

## TERMS OF REFERENCE FOR THE R&D PROJECT

### 1. Title of the Project:

Study of Water-stops Used at Transverse Contraction Joints in Masonry and Concrete Dams

### 2. Background:

**2.1** The contraction joints in masonry and concrete dams provide passages through the dam which unless sealed, would permit the leakage of water from the reservoir to the downstream face. To check this leakage, water-stops are installed in the joints adjacent to the upstream face. The project aligns with the growing demand for robust and effective solutions at transverse contraction joints in masonry and concrete dams to address issues related to water seepage and structural integrity.

**2.2** BIS has published an Indian Standard IS 15058:2002 ‘PVC Water-Stops at Transverse Contraction Joints for Use in Masonry and Concrete Dams - Specification’ which gives the technical specifications of PVC water-stops. At present, there are 7 licenses in operation under IS 15058:2002. However, some quality parameters such as flexural strength and tear resistance have not been addressed in the existing Indian Standard. BIS has also published an Indian Standard IS 12200:2001 ‘Provision of Water-Stops at Transverse Contraction Joints in Masonry and Concrete Dams — Code of Practice (First Revision)’ which deals with the provision of PVC water-stops across ungrouted transverse contraction joints in masonry and concrete dams.

**2.3** Dam Safety Act, 2021 also focuses on ensuring structural integrity and safe operation of dams. The development of technical specifications and testing methods for PVC water-stops or water-stops of any other alternative material is vital for ensuring the durability and performance of these critical components in dam construction.

### 3. Objective:

**3.1** To study the latest advancements in the field of water-stops used at Transverse Contraction Joints in Masonry and Concrete Dams, in view of the trade, technology, and performance.

**3.2** To develop comprehensive technical specifications that will guide the manufacturing, testing, installation, and maintenance of PVC water-stops, or water-stops of any other alternative material, contributing to the overall safety and efficiency of dam structures.

#### **4. Scope:**

The Scope of this R&D project is as follows:

##### **4.1 Material selection and properties:**

- a. Study and analyze the national/international literature through standards, research papers, and other peer-reviewed documents to identify the performance parameters, type, and manufacturing practices for further study.
- b. Collect and analyze the production and consumption data from manufacturers, construction companies, dam owners, and industry reports.
- c. Identify suitable materials, including PVC water stops and potential alternatives.
- d. Define material properties such as tensile strength, tear resistance, flexural strength, elongation, chemical resistance, durability, etc.
- e. Analyse material properties, previous applications, and performance in similar dam construction projects.

**4.2** Collect and analyze the laboratories engaged in testing and research related to water-stops, including their infrastructure, equipment, and areas of specialization.

**4.3** Collect and analyze the import/export statistics from relevant government agencies, trade associations, and other databases.

**4.4** based on the above (4.1 to 4.3) field visit & sample plan to be finalized with the approval of BIS.

**4.5** Carry out survey and interviews with water-stop manufacturers, including assessment of production capacities, technological capabilities, storage and transportation conditions and testing as per the finalized plan.

**4.6** Develop design specifications for water stops, considering variations in dam dimensions and structural requirements. Also specify dimensions, profiles, and configurations for effective sealing at transverse contraction joints.

**4.7** Establish testing protocols to assess the performance of water stops under various conditions. Define criteria for evaluating water tightness, resistance to environmental factors, and long-term durability.

**4.8** Investigate the compatibility of selected materials with different dam construction materials. Address potential issues related to chemical reactions or structural incompatibilities.

**4.9** Cost-benefit analysis

**4.10** Preparation and submission of an analytical report covering the entire scope of the Project

#### **5. Research Methodology:**

The project will involve the following research methodologies:

**5.1** Study the literature and analyze it with respect to the scope.

**5.2** Survey the market through structured questionnaires for collecting information with respect to the scope.

**5.3** Contact the relevant organizations and associations (Industry/ user associations) for gathering the data.

**5.4** Visits to the manufacturing units to observe, manufacturing processes and in-process controls.

- 5.5** Discussion with focused groups (Quality control personnel and the person responsible for manufacturing) through structured questionnaires.
- 5.6** Collection of samples – samples are to be collected during the visits to industries as per the finalized plan.
- 5.7** Testing of samples – test the samples and submit the analyzed results (Samples shall be tested in BIS-recognized laboratories/ laboratories of national repute).
- 5.8** Comprehensive reporting on all aspects given in the scope.

## **6. Sampling Plan:**

- a. Two manufacturers from large and MSME companies each shall be visited (unless the manufacturing database indicates otherwise) to understand and collect data from the manufacturers and organizations involved in manufacturing.
- b. Two samples for each type shall be tested, preferably from different manufacturers/brands, for all the performance/properties.
- c. At least two users of the product need to be visited for their feedback.
- d. At least two laboratories must be visited, preferably one in the government sector and one in the private sector (NABL accredited laboratories/ BIS approved laboratories/ laboratories of BIS MoU partner institutes).

## **7. Deliverables:**

The list of expected outputs or deliverables is as follows:

- a. Detailed project report covering all the aspects given in the scope and appending all the reports mentioned in the scope.
- b. Comprehensive report presenting import/export analysis, manufacturing capacity assessment, laboratory availability, and production and consumption data analysis.
- c. Summary of presentations highlighting key findings, market trends, and strategic recommendations for stakeholders.
- d. Detailed database or repository of gathered information for future reference or expansion of research.

## **8. Timeline and Method of Progress Review:**

The duration of the project shall be **Five months**

Stage 1: An interim progress report indicating the review of the literature, desktop research and sampling & visit plan shall be submitted within **one month** from date of award of the project.

Stage 2: First progress report shall be submitted by the end of **Three months** from date of award of the project. This report may not wait for receipt of final test reports of samples.

Stage 3: Final Project Report (FPR) shall be submitted within **Five months**.

## **9. Support from BIS:**

BIS will provide access to latest available editions of Indian standards and/ or international standards relevant to the project, on request.

**10. Nodal officer:**

Member Secretary of Dams and Spillways Sectional Committee, WRD 09

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