે.'

RNI registration no. GU/2014/55229

વર્ષ ૨, અંક ૫ " એનેટ, કોલમેન એન્ડ  
કંપની લિમિટેડ વતી હિતેશ બુદ્ધાભટ્ટી દ્વારા  
ફુડિયા રોબર, ૧૩૬, આશ્રમ રોડ, અમદાવાદ  
૩૮૦૦૦૮થી પ્રકાશિત ફોન નં. ૯૭૭૭૩૩૦૦,  
ફેક્સ ૯૭૭૭૩૫૦૦ અને વર્કમાન પબ્લિશર્સ  
લિમિટેડ, વેવલપુર, અમદાવાદ ૩૮૦૦૫૫ દ્વારા  
મુદ્રિત. તંત્રી: અનલ ઉમટ

# 'City needs better building codes'

*Researchers at ISR convention focus on earthquake-resistant structures*

dna correspondent @dnaahmedabad

The Institute of Seismological Research (ISR) conducted its 4th convention in Ahmedabad on Monday, with different stakeholders like, builders, contractors, building professionals and students as audience, while researchers presented their studies. Points discussed at the convention - like the fact that buildings with greater open spaces in ground floors (parking spaces) are more affected by earthquakes - hinted at the weakness of current building practices in the city.

On the first day of the two-day convention, researchers focused on reducing earthquake losses. Experts and speakers from countries like Italy, Germany, USA and Japan are attending the meet.



BK Rastogi at the convention

BK Rastogi, director general, ISR, said, "If buildings in Ahmedabad are built following proper building codes, there can be multistoried buildings, which will still be safe against earthquakes." He added, "Having two-storied basements in buildings provide greater strength to the entire structure."

Rastogi also said that ISR has made immediate recommendation to upgrade building codes with changes that can help buildings to resist 50% to 100% more stress in the city and certain

other areas.

He added, "Worldwide, building codes have already been upgraded, and India needs to upgrade our building codes keeping geological fault areas in mind. This is essential where more than 50% damage is expected." He stressed that we need to review and rework our building codes keeping in step with global research findings and new technology developments.

Gujarat has two very earthquake-prone areas. Kutch is the most sensitive, registering

**G** Many buildings have very open ground floors, but shear walls in four corners of the building add much more strength, and absorb more stress during earthquake

**BK RASTOGI**,  
director general, ISR

earthquakes of 8 magnitude on the seismic scale. A area with about 40 km diameter in Kutch is highly earthquake prone. The Narmada and Cambay area is the second-most sensitive with earthquakes reaching 6 magnitude on the seismic scale. Here, an area about 20km in diameter is hazardous. Ahmedabad, too, falls in an earthquake prone zone, as also Bharuch and Anklshwar in south Gujarat. These areas are counted as the second most earthquake prone areas in the state, after the highly sensitive zones of Kutch and Cambay.









