



ICOLD & APG Symposium
on
Sustainable Development of Dams & River Basins



Safety Inspection of Dam in India

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Feb, 24th-27th 2021, New Delhi, India

Introduction

- India ranks 3rd after China and USA in terms of the number of dams in terms of number of large dams.
- As per NRLD- 2019:
 - 5534 Constructed Large Dam
 - 411 Under-Construction Large Dam (As per ICOLD Specification)
 - 75% are more than 20 years old & avg. age is more than 40 years
- An unsafe dam constitutes a hazard to human life, environment including flora fauna, riverine ecology and public assets.
- Safety of dam is a matter of great concern to the general public and it becomes a responsibility of dam owners to take necessary steps to ensure the safety of dams.
- CWC has, as part of institutional strengthening, prepared guidelines and manuals for Dam Safety.
- CWC has published “*Guidelines for Dam Safety Inspection of Dams*” in January 2018.

Overview on Dam Safety Inspection

- Safety and maintenance of dams primarily rests with owners which are invariably the State Govts., Central and State power generating PSUs etc.
- Dam owners are generally carrying out the Scheduled inspection (i.e. pre-monsoon, post-monsoon inspections), comprehensive dam safety evaluation and special inspection.
- Dam owners are expected to submit their inspection report/ health status report of all the large dams to DSO, CWC for the examination.
- Health Status Reports also to be uploaded on Dam Health and Rehabilitation and Monitoring Application (DHARMA).
- The primary goal of DSO, CWC is to encourage and assist the advancement of dam safety practices that will help to ensure operation of dams to their full capacities and intended purpose, and also to reduce the risk to lives and properties from consequences of both structural and operational dam incidents and failures.

Dam Safety Inspection Program

- to ensure proper operation and maintenance;
- to discover unsafe conditions and determine why they exist;
- to recommend remedial measures to mitigate the deficiency or defect that will safeguard the dam and its appurtenances.

Type of Inspections:

- Scheduled Inspections:** generally pre and post monsoon inspection, used to establish needed repairs and repair schedules, and to assess the safety and operational adequacy of the dam. Scheduled inspections are also performed to evaluate previous repairs.
- Comprehensive Evaluation Inspections:** detailed examination of the all component of dam is carried out through an independent panel of experts constituted for the purpose of determining the conditions of specified dam and its reservoir.
- Special Inspections:** to resolve specific concerns or conditions at the site on an unscheduled basis.
- Informal Inspections:** a continuing effort by on-site personnel performed while carrying out their regular duties on daily basis.

Inspection Items

- **Concrete Structures in General** : Concrete Surfaces, Structural Cracking, Movement, Junctions, Drains ,Water Passages, Seepage or Leakage, Monolith Joints, Foundation Abutments etc.
- **Embankment Structures in General**: Settlement, Slope Stability, Seepage, Drainage Systems, Slope Protection etc.
- **Spillway Structures**: Control Gates and Operating Machinery, Unlined Saddle Spillways, Approach and Outlet Channels, Stilling Basin (Energy Dissipators) etc.
- **Outlet Works**: Intake Structure, Operating and Emergency Control Gates, Conduits, Sluices, Water Passages, Stilling Basin (Energy Dissipater), Approach and Outlet Channels, Drawdown Facilities etc.

Inspection Items

- **Safety and Performance of Instrumentation:** Headwater and Tail-water Gauges, Horizontal and Vertical Alignment Instrumentation (Concrete Structures), Horizontal and Vertical Movement, Consolidation and Pore-water Pressure Instrumentation (Embankment Structures), Uplift Instrumentation, Drainage System, Seismic Instrumentation etc.
- **Reservoir:** Shore Line, Sedimentation, Potential Upstream Hazard Areas, Watershed Runoff Potential etc.
- **Downstream Channel**
- **Operation and Maintenance Protocols:** Reservoir Regulation Plan, Maintenance etc.
- **Disaster Management Plan**
- **Security Arrangement for Dam and Dam Appurtenances**
- **Basic Dam Facilities**

Documentation of Inspection

- dam owner/operator to keep log books, history sheets and records throughout the entire life of the dam.
- Accurate records can better illustrate the dynamic nature of the structure and may help pinpoint problems.
- Dam owner should create a permanent file in which to keep inspection records, including documentation of actions taken to correct conditions found in the inspections.
- **Method of Documentation**
 - **Inspection Checklist:** Each type of inspection may have its own checklist format, and the format used for an inspection may be predetermined by the owner or CDSO. Format for schedule inspection check list is given in the Guideline.
 - **Field Sketches:** intended to supplement the information recorded on the inspection checklists

Documentation of Inspection (Contd.)

- **Inspection Report Form:** Current CDSO regulations require the completion and submission of a Scheduled Dam Safety Inspection Report Form for comprehensive evaluation inspections on high hazard dams. A detailed written report incorporating the Inspection Report Form, a summary of findings, recommendations, conclusions, photographs, and other supporting data must be prepared for comprehensive evaluation inspections.
- **Photographs:** Inspection photographs can be vitally important. Over time, photographs serve to provide a pictorial history of the evolving characteristics of a dam.
- **Voice Recorder:** Tape recorders, especially the micro recorders, can be convenient when it is difficult to write while an inspector is observing field conditions.
- **Others:** Monitoring Data, Inspection Notes, Global Positioning Sensors (GPS) and Smart phones and Laptop Computers etc.

Conclusion

- After the independence, India has invested substantially in infrastructure necessary to store surface runoff in reservoirs formed by large, medium, and small dams with associated appurtenances.
- To ensure the proper maintenance and safety of dams, inspection of dams are important for their health monitoring and remedial works.
- Dam Safety procedure may vary from State to State and organisation to organisation.
- To bring uniformity and standardization in safety inspection of dams across India, Central Water Commission (CWC) published first edition of Guidelines for Safety Inspection of Dams in June 1987.
- Dam Safety Bill, 2019 emphasizes need for uniform dam safety procedures to provide surveillance, inspection, operation and maintenance of the specified dam and setting up of institutional mechanism for prevention of dam failure related disaster.

Thank You!