TERMS OF REFERENCE FOR R&D PROJECT

Title of the Project: Study of quality requirements of grades of Hot-rolled medium and high carbon steel sheet, plate and strip used for general engineering purposes.

1. Background

1.1 Medium and High carbon Steels are a category of steels with carbon more than 0.3%. Presently, the Indian Standards on hot-rolled steels cater only to plain carbon steels (carbon up to 0.3%). In order to satisfy both excellent formability and high hardness after heat treatment, manufacturing industry moved towards medium and high carbon steels. Medium and High Carbon Steel over the years have gained importance on account of safety and reliability coupled economical approach for well-improved performances. As per the information available from diverse sources and as informed by Ministry of Steel, this product is being used widely and also imported in large quantities.

1.2 In absence of established data for the quality requirements comprising chemical and mechanical properties of these grades supplied in sheet, plate and strip, there is no Indian standard on the subject as on date.

1.3 This R&D project is devised for collection of data on grades, their properties (chemical, mechanical, metallurgical, physical) and verification of grades therein, which would be helpful in formulation of a new Indian standard on Hot-rolled medium and high carbon steels for general engineering 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 hot-rolled medium and high carbon steel sheet, plate and strip used for general engineering purposes.

3. Scope

3.1 Study the available literature, national and international standards/ sector specific standards such as ASTM, JIS, EN, GB/T, ISO and SAE available on the subject, research papers, any study conducted by other organizations and companies' brochure. Identify the grades of Hot-rolled medium and high carbon steels, 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 (sheet, plate & strips),
d. Condition of supply (Hot-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. 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

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 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 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