

TERMS OF REFERENCE FOR R&D PROJECT

Title of the Project: Study of quality requirements of grades of steel billets, bars and sections for boilers.

1. Background

1.1 With the service of large-scale power stations, a large number of subcritical, supercritical and even ultra-supercritical boilers have been put into industrial applications, and steels for boilers have also been greatly developed as basic materials.

The production process of the steels should have accurate composition control, low impurity elements, pure steel smelting technology and precise temperature control and good dimensional accuracy and shape, which is required by the production process of boilers.

1.2 According to different working conditions, boiler grade steels can be divided into two categories: steels for room temperature and medium temperature pressure parts and steel for high temperature pressure parts.

1.3 Indian Standard 'IS 2100:1970 Specification for Steel Billets, Bars and Sections for Boilers' is available for semis for forgings and sections for boilers. This specification presently specifies requirements of two grades. This standard is more than 50 years old and presently does not capture most of the grades mentioned in Indian Boiler Regulations (IBR) -1950. Also, with advancement in steel making and thermo-mechanical processing of steels, more grades of steels are produced, imported and used for boilers.

1.4 With an aim to cover all such relevant grades of steels used in boiler construction, this R&D project is devised for collection of data on grades, their properties (chemical, mechanical, physical and metallurgical) and verification of specific requirements therein, which would be helpful in revision of Indian standard on 'Specification for Steel Billets, Bars and Sections for Boilers'.

1.5 Indian standards can be accessed following the link <https://standardsbis.bsbedge.com/>.

2. Objective

To collect data and information, from primary and secondary sources, of the quality requirements (chemical, physical, metallurgical and mechanical properties) and their verification for steel billets, bars and sections used for boilers.

3. Scope

3.1 Study the available literature, national and international standards/ sector specific standards such as ASTM, JIS, EN, GB/T, ISO, ASME and SAE available on the subject, research papers, any study conducted by other organizations and companies' brochure. Identify the grades of steel billets, bars and sections for boilers, their chemical, physical, metallurgical and mechanical properties and any other requirements which can be included in the standard.

3.2 Identification of manufacturers of the product.

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

- a. Raw material used,
- b. Grades of steels manufactured,
- c. Form (billets, bars & sections),
- d. Condition of supply(with guaranteed properties),
- e. Quality parameters (chemical, physical, metallurgical and mechanical properties) of different grades in various forms,
- f. Manufacturing process,
- g. Recommended heat treatment,
- h. In-process quality checks,
- i. Test facilities and test methods,
- j. Tests undertaken,
- k. Routine tests for accepting lots,
- l. Mill test certificates issued,
- m. Delivery conditions,
- n. Surface protection,
- o. Weldability requirements,
- p. Sampling plan for accepting a lot,
- q. Marking, labelling and Packaging requirement &
- r. Steps taken for addressing sustainability.

3.4 Identification and visit to the laboratories for collection of relevant data and witnessing the testing of the samples drawn, if required, for verification of quality requirements.

- 3.5 Check the quantity of the product imported and exported and 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 specification as per which the product is being traded.
- 3.6 Identification of users of the product and take data of quantity being used by them, specification used, check for the test certificates received by them and study the chemical and physical properties chemical, physical, metallurgical and mechanical properties mentioned in the TC. Also understand from the user the optional properties required by them for the product.
- 3.7 Preparation of comprehensive project report incorporating the points mentioned above.

4. Methodology:

- 4.1 Study the literature and analyse the findings.
- 4.2 Visit any two manufacturing unit(s) and
 - a. Observe the manufacturing process,
 - b. Examine in-process controls,
 - c. Conduct focussed group discussions with quality/production personnel
 - d. Collect the data as mentioned in the scope through a questionnaire.
 - e. Draw samples of the grades and get it tested in BIS approved laboratories/BIS MoU partner educational institutes
 - f. Gather information on requirements for Regulatory compliance such as Indian Boiler Regulations 1950.
- 4.3 Visit laboratories and make report on
 - a. Test equipment required,
 - b. Test methods used,
 - c. Testing charges,
 - d. Testing time required,
 - e. Sample size.
 - f. witness testing of samples drawn from Manufacturers /users/importers
(not all tests but to the extent possible shall be witnessed)
- 4.4 Visit importers and exporters and collect data as mentioned in the scope through a questionnaire.
- 4.5 Visit users of the product and collect data as mentioned in the scope through a questionnaire. Also, emphasis should be laid on gathering information pertinent to requirements for Regulatory compliance such as Indian Boiler Regulations-1950.
- 4.6 Relevant Information on such steels to be gathered from at least one Inspecting Authority for Inspection & Certification of Boilers recognized by Central Boilers Board, New Delhi.
- 4.7 Analyse the above data and test reports and include the same in the project report.

5. Sampling plan:

- 5.1 Two manufacturers, each from large and MSME scale shall be visited.
- 5.2 Samples for testing may be drawn from manufacturer, user, importer or market.
- 5.3 Two heats for each grade shall be drawn for testing of chemical, physical, metallurgical and mechanical properties (room temperature/high temperature) mentioned in the standard and as identified in the literature survey/information gathered from manufacturers or users.
- 5.4 Two users (power generation/other industries) of the product shall be visited.
- 5.5 Two NABL accredited laboratories, preferably one in government sector and one in private sector shall be visited.

6. Deliverables:

- 6.1 Final project report, in hard copy format as well as in editable soft copy, covering all aspects mentioned in the scope.
- 6.2 Questionnaire, visit reports, test reports, mill test certificates to be appended with the final project report.

7. Time lines

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, inspecting authority and discussion with BIS for finalization of the sampling plan	1 month
2	Visit to manufacturers, testing laboratories, users and importers and exporters and data collection, and verification of quality requirements through testing	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 test report from independent laboratories if the test is of long duration (> 1 month).

8. Support BIS will provide:

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

9. Relevant sectional committee and Nodal officer from BIS

Sectional committee:

- MTD 4-Wrought Steel products Sectional Committee Sectional Committee

Nodal officer :

- Mr Arun Pucchakayala, Scientist D/ Joint Director – Member Secretary MTD 4,
- Email : mtd4@bis.gov.in Tel: 011-23231085