

TERMS OF REFERENCE FOR THE R&D PROJECT

Title: Study of grades and chemical and mechanical properties of seamless ferritic alloy steel pipes and fittings for high-temperature steam service.

1. Background:

1.1 Seamless ferritic alloy steel for high-temperature steam service is used extensively for high-temperature applications in various industries like pipe and natural gas, petroleum, boilers, and high-pressure applications.

1.2 The high-temperature applications of these steel require specific properties at elevated temperatures.

1.3 In addition of the requirements specified in the standards for seamless ferritic alloy steel pipes for high temperature service, Central Boilers Board, constituted under Section 27A of the Indian Boilers Act 1923 (5 of 1923) is responsible for making regulations for laying down the standards for materials, design, construction as well as for registration and inspection of boilers. The requirement specified by Central Boilers Board shall also be reviewed while studying the requirements of grade and properties of seamless ferritic alloy steel for high-temperature steam service.

1.4 Bureau of Indian Standards (BIS) has formulated IS 6630:1985 “Seamless ferritic alloy steel pipes for high-temperature steam service- specification” which specifies the requirement of five grades used for high-temperature application. This project is aimed at upgrading this specification by inclusion of new grades which are currently being used in the industry.

1.5 This standard along with the other relevant standards can be accessed from <https://standardsbis.bsbedge.com>.

2. Objective:

To collect relevant data and information from primary and secondary sources for existing and new grades of seamless ferritic alloy steel pipes and fittings for high-temperature application and verify the properties of these grades, and provide a comprehensive report covering sizes, types, grades, varieties of pipes and fittings and fittings along with their specifications, tests and requirements.

3. Scope:

3.1 Study the available literature like national and international standards such as ASTM, JIS, EN, ISO etc available on the subject, research papers, any study conducted by other organisations, companies' brochure. Identify the grades, their chemical, and mechanical properties and any other requirements which can be included in the standard.

3.2 Collect data of the manufacturing base of the product.

3.3 Visit the manufacturers of the product and get the information on the following:

- a) Types of Raw material used;
- b) Varieties/grades manufactured;
- c) Quality parameters (chemical, electrical and mechanical properties) of different grades
- d) Manufacturing process;
- e) Safety requirements;
- f) Additional requirement specified by the purchaser or Engineering, Procurement, and Construction (EPC) companies;
- g) In process quality checks;
- h) Test facilities and test methods used;
- j) Marking and labelling being done;
- k) Packaging requirement;
- l) Tests being undertaken;
- m) Testing facilities in the plant;
- n) Addressing sustainability in processes such as using energy efficient process, using renewable energy sources, recycling and reuse; and
- p) Waste recycling.

3.4 Identification and visit to the laboratories

3.5 Check the quantity of the product imported and exported and the countries with which the trade for this product is occurring. Also check if any technical regulations exist for this product in these countries. Take data of the foreign specification as per which the product is being imported or exported.

3.6 Identify the users of the product and take data of the quantity being used by them, specifications used, check for the test certificates received by them and study the chemical and physical properties mentioned in the TC. Also understand from the user the main properties required by them in the product.

3.7 Prepare a comprehensive project report incorporating the points mentioned above.

4. Methodology:

4.1 Study the literature and analyse the findings.

4.2 Visit the manufacturing unit and

- a) observe the manufacturing process;
- b) examine in-process control measures;
- c) conduct focussed group discussion with quality personnel;
- d) collect the data as mentioned in the scope through a questionnaire; and
- e) draw samples of the existing or new grades and get them tested in BIS-approved laboratories and laboratories of BIS MoU Partner Institutes.

4.3 Visit laboratories and make reports on

- a) test equipment required;
- b) test method being used;
- c) testing charges; and
- d) testing time required.

4.4 Visit the identified importers and exporters and collect data as mentioned in the scope through a questionnaire.

4.5 Visit the users of the product and collect data as mentioned in the scope through a questionnaire.

4.6 Compile the requirements by the Central Boiler Board for alloy steel pipe for boiler and high-temperature applications.

4.7 Analyse the data and test reports from diverse sources and include the same in the project report.

5. Sampling plan:

- a) Two manufacturers from each large and MSME shall be visited;
- b) Three samples for five grades majorly grades of pipes used in India shall be tested for all the parameters as specified in the relevant standard and any additional parameter as considered necessary from literature survey;
- c) Samples may be drawn from manufacturer, user, trader or market;
- d) Two users of the product shall be visited; and

- e) Two laboratories, preferably one in the government sector and one in the private sector shall be visited.

6. Deliverables:

6.1 Final project report, in hard copy format as well as in soft copy, covering all aspects mentioned in the scope.

6.2 Questionnaire, discussion, visit reports, test certificates, extract of International specifications, test reports to be appended with the final project report.

7. Timeline:

The duration of the project is 4 months from the date of award of the project. The proposed indicative timeline stage-wise is given below:

| Sl No. | Stage | Time from date of award of project (cumulative) |
|---------------|---|--|
| 1 | Literature review and identification of manufacturing base, testing laboratories, user/user industry, and discussion with BIS for the finalization of sampling plan | 1 month |
| 2 | Visit to manufacturers, testing laboratories, users and importers and exporters and data collection | 3 months |
| 3 | Preparation and submission of first draft report to BIS | 3.5 months |
| 4 | Submission of final project report | 4 months |

NOTE – The proposer may submit the draft report to BIS without waiting for a test report from independent laboratories if the test is of long duration test.

8. Support BIS will Provide:

- a) National /international standards relevant to the project;
- b) Details of BIS Licensees details;
- c) Product manual; and
- d) Details of BIS recognized laboratories.

9. Relevant sectional committee and Nodal officer from BIS Sectional committee:

MTD 19-Steel Tubes, Pipes and Fittings Sectional Committee Sectional Committee

Nodal officer:

Mr Sachin Choudhary, Scientist C/ Deputy Director – Member Secretary MTD 19,

Email: mtd19@bis.gov.in

Phone: 011-23608408