Qualification of Distributors of Metallic Materials for Use in the Petroleum and Natural Gas Industries

API STANDARD 20J
FIRST EDITION, XXX 201X
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1 Scope

1.1 Purpose

This API standard specifies requirements for the qualification of distributors of metallic materials used in the petroleum and natural gas industries.

1.2 Applicability

This standard is applicable to distributors of metallic bar, plate and tubular products where API product standards require such services or otherwise specified as a requirement for compliance. For organizations that manufacture and distribute metallic material, this standard only addresses the distribution portion of their processes.

1.3 Distributor Qualification Level (DQL)

This API Standard establishes the requirements for two distributor qualification levels (DQL). These DQL levels define different levels of distributor quality controls and qualification requirements.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies.

For undated references, the latest edition of the referenced document (including any amendments) applies, except that new editions may be used on issue and shall become mandatory upon the effective date specified by the publisher or 6 months from the date of the revision (where no effective date is specified).

API Specification Q1, Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry
API Standard 20D, Nondestructive Examination Services for Equipment Used in the Petroleum and Natural Gas Industry
API Standard 20H, Heat Treatment Services – Batch Type for Equipment used in the Petroleum and Natural Gas Industry
AMS 2750, Pyrometry
ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories

3 Terms, Definitions and Abbreviations

3.1 Terms and Definitions

3.1.1 acceptance criteria
Defined limits placed on characteristics of materials, products or services

3.1.2 calibration
Comparison and adjustment to a standard of known accuracy

3.1.3 chemical analysis
Determination of the chemical composition of material

3.1.4 conformance
Compliance with specified requirements

3.1.5 distributor
An organization that maintains and provides metallic bar, plate and tubular products for resale.

3.1.6 heat treatment
Specified, timed sequence of controlled heating and cooling of materials for the purpose of changing physical or mechanical properties.

3.1.7 metallic material
Any product included in the scope of this standard

3.1.8 mill
A factory in which metals are hot worked, cold worked, or melted and cast into standard shapes suitable for secondary fabrication into commercial product.

3.1.9 off-site
A related facility of the organization, operating under the same Quality Management System as the identified distributor of the product.

3.1.10 on-site
The distributor's facility

3.1.11 outsourced
Any activity performed by a qualified outside organization.

3.1.12 processes that require validation
Processes where resulting output cannot be verified by subsequent monitoring or measurement.

3.1.13 receiving verification
The process of ensuring the product received meets purchase requirements.
3.1.14 remote technical assessment
A technical assessment of capabilities performed using a method other than an on-site audit. This includes, but is not limited to a checklist or a survey.

3.1.15 rough machining
An intermediate machining activity not intended as a final dimension.

3.1.16 service suppliers
Suppliers that perform one or more of the following activities on behalf of the distributor:
− machining
− material testing
− heat treatment
− nondestructive examination

3.1.17 sub-distributor
A distributor that is a supplier to the Standard 20J distributor

3.1.18 traceability
The ability to verify the history and delivery location of an item by means of documented record identification.

3.2 Abbreviations
DQL Distributor Qualification Level
MOC Management of Change
NDE Nondestructive Examination
QMS Quality Management System

4. Distributor Qualification
4.1. General
DQL-1 is the base level of qualification. DQL-2 requires additional controls to ensure product meets specific customer and industry requirements. Qualification to DQL-2 also qualifies a distributor to DQL-1.

The following paragraphs describe the conditions which, when met, allow a distributor to receive the appropriate DQL.

4.2 Facilities and Equipment
In order to conform to this standard, the distributor shall have the following on-site capabilities, at a minimum:
− equipment to receive and ship material to customers;
− A facility to store and maintain physical inventory;
− appropriate handling and lifting equipment;
4.4 Distributor Qualification Levels

4.4.1 DQL-1 Distributor

The DQL-1 distributor shall establish, document, implement and maintain, at all times, a quality management system (QMS). The distributor shall determine the processes needed for the quality management system and their application throughout the distributor’s facility. As a minimum, the following QMS elements shall be addressed and shall be in conformance with API Q1:

- purchasing control
- determination of requirements
- control of production and servicing
- personnel competence
- internal audit
- control of testing, measuring, and monitoring equipment
- control of Nonconforming Product
- improvement (corrective and preventive action)
- inspection and testing
- identification and traceability
- control of records
- risk assessment and management
- management of change

4.4.2 DQL-2 Distributor

A DQL-2 distributor shall meet the requirements specified for a DQL-1 distributor as well as the additional requirements for a DQL-2 distributor as defined in this standard.

4.4.3 Guidance for Distributor Qualification Requirements

Table 1 references the sections in which different qualification requirements are specified for DQL-1 and DQL-2.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>DQL-1</th>
<th>DQL-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Management System</td>
<td>4.4.1</td>
<td>4.4.2</td>
</tr>
<tr>
<td>Initial Approval of a Mill</td>
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<td>Periodic Evaluation of a Mill</td>
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<td>Review of Order Requirements with Distributors and Service Suppliers</td>
<td>7.4.5.1</td>
<td>7.4.5.2</td>
</tr>
</tbody>
</table>
4.4.3 Records of Qualification
The distributor shall maintain evidence of conformity to the requirements of Section 4 of this document.

5. Responsibilities and Duties
The distributor shall ensure that:
− all functions are performed in accordance with specified standards and applicable quality control criteria;
− operations are only performed for which it is adequately equipped and have personnel who are qualified against defined competencies;
− sub-tier suppliers of products or services are controlled;
− testing, measurement, and monitoring equipment is calibrated and personnel are qualified in accordance with the requirements of the distributor’s written procedure;
− the facility and equipment are properly maintained;
− any discrepancy or limitation imposed on the requested material and associated operations by such factors as size, traceability, form, shape, material or procedure are communicated to the purchaser;
− any irregularity or deficiency noted in the purchaser’s procurement documents are communicated to the purchaser; and
− formal reports of all material supplied are promptly provided to the purchaser.

6. Personnel Training and Competency Requirements
6.1 Personnel shall be competent based on the appropriate education, training, skills, and experience needed to meet product and customer requirements. A written procedure shall define personnel competency, and identify training and qualification requirements. The organization shall identify:
− roles that require familiarity with metallic material processing and testing;
− roles that require a knowledge of metallic material processing and testing;
− methods required for personnel training qualifications;
− knowledge and training necessary to address specific customer requirements;
− qualifications required for personnel performing processes that require validation;
− method(s) used to verify the competency of personnel.

6.2 The distributor shall maintain evidence of conformity to the requirements of Section 6 of this document.

7 Distributor Process Control
7.1 General
This section addresses the required controls for a distributor to supply metallic material to their customer.

7.2 Review of Order Requirements
7.2.1 An order review shall be conducted prior to the distributor’s commitment to deliver product. The distributor shall maintain a documented procedure for the review of order requirements that addresses, as a minimum, that:
- purchase order requirements are identified, reviewed and understood;
- the distributor has the capability to meet the purchase order requirements;
- purchase order requirements are acknowledged and documented;
- any deviations and/or clarifications accepted by the purchaser shall be documented.

7.2.2 Where contract requirements are changed, the distributor shall ensure that relevant documents are amended and that relevant personnel are made aware of the changed requirements.

7.2.3 Records of the results of the review, including resulting actions, shall be maintained.

7.3 Control of Mills

7.3.1 General
Distributors shall maintain a documented procedure(s) to ensure that purchased metallic material conforms to specified requirements. The procedure(s) shall conform to the purchasing requirements in API Specification Q1.

7.3.2 The distributor shall maintain a list of approved mills by location and scope of supply.

7.3.3 Initial Approval of a Mill

7.3.3.1 A DQL-1 distributor shall perform initial approval of a mill through:
   a) Verification of an accredited Quality Management System and,
   b) Verification of an initial order to ensure conformance to the agreed upon purchase requirements, as specified in 7.3.6 of this document.

7.3.3.2 In addition to DQL-1 requirements, a DQL-2 distributor shall also:
   a) Maintain a documented procedure to validate the mill initial order. The documented procedure with acceptance criteria shall include, as applicable:
      1) chemical analysis
      2) mechanical testing
      3) NDE
      4) microstructure
   b) Perform an assessment of the mill’s capabilities and controls through either:
      1) an on-site technical audit or
      2) A technical questionnaire, which shall be reviewed by competent personnel. If the response does not meet the distributor’s requirements, then an on-site technical audit shall be performed. The technical questionnaire shall include, as applicable to the scope of supply:
         − scope of capabilities (grades, sizes, product form);
         − melt practice, pouring/casting, and capacity (tonnage);
− testing capability and equipment;
− calibration of measuring and testing equipment;
− outsourced activities;
− processing such as rolling, forging, straightening, etc.;
− heat treatment capabilities to include heat treatment furnace qualification, method used for instrument calibration, and quench control;
− NDE capabilities;
− certifications / records;
− industry licenses or accreditation;
− process monitoring and controls.

Note: An example of an extensive questionnaire (Mill Technical Assessment) is included in Annex A for use as a guide for a distributor in preparing a technical questionnaire.

7.3.3.3 Records of the results of the mill approval, including resulting actions, shall be maintained.

7.3.4 Periodic Evaluation of a Mill

The distributor shall maintain a documented procedure for the monitoring and re-evaluation of mills. The procedure shall identify the minimum performance requirements and the process for continual monitoring of the mill against these requirements. The frequency of periodic evaluation shall be based upon a risk assessment of product quality and availability of alternate sources. The risk assessment shall take into account a mill's performance history, purchasing frequency and any changes that have occurred at the facility. The frequency of the evaluation shall be documented.

The mill re-evaluation shall be performed through one or more of the following:

− on-site audit;
− technical assessment;
− review of supplier performance; or
− verification of an applicable API license;

For mills who do not meet these requirements, the procedure shall address the process for periodic evaluation and actions required.

Records of the results of the mill periodic evaluation, including resulting actions, shall be maintained.

7.3.5 Additional Requirements for a DQL-2 Distributor

A DQL-2 distributor shall identify material for periodic evaluation, which shall be tested in accordance with the applicable material standard by a laboratory conforming to the scope of the test method in accordance with an internationally recognized standard for test laboratories, such as ISO 17025. The frequency of the evaluation shall not exceed 36 months and shall be documented.

Records of the results of the periodic evaluations, including resulting actions, shall be maintained.

7.3.6 Review of Order Requirements with a Mill
7.3.6.1 General
The distributor shall perform an order review with the mill to ensure that the product ordered meets the requirements of this standard and any additional purchase order specific requirements.

7.3.6.2 DQL-2 distributors shall maintain records of the results of the review, including any resulting actions.

7.4 Control of Sub-Distributors and Service Suppliers

7.4.1 General
Distributors shall maintain a documented procedure to ensure that outsourced activities conform to specified requirements. The procedure shall conform to the purchasing requirements in API Specification Q1.

7.4.2 Initial Approval of Sub-Distributors
Distributors may procure materials from sub-distributors. The distributor shall ensure that the sub-distributor is qualified through one of the below methods:

7.4.2.1 A DQL-1 distributor shall ensure the sub-distributor maintains an accredited QMS or meets one of the following:

a) verification that the supplier’s QMS conforms to the quality system requirements specified for suppliers by the distributor; or

b) assessment of the supplier to meet the distributor’s purchasing requirements; or

c) assessment of the product upon delivery or activity upon completion.

7.4.2.2 A DQL-2 distributor shall additionally ensure that the sub-distributor:

a) has an API Standard 20J DQL-2 registration; or

b) the supplying mill for the sub-distributor has been approved by the distributor; or

c) the distributor shall test and qualify the order against the requirements of section 7.3.3.2 b).

7.4.2.3 Records of the results of the sub-distributor approval, including resulting actions, shall be maintained.

7.4.3 Initial Approval of Service Suppliers

7.4.3.1 DQL-1 distributors shall approve service supplier in accordance with Table 2. If the processes listed in Table 2 are performed, the service supplier shall be in conformance with the listed standards or equivalents.

<table>
<thead>
<tr>
<th>Service</th>
<th>Qualification Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machining</td>
<td>Verification of capabilities and controls through an on-site audit or a remote technical assessment that addresses the following, as a minimum:</td>
</tr>
<tr>
<td></td>
<td>− calibration</td>
</tr>
</tbody>
</table>

Table 2 – Service Supplier Qualification Requirements
Material Testing

The test facility shall be qualified through verification of capabilities and controls via an on-site audit or remote technical assessment that addresses the following, as a minimum:

- calibration of equipment
- validation of sample preparation and test methods
- conformance to international standards
- identification and traceability
- qualification of personnel
- record retention
- preservation of product

Verification of ISO 17025 accreditation for the required service is acceptable in lieu of an audit or technical assessment.

Heat Treatment

Verification of capabilities and controls through an on-site technical audit or remote technical assessment. For suppliers performing batch heat treatment, an API registration to API Standard 20H is acceptable in lieu of an audit or technical assessment.

Nondestructive Examination

Verification that the vendor meets the requirements of API Standard 20D through an on-site audit or remote technical assessment. An API Standard 20D registration is acceptable in lieu of an audit or technical assessment.

7.4.3.2 DQL-2 distributors shall approve service suppliers by either an on-site audit or the specified API registration or QMS accreditation as specified in Table 2. If the processes listed in Table 2 are performed, the service supplier shall be in conformance with the listed standards or equivalents. A remote technical assessment shall not be used.

7.4.3.3 Rough machining service suppliers only require qualification to DQL-1.

7.4.3.4 Records of the results of the service supplier approval, including resulting actions, shall be maintained.

7.4.4 Periodic Evaluation of Sub-Distributors and Service Suppliers

7.4.4.1 DQL-1 Requirements

DQL-1 distributors shall maintain a documented procedure for the monitoring and re-evaluation of sub-distributor and service suppliers. The procedure shall identify the minimum performance requirements and the process for continual monitoring against these requirements. The
frequency of periodic evaluation shall be based upon a risk assessment of product quality and availability of alternate sources. The risk assessment shall take into account a sub-distributor or service supplier performance history, purchasing frequency, and any changes that have occurred at the facility. The frequency of the evaluation shall be documented.

The sub-distributor and service supplier re-evaluation shall be performed through one or more of the following:

- on-site audit;
- technical assessment;
- review of supplier performance; or
- verification of applicable API license.

For sub-distributors and service suppliers who do not meet these requirements, the procedure shall address the process for evaluation and actions required.

Records of the results of the sub-distributor and service supplier evaluation, including resulting actions, shall be maintained.

7.4.4.2 DQL-2 Requirements

In addition to DQL-1 requirements, a DQL-2 distributor shall perform a sub-distributor and service supplier re-evaluation annually, at a minimum.

7.4.5 Review of Order Requirements with Service Suppliers

7.4.5.1 General

The distributor shall ensure that the service supplier can provide a product or service that meets the requirements of this standard and any additional purchase order specific requirements.

7.4.5.2 DQL-2 Requirements

DQL-2 distributors shall maintain records of the results of the review, including resulting actions.

7.5 Distributor Performed Processes

The distributor may perform additional processes on the metallic material product prior to delivery to the customer. If the processes listed in Table 3 are performed, the distributor shall be in conformance with the listed standards or equivalents.

<table>
<thead>
<tr>
<th>Table 3 – Distributor Performed Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process</strong></td>
</tr>
<tr>
<td>Heat Treatment - Continuous</td>
</tr>
<tr>
<td>Heat Treatment - Batch</td>
</tr>
<tr>
<td>NDE</td>
</tr>
</tbody>
</table>
### 7.6 Sampling for Material Testing

7.6.1 When a distributor provides a sample to a test facility for material testing, the distributor shall maintain a procedure documenting the collection and preparation of the test specimen. The procedure shall define the factors to be controlled to ensure the validity of the test results, compliance with applicable material or test specifications, and traceability of the test specimen to the original material. This procedure shall be available where the sampling is conducted.

7.6.2 Records of sampling shall be maintained.

### 7.7 Inspection Requirements

7.7.1 General

The distributor shall maintain a documented procedure that defines the inspection process and acceptance criteria. The procedure shall include requirements for receiving, in process, and final inspection and ensure that identification and traceability of product is maintained throughout the process, as specified in 7.8.

Where sampling is used, the sampling plan shall be based on evaluation of the risk and shall be documented.

7.7.2 Receiving Inspection

The distributor shall verify that product or service delivered meets stated purchase order requirements and associated acceptance criteria.

7.7.3 In Process and Final Inspection

The distributor shall verify that the product meets the customer's requirements. This includes marking, packaging, and documentation requirements.

7.7.4 Records

Records of inspection shall be maintained.

### 7.8 Identification and Traceability

The distributor shall have documented procedures for control of identification and traceability throughout the process. The procedure shall include, as a minimum:

| Material Testing | - Verification of API 20D conformance through an internal on-site process audit  
| - ISO 17025 accreditation for the required service or  
| - Verification of test execution in accordance with applicable international standard test methods or material specifications |
− method of marking the product;
− method of ensuring the physical marking is traceable to all records associated with the product;
− method for ensuring traceability of product back to received material after any processing where the original marking is removed;
− process for verification of product traceability during storage;
− requirements for maintenance or replacement of identification and or traceability marks;
− method of ensuring traceability for any product during outsourced processes; and
− method for verifying traceability upon material receipt.

7.9 Nonconforming Product

The distributor shall maintain a documented procedure to define controls and responsibilities needed to ensure nonconforming product is identified and controlled to prevent its unintended use or delivery.

Records of disposition of nonconforming products shall be maintained.

7.10 Customer-supplied Property

The distributor shall maintain a documented procedure for the identification, verification, safeguarding, preservation, maintenance, and control of customer-supplied property, including intellectual property and data, while under control of the organization. The procedure shall include requirements for reporting to the customer any loss, damage, or unsuitability for use of customer-supplied property.

Records for the control and disposition of customer-supplied property shall be maintained.

7.11 Preservation of Product

The distributor shall maintain documented procedures describing the methods used to preserve the product throughout the process in order to maintain product integrity.

Corrosion protection of material shall be based on material type and customer requirements. Preservation shall include transportation, handling, storage, packaging, and protection. At a minimum, the following controls shall be addressed:
− residual magnetism,
− mechanical damage from handling,
− method of preventing dissimilar metal contact and/or contamination,
− residual chemical contamination from cleaning solutions and markers,
− environmental exposure for alloys susceptible to corrosion.

7.12 Measuring and Testing Equipment

The distributor shall maintain a documented procedure in order to ensure that testing, measurement, and monitoring equipment is calibrated and maintained and that the equipment is
used in a manner that is consistent with monitoring and measurement requirements. Calibration shall conform to and be traceable to nationally or internationally recognized standards, as applicable.

Records of calibration shall be maintained.

8.0 Management of Change (MOC)

8.1 The distributor shall maintain a documented procedure for MOC. The MOC process shall be initiated when a change is made that may impact the quality or availability of product. The procedure shall address that an MOC is required when a change is made at the distributor, mill, sub-distributor or service supplier. Some examples of changes that require an MOC include but are not limited to:

- management / ownership change
- facility location change
- process change
- supplier change

8.2 Minimum criteria to include in the MOC evaluation are:
- nature of the change,
- location where the change is occurring,
- personnel affecting product conformance,
- identification and assessment of risk due to the change,
- actions taken to address risk due to the change,
- impact of the change on the product or service.

8.3 The distributor shall notify relevant parties, including the customer when required by contract, of the change and any residual or new risk due to the change.

9. Activities Performed by the Distributor

The distributor shall maintain the capability to perform on-site or off-site (see definition 3.1.9) the activities listed in Table 4. When these activities are not performed on-site or off-site and are not part of a purchased service, they shall be performed by distributor’s personnel.

Table 4 – Process Activities Performed by the Distributor

<table>
<thead>
<tr>
<th>Item</th>
<th>Process Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receiving Verification</td>
</tr>
<tr>
<td>2</td>
<td>Traceability</td>
</tr>
<tr>
<td>3</td>
<td>Marking</td>
</tr>
<tr>
<td>4</td>
<td>Final Inspection</td>
</tr>
</tbody>
</table>
10. Records and Document Control

10.1 The distributor shall maintain a documented procedure to identify the controls and responsibilities needed for the identification, collection, storage, protection, retrieval, retention and disposition of records required in this standard.

10.2 Records shall remain legible, identifiable, and retrievable. Records shall be retained for a minimum of five (5) years after date of shipment or as required by customer, legal, and other applicable requirements, whichever is longer.
ANNEX A  
(informative)

Mill Technical Assessment

This annex provides an example of an extensive mill technical assessment that may be used as a guide by the distributor in the preparation of a technical questionnaire. The form is intended to form the basis for the technical questionnaire required by this document and may be used as is or in part.

<table>
<thead>
<tr>
<th>1. General</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mill Name</strong></td>
</tr>
<tr>
<td><strong>Address</strong></td>
</tr>
<tr>
<td><strong>Tel. Number</strong></td>
</tr>
<tr>
<td><strong>Supplier contact name</strong></td>
</tr>
<tr>
<td><strong>Type of facility</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Product size capability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bar:</strong> Yes ☐ No ☐</td>
</tr>
<tr>
<td><strong>Forgings:</strong> Yes ☐ No ☐</td>
</tr>
<tr>
<td><strong>Tubing:</strong> Yes ☐ No ☐</td>
</tr>
<tr>
<td><strong>Plates:</strong> Yes ☐ No ☐</td>
</tr>
<tr>
<td><strong>Others:</strong> Yes ☐ No ☐</td>
</tr>
</tbody>
</table>

Date: __________________
Grades Produced (list all):

<table>
<thead>
<tr>
<th>Carbon Steel</th>
<th>Low Alloy</th>
<th>Stainless</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.1 Production Overview – Carbon Steel

<table>
<thead>
<tr>
<th>Melting</th>
<th>Blast Furnace</th>
<th>BOF Melting</th>
<th>EAF Melting</th>
<th>None</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refining</td>
<td>Vacuum Degas</td>
<td>Argon Bubbling</td>
<td>Ladle Refining</td>
<td>None</td>
<td>Others</td>
</tr>
<tr>
<td>Billet/Blooms</td>
<td>External Source</td>
<td>Internal Billets</td>
<td>Both</td>
<td>None</td>
<td>Others</td>
</tr>
</tbody>
</table>

2.2 Production Overview- Low Alloy Steel

<table>
<thead>
<tr>
<th>Melting</th>
<th>Blast Furnace</th>
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<td>Both</td>
<td>None</td>
<td>Others</td>
</tr>
</tbody>
</table>

2.3 Production Overview- Stainless Steels

<table>
<thead>
<tr>
<th>Melting</th>
<th>Blast Furnace</th>
<th>BOF Melting</th>
<th>EAF Melting</th>
<th>None</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refining</td>
<td>Vacuum Degas</td>
<td>Argon Bubbling</td>
<td>Ladle Refining</td>
<td>None</td>
<td>Others</td>
</tr>
<tr>
<td>Billet/Blooms</td>
<td>External Source</td>
<td>Internal Source</td>
<td>Both</td>
<td>None</td>
<td>Others</td>
</tr>
</tbody>
</table>
2.4 Production Overview- Other Materials

<table>
<thead>
<tr>
<th>Melting</th>
<th>Blast Furnace</th>
<th>BOF Melting</th>
<th>EAF</th>
<th>None</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Refining</td>
<td>Vacuum Degas</td>
<td>Argon Bubbling</td>
<td>Ladle Refining</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Billet/Blooms</td>
<td>External Source</td>
<td>Internal Billets</td>
<td>Both</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Inspection of Blooms, Billets, Bars

Flaw Detection:
- **Visual?**  
  - Yes [ ]  
  - No [ ]
  - Product Inspected:  
    - Bloom [ ]  
    - Billet [ ]  
    - Bar [ ]  
    - Coil [ ]  
    - Rod [ ]  
    - Other [ ]
- **MPI?**  
  - Yes [ ]  
  - No [ ]
  - If yes, specify:  
    - A.C. [ ]  
    - D.C. [ ]
  - Product inspected:  
    - Bloom [ ]  
    - Billet [ ]  
    - Ingot [ ]
- **Eddy Current?**  
  - Yes [ ]  
  - No [ ]
  - If yes, specify bar size limitation
- **Ultrasonic?**  
  - Yes [ ]  
  - No [ ]
  - If yes, what type?
- **Thermal imaging?**  
  - Yes [ ]  
  - No [ ]
- **Hot eddy current?**  
  - Yes [ ]  
  - No [ ]

Conditioning is performed?  
- Yes [ ]  
- No [ ]

Defect working method
- If yes, specify:  
  - Chipping [ ]  
  - Grinding [ ]  
  - Scarfing [ ]  
  - Other [ ]
- Product conditioned:  
  - Bloom [ ]  
  - Billet [ ]  
  - Slab [ ]  
  - Other [ ]
4. Rolling & Piercing

Rolling/Piercing

Mill type

Size range/length capability

Grades that can be rolled & pierced on this unit

Reheat Furnace

Batch furnace used

Number

Type

Billet

Bloom

Ingot

Number of re-heat furnaces

Furnace dimensions

Fuel

Type of burners

Location:

Top

Bottom

Both

Sides

Waste heat recovery?

Yes

No

Type of hearth:

Walking beam

Pusher

Hot skids

Stationary

Number of zones

Furnace computer controlled?

Yes

No

Number of controlling thermocouples

Position of thermocouples

Date of last survey

Average reheat time

No. of billets in the furnace at one time

How are billets/blooms/ingots mapped and selected from the rolling furnaces to maintain traceability?

Cut-to-length or multiple length bars are:

Hot sheared?

Yes

No

Cold sheared?

Yes

No

Warm sheared at a temperature of

If yes, are ends stressed relieved?

Yes

No

What is stress relief temperature?

What are typical grades that need to be stress relieved?

Hot sawed?

Yes

No
Cold sawed? □ Yes □ No

MILL COMPUTER CONTROLLED: □ Total □ Partial □ None

Explain how heat number traceability is maintained on the product:

Cooling bed? □ Yes □ No

If yes, what type:

Is product rotated? □ Yes □ No

Is product water cooled after rolling? □ Yes □ No

STORAGE OF PRODUCT
Identify: □ Covered □ Exposed
Describe:

Warehouse:

CUTTING TO LENGTH
Method of cutting:

STRAIGHTENING
Criteria for use:
Type of machine: Configuration:
Surface quality controls:

PRODUCT IDENTIFICATION
Numerical I.D. (stamp, tag, etc.)? □ Yes □ No
Method used to maintain heat identity:

Paint code:
Other:

5. HEAT TREATMENT
In-house treatment or is this process outsourced? □ In House □ Outsourced
If outsource, name of vendor:
Has vendor been site audited? □ Yes □ No
ISO certified? □ Yes □ No
<table>
<thead>
<tr>
<th>#</th>
<th>Name of Furnace (Manufacturer)</th>
<th>Type of Furnace (Batch/Continuous)</th>
<th>Size range capabilities (min/max OD)</th>
<th>Maximum Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Furnace Details

- Batch Furnace
- Continuous Line Heat Treat

Heating method:
- Gas
- Oil
- Induction
- Electric
- Other

Furnace atmosphere:
- Reducing
- Oxidizing
- Vacuum
- Sealed
- Other

Walls:
- Fire brick
- Fiber

Bed layout:
- Stationary brick
- Walking beam
- Rollers

Furnace dimensions:
Batch: _____ X _____ X _____
Continuous Line: ____________________________

Number of Burners _________________
- Top fired
- Bottom fired

Locations of burners in the furnace: ____________________________

Furnace monitoring method:
- Furnace set point thermocouples
- Optical
- Other

Number of monitoring furnace thermocouples ______
Locations in the furnace: ____________________________

Capable of using heat sink, or contact thermocouples?  
- Yes  
- No

Any restrictions? ____________________________

Furnace charts used:  
- Yes  
- No  
Available upon request?  
- Yes  
- No

Furnace surveys conducted  
- Quarterly  
- Every 6 months  
- Annually  
- Other ______

Furnace Survey Information:

Number of thermocouples used: ____________________________

Is there a standard procedure used for this furnace survey?  
- Yes  
- No

Is the entire furnace mapped with thermocouples in this survey?  
- Yes  
- No

If no, explain ____________________________
Is the survey conducted with a full load, or empty? 

Furnace temperature certified for use from \( \_\_\_\_\_\_^\circ C/\_\_\_\_\_\_^\circ F \) to \( \_\_\_\_\_\_^\circ C/\_\_\_\_\_\_^\circ F \)

Controlled to within \( \pm \_\_\_\_\_\_ \) \( \_\_\_\_\_\_^\circ C/\_\_\_\_\_\_^\circ F \) Date of last survey: 

Statistical Process Control used? \( \Box \) Yes \( \Box \) No

Other Furnaces

Provide same furnace information as above for more than one furnace.

Quench Capabilities

<table>
<thead>
<tr>
<th>Bath type quench used</th>
<th>( \Box ) Yes</th>
<th>( \Box ) No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous line quench</td>
<td>( \Box ) Yes</td>
<td>( \Box ) No</td>
</tr>
</tbody>
</table>

Number of tanks

Can as-quenched test be performed on the material? \( \Box \) Yes \( \Box \) No

For bath type quench processes:

Tank Description

Quench Method: \( \Box \) Water \( \Box \) Polymer \( \Box \) Oil

If polymer is used, describe the method and frequency of tests to ensure the concentration is adequate:

If oil is used, describe the type of oil used:

Does the oil quench process use any cooling methods? \( \Box \) Yes \( \Box \) No

Describe:

Capacity of the tank gallons: \( \_\_\_\_\_\_ \) Dimensions: \( \_\_\_\_\_\_ \)

If necessary, can a sample be cut off the product prior to tempering? \( \Box \) Yes \( \Box \) No

\# of impellers in tank for agitation: \( \_\_\_\_\_\_ \) Immersion: \( \Box \) Manual \( \Box \) Automatic

Is agitation sufficient to ensure a good quench? \( \Box \) Yes \( \Box \) No

How is this determined and monitored? 

Capable of monitoring quench temperature before and after quench? \( \Box \) Yes \( \Box \) No

Cooling towers used? \( \Box \) Yes \( \Box \) No Filtration system? \( \Box \) Yes \( \Box \) No

Estimated quench delay time from austenitizing furnace to beginning of quench: \( \_\_\_\_\_\_ \) minutes

Other Tanks

Provide same furnace information as above for more than one tank.

For continuous line quench process:

(Note: if the continuous line uses an immersion type quench, report the information above)
Type of quench process used: __________________________________________

# of spray rings used: _________  Angled?  □ Yes  □ No  Straight?  □ Yes  □ No
Scale pressure spray used prior to quench?  □ Yes  □ No
Water pressure: __________________________  GPM

Is there an inside diameter quench lance used for tubing?  □ Yes  □ No
Is the water temperature monitored prior to quench?  □ Yes  □ No
Are cooling towers used?  □ Yes  □ No  Filtration system?  □ Yes  □ No

Estimated quench delay time from austenitizing furnace to beginning of quench, _________ minutes/seconds

Is the material at the exit zone of the quench monitored via a temperature monitoring device?  □ Yes  □ No
If no, is there sufficient evidence/tests to ensure that the material has received an adequate quench?

__________________________________________________________

Describe:

6. Routine Metallurgical Testing

Lab Certified to: ___________________________ For: ___________________________

Chemistry

Name of unit(s) used to determine chemistry: __________________________________________

Calibration frequency: __________________________________________

Does the mill use wet___________ and dry___________ methods to determine elements?

When is the ladle analysis obtained?

When are product analyses obtained?

Typical residual element levels are:

Cu: ________  Cr: ________  V: ________  Sn: ________  As: ________  Ni: ________
Mo: ________  Cb/Nb: ________  Ti: ________  Sb: ________  Cd: ________

Is hydrogen content routinely sampled?  □ Yes  □ No

Mechanical Properties

Name and type of test equipment:
Testing in accordance with ASTM A 370?  □ Yes  □ No

If no, what standard is used?

How often is the equipment calibrated?

In-house calibration or is this process outsourced?  □ In House  □ Outsourced

If outsourced, name of vendor: ____________________________________________

Has vendor been site audited?  □ Yes  □ No  ISO certified?  □ Yes  □ No

If third party, supply name of the vendor: ________________________________________

How are tensile specimens identified and correlated to a specific order?

Tensile configuration:  □ Round  □ Flat strip  □ Sub-size specimens  □ Threaded ends

Tensile charts kept on file:  □ Yes  □ No  If yes, how long?

Broken tensile specimens kept for a period of time?  □ Yes  □ No  If yes, how long?

Charpy Impacts

Describe the Charpy impact equipment: _______________________________________

Calibration frequency: _______________________________________________________

Who furnishes the Charpy specimens for the calibration?

What standard is used for this process?

Is the “V” notch of the specimens routinely checked to see if it is in tolerance?  □ Yes  □ No

Is an optical comparator used?  □ Yes  □ No

Frequency of this check: _____________________________________________________

Temperature capability of this equipment?  From _______ °C/°F to _______ °C/°F

Is ASTM E 23 used for this process?  □ Yes  □ No  If no, what standard is used?

Can the mill evaluate lateral expansion?  □ Yes  □ No

Can the mill evaluate % shear of the impact specimens?  □ Yes  □ No

Does the mill have any capability to perform CTOD tests (ASTM E1820 or BS-7448) or other fracture toughness testing?  □ Yes  □ No

Hardness Testing Capabilities

Describe the hardness testing equipment in the lab: _____________________________

Internal calibration:  □ Yes  □ No  Calibration frequency: _______________________

External calibration:  □ Yes  □ No  Calibration frequency: _______________________

Describe the hardness testing equipment in the plant: _____________________________
Internal calibration: Yes ☐ No ☐ Calibration frequency: ____________________________

External calibration: Yes ☐ No ☐ Calibration frequency: ____________________________

Standard used for Rockwell? ______________________________________________________
Standard used for Brinell hardness? ____________________________________________

**Corrosion Testing Capabilities**

Does the mill have any corrosion testing capabilities? Yes ☐ No ☐

If yes, describe the tests and standards used:

_________________________________________________________________________

**Hardenability**

Routinely checked?

Jominy sample: ________________________________________________________________
☐Machined ☐Cast ☐Rolled ☐Forged ☐Calculated

Can the mill calculate and report the ideal diameter (DI) per SAE or ASTM? ☐Yes ☐No

**Macro-etch/Chemical Segregation test ASTM E 381** ☐Yes ☐No

If yes, specify the test method

Describe sampling plan: _________________________________________________________

Product tested: ☐Bloom ☐Billet ☐Slab ☐Other

Typical macro results for alloy steels: __________________________________________

**Micro Cleanliness, ASTM E 45 Method A, measured** ☐Yes ☐No

Metallographic? ☐Yes ☐No

Image Analysis used? ☐Yes ☐No

Describe typical inclusion level on your alloy steels: ______________________________

**Grain Size Determination**

How is the grain size determined?

Method used: _______________________________________________________________

When is the material sampled for grain size?

Fine grain practice (ASTM E112-grain size of 5 or finer): Typical range: ____________

How is the grain size reported (i.e. austenitic or ferritic)? __________________________

What is the typical practice for grain refinement?

Can the mill perform micro analysis ☐Yes ☐No
Can the mill evaluate % martensite in the microstructure? ☐Yes ☐No
Determine ferrite content for stainless steel alloys? ☐Yes ☐No ☐NA

7. Straightening Capabilities
Describe the type of straightening capabilities:

Is the straightening performed ☐Hot ☐Cold
If hot straightening is employed, is there a minimum temperature requirement? ☐Yes ☐No
Comment: ___________________________________________________________
If the straightening is performed cold, is the material stress relieved after this process? ☐Yes ☐No
If no, can the mill guarantee that the material did not exceed 5% outer fiber deformation during the straightening process? ☐Yes ☐No
If material is stress relieved, is it stacked, bundled or loaded individually? __________________________________________________________
Comment: __________________________________________________________
Tolerance of straightness that we can expect from the mill? __________________________________________________________

8. Finishing and Marking Capabilities
Can the mill perform any of the following:
Rough turning? ☐Yes ☐No RMS Finish__________________________________________
Peeling? ☐Yes ☐No RMS Finish_____________________________________________
Grinding? ☐Yes ☐No RMS Finish_____________________________________________
Polishing? ☐Yes ☐No RMS Finish_____________________________________________
Sand blasting? ☐Yes ☐No_____________________________________________________
Shot blasting? ☐Yes ☐No Finish______________________________________________
Does the mill stamp heat numbers on the ends of the material? ☐Yes ☐No
If no, what form of traceability is maintained on the material? ___________________________
Is paint stenciling used as a standard marking practice? ☐Yes ☐No
If yes, is the continuous line marking, or manually applied? ___________________________
Can the mill maintain joint traceability (for tubes) and mark them accordingly? ☐Yes ☐No
Is there any manual or automatic grinding performed on the material to remove surface defect? ☐Yes ☐No
If yes, what criteria is used to determine depth of grinds ____________________________
Can the mill paint color codes on the end of the material, if necessary? □ Yes □ No

9. Non Destructive Testing

In-house treatment or is this process outsourced? □ In House □ Outsourced

If outsourced, name of vendor: ____________________________

Has vendor been site audited? □ Yes □ No

ISO certified? □ Yes □ No

List the NDE capabilities below:

<table>
<thead>
<tr>
<th>Test type</th>
<th>Manual/Automatic</th>
<th>Size limits</th>
<th>Standard used</th>
<th>Rejection criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrasonic Straight beam</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If automatic, # of transducers for the scan: __________ 100% of the component subject to scan? □ Yes □ No

Equipment description:

For Bars: Can the mill perform an axial straight beam from the ends of a bar? □ Yes □ No

If yes, is there a calibrated standard established? □ Yes □ No

Back reflection method used? □ Yes □ No

Axial 45% shear wave used? □ Yes □ No

If yes, note the notch of FBH rejection criteria: __________________________________________

<table>
<thead>
<tr>
<th>Test type</th>
<th>Manual/Automatic</th>
<th>Size limits</th>
<th>Standard used</th>
<th>Rejection criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shear wave Ultrasonic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Equipment description:

Longitudinal and transverse directions tested? □ Yes □ No

Test type                           | Manual/Automatic | Size limits | Standard used | Rejection criteria |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Eddy Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Equipment description:
<table>
<thead>
<tr>
<th>Test type</th>
<th>Manual/Automatic</th>
<th>Size limits</th>
<th>Standard used</th>
<th>Rejection criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flux leakage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnetic particle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid penetrant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-ray</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Equipment description:**

<table>
<thead>
<tr>
<th>NDE operator/supervisor qualifications:</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of inspectors</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Can separate NDE reports be furnished with the mill test reports?  □ Yes  □ No
Can qualification records and eye exams be furnished, if requested?  □ Yes  □ No
If required, can the mill test and report residual magnetism in the product prior to shipment?  □ Yes  □ No
If yes, can the mill meet a 20 gauss maximum prior to shipment?  □ Yes  □ No
Does mill use preventive maintenance procedures? □ Yes  □ No

Is maintenance an in-house or outsourced function? □ IH  □ OS

Does mill maintain statistics on equipment maintenance? □ Yes  □ No

If so, are the maintenance statistics reviewed for improvement? □ Yes  □ No

Are there written procedures and intervals for maintenance of equipment? □ Yes  □ No

Have minimum qualifications been established for each maintenance of equipment position? □ Yes  □ No

Are there training records for maintenance personnel? □ Yes  □ No

Are there Management of Change and Risk Management records? □ Yes  □ No

10. Supplemental Questions and Comments

Are heat certifications typically supplied with the shipment and is the certification available for electronic transmittal? If not, explain how MTRs are sent.

Any major scheduled plant improvements with projected completion date:

Questionnaire completed by:
Signature: ____________________________________________

Name: _________________________________________________

Function/Title: __________________________________________

Reviewed by: ____________________________________________

Date: __________________________

Approved: Yes  No

Date: __________________________
Bibliography

[5] ASTM E381, Standard Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings