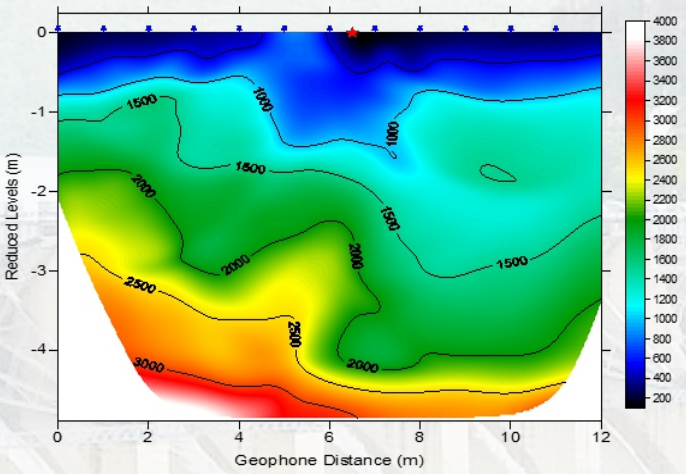
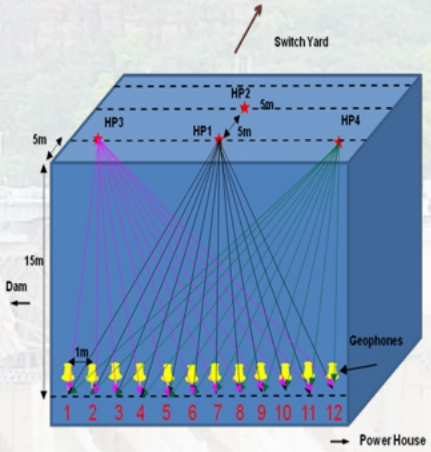
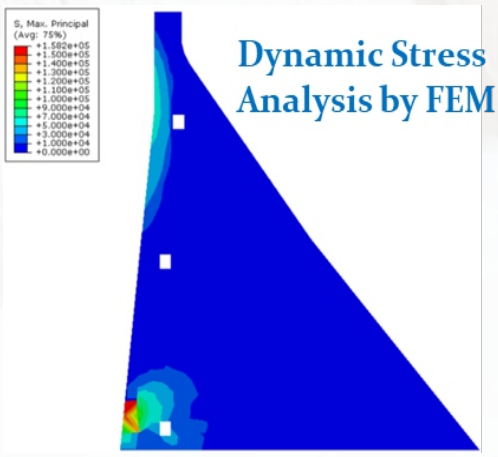
CWPRS: *Safeguarding India's Dams for the Next Century*

Research · Innovation · Resilience







Ministry of Jal Shakti

Department of Water Resources, RD & GR

Central Water and Power Research Station

Khadakwasla, Pune - 411024

About CWPRS: *Securing India's Dams with Science and Expertise*

The **Central Water and Power Research Station (CWPRS), Pune,** established in 1916, is the nation's premier institute for applied hydraulic research under the Ministry of Jal Shakti, Department of Water Resources, River Development and Ganga Rejuvenation, Government of India. For over a century, CWPRS has been the trusted backbone behind India's water infrastructure—contributing to the safe design, operation and rehabilitation of dams, barrages, hydropower projects, irrigation systems and river training works. At the heart of CWPRS is its multidisciplinary expertise: Applied Earth Sciences, Foundations and Structural engineering and hydraulic machinery & instrumentation. This unique integration allows CWPRS to study every stage of a dam's life cycle—from foundation investigations and structural stability analysis to vibration, cavitation, seepage control, instrumentation and rehabilitation of distressed structures. With state-of-the-art laboratories, physical and numerical modelling facilities and a team of highly qualified scientists, CWPRS delivers science-based solutions that enhance dam safety, extend service life and ensure reliable performance under aging, seismic and climatic stresses. Over the decades, CWPRS has left its imprint on nearly every major dam project in India — from Bhakra and Hirakud to Sardar Sarovar, Tehri, Indira Sagar, Nathpa Jhakri and Polavaram —each standing testimony to our enduring commitment to research, innovation and resilience in water engineering. Today, as India faces the twin challenges of aging infrastructure and climate variability, CWPRS continues to stand as the nation's knowledge partner in dam safety and rehabilitation, securing water and energy lifelines for generations to come.

Why Dam Safety Matters

India is home to over **6,100 large dams,** ranking third in the world after the USA and China. These structures are the silent sentinels of our water security—powering our hydroelectric stations, irrigating millions of hectares, supplying drinking water and protecting lives from floods. But many of these dams were built in the last century, designed and constructed with methods and materials that, though robust for their time, do not always meet today's advanced safety standards. Decades of service, natural aging, repeated exposure to floods and earthquakes and changing climate patterns have begun to take their toll.

The warning signs are visible: seepage, cracking, deformation, loss of material strength, foundation settlement and seismic vulnerabilities. In fact, more than 50% of India's dams have already crossed half their design life and several are over a century old.

The implications go far beyond engineering. A distressed or unsafe dam threatens lives, property, livelihoods and the very trust people place in water infrastructure. Conversely, a safe and resilient dam ensures uninterrupted irrigation, reliable power, stable water supply and disaster mitigation—cornerstones of national growth and security.

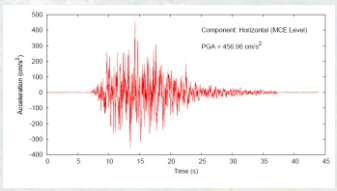
That is why **dam safety is not just an engineering concern—it is a national priority.**

CWPRS provides the **science, technology and expertise** to address these challenges—extending the life of dams, restoring safety and protecting communities.

Our Integrated Expertise

An Integrated Approach to Dam Safety - CWPRS brings together three specialized domains to deliver **end-to-end solutions** for dam safety and rehabilitation:

1. Applied Earth Sciences

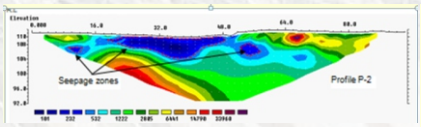


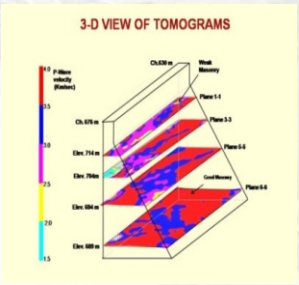
Understanding the ground beneath and around dams

- Seismic safety assessments and site characterization.
- Subsurface and geophysical investigations to identify seepage, weak foundations, and buried voids.
- Landslide, slope stability and reservoir rim protection.
- Site-specific seismic hazard analysis and reservoir-induced seismicity.
- Non-destructive testing (NDT) and laboratory evaluation of dam materials.

Research Outcome: A clear understanding of earth–structure interaction for safe foundations and long-term stability.

2. Foundation & Structures



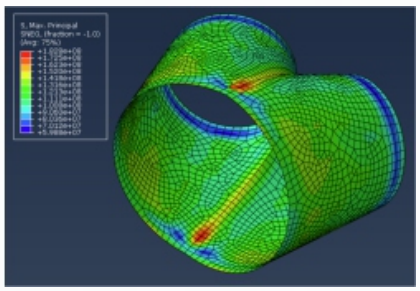


Strengthening the engineering backbone of dams

- Structural health assessment of gravity, masonry, earthen and rockfill dams.
- Stress–strain and stability analyses under static and dynamic conditions.
- Seepage control and grouting techniques.
- Repair and rehabilitation methodologies tailored to field conditions.
- Structural assessment of penstocks, bifurcations and anchor blocks.
- Long-term safety surveillance through dam instrumentation data

Research Outcome: Strengthened structures that withstand floods, earthquakes, and decades of service.

3. Hydraulic Machinery, Cavitation & Instrumentation



Ensuring smooth operations and safe performance

- Cavitation and vibration studies for turbines and spillways.
- Performance evaluation of water conductor systems and powerhouse components.
- Advanced instrumentation for dam behaviour monitoring.

Research Outcome: Safe, efficient and continuously monitored hydropower and dam operations.

"Three disciplines. One mission: Safe, resilient and reliable dams"

Integrated Approach, Capabilities & Legacy of Trust

CWPRS solutions combine **earth science, structural engineering and hydraulic machinery expertise** into a **single coherent strategy**.

Our Capabilities

- Dam Rehabilitation
  – Crack & seepage detection, grout solutions, stability enhancement
- Seismic Safety
  – Strong motion studies, reservoir-induced seismicity, site-specific design parameters
- Instrumentation
  – Selection, calibration, and installation of dam monitoring systems
  – Real-time health monitoring and safety assurance
- Hydraulic Systems
  – Penstock strain testing, turbine vibration studies, draft tube flow assessments

Our Legacy of Trust

> ***"For over 100 years, CWPRS has guided India's river valley, hydropower and dam projects — from concept to operation. Our solutions safeguard lives, assets and national water security."***

Footprints Across Every Iconic Dam:

- **Hirakud, Massanjore, Koyna, Temghar :** Identification of grouting and shotcrete materials
- **Bhakra, Hirakud, Baglihar and Sardar Sarovar:** Specialized dam safety reviews ensured reliability of these national assets.
- **International footprint:** Studies for Salma Dam (Afghanistan), Mangdechhu (Bhutan) and Lower Seti (Nepal).

Institutional Anchor for Dam Safety

- Principal Technical Arm supporting the **National Dam Safety Authority (NDSA)**.
- Partner in the World Bank–supported Dam Rehabilitation and Improvement Project **(DRIP)**.
- Over **100 dam safety and rehabilitation studies** in the last five years.
- Established **Dam Rehabilitation Centre** as a national hub for technical excellence.

The CWPRS Advantage

- Over **6,400 research studies** since 1916.
- Expertise spanning **dams, hydropower projects, barrages, reservoirs, ports and coastal structures**.
- A trusted partner for **research-driven, field-tested, cost-effective solutions**.

"CWPRS: Where Research Meets Real-World Safety"

Securing India's Dams • Strengthening National Water Infrastructure

Contact Us

Dr Prabhat Chandra
Director
Central Water & Power Research Station
Khadakwasla, Pune – 411024, Maharashtra, India
✆ +91-20-24103500 | ✉ director.cwprs@gov.in | www.cwprs.gov.in