TERMS OF REFERENCE FOR R&D PROJECT

Food and Agriculture Department

Water Purification Systems Sectional Committee, FAD 30

1 TITLE OF THE PROJECT

Study on effective technologies/methodologies available for removal of iron from water for drinking purposes.

2 BACKGROUND

2.1 Iron-bearing water has an astringent, metallic, or bitter taste. The presence of iron in water is objectionable owing to the production of discoloration and turbidity. Provision of water treatment plants for rural and urban areas, as well as isolated small and medium-sized colonies, poses certain problems due to the small quantity of water required, difficulty in site execution, and challenges in adopting usual courses of tendering, supervision, etc. In order to provide clean water to such populations, water treatment methods that are simple to operate are needed.

2.2 The Indian standard IS 12918: 1990, Guide for the removal of iron from water for rural drinking water supply (Chemical treatment method), was formulated specifically for the treatment of iron-bearing water in rural areas dependent on hand pumps. This standard prescribes guidelines for the removal of iron by chemical treatment methods in rural drinking water systems. IS 12918 may be downloaded from the BIS website by following the link: https://standardsbis.bsbedge.com/BIS_SearchStandard.aspx?Standard_Number=12918&id=0.

2.3 The standard IS 12918 has been taken up for review under the Water Purification Systems Sectional Committee, FAD 30 of BIS, to update the standard, considering available technology and present-day practices for iron removal in drinking water supply. The Committee observed that the current standard is limited to rural areas and lacks practical efficiency and relevance to contemporary methodologies in iron removal treatment. The revision, however, aims to address both rural and urban areas, with the goal of providing updated and effective solutions for iron removal in both contexts. The Committee also noted that the Handbook on Drinking Water Technologies from the Ministry of Jal Shakti provides various technologies for iron removal, which can be accessed through the link: https://ejalshakti.gov.in/MISC/InnovationProvenTech_Rep_W.aspx. Accordingly, it has been decided to conduct a study on present-day technologies and methodologies for removal of iron from water for drinking water supply, encompassing various aspects of best practices and recommended protocols.

3 OBJECTIVE

The objective of this study is to comprehensively analyze and assess the various available technologies and practices for removal of iron in drinking water. The study will focus on collecting technical information related to the methodologies, design parameters, and operational considerations essential for iron removal. It aims to evaluate the feasibility and cost-effectiveness of the adaptability of different technologies. Furthermore, the study aims to generate context-specific protocols suited to various plant sizes, level of iron contamination and geographic challenges.

4 SCOPE

4.1 Study of existing literature on research publications, international/national/ regional guidelines & standards related to removal of iron from water for drinking water supply.

4.2 Primary survey at different geographical and climatic conditions to understand the best practices, relevant technologies and methodologies for removal of iron from water for drinking water supply.

4.3 Stakeholder consultation for development of an all-inclusive guide based on the study conducted for removal of iron from water for drinking water supply.

5 RESEARCH METHODOLOGY

5.1 Undertake a thorough literature review as per **4.1** and prepare a summary report.

5.2 Collect information on various plants (both rural and urban) in the country for iron removal from water for the drinking water supply and the methodologies used by them.

5.3 Identify the geographical sites of iron contamination to map the extent of the contamination, identify challenges and recommended practices to mitigate these challenges, and the application of modern-day technology for the purpose.

5.4 *Sampling plan:*

(i) Conduct a primary survey among stakeholders (minimum 15) involved in iron removal from water for drinking water supply to understand the best practices being employed in the country.

(ii) Conduct onsite visits to a minimum of 10 different locations (identified in **5.3**) in the country for the detailed study.

5.5 Study relevant technologies and methodologies used and performance parameters such as iron removal efficiency, residual iron content, oxidation time, filtration rate, best practices, related protocols, feasibility and effectiveness of such processes and design considerations *vis-a-vis* geographical location, level of iron contamination and capacity/size of the plant.

5.6 Evaluate the performance of existing treatment plants, and comparison of emerging technologies with prevalent ones, with emphasis on effectiveness, operational sustainability and economic viability.

5.7 Based on the detailed literature review, stakeholder consultations and on-site visits, prepare an all-inclusive guide on various technologies, methodologies and protocols which are recommended for iron removal from water for drinking water supply based on the geographical locations, level of iron contamination and size of the plant.

6 EXPECTED DELIVERABLES

Detailed project report of the work done, in hard copy and digital formats, as per the scope specified under **4**, with the following as appendices:

a) Database on various iron removal plants for rural drinking water supply in different rural locations of the country.

b) Research findings collected through the secondary as well as primary study, including Questionnaires (from surveys), field-specific empirical data/ information on technologies and methodologies employed. Discussion and visit reports, to be appended to the project report.

c) Working draft of standard covering comprehensive guidelines on various technologies, methodologies and protocols *vis-a-vis* geographical location, level of iron contamination and capacity/size of the plant which are recommended for iron removal from water for drinking water supply.

7 TIMELINE AND METHOD OF PROGRESS REVIEW

7.1 Timeline for the project is 6 months from the date of award of the project.

7.2 Stages of review:

Stage	Timeline
Stage I : Review of literature (published research, international/ regional guidelines & standards) and collection of information on various plants in the country	2 months

for iron removal from water for rural as well as urban drinking water supply and the methodologies used by them. Conduct primary survey among stakeholders (minimum 15) involved in iron removal from water for drinking water supply to understand the best practices being employed in the country.	
Submission of mid-term report	End of 2nd month
Stage II : On-site visits at different locations in the country. Study and evaluation of various technologies, methodologies and protocols *vis-a-vis* geographical location, level of iron contamination and capacity/size of the plant.	3rd to 5th month
Stage III : Draft report and working draft submission – The Sectional Committee will evaluate the draft report and working draft and provide feedback/recommend changes if required.	6th month.

At the end of the 6th month, the project allottee is to submit final project report incorporating the recommendations/feedback of the Committee.

***Note**: The timelines given above are indicative and calculation of time will start from the date of award of sanction letter for the project to the Project leader.*

8 SUPPORT FROM BIS

8.1 Access to Indian and International Standards.

8.2 Letters from BIS to concerned stakeholders for support in research project.

9 NODAL OFFICER

Ms Disha Zanwar, Scientist-C/ Deputy Director and Member Secretary FAD 30, BIS, may be contacted at fad-wps@bis.gov.in for any queries on the research project.