Information Bulletin

Workshop on

SEISMIC ASPECTS OF DAM SAFETY AND DESIGN

29th September – 1st October, 2026
New Delhi

Organised by

INCOLD

Indian Committee on Large Dams

ESTD. 1927 NEW DELHI

Central Board of Irrigation & Power

BACKGROUND AND COURSE OVERVIEW

Storage dams are the most challenging projects in the civil engineering profession, requiring knowledge of different technical and non-technical disciplines. The training course offered by INCOLD is concerned with seismic safety aspects of dams. Unlike buildings and other structures, which are mainly designed to resist ground shaking, large dams can be affected in different ways by strong earthquakes, i.e.

1. Ground shaking causing cracks and deformations in concrete and embankment dams, spillways, low-level outlets, powerhouses, switchyard, desilting basins, underground structures, electro-mechanical equipment, etc.
2. Movements of active faults or discontinuities in the footprint of dam or reservoirs.
3. Mass movements (landslides, rockfalls, avalanches, etc.) at dam site and in reservoir causing (i) impulse waves that may overtop the dam, (ii) blocking intakes of safety-critical spillways and low-level outlets, (iii) damaging the dam body, spillway gates, equipment and other types of structures and buildings of large hydropower schemes, and (iv) blocking access roads to the dam.
4. Liquefaction in earth dams and/or the foundation of mainly small dams causing large deformations in the dam body and/or the foundation, Moreover, liquefaction of loose sediments in reservoirs and turbidity currents in the reservoir may block intakes of spillways, low-level outlets and /or headrace tunnels, etc.

Water storage dams with a large damage potential, must be able to withstand the strongest ground motion to be expected at the dam site. This is different from building structures, which are designed against earthquakes using earthquake ground motion parameters with a return period of typically 475 years, whereas large storage dams and safety-critical equipment such as spillways and low-level outlets must withstand ground motions with a return period of up to 10,000 years as well as the effects of the worst-case earthquake scenario for the dam site.

Dams were the first structures designed against earthquakes, on a worldwide basis, starting in the 1930s. At that time, the ground shaking was represented by a seismic coefficient of typically 0.1, almost irrespective of the seismic hazard at the dam site, which was often unknown. The seismic analysis was done with the pseudo-static method, ignoring the dynamic characteristics of dams. Because of its simplicity, this method is still in use today, although it has become clear that this method is obsolete following the observations made during the 1971 San Fernando earthquake. The pseudo-static method is also not compatible with current seismic guidelines (ICOLD Bulletin 148) and, therefore, this obsolete method shall no longer be used for the safety checks of large storage dams. Using the pseudo-static concept, the seismic load case was rarely governing the design of a dam. However, today, the earthquake load case has become the dominant load case for the design of most dams.

Since the 1930s considerable developments in the seismic analysis and design of large storage dams have taken place. The main developments may be described as follows:

1. Change from pseudo-static analysis to dynamic seismic analysis of dams,
2. Change from the representation of the earthquake ground shaking by a seismic coefficient to the safety evaluation earthquake ground motion represented by acceleration response spectra and spectrum-matched acceleration time histories,
3. Change from the single ground shaking hazard to multiple seismic hazards including ground shaking, mass movements, faulting, etc. and
4. Change from the stability safety factor and allowable stresses concepts to rational seismic performance criteria, characterized by dam deformations and seismic failure modes of dams.

Today, a modern dam safety concept includes the following elements:

1. Structural safety,
2. Dam safety monitoring,
3. Operational safety and maintenance, and
4. Emergency planning.

Earthquakes play a role in all these safety elements, which will be addressed in the workshop.

If we use modern seismic design criteria for large dams (ICOLD Bulletin 148), the following, very general, performance criteria apply for the effects of the strongest ground motion at a dam site:

1. to retain the reservoir and to protect the people from the catastrophic release of water from the reservoir,
2. to control the reservoir level after an earthquake as a dam could be overtopped if the inflowing water into the reservoir cannot be released through damaged spillways or low-level outlets, which is of main concern for embankment dams as these dams may be destroyed, and
3. to lower the reservoir level after an earthquake (i) for repair works, (ii) for increasing the safety of a damaged dam or (iii) when there are doubts about the safety of a dam.

These new seismic performance criteria are different from those used in the past, when a dam was declared safe, when for different load combinations including static and seismic loads, the stresses were within the allowable stresses, the deformations were within allowable deformations, and the safety factors against sliding, overturning and others were larger than the safety factors specified in design guidelines. This concept has been used in the past and is still being used by some engineers today.

The seismic safety criteria for the dam body and safety-critical components and equipment are as follows:

1. Dam body: Structural damage (cracks, deformations, leakage etc.) is accepted as long as the stability of the dam is ensured and when there is no uncontrolled release of large quantities of water from the reservoir causing flooding in the downstream region of the dam.
2. Safety-critical components and equipment: These components and equipment must be fully operable during and after the safety evaluation earthquake (SEE). Minor distortions are accepted as long as they have no impact on the proper functioning of the components and equipment.
3. Abutment rock (important for arch dams): All abutment wedges must be safe.
4. Reservoir slopes: No mass movements into the reservoir are accepted, which block intakes of the spillway or low-level outlets or which create large impulse waves in the reservoir that could cause overtopping of the dam crest.

The last requirement is very important for embankment dams. Furthermore, the possibility of large earthquake-triggered mass movements and the release of stored water, sediments and debris in the catchment area must be considered. This is a special safety concern for the Himalayan region.

As safety-critical elements must function after strong earthquakes, the hydro-mechanical and electro-mechanical engineers must also be familiar with the seismic safety philosophy used for large dams. It is not only the concern of civil engineers as people may believe wrongly.

PROGRAMME DETAILS

Seismic Aspects of Dam Safety and Design (29 September, – 1 October, 2026)

WORKSHOP COURSE DETAILS:

The following subjects will be addressed:

Day 1 : How to deal with the many hazards affecting dam safety; Performance of dams during strong earthquakes; Lessons learnt from recent earthquakes; Seismic design and safety criteria for large storage dams; Seismic information the dam engineers need from seismologists (probabilistic and deterministic seismic hazard analysis).

Day 2 : Modern dam safety concepts for controlling effects of seismic hazards; Seismic design aspects of concrete and embankment dams; Selection of dam types in seismic regions; Seismic analysis of concrete and embankment dams for different types of earthquakes (operating basis earthquake and safety evaluation earthquake); Dynamic stability analysis of concrete and embankment dams; Case studies.

Day 3 : Seismic hazard in India and seismic monitoring of Indian dams; Indian earthquake codes and regulations for dams; Seismic rehabilitation of Indian dams with inadequate earthquake safety. The session may also include expert lectures on the fixing of seismic design parameters for river valley projects by the National Committee on Seismic Design Parameters (NCSDP), as well as a special lecture by a seismologist from the India Meteorological Department (IMD), New Delhi, on the Bhuj Earthquake and its implications for dam safety and seismic design practices.

WHO SHOULD ATTEND?

This workshop is strongly recommended for engineers involved in the safety of dams and in particular for young professionals, who want to be up-to-date with the current state-of-the-art and state-of-the-practice in the seismic analysis, design and safety evaluation and assessment of dams, i.e.

1. Dam professionals (civil, geotechnical, earthquake engineering and hydro-mechanical and electro-mechanical engineers),
2. Dam consultants,
3. Dam owners. and
4. Dam safety authorities.

SPEAKERS

Dr. Martin Wieland, Chairman, ICOLD Committee on Seismic Aspects of Dam Design, Switzerland

Dr. Ishwer Datt Gupta, Independent Scholar, (Formerly Director, CWPRS Pune)

India Meteorological Department

Prof. Pradeep Kumar Ramancharla, Director, CSIR – Central Building Research Institute Roorkee, Uttrakhand

"Demonstration of Time History Seismic Analysis of a concrete gravity dam of India"

REGISTRATION DETAILS

Date & Venue : The date for the Workshop 29 September – 1 October, 2026 at CBIP Conference Hall, New Delhi

Official Language: The official language for the event is English.

Registration Fee for delegates to participate in the workshop is as follows:

Workshop	Delegate
Registration fee for Workshop on Seismic Aspects of Dam Safety and Design: 3 days workshop (29 & 30 September and 1 October, 2026)	16,000/-*

*GST extra @ 18% on registration fees given above.

The registration fee includes a registration kit, working lunch, and tea/coffee during the conference. Participants are required to make their own arrangements for accommodation, travel, and other personal expenses. Please note that the registration fee is non-refundable.

SPONSORSHIP OPPORTUNITY

Sponsorship Fee: ₹2,00,000/-

The sponsor's logo will be prominently displayed on the Workshop backdrop and banners. The sponsorship includes five complimentary delegate registrations for participation in the conference. The sponsor will also be acknowledged during the inaugural and closing sessions. In addition, the sponsor will be provided one full-page advertisement in the INCOLD Journal.

OPPORTUNITIES FOR TABLE TOP DISPLAY

Limited Slots are available @ Rs. 50,000/- Plus GST, for display of products, services & Innovations

PAYMENT DETAILS:

Kindly arrange to remit the payment by bank demand draft/ cheque payable at par in New Delhi, drawn in favour of "Committee for International Commission on Large Dams, India" or by bank transfer to the following account:

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RESOURCE SPEAKER

DR. MARTIN WIELAND

Martin Wieland has been the Chairman of the ICOLD Committee on Seismic Aspects of Dam Design since 1999 and has more than 40 years of experience in dam and earthquake engineering. He has worked in 35 countries, on 115 large dam projects and obtained his civil engineering degrees from the Swiss Federal Institute of Technology in Zurich, Switzerland. He has authored more than 300 technical papers in the fields of dam and earthquake engineering and is an Honorary Member of ICOLD and the Swiss Committee on Large Dams. He also received an Honorary Professorship from Hohai University in Nanjing, China in 2002. He was the leader of the ICOLD expert team of the joint CHINCOLD-ICOLD mission to inspect the damage caused to dams and hydropower plants by the May 12, 2008 Wenchuan earthquake in Sichuan Province. Dr. Wieland has been a member of panel of experts of several large storage dams including the 272 m high Enguri arch dam in Georgia. He was also a member of the Structural Advisory Board for the Panama Canal Authority (ship locks for the recently completed new Panama Canal).

Contact :

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DR. ISHWER DATT GUPTA

Dr. Ishwer Datt Gupta is an internationally recognized expert in Earthquake Engineering with over 46 years of research, consultancy, and professional experience. He specializes in engineering seismology, strong-motion studies, seismic hazard assessment, site-specific design ground motion, and the seismic safety of dams and other critical infrastructure.

After joining the Central Water and Power Research Station (CWPRS), Pune in 1979, he served in various scientific and managerial positions before retiring as Director in 2013. He subsequently served as Visiting Professor at IIT Roorkee and is presently working as an Independent Researcher and Consultant.

Dr. Gupta has authored more than 160 research papers, supervised eight Ph.D. scholars and conducted about 150 engineering consultancy studies. He has also contributed significantly in updating of the NCSDP Guidelines for Site-Specific Seismic Studies for river valley projects and the IS 1893 (Part 1) code of practice for Earthquake-Resistant Design of Structures. He is member on the editorial boards of several technical journals and reviewer for numerous international journals. Dr. Gupta is the recipient of several best paper award and the ISET Trifunac Award (2022) for significant contributions to strong-motion studies.

INCOLD

Workshop on

Seismic Aspects of Dam Safety and Design

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REGISTRATION FORM

(To be filled in block letters, preferably typed)

1. Name of Participant _____
   (Surname) (First Name) (Prefix Prof/Dr./Mr./Mrs./Ms.)
2. Name of Organization: _____ Designation : _____
3. E-mail : _____ Mobile No. _____
4. Payment details (Organisation's GST No. to be mentioned in the Tax Invoice)
   Bank Draft/cheque No. _____ dated _____ INR _____ drawn on Bank _____
   is enclosed/is being sent separately.

I intend to participate in the deliberations of the workshop.

Dated _____ Signature_____

SECRETARIAT

All correspondence related to the workshop should be addressed to:

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