TERMS OF REFERENCE FOR THE R&D PROJECT

1. Title : Study on the Design, Manufacture, Testing, and Performance Requirements of Foot Valves for Waterworks Purposes

2. BACKGROUND

2.1. Foot valves play a crucial role in waterworks systems, serving as indispensable components for efficient water flow and distribution. These specialized valves are strategically positioned at the bottom of suction pipes in wells or reservoirs, allowing water to enter the pump while preventing backflow when the pump is turned off. The foot valve opens during the suction phase and enable water to pass through easily. Once the pump is deactivated, the valve promptly closes, preventing water from flowing back and maintaining prime for subsequent pumping cycles. The reliability and effectiveness of foot valves are paramount in ensuring the uninterrupted operation of water supply systems, safeguarding against potential damage to pumps and maintaining a consistent flow of water for various domestic, agricultural, and industrial purposes.

2.2. BIS has formulated IS 4038: 1986 'Specification for Foot Valves for Waterworks Purposes (*second revision*)' which prescribes the requirements for design, manufacture, dimension, and testing of foot valves for waterworks purposes. This project aims to upgrade the specification of foot valves for waterworks purposes based on the latest manufacturer practices and technological advancements.

3. OBJECTIVE

The objective of this research project is to collect data, information, and evidence from primary and secondary sources on design, manufacture, testing, and performance requirements of copper alloy gate, globe, and check valves for waterworks purposes.

4. SCOPE OF THE PROJECT

The scope of this multifaceted project aims for a comprehensive understanding through the following key components:

4.1. Literature Review:

- Undertake an extensive review of existing literature related to foot valves for waterworks purposes.
- Include a review of relevant national, other national, and international standards.
- Analyse research papers, studies conducted by industry or organizations, and any other relevant literature.

4.2. Import/Export Analysis:

- Scrutinize the import/export dynamics of foot valves for waterworks purposes.
- Investigate the technical regulations governing the product in countries with significant export/import activity.

4.3. Manufacturing Base:

- Study and compile data on the manufacturing practices of foot valves in India, covering production processes, facilities, and distribution networks.
- Gather insights into production capacities, technological capabilities, regulatory compliance, and market dynamics within the Indian context.

4.4. Feedback:

- Develop a structured questionnaire to obtain feedback from major importers, exporters, manufacturers, users, and laboratories.
- Conduct interviews to collect first-hand information on practical aspects, challenges, and suggestions for improvement.

4.5. Visits to Manufacturers:

- Undertake visits to manufacturing facilities in India to gain in-depth knowledge of the production processes involved.
- Identify and document the diverse manufacturing processes employed for foot valves.

4.6. Sample Collection and Testing:

- Collect representative samples of foot valves for laboratory analysis.
- Testing of the samples in BIS approved or NABL accredited labs to determine design, manufacture, and performance requirements.

4.7. Data Analysis:

- Undertake a comprehensive analysis of all collected data, incorporating findings from the literature review, manufacturing visits, sample testing, and feedback.
- Identify patterns, trends, and critical insights relevant to the design, manufacture, testing, and performance of foot valves.

5. METHODOLOGY

In respect of the areas covered under the scope, the methodology encompasses the following:

5.1. Review the literature as specified under the Scope.

5.2. Preparation of the questionnaire and share the same with major importers, exporters, manufacturers, users, and laboratories to get feedback.

5.3. Visit the manufacturers of foot valves to collect relevant data. During the visit to manufacturers, data shall be collected for the following:

- Raw materials used in the manufacturing.
- In house quality control requirements of the raw materials.
- Varieties of foot valves manufactured.
- Manufacturing methodologies.
- In process quality control measures.
- Packaging, marking, and labelling practices.
- Data on testing for quality control of final product.
- Sustainability efforts being used by the manufacturer with respect to Reduce, Reuse, and Recycle (3Rs).
- Draw samples as per the sampling plan given in **6** and get them tested in BIS approved or NABL approved laboratories to get the relevant data.

5.4. Visit the two Govt or NABL approved laboratories to witness the testing of the product. During the visit data shall be collected for materials, equipment, and methodologies used in the testing. Collect insights into technological advancements and best practices in valve testing.

5.5. Analyse the data as specified in the Scope and identify patterns, trends, and critical insights relevant to the design, manufacture, and performance of these valves. The data analysis shall encompass the following:

- Standard nominal sizes of the foot valves.
- Materials which can be used for the desired performance.
- Types of foot valves and their detailed manufacturing details.
- Test methods for construction, performance, and durability requirements.
- Construction, performance, and durability requirements.

6. SAMPLING PLAN

- Manufacturer from each large, small and micro scale shall be visited for foot valves.
- Three samples shall be collected for each variety of the valve.
- The samples shall be tested in BIS approved or NABL accredited laboratories for design, construction, and performance requirements.

7. DELIVERABLES

Considering the scope and objectives, the following are the deliverables:

- Project report covering all the aspects of the Scope.
- Questionnaire, feedback, and test reports shall be appended to the project report.

8. TIMELINE AND DELIVERY MILESTONES

The timeline of the project shall start from the date of issue of sanction letter by BIS. The details are as follows:

Stage	Timeline
Report on the literature review, manufacturing base, import/export dynamics, questionnaire, and feedback.	1 month
Visit to manufacturers and laboratories and sample collection and their testing.	2 months
Final report and suggestions.	1 months
NOTE — In case of delay in submission of final report, the justification shall be given by the awardee for consideration by the Sectional Committee.	

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 PERSON

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