

TERMS OF REFERENCE FOR THE R&D PROJECT

Title: Study of grades and properties of seamless and welded pipes and fittings for sub-zero temperature service

1. Background:

1.1 Seamless and welded pipes and fittings for sub-zero temperature service is used extensively for critically low-temperature applications in various industries like oil and natural gas, petroleum industry. The low-temperature applications of these steel require specific properties of notch toughness at critically low temperature.

1.2 Bureau of Indian Standards (BIS) has formulated a standard for seamless and welded pipes and fittings for sub-zero temperature service IS 6286:1971 which specifies the requirement of four grades used for low-temperature applications. However, this specification is very old and besides the grades mentioned in the standard there are other grades which are manufactured and widely used in the country.

1.3 A need was thus felt to undertake research to identify the grades and verify the properties of these grades used in seamless and welded pipes and fittings for sub-zero temperature service. This will in turn help in upgradation and revision of IS 6286.

1.4 The standards mentioned above can be accessed from <https://standardsbis.bsbedge.com>.

2. Objective:

To collect relevant data and information from primary and secondary sources for grades of seamless and welded pipes and fittings for sub-zero temperature service 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 in the country.

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, 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) Heat treatment process;
- j) Test facilities and test methods used;
- k) Marking and labelling being done;
- l) Packaging requirement;
- m) Tests being undertaken;
- n) Testing facilities in the plant;
- p) Addressing sustainability in processes such as using energy efficient process, using renewable energy sources, recycling and reuse; and
- q) Waste recycling.

3.4 Identify and visit 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 test certificate. 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,
- d) testing time required, and
- e) the tests being undertaken on the samples sent for testing.

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 of major gas-producing plants and requirements for gas transportation.

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 each from large and MSME shall be visited.
- b) Three samples for each grade shall be tested with different outer diameters and wall thicknesses for all the parameters as specified in the relevant standard and any additional parameter as considered necessary from the literature survey.
- c) Samples may be drawn from manufacturers, user, traders or market.
- d) Two users of the product shall be visited.
- 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:

SI 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
- d) Details of BIS and BIS recognized laboratories.

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

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

Nodal officer:

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

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