Welding Services for Equipment used in the Petroleum and Natural Gas Industry

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1 Scope

1.1 Purpose

This standard specifies requirements for the qualification of suppliers of welding services used in the manufacturer of equipment for the petroleum and natural gas industries.

1.2 Applicability

The requirements of this standard apply to welding operations performed in a welding facility or in the field. Included are pressure containing, pressure controlling, overlay and structural welds.

NOTE This standard does not limit the responsibility of any manufacturer of commercial products utilizing continuous line heat treatment services and manufactured to an API standard from its responsibility for compliance with all applicable requirements of that API standard.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any addenda) applies, except that new editions may be used on issue and 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*

ISO/IEC 10725*, General requirements for the competence of testing and calibration laboratories*

3 Terms, Definitions and Acronyms

For purposes of this standard, the following terms, definitions, and acronyms apply.

3.1
acceptance criteria

Defined limits placed on characteristics of materials, processes, products, or services.

3.2
calibration
Comparison and adjustments of equipment output and measuring instruments to a standard of known accuracy.

3.3
equipment inspection
A process performed to verify the calibration status of reference, primary, transfer or working standards and reference materials, carried out according to defined procedures and schedules.

3.4
familiarity
The state of being familiar with something; possessing a basic understanding of a topic but not being experienced, practiced or skilled in a topic.

3.5
knowledge
Information, understanding or skill gained from experience or education; greater understanding than familiarity however not equivalent to a subject matter expert (SME)

3.6
nondestructive examination
NDE
A method used to check the soundness of a material or a part without impairing or destroying the usability of the part.

3.7
procedure qualification record
PQR
A record of welding variables used to produce an acceptable test weldment and the results of tests conducted on the weldment to qualify a WPS.

3.8
subject matter expert
SME
A person who, by possession of a recognized degree or professional standing or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to a specific subject matter

3.9
traceability

The ability to verify the history, location, or application of an item by means of documented recorded identification.

3.10
verification
The adjustment of an NDE instrument using an appropriate reference standard, to obtain or establish a known and reproducible response. This is usually preformed prior to an examination, but can be carried out anytime there is concern about the examination or instrument response.

3.11
welding procedure specification
WPS
A document providing the required welding variables for a specific application to ensure repeatability by properly trained welders and welding operators.

3.12
welding services supplier
WSS
An organization that provides welding services for equipment used in the petroleum and natural gas industry.

4 Welding Services Supplier Qualification

4.1 General

Welding service supplier (WSS) shall implement and maintain required controls to ensure product and services meet specific customer and industry requirements.

4.2 Facilities and Equipment

In order to conform to this standard, the WSS shall have the following capabilities:

- Equipment to perform required welding activities;
- A facility to house welding equipment;
- Appropriate handling and lifting equipment (as applicable);
- Inspection and test equipment (as applicable).

4.3 Welding Services Supplier Quality Management System (QMS)

The WSS shall establish, document, implement and maintain, at all times, a QMS and associated processes. The QMS shall be in conformance with API Specification Q1. The WSS shall determine the processes needed for the quality management system and their application through all operations. In addition to the requirements of API Q1, the QMS shall address:

- Product Requirements
- Technical Review
- Control of Outsourced Services
- Training and Competency of Welding Personnel
- Training and Competency of Inspection Personnel
- Control of Production Equipment
- Testing Equipment
- Preventive Maintenance
- Control of Welding Procedure Specifications
- Qualification of Welding Procedures
- Production Planning
- Storage and Handling of Welding Consumables
- Control of Post Weld Heat Treatment
- Control of Welding Inspection and Testing

4.4 Technical Review Requirements

The WSS shall maintain procedure(s) to ensure that technical requirements are reviewed prior to acceptance of the order.

The WSS shall maintain records of this review including:

- Material specifications
- Acceptance criteria for welds
- Qualification of welding procedures
- Qualification of welding personnel
- Outsourced services
- Inspection and testing requirements including third party verification
- Identification and traceability (see 7.3)

- Details of completed welds (weld map)
- Special welding requirements
- Requirements for use of special methods

5 Personnel Training and Competency Requirements

Personnel shall be competent to carry out assigned tasks/responsibilities 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 WSS shall Identify:
- Roles that require familiarity with welding and testing
- Roles that require a knowledge of welding 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.

The WSS shall maintain evidence of conformity to the above requirements.

6 Weld Processes, Equipment and Qualification Requirements

6.1 General

The WSS shall maintain a system of written procedures for each welding support service performed. Welding procedures shall comply with the applicable nationally or internationally recognized standards. The procedures shall include a description of the methods used.

The development of a weld practice shall comply with the design controls of API Specification Q1. Individual(s) other than the person or persons who developed the procedure shall approve the final procedure. Design and development changes including changes to procedures, shall require the same controls as the original design and development, and design documentation.

6.2 Equipment Inventory (welding, inspection, heat treatment, NDE, monitoring)

The WSS shall maintain an inventory of all available welding and support equipment with the following information noted:

- Name of the manufacturer
- Equipment model and serial number
- calibration requirements, current software etc.
- Range of operation and range of calibration
- Traceable to a recognized international standard used for calibration
- Frequency of calibration
- Allowable tolerances or maximum sensitivity

6.3 Calibration and Verification

6.3.1 General

Equipment used to inspect, test or examine material or other equipment shall be identified, controlled, calibrated and adjusted at specified intervals in accordance with documented manufacturer instructions, and consistent with nationally or internationally recognized standards. Records of all calibration shall be maintained.

6.3.2 Measuring and Testing Equipment

The WSS 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.

6.3.3 Welding Equipment

Welding machines and welding control equipment shall be calibrated as specified by the manufacturer. The frequency of calibration shall be at least annually. In addition, the following shall be checked during calibration:

- Condition of volt meters, amp meters and gas flow meters (if equipped)
- Condition of cables
- Condition of hoses (if equipped)
- Condition of wire feeders (if equipped)

6.3.4 Calibration Identification

Calibration status of equipment shall be available in a log that provides traceability to the specific piece of equipment. Equipment shall be uniquely identified by a label, etching, or a tag.

6.3.5 Calibration Records

The WSS shall specify how records are maintained on each item of equipment used to control quality. The record shall include the following:

- Type of equipment
- Serial number
- Calibration frequency
- Calibration tolerance
- Date calibrated
- Next calibration due date
- As-found condition
- As-left condition
- Standard(s) used
- Calibration procedure or method

7 Material Preservation and Control

7.1 General

The WSS shall maintain a written procedure that details the system of material preservation and control. Controls, including those for identification and traceability shall be established to ensure the integrity of base materials and consumables during receipt, handling, storage, and usage.

7.2 Weld Consumable Material Control

The WSS shall maintain a written procedure that details the system of weld consumable material control.

As a minimum, the material control procedure shall include the following:

- Welding consumables shall conform to ASME BPVC Section IIC, AWS A5.01, other AWS A5 standards or the manufacturer's written specifications.
- A purchasing document that describes the item and ensures that the correct consumable materials are ordered;
- A system that ensures that the correct consumable material has been received, released for use, and how nonconforming or unverified weld consumable material or items are prevented from use;
- When weld consumable material certifications or weld consumable material test reports are required, they shall be reviewed to verify that the weld consumable material meets the requirements established by specifications;
- The applicable consumable material shall appear on the WPS/PQR.
- Controls shall be in place that define procedure for issuing welding consumables, and designate personnel responsible to ensure that the proper filler material is used. Partially used welding Consumables left on the machines shall be identified to ensure traceability.
- Storage practices to prevent intermixing of filler metal types, sizes and heat numbers (if applicable) shall be established. Storage practices to prevent contamination of the various filler metal types used by the fabricator, including any elevated temperature holding requirements of the filler metal manufacturer and the applicable code or filler metal specification.
- Length of time that issued filler metals may be exposed to the atmosphere before returning to the rod oven or crib. Re-drying (baking) requirements (or other disposition) for filler metals which have exceeded the maximum allowable exposure time.
- Reconditioning of welding consumables shall be in accordance with manufactures specifications or recommendations.
- Filler metal issue and return log sheets.
- Scrapping or disposition of unusable or damaged filler metals.

7.3 Base Material Control

The WSS shall maintain a written procedure that details the system of base material control. As a minimum, the material control procedure shall include the following:

- Purchasing document that describes the item and ensures that the correct base materials are ordered
- System that ensures that the correct base material has been received, released for use, and how nonconforming or unverified base material or items are prevented from use
- When base material certifications or base material test reports are required, they shall be reviewed to verify that the base material meets the requirements established by specifications

7.4 Material Identification and Traceability

The WSS shall maintain documented procedures and maintain records for control of identification and traceability throughout the manufacturing process. The procedure shall include:

a) Method for verifying traceability upon material receipt
b) Method of ensuring the physical marking is traceable to all records associated with the product
c) Method for ensuring traceability of product back to received material after any processing where the original marking is removed

d) Process for verification of product traceability during storage
e) Requirements for maintenance or replacement of identification and or traceability marks
f) Method of ensuring traceability for any product during outsourced processes

The records shall provide traceability for specific welds and include,

1) Consumable Materials
2) Base Materials
3) Location of Weld Repair (weld map)
4) Weld Maps (when required) shall contain the following Traceability information
    i. Part Sketch denoting new weld /repair Area
    ii. Part Number
    iii. Serial number
    iv. Welder's stamp or ID number
    v. NDE Report Number of verification of Defect Removal
    vi. WPS used
    vii. Filler Material Heat/Batch/Lot
    viii. Weld Flux Heat/Batch/Lot, if used
    ix. Welding Equipment
5) Welding Operators
6) Welding Procedure and Qualifications
7) PWHT Chart(s) showing all accumulated hours for each weld joint

7.5 Preservation of Product

The WSS shall maintain documented procedures describing the methods used for handling, storage and preservation of 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.

8 Qualification of Weld Procedure Specifications and Controls

8.1 General

The WSS shall maintain a written procedure that details the welding procedure qualifications including the following minimum requirements:

a) Welding procedures and procedure qualification shall be in accordance with the ASME, AWS, ISO including other codes or standards and design specifications as applicable. The qualified and approved procedure shall identify the applicable code(s) or specification(s).
b) When the governing specifications require that welding procedures be qualified by test, the welding services provider shall include PQRs that support the applicable WPSs. Some Codes permit the use of prequalified WPSs or Standard Welding Procedure Specifications (SWPSs) published by the ASME B&PVC, AWS. In these cases, PQRs are not required.
c) All WPS and PQR documentation shall be reviewed and accepted to ensure code compliance, based upon the welding service supplier's written procedure. The individual approving the WPS and PQR shall be one of the following:

- A degreed Engineer (preferably welding, metallurgical, or material science)
- Certified Welding Engineer or SME

8.2 Control of Weld Procedure Specifications

The WSS shall maintain a written procedure that details the control of welding procedure specifications including the following minimum requirements:

- The authority for qualification, assignment, and revision of WPSs and PQRs shall be defined.
- The applicable revision WPSs shall be available to welders and/or welding operators during testing and production welding.
- Applicable WPSs shall be listed on drawings, shop routers, weld maps or other production documentation.
- For procedure qualification, a PWPS shall be available to welders and/or welding operators.

8.3 Welder Performance Qualification

8.3.1 General

The WSS's written procedure shall contain provisions requiring all welders and welding operators to be qualified in accordance with the governing welding codes and/or applicable standards. The WSS's written procedure shall identify the following:

- The responsibility for review of the WPQ record for compliance to applicable code(s) and specifications shall be defined
- WPQ records shall be reviewed for compliance to applicable code(s) and specifications
- The system for how welders and welding operators are identified (by a number, letter, or symbol) shall be defined
- The responsibility for verifying that only qualified welders and welding operators are assigned to specific jobs shall be defined
- The responsibility for verifying the continuity of welders and welding operators' qualification in accordance with the code or specification shall be defined
- Personnel performing welding shall take and pass an annual vision examination in accordance with the WSS documented procedures that conforms to the applicable requirements of AWS Visual Acuity Record

8.3.2 Welding Inspection Personnel

The WSS shall have at its disposal competent personnel for performing and supervising the inspection and testing of the welding operations to ensure compliance to specified requirements.

Personnel performing visual inspection of welding operations and completed welds shall be qualified to one of the following:

- AWS Senior Certified Welding Inspector (SCWI) in conformance with the provisions of AWS QC1
- AWS Certified Welding Inspector (CWI) in conformance with the provisions of AWS QC1
- AWS Certified Associate Welding Inspector (CAWI) in conformance with the provisions of AWS QC1 and under the supervision of an AWS SCWI or AWS CWI
- CSWIP Certified Visual Welding Inspectors (Level 1)

- CSWIP Certified Welding Inspectors (Level 2)
- CSWIP Certified Senior Welding Inspectors (Level 3)
- Welding inspector certified by the manufacturer's or remanufacturer's documented training program. The manufacturer or remanufacturer shall have written procedures:
    - Defining the In-house welding inspector certification program including training syllabus, Instructor qualification requirements, length of certification and renewal requirements;
    - Defining the roles, responsibilities, authority and accountability of a welding inspector
    - Defining essential welding variables and equipment monitoring

8.3.3 Procedures

The WSS shall maintain written procedures:

— defining the WSS welding inspector certification program including training syllabus, instructor qualification requirements, length of certification, and renewal requirements

— defining the roles, responsibilities, authority, and accountability of a welding inspector

— To assure compliance with essential welding variables and equipment monitoring

— defining welding, weld NDE, and post-weld heat treatment (PWHT) audits. Internal audits shall be performed at least annually, covering all on-site areas and shifts. WSS audits shall be performed in accordance with the WSS's written procedure for validation of WSS processes

9 Inspection Requirements

9.1 General

The WSS shall maintain a documented procedure that defines the inspection process. The procedure shall include requirements for receiving, welding, and final inspection and define how the provider determines inspection requirements of products and services to meet industry codes, client specifications and/or client purchase order requirements.

Where sampling is used, WSS's sampling plans shall be based on documented risk assessment and be provided to the customer for approval.

9.2 Receiving Inspection

The WSS shall maintain a documented procedure that defines the process for verification that the product or services delivered meet stated purchase order requirements and associated acceptance criteria.

9.3 In-process Inspection

The WSS shall maintain documented procedures for inspection processes that include the following:

a) Type of inspection to be performed and recorded
    1) Dimensional
    2) Preheat
    3) Inter Pass Temperature
    4) Welding
    5) In-Process NDE
b) Post weld heat treatment
c) Frequency of inspections necessary to ensure required quality of welds
d) Acceptance criteria used for weld inspection

9.4 Final Inspection

The WSS shall verify that the product meets the customer's requirements. This includes:

a) Dimensional Inspection to manufacturing prints and drawings
b) NDE Inspection
c) Data Books
d) Marking
e) Packaging

9.5 Inspection Records

The WSS shall maintain all inspector and inspection records as defined below;

a) Inspector Certifications
b) Continuity Logs
c) Inspection Reports
d) Material Certifications
    1) Base Material
    2) Welding Consumables

10 Control of Service Suppliers

10.1 General

WSS 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.

10.2 Service Supplier Qualification Requirements

WSS shall approve a service supplier in accordance with Table 1. If the processes listed in Table 1 are performed, the service supplier shall be in conformance with the listed standards or equivalents.

Table 1 – Service Supplier Qualification Requirements

Service	Qualification Requirements
Welding	Verification of capabilities and controls through an on-site technical audit. An API registration to API Standard 20G is acceptable in lieu of an audit or technical assessment.
Machining	Verification of capabilities and controls through an on-site audit or a remote technical assessment that addresses the following, as a minimum: – calibration – identification and traceability – qualification of personnel – controls in place for services being provided – preservation of product – inspection
Material Testing and Calibration	The organization 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 conformance for the required service is acceptable in lieu of an audit or technical assessment may be used for approval of a service supplier.
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. For suppliers performing NDE, an API Standard 20D registration may be accepted in lieu of an audit or technical assessment.

10.3 Approval of Service Suppliers

WSS shall approve service suppliers by either an on-site audit, the specified API registration or QMS accreditation as specified in Table 1. If the processes listed in Table 1 are performed, the WSS shall be in conformance with the listed standards or equivalents.

NOTE Client AVL does not release WSS from the responsibility of the service supplier audit.

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

10.4 Periodic Evaluation of Sub-suppliers of welding services and Service Suppliers

WSS shall maintain a procedure for the monitoring and re-evaluation of sub-suppliers of welding services 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-welding services supplier or service supplier performance history, purchasing frequency, and any changes that have occurred at the facility. The frequency of the evaluation shall be documented and shall not exceed 24 months.

The sub-supplier of welding services and service supplier re-evaluation shall be performed consistent with the requirements defined in Table 1.

For sub-suppliers of welding services and service supplier who do not meet the defined requirements, the procedure shall address the process for determining and implementing corrective actions required to bring the sub supplier into compliance.
Records of the results of the sub-suppliers of welding services and service supplier evaluation, including resulting actions, shall be maintained.

10.5 Review of Order Requirements with Service Suppliers

The WSS 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.

The WSS shall maintain records of the results of the review, including resulting actions.

11 Welding Services Supplier Performed Processes

The WSS may perform additional processes on the metallic material product prior to delivery to the customer. If the processes listed in Table 1 are performed, the WSS shall be in conformance with the listed standards or equivalents.

12 Records and Document Control

The WSS 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. Records to be maintained by WSS:

- Technical review records
- Review of order requirements
- Training and competency
- Inventory of welding & support equipment
- Calibration records
- Identification and traceability
- Visual acuity
- Weld process records
- Weld map
- Weld procedure specifications
- Weld procedure qualification records
- Weld personnel qualification records
- Continuity logs
- Routers
- Inspector certification
- Inspection and test reports (fit up, in process inspections, final inspections)
- Material Test Reports (MTRs)
- Supplier approval
- Supplier periodic evaluation
- Review of order requirements with sup-suppliers

Records shall remain legible, identifiable and retrievable. Records shall be maintained for a minimum of 5 years or as required by the customer, legal and other applicable requirements, whichever is longer.

ANNEX A
(Informative)

Weld Supplier Audit Process

This annex provides an example of an extensive weld supplier audit survey form that may be used as a guide by the weld supplier 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.

1) **Processes performed at this facility (check appropriate boxes):**

☐ Flux Cored Arc Welding (FCAW) ☐ Submerged Arc Welding (SAW) ☐ Brazing

☐ Gas Metal Arc Welding (GMAW) ☐ Shielded Metal Arc Welding (SMAW)

☐ Gas Tungsten Arc Welding (GTAW) ☐ Foundry In-Process Completion/Repair Welding of Castings

2) **Identify which of the following material / alloy groups are used:**

☐ Carbon and Low Alloy Steels ☐ Alloy Steels ☐ Stainless Steels

☐ Precipitation Hardening Stainless Steels ☐ Nickel and Nickel based alloys

☐ Precipitation Hardening Nickel based Alloys ☐ Aluminum and Aluminum based Alloys

☐ Magnesium based Alloys ☐ Titanium and Titanium based Alloys

☐ Cobalt based Alloys ☐ Other (list):

3**) Identify any facility Third Party Welding Accreditations /Certifications:**

☐ PED ☐ ASME U1 ☐ ASME U2 ☐ Other:

Questions	Response
Number of Current welding shifts	
Number of Welding Inspectors at the Facility	
Number of Welding Technicians at the Facility	
Number of Welders or Welding Operators at the Facility	
Number of Welding Supervisors at the Facility	

Number of Welding Engineers at the Facility	
Does the Facility perform the NDE Inspections required by the Quality Plan? (if yes use the respective NDE Audit Checklist Sections)	If Yes, which? ☐ PT ☐ MT ☐ RT ☐ UT ☐ POUT (if Required)
Subcontracted NDE Operations	If Yes, to who? ☐ PT ☐ MT ☐ RT ☐ UT ☐ POUT (if Required)
Name of the PWHT Subcontractor if Applicable	
List of Qualifications for Each Subcontractor	
Who has the ability to stop the Welding operations if they don' meet Standards requirements?	
How are Third Party Inspection points identified on Shop Paperwork?	

Questions	Yes/ No	Comments
Welder Qualification		
Does the Auditee have a written procedure for the qualification of welding/brazing personnel? Document No: Rev: NOTE: A response of "**we work to the industry standard**" is not acceptable. API Product Specifications require that the company performing welding shall have procedures for monitoring, updating and controlling the qualification of welders, welding operators and the use of welding-procedure specifications. API Q1 specifically calls out welding as a process that requires Validation and a documented procedure defining training, qualification, requalification, revoking certifications and records. Records shall include failures and retaining.	☐ Yes ☐ No	
Does the procedure specify the standard to which qualification is required?	☐ Yes ☐ No	
Does the qualification procedure specify conditions under which welding personnel qualifications may be revoked?	☐ Yes ☐ No	
Does the procedure address what happens when a Welder / Weld Operator does not pass the test?	☐ Yes ☐ No	
Does the facility do bolt hole, tapped hole and blind hole repair?	☐ Yes ☐ No	
Does the procedure cover how are welders qualified for bolt hole, tapped hole and blind hole repair?	☐ Yes ☐ No ☐ N/A	
If yes, does the procedure state that qualification is in accordance with API 6A, or API 16A?	☐ Yes ☐ No ☐ N/A	
If bolt hole, tapped hole and blind hole repair is performed, verify that on these types of weld that the welders qualified for hole repair? (API 6A, 16A)	☐ Yes ☐ No	

Questions	Yes/ No	Comments
	☐ N/A	
Does the procedure require that Tack Welders be qualified? (To ensure tack welds are only performed by qualified personal) Note: Tack welders shall be Qualified in accordance with ASME BOP Code Section IX)	☐ Yes ☐ No	
Does the procedure address maintaining records when a welder does not pass the test?	☐ Yes ☐ No	
Is the filler material used for tacking when required, same as the specified for the WPS to be used on the joint? If different is the filler metal specified in the relevant documents. NOTE: If a different filler metal is permitted, a WPS shall be qualified for the required filler metal.	☐ Yes ☐ No	
Is tacking criteria specified such as tack size, sequence, and location and is it performed by qualified welders to an approved operation sheet? (To ensure tack welding has part specific instruction, i.e., number of tacks, location, size, filler material, WPS, in-process inspection etc.)	☐ Yes ☐ No	
When performing tack welding are controls used to prevent stray arc strikes, under cut, and oxidation? (To prevent non-conforming product.) Note: For example, welder qualification / training, direct earthing / grounding of parts, usage of qualified WPS's, appropriate fixtures. Verify parts have controlled tacking, if any tack welding is being carried out on any parts/components.	☐ Yes ☐ No	
Does the procedure specify the frequency for Welder / Weld Operator / Brazer re-qualification?	☐ Yes ☐ No	
Are personnel (Welder / Weld Operator / Brazer) qualified for the process(s) they perform in production?	☐ Yes ☐ No	
Are personnel qualification records available for each welder, welding operator or brazer? (5 yr. retention time)	☐ Yes ☐ No	
Are Temporary / Contract welders used at the Auditee's	☐ Yes	

Questions	Yes/ No	Comments
Facility?	☐ No ☐ N/A	
If yes, are Temporary / Contract welders using the Auditee's WPS's?	☐ Yes ☐ No ☐ N/A	
If yes, does the documented Qualification Procedure address the qualification of Temporary / Contract welders?	☐ Yes ☐ No	
If yes, did the Auditee give the welder performance qualification test? Are records kept at the Auditee's Facility and available to the Auditor?	☐ Yes ☐ No ☐ N/A	
If no, are the WPS's used by the temporary welder approved by? For Temporary Welders does the Auditee have the welder performance qualification records?	☐ Yes ☐ No ☐ N/A	
Does the Auditee's Facility have a continuity log for the Temporary / Contract Welders?	☐ Yes ☐ No ☐ N/A	
Does the facility have a Continuity Log?	☐ Yes ☐ No	
Does the continuity log show that the welder/weld operator has welded in the process at least once every six months since initial certification? Note: This is for each process that the welder is qualified for. Also, be aware that Manual, Automatic and Machine variations on a process require continuity (Example GTAW– Manual and GTAW – Automatic)	☐ Yes ☐ No	
Welder Stamps		

Questions	Yes/ No	Comments
Does each welder have a stamp or identification number for traceability?	☐ Yes ☐ No	
If yes, is there a documented procedure for control of Stamps? Document No: Rev:	☐ Yes ☐ No	
Are the stamps identified "low stress" ones? (Ball stamp)	☐ Yes ☐ No	
Are different stamps used for CRA then the ones used on Steel?	☐ Yes ☐ No	
Are the stamps used for CRA made from CRA material or Plated Steel?	☐ Yes ☐ No	
Weld Inspectors / Welding Engineers /Welding Technicians /Supervisors		
Does the Auditee have a written procedure defining the In-house Welding Inspector certification program including training syllabus, Instructor qualification requirements, the length of certification and renewal requirements? Document No: Rev: Note: Procedure shall contain eye test requirements.	☐ Yes ☐ No	
Are qualification records current?	☐ Yes ☐ No	
Does the Weld Inspector qualification procedure address the physical requirements, including annual vision examination?	☐ Yes ☐ No	
Are records of vision examinations on file and current?	☐ Yes ☐ No	

Questions	Yes/ No	Comments
Does the Auditee have a written procedure defining the roles, responsibilities, authority and accountability of a welding inspector? Document No: Rev:	☐ Yes ☐ No	
Are the functions of the Welding Engineer and Welding Technician (if applicable) clearly defined? Note: For example, in accordance with EN 719 or ISO 3834-2.	☐ Yes ☐ No	
Are Welding Engineers correctly trained and qualified. Report level of qualifications, college degree etc.?	☐ Yes ☐ No	
Are Welding Technicians correctly trained and qualified?	☐ Yes ☐ No ☐ N/A	
Are the responsibilities, authorities and accountabilities of the welding supervisors defined, documented and communicated?	☐ Yes ☐ No	
Are the welding supervisors trained for welding or have welding backgrounds?	☐ Yes ☐ No	
Weld Consumables		
Does the Auditee have a written procedure for storage and control of welding consumables? Document No: Rev: Note: The documented consumable control system must address the following: purchasing, receiving, storage & release, shop control, material identification and traceability	☐ Yes ☐ No	
Does the procedure provide clear instructions or reference procedures for purchasing consumables including certification paperwork? Note API Q1 requirements for purchasing documentation. The Auditee must be able to show the auditor examples of written Purchase Orders that specify filler material specification, size, and identification requirements or cite Specifications.	☐ Yes ☐ No	

Questions	Yes/ No	Comments
Are low hydrogen electrodes procured in hermetically sealed containers or vacuum packs?	☐ Yes ☐ No	
Does the procedure define methods to control the exposure of low hydrogen electrodes after removal from containers or ovens, suitably limited based on classification? NOTE: Review the procedure for adequacy to control electrodes, which may include storage temperature, humidity control, oven control, time limits, re-stocking, re-issue.	☐ Yes ☐ No	
Are there clear instructions or procedures referenced for receiving and stocking consumables? (Incoming Inspection	☐ Yes ☐ No	
Is the Auditee performing receiving inspection as required by procedure to ensure that purchase order conditions are met, including composition, identification, size and Certification paperwork? Note: The procedure must specify what is required to be checked at receiving inspection. The inspection must be performed to ensure that P.O. conditions are met (API Q1 requirement). The Auditee must show the auditor the chemistry certs, which fall within the range allowed by specification or certificate of conformity with heat lot traceability stating that the filler material meets the requirements of the applicable filler material specification. (SAW fluxes may not have chemical composition certificates)	☐ Yes ☐ No	
Does the documented procedure define the specification and certification requirements including receiving inspection verification for the shielding gas? (To avoid using poor quality or contaminated gasses that are known to have detrimental effect on product quality) Note: The Auditee must specify a gas specification or grade/purity on their P.O.s or in a specification called out on the P.O. to the gas supplier, and the gas certs must specify compliance to the spec or grade/purity. There is no requirement for traceability of gas to individual bottles / serial numbers When a Weld Supplier mixes gasses to the requirements, the supplier shall have a procedure defining how the mixing procedure will be controlled. As a minimum, the individual gasses must be controlled as stated above. In addition, the supplier must define how and when they will periodically analyze the mixed gas to demonstrate the mixed percentage has been achieved.	☐ Yes ☐ No	

Questions	Yes/ No	Comments
Note: All shielding gasses shall meet the requirements of SFA-5.32.		
Are the certifications or certificates of conformity for consumables maintained in an accessible filing system?	☐ Yes ☐ No	
Is there a procedure stating that records are maintained for 5 years or per P.O.? Note API Q1 requirement.	☐ Yes ☐ No	
Does the procedure provide clear instructions on primary and secondary storage of consumables? Note: should define temperature and humidity for primary storage and holding oven temperatures for consumables that need ovens and reconditioning requirements if allowed.	☐ Yes ☐ No	
Does the procedure address how the primary and secondary storage areas are monitored?	☐ Yes ☐ No	
Does the procedure address how consumables are issued? (consumable lot control shall requirements be outlined in the procedure)	☐ Yes ☐ No	
Does the filler material meet the specification requirements?	☐ Yes ☐ No	
Are consumable certificates included the filler material shipment?	☐ Yes ☐ No	
Are filler metal containers or bundles marked with the manufacturer's name, AWS or national standard classification, Heat Number/ Lot Number and type? Note: Filler material containers in storage area shall be marked to provide for positive traceability to heat and/or lot number.	☐ Yes ☐ No	
Is filler material stored in a clean, dry environment and in accordance with the facility's written procedure?	☐ Yes ☐ No	

Questions	Yes/ No	Comments
Is bare weld wire flag tagged, stamped or marked by laser? (as applicable)	☐ Yes ☐ No	
Does the process require drying/holding ovens? (To ensure Low Hydrogen Welding practice)	☐ Yes ☐ No	
Does the oven temperature meet the electrode control procedure requirement?	☐ Yes ☐ No	
Is filler material segregated by specification number in such a manner to prevent co-mingling of different sizes or filler material specification numbers? (To prevent inadvertent use of the incorrect filler material on production parts.) Note: Filler material storage locations for each type of filler are clearly identified by material specification number, Lot Number and filler material size.	☐ Yes ☐ No	
Is the exposure of low hydrogen electrodes, after removal from containers or ovens, suitably limited based on electrode classification when used?	☐ Yes ☐ No	
How are the electrodes transferred from oven to portable quivers? (To ensure Low Hydrogen Welding practice)	☐ Yes ☐ No	
Does the process have a filler metal storage, with controlled access? (To ensure filler metal quality and application)	☐ Yes ☐ No	
Do you record filler metal distribution and return of unused filler metal? (To ensure filler metal quality and application)	☐ Yes ☐ No	
If filler material identification markings are lost, missing, or destroyed, is the material scrapped?	☐ Yes ☐ No	
Does the Auditee control the use of electrodes/fluxes by the welding operator? How?	☐ Yes ☐ No	
Does the procedure define the method is used for Storing SAW Flux? (controlled per consumable procedure) Note: Review adequacy for flux control, which may include storage temperature, humidity control, oven control, time	☐ Yes ☐ No	

Questions	Yes/ No	Comments
limits, re-stocking, re-issue		
Does the process use recrushed SAW Flux? NOTE: Use of recrushed slag as flux is not permitted for any SAW welding application.	☐ Yes ☐ No	
Are heat numbers of the filler materials logged on work orders/shop paperwork to allow traceability of the welding consumables to the part/component welded?	☐ Yes ☐ No	
Are fluxes and filler metals segregated and stored in limited access area and issued only as required by authorized personnel?	☐ Yes ☐ No	
Are fluxes and filler metals stored where they will be protected against contamination (moisture, oil) and damage?	☐ Yes ☐ No	
Are welding flux containers including ovens properly identified? Heated Hoppers?	☐ Yes ☐ No	
Does the procedure address proper storage of Flux Core wire reels?	☐ Yes ☐ No	
Are flux core wire reels moved to an oven after 8 hours of exposure?	☐ Yes ☐ No	
Is bare wire stored in such way so that it is kept clean and rust free?	☐ Yes ☐ No	
If bare wire reels are left on the machine are they covered?	☐ Yes ☐ No	
Is there a defined method for Distribution of Shielding Gases? (To measure capacity risk factors)	☐ Yes ☐ No	
Does the Auditee have a written procedure defining essential welding variables and equipment monitoring? (API 6A, 16A) Document No: Rev:	☐ Yes ☐ No	

Questions	Yes/ No	Comments
Are welding/brazing procedures / schedules qualified in accordance with applicable specifications?	☐ Yes ☐ No	
Are filler material requirements specified on drawings or welding/brazing WPS?	☐ Yes ☐ No	
Are the shielding gases used in compliance with WPS requirements?	☐ Yes ☐ No	
Do gas lines and regulators used for the shielding gas meet requirements?	☐ Yes ☐ No	
Does the welder / weld operator know how to read the gas flow meter to assure setting is within the range specified on the WPS? Note: The reading point of the ball varies per gage manufacturer. Some are top, others are bottom and some are middle of the ball.	☐ Yes ☐ No	
Is welding joint preparation always done according to a WPS or documented procedure? (To reduce distortion variation and ensure full joint penetration) Note: Assure that parts are prepared (e.g., cleaned, proper joint clearances and fit-up, alignment tolerances, joint run-out, joint configuration, cleanliness of filler material, etc.) and tooling and fixtures are in accordance with requirements prior to processing	☐ Yes ☐ No	
Does the shop have adequate lighting for fabrication operations? (To ensure welder and inspectors can check for proper fit up and weld appearance.)	☐ Yes ☐ No	
Are there adequate procedures and shop practices to prevent contamination of stainless steels by carbon and low alloy steels and copper? Fabrication of stainless steel components shall be in a separate isolated space if possible. There shall be no direct impingement of carbon and low alloy grinding dust and sparks on the stainless steel. Stainless steel pipes and plates shall be stored such that there is no direct contact with carbon and low alloy steels. Separate cleaning brushes and grinding wheels shall be used for stainless steels, preferably color coded. Use of carbon steel bristled brushes is not permitted on stainless steel	☐ Yes ☐ No	

Questions	Yes/ No	Comments
components.		
Prior to welding/brazing, are all surfaces be free of slag, visible surface oxides, scale, protective finishes, oils, grease, dirt, cracks, lamination, burrs, or other foreign materials?	☐ Yes ☐ No	
Are welded surfaces always clean, without rust, oil, humidity, paint? (To prevent weld defects) Note: Verify that the cleaning requirements are defined for shop personnel on a part router or work instruction.	☐ Yes ☐ No	
Is there a documented procedure for Preheat and Interpass control (API 6A, 16A)? Document No: Rev: Note: A response of "**we work to the WPS requirements**" is not acceptable. API requires Preheating of assemblies or parts, when required by the WPS, shall be performed in accordance with the company's written procedures. A written quality procedure that specifies requirements for ensuring suitable/capable preheat/interpass temperature control should include heating methods, distance set-off for torch heating, neutral flame, etc.	☐ Yes ☐ No	
Does the process have control devices for pre-heating and interpass temperature (thermocouple, thermofusible pencils, contact pyrometers etc.) to ensure WPS compliance?	☐ Yes ☐ No	
Prior to the deposition of each pass in a multiple pass weld, does the welder or welding operator perform interpass cleaning and visually examine the previous pass for contamination and defects?	☐ Yes ☐ No	
Are defects or contamination removed prior to the deposition of subsequent passes?	☐ Yes ☐ No	
Are cleaning tools, such as brushes, flap wheels, abrading tools etc. marked with the material type they are used on in order to avoid cross contamination?	☐ Yes ☐ No	
Does the welder know not to use cleaning and grinding tools on both CRA and Carbon Steel materials?	☐ Yes ☐ No	

Questions	Yes/ No	Comments
Is there a documented procedure for Control of CRA Alloy Properties? (API 6A, 16A) Document No: Rev: Note: API requires the company performing welding shall use a written procedure that provides controls for consistently meeting the specified material surface properties in the final machined condition. At a minimum, this shall include inspection methods and acceptance criteria	☐ Yes ☐ No	
For Corrosion Resistant Overlays does the company have a documented technique for measuring the specified overlay thickness? (API 6A, 16A) Document No: Rev: Note: API requires the company performing welding shall have a written procedure for corrosion-resistant weld overlay shall include a technique for measuring the specified overlay thickness as required per the approved WPS.	☐ Yes ☐ No	
Are all the sub-contractors maintained under the Quality Assurance control? Have all sub-contractors been audited.	☐ Yes ☐ No	
Does an approved sub-contractor's surveillance procedure exist?	☐ Yes ☐ No	
Are applicable specifications available for personnel qualification at the facility?	☐ Yes ☐ No	
Are all welds/brazes visually inspected to requirements?	☐ Yes ☐ No	
Is weld/braze configuration in accordance with applicable specifications?	☐ Yes ☐ No	
Do completed welds/brazes meet customer visual requirements regarding flux, spatter, scale, slag or other foreign matter?	☐ Yes ☐ No	
Does Quality Inspectors have gages for welding visual control and measurement (weld fillet gages, undercuts, etc.). (To ensure adequate visual inspection capability)	☐ Yes ☐ No	

Questions	Yes/ No	Comments
Is the inspection documented?	☐ Yes ☐ No	
Is there a qualified or trained visual welding inspector in the company? (To ensure adequate visual inspection capability)	☐ Yes ☐ No	
Is the correlation between production and qualification test specimens for welding based on the following? Process Base Metal Composition Material Thickness Position Base Metal Form (sheet, plate, or tube) Type of Joint Backing Material Penetration Single/Double Weld Current Type	☐ Yes ☐ No	
Are qualification records current?	☐ Yes ☐ No	
Are qualification test records approved by an authorized supplier representative?	☐ Yes ☐ No	
Calibration		
Is the welding/brazing equipment (Amps, volts, speed) calibrated? (1 yr. interval or less) Note**:** It is recognized that mechanical flow meters do not need to be calibrated, however mass flow meters do require calibration and these are calibrated per the Manufacturer's instructions.	☐ Yes ☐ **No**	

Questions	Yes/ No	Comments
Is annually certification of welding machine outputs maintained within +/-5% of expected setting? And controlled every 50A and 5V steps?	☐ Yes ☐ **No**	
Are holding ovens for electrodes calibrated annually?	☐ Yes ☐ **No**	
Are there identifications of the calibration status present on each welding machine or devices?	☐ Yes ☐ **No**	
Is there a documented procedure for temperature uniformity and system accuracy tests for PWHT Ovens?	☐ Yes ☐ No	
Does the procedure specify the following as a minimum? a) Test Frequency b) Test temperature(s) and range(s)? c) Temperature range covering all thermal operations? d) Placement and recording of thermocouples in accordance with specification? e) Period of monitoring after temperature stabilization? f) Calibration of test instruments traceable to a national standard certification body? Note: The procedure must include all of the listed items. The testing can be performed internally or by an outside calibration source, however a Certificate of Conformity is required that includes all of the listed items.	☐ Yes ☐ No	
Does the process have a valid +/-15^{o}F furnace survey? (To ensure consistency of PWHT Temps)	☐ Yes ☐ No	
Are test records / results that meet procedure requirements available for each furnace / oven?	☐ Yes ☐ No	

Questions	Yes/ No	Comments
When in use, does the oven (furnace) employ a continuous temperature recorder? Note: This includes a chart recorder or data logger	☐ Yes ☐ No	
Are the calibration records maintained [at least for 10 years]?	☐ Yes ☐ No	
Is there a documented procedure for Post-weld heat treatment of components? Document No: Rev: Note API requires for 16A Parts.	☐ Yes ☐ No	
Does the company have Post Weld Heat Treatment (PWHT) capability sufficient for parts? (To measure capacity risk factors)	☐ Yes ☐ No	
Post Weld Heat Treatment (PWHT) furnace: what is size and maximum temperature? (Does it meet part requirements)	☐ Yes ☐ No	
How many thermocouples can be located directly on the part? (To ensure consistency of PWHT Temps)	☐ Yes ☐ No	
When required, is PWHT of weldments performed in accordance with WPS requirements?	☐ Yes ☐ No	
Are furnaces used for pre- and post weld heat treat provided with suitable means for controlling the temperature, if applicable?	☐ Yes ☐ **No**	
Are furnace control temperature tolerances within WPS specified criteria?	☐ Yes ☐ **No**	

Questions	Yes/ No	Comments
Do written procedures require preventative maintenance of equipment and tooling at a specified frequency?	☐ Yes ☐ **No**	
Do records indicate that maintenance is performed on equipment and tooling in accordance with established procedures?	☐ Yes ☐ **No**	
'Does the Auditee track the quality of the welds?	☐ Yes ☐ No	
a) By Process?	☐ Yes ☐ No	
b) By Welder	☐ Yes ☐ No	
c) By Product	☐ Yes ☐ No	
Does the Auditee maintain a continuous improvement plan to decrease the welding deviations? (corrective actions)	☐ Yes ☐ No	
Are NDT process applied to the weld joint preparation? (To ensure that there are no laminations or cracks in the weld joint faces)	☐ Yes ☐ No	
Is there a documented procedure that establishes equipment qualification requirements? Note: Documented procedures shall be available describing how the equipment is qualified / re-qualified / frequency of re-qualification and records of equipment qualification available. Auditor must review records to establish the qualification has been performed in accordance with customer specifications.	☐ Yes ☐ No	
Are qualification records/results that meet procedure requirements available for each machine?	☐ Yes	

Questions	Yes/ No	Comments
Note: Records of qualification shall be available for each machine used.	☐ No	
For automatic / semi-automatic welding, are qualified welding settings monitored and maintained within ±10%, unless otherwise specified by requirements?	☐ Yes ☐ No	
Is there a documented procedure to ensure weld settings are maintained within specified tolerances as defined in the WPS? Note: Procedural control to ensure settings are not changed by unauthorized personnel / methods. There are many ways to establish this. For example, a higher level quality procedure that mandates operators to work to the written instruction coupled with a defined range on the WPS.	☐ Yes ☐ No	
Is there a documented procedure that ensures the reproducibility of qualified machine settings? (To establish that the Auditee is ensuring qualified machine settings are capable of consistently producing acceptable welds) Note: This can be done in a number of ways (e.g., via parameter data collection system, Statistical Process Control, review of nonconformance data, NDT results, in-process testing, etc.). Procedure should state how the Auditee will do this	☐ Yes ☐ No	
Is there a documented procedure to ensure, that when a trend indicating deterioration of welding is encountered, an investigation is conducted to assign the cause and implement corrective action?	☐ Yes ☐ No	
Is there a documented procedure to ensure that where the assigned cause is attributed to the qualified machine/schedule being unable to produce acceptable welds, the Auditee stops welding and requalifies the machine/WPS in accordance with the applicable specification requirements? Note: Provision within a process specific or procedure describing the process for the re-qualification of the equipment / WPS.	☐ Yes ☐ No	
Is there a documented procedure that defines and controls the requirements for in-process weld correction(s) prior to submitting the weld joint for acceptance inspection? NOTE: In-Process Correction - A correction made before the	☐ Yes ☐ No	

Questions	Yes/ No	Comments
weld leaves the weld station and before submittal to inspection. The correction must be performed according to engineering drawing, process specification limitations and acceptance criteria. The Auditee's procedure shall state that, "in-process corrections are performed in accordance with specification requirements", and how does it flow down to the operator.		
Is there a documented process in place to ensure rework cycles are tracked and recorded?	☐ Yes ☐ No	
Is the Auditee following the above procedure?	☐ Yes ☐ No	
When performing rework, is it in accordance with an approved documented procedure? Note: Rework is the re-welding (repair welding/base metal repair) of a part prior to requiring design authority approval. (For example, MRB, concession). Design authority approval is required	☐ Yes ☐ No	
Shop Control		
Is there only one specification of filler material within the welder's / weld operator's immediate work zone at one time? (The correct filler material has been selected for the job which is in production to prevent inadvertent use of the incorrect filler material on production part(s)) Note: Determine if the weld operator could inadvertently select the wrong filler due to other fillers being in reach during welding. The only exception is where the weld schedule defines more than one filler for the component being welded, in which case the fillers can be allowed within the immediate work zone, providing all filler materials are identified and the different materials cannot be mixed by mistake.	☐ Yes ☐ No	
If filler material identification markings are lost, missing, or destroyed, is the material scrapped?	☐ Yes ☐ No	

Questions	Yes/ No	Comments
For Reels left at a machine, can the cleanliness of the filler material be demonstrated immediately prior to welding? Note: To be verified during the job audit. Immediately prior to welding the wire is wiped with a clean white cloth moistened with Acetone or a suitable solvent, or clean white paper moistened with Acetone or a suitable solvent Certain alloys will always leave a mark on the cloth / paper even though the wire has been adequately cleaned. If the shade of the mark is questionable but the mark on the cloth / paper remains approximately the same shade after multiple wipes, then there is no finding.	☐ Yes ☐ No	
Maintenance of Equipment		
Is there a documented procedure to ensure welding machines, fixtures, tooling and tooling material are suitable and capable of consistently producing acceptable welds?	☐ Yes ☐ No	
Is the Auditee following the above procedure?	☐ Yes ☐ No	
Are gas lines and tubes used for the transportation of shield gas part of the Maintenance program?	☐ Yes ☐ No	
Are gas lines and tubes used for the transportation of shielding gas made from neoprene, PTFE, or material suitable for gas being used? **(**To avoid using contaminated gasses due to leakage because of incorrect or poor quality / porous material.) **Note:** Auditor to visually check gas lines. If gas lines are made of suitable material and no degradation is visible, no further checks are required. If the tube material is incorrect and / or it shows signs of degradation, Auditee must demonstrate that the gas has not been contaminated as a result of this. Examples of how this could be demonstrated are oxygen meters, dew point meters or strike plates etc.	☐ Yes ☐ No	
Is weld Map /weld documentation completed correctly?	☐ Yes ☐ No	

Foundry

Questions	Yes/ No	Comments
Is welding performed in accordance with the written procedures/schedules?	☐ Yes ☐ No	
Do the welding procedures include all details required by applicable specification? what about third party approval)	☐ Yes ☐ No	
Are welder and welding operators qualified in accordance with Requirements for process/materials?	☐ Yes ☐ No	
Is welding performed only when authorized in writing or allowed in the applicable procedure?	☐ Yes ☐ No	
Is rework welding limited to conditions and locations specified by	☐ Yes ☐ No	
Is there an approved repair procedure?	☐ Yes ☐ No	
Are weld deposits contoured prior to heat treatment to meet the dimensional and surface roughness requirements of the engineering drawing if required?	☐ Yes ☐ No	
If required, are all welded areas on castings identified by an appropriate defined method?	☐ Yes ☐ No	
Hydrogen bake out, slow cooling after completion of welding, PMI for CRA and DSS and SDSS. Back purge for open root CRAs. No short circuit GMAW is permitted. Wait period NDE for as welded carbon steels, low allow steels welds shall have PWHT even for no NACE applications. NDE before PWHT. Methods to determining left over overlay thickness for cold repairs.		

Job Audit

Job Status	Work Order Number	Qty	Drawing Number	Material Spec.	BM Thickness (in.)	Filler Metal	Shielding Gas	Voltage (V)	Current (A)	Travel Speed (ipm)	Welder/Operator /Brazer	Welder ID	Welding Process	WPS Number	Preheat Temp (°F)	Interpass Temp (°F)	PWHT (Time and Temp)	Welder Certified
																		□ Yes □ No
																		□ Yes □ No
																		□ Yes □ No
																		□ Yes □ No
																		□ Yes □ No
																		□ Yes □ No
																		□ Yes □ No