

## TERMS OF REFERENCE FOR R&D PROJECT

**Title of the Project: Study of quality requirements of grades of Hot-rolled and cold-rolled Stainless Steels used for structural purposes.**

### **1. Background**

- 1.1 Stainless steel has many desirable characteristics which can be exploited in a wide range of construction applications as it is corrosion-resistant and long-lasting, making thinner and more durable structures possible. Presently, the Indian Standards on Structural Steel is available only for carbon steels. It is so because that historically the high initial material cost of stainless steel has limited its use primarily to specialized and aesthetic applications.
- 1.2 Of late, life cycle costs and transition towards sustainability resulted in accelerating interest in the use of stainless steel for construction. A large quantity of stainless steel is now manufactured or imported for structural purposes. Although a number of similarities between stainless steel and ordinary carbon steel exist, there is sufficient diversity in their physical properties and requires separate treatment in structural design. These grades of stainless steel are manufactured in the form of sheet, plate, section, bar & strips and used for structural purposes.
- 1.3 In absence of established data for the quality requirements comprising chemical and mechanical properties of these grades, there is no Indian standard on the subject as on date.
- 1.4 This R&D project is devised for collection of data on grades, their properties (chemical, mechanical, physical) and verification of grades therein, which would be helpful in formulation of a new Indian standard on **Hot-rolled and cold-rolled Structural Stainless Steel for structural purposes.**

### **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 Stainless Steel grades supplied in Hot-rolled and cold-rolled condition and used for structural purposes.

### **3. Scope**

- 3.1 Study the available literature, national and international standards/ sector specific standards such as ASTM, ANSI/ASCI, JIS, EN, GB/T, ISO and IRSM available on the subject, research papers, any study conducted by other organizations and companies' brochure. Identify the grades of structural stainless steel, 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 stainless steels manufactured
- c. Form (sheet, plate, section, bar & strips)
- d. Condition of supply (Hot-rolled/cold-rolled with types of heat treatment)
- 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. Tests for Corrosion resistance
- 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

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.

4.6 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 as identified in the literature survey/information gathered from manufacturers or users.

5.4 Two users 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 and all other relevant information/data collected during the course of the project 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:

Sr 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 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 16-Alloy Steels and Forging Sectional Committee Sectional Committee

### Nodal officer :

- Mr Arun Pucchakayala, Scientist D/ Joint Director – Member Secretary MTD 16,
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