Procedure—Storage of welding Consumables and Baking Electrode Requirements

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1. **Scope:**
   - 1.1. PREPARATION & QUALIFICATION OF WPS's AS PER REQUIREMENT.
   - 1.2. QUALIFICATION & TRAINING OF WELDERS & WELDING PERSONNELS.
   - 1.3. EXPIRATION, REVOCATION, RENEWAL/REQUAIFICATION OF WELDERS.
   - 1.4. DETAILS ABOUT WELDING PARAMETERS CONTROL & THEIR EFFECT ON WELDING.
   - 1.5. WELD REPAIR PROCEDURE QUALIFICATIONS.
   - 1.6. CONTROL OF WELDING EQUIPMENTS & WELDING CONSUMABLES.

2. **Reference code and Standards**
   - *2.1. ASME Boiler and Pressure Vessel Code Sec-IX-Latest edition*
   - 2.2. API Spec 6A -21st Edition - Specification for Wellhead and Christmas Tree Equipment.
   - 2.3. API Spec 16A -4th Edition, Latest edition - Specification for Drill Through Equipment
   - 2.4. API Spec 16C -3rd Edition, Latest edition- Specification for Choke and Kill Equipment

3. **PURPOSE**
   - 3.1. To ensure all the appropriate controls are identified & maintained such that the production/fabrication division's aim to produce welding joints (pressure & non-pressure) that meet the project & client specifications as well as the applicable codes & standards shall be fulfilled.
   - 3.2. TO ASSURE COMPLIANCE WITH SARA SAE QUALITY MANAGEMENT SYSTEM.

4. **WELDING PERSONNELS QUALIFICATION REQUIREMENT**
   - 4.1. The personnel qualification requirement for welding inspection activities shall be minimum one of the below:
     - a) AWS-SCWI
     - b) AWS-CWI
     - c) AWS-CAWI
     - d) CSWIP 3.0
     - e) CSWIP 3.1
     - f) CSWIP 3.2
     - g) Authorized welding inspector by the manufacturer documented training programme.

5. **Responsibility**
   - 5.1. **Welding Engineer/ Welding Inspector**
     - 5.1.1. Preparation & development of Welding procedures as per the Fabrication code and Client/Customer requirements.

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5.1.2. Co-ordinating Qualification process of WPS's & welders as per Code requirements.
5.1.3. Verifying need of Requalification/Revisions of approved welding documents as per applicable codes revised latest editions.
5.1.4. Verification of proper usage of WPS's, Welders and Welding consumables as per the approved drawings.
5.1.5. To provide training sessions to Welding supervisors & welders about usage of WPS's , Control & Monitoring of Welding parameters, consumables use and storage, Use of equipments etc.
5.1.6. To maintain welders continuity by verifying allotment of work, such that there shall not be a gap of more than 6 months without welding in defined process.
5.1.7. To prepare & maintain Welder continuity log.
5.1.8. To prepare a list of Approved WPS's & updating the Design Engineer so that they can indicate WPS Nos. in fabrication drawings.
5.1.9. To perform inspections before, during & after welding.
5.1.10. To check whether Revocation, Requalification & new Qualification is required in case.

5.2. **Welding Shop Supervisor**

5.2.1. To maintain & update register for Consumable re-drying or baking limits.
5.2.2. To maintain & update register for weld joints(Pressure & Non pressure structural items) & Overlays(SS & Inconel).
5.2.3. To assist Welding engineer during Qualification processes like arrangement of Welding equipments, test coupon arrangements etc.
5.2.4. To make ensure that all welding shop equipments are calibrated & are in good working stage.
5.2.5. To arrange Material(As per BID or Drawing received) & Welding consumables for welders.
5.2.6. To make ensure that Proper material has been received & verify Consumables are as per WPS requirements.
5.2.7. To check WPS about requirement of NDE & Preheat/PWHT & Co-ordination with QC team for the workflow.
5.2.8. To assist Welding Engineer in training activities of welders.

5.3. **Design Engineer**

5.3.1. To mention applicable WPS No. In fabrication drawing with reference to list of Qualified WPS.
5.3.2. Co-ordinate with Welding Engineer/ Inspector for non-availability of WPS for particular material combination at the time of drawing preparation.

6. **PROCEDURE**

6.1. **WPS & PQR**

6.1.1. Firstly, PWPS shall be prepared & Qualified in accordance to ASME Section IX, Fabrication code requirements & Additional Customer Requirements.
6.1.2. As per the PWPS, Test coupons shall be prepared (Meeting the range of thickness to be Qualify).& PQR shall be performed on the Test Coupons. It shall be done in the presence of Welding Inspector/Engineer & 3rd Party Inspector (If required by code/Client). After

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Welding PWHT/Stress relieving shall be done(If required in PWPS).After completion of all processes mentioned in PWPS, Samples for Mechanical & Metallurgical Testing shall be taken out & tested. After getting satisfactory results only, A PQR document shall be prepared & Both WPS & PQR shall be approved by Welding Engineer for further production welds.

6.1.3. **Qualification and acceptance criteria's (Required test, Examination and documents) for Butt/Fillet weld WPS shall be as follows.**

a) **Visual Examination of Weld Joint Preparation.**

Acceptance Criteria:

- ✓ Pre-cleaning shall be performed & Surface shall be free from Rust, Grease, oil or visible surface defect like crack, laps, voids, pits , pores etc.
- ✓ Before tacking, Test Coupon shall be inspected for Root face, Squareness, bevel Angle, Thickness.
- ✓ After Tacking of Test coupon, Root gap, Alignment by Hi-Lo gauge shall be checked & it shall be under the limits specified.

b) **During Welding Inspections:**

- ✓ During welding the inspector shall verify the parameters such as Pre-heat temperature ,current, voltage, travel speed, Heat input.
- ✓ Welding inspector shall check the Weaving width, Electrode holding angle, Inter-pass temperature (It shall be more than preheat temperature).

c) **Visual Examination of Completed welding**

Acceptance Criteria:

- ✓ Complete weld shall be cleaned to free from spatter, slag.
- ✓ Weld shall be show complete penetration and fusion & free from under cut.
- ✓ Groove shall be complete filled, and reinforcement shall be 2mm max.
- ✓ No open surface porosity shall be exist having major dimensions more than 2mm.
- ✓ All evidence of arc strike shall be ground and verified by LPE or MPI to ensure no crack caused by arc strike. If crack observe than removed and welded by as per PWPS or available qualified QPS.

d) **Surface Examination of weld after PWHT**

Welded test coupon shall be examined visually & NDE shall be performed as follows:

- ✓ For ferromagnetic material - DPT/MPT
- ✓ For Non-ferrous material - DPT only

Acceptance Criteria:

- ✓ Weld shall be confirming the requirement of API-6A PSL-3 for pressure containing weld surface NDE criteria.

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e) **Volumetric Examination of weld after PWHT**

If required by Fabrication code or Customer specified, Volumetric examination shall be conducted.(UT or RT)

Acceptance Criteria:

- ✓ Weld shall conform the requirement of API -6A PSL-3 for pressure containing weld volumetric NDE criteria.

f) **Hardness test of weld**

If required by Fabrication code or Customer specified, Hardness tests shall be performed.

Acceptance Criteria:

- ✓ Weld, HAZ and parent metal hardness shall be 22HRC Max (248HV) for Austenitic stainless steel, Low Alloy steel and Carbon Steel.
- ✓ Weld, HAZ, Parent material Hardness shall be 35 HRC (332HV)max. For Ni-625 (UNS N06625)
- ✓ Minimum hardness value for 36K material shall be 140HBW (140HV)
- ✓ Minimum hardness value for 45K material shall be 140HBW (140HV)
- ✓ Minimum hardness value for 60K material shall be 174HBW (174HV)
- ✓ Minimum hardness value for 75K material shall be 197HBW (197HV)
- ✓ Minimum hardness value for 85K material shall be 207HBW (207HV)

g) **Transverse Tensile test for weld**

As per ASME Section-IX, Table QW-451.1,2 specimen shall be taken for Tensile testing & test shall be performed as per ASTM A 370.

Acceptance Criteria:

- ✓ Tensile strength value for PQR Test coupon shall be equal to or greater than the base/Parent metal tensile value.
- ✓ If Test coupon is made from 2 dissimilar metals, then test coupon tensile value shall be equal or more than the base metal with lower tensile value.
- ✓ For 36K material Minimum UTS-248 MPa.
- ✓ For 45K material Minimum UTS-310 MPa.
- ✓ For 60K material Minimum UTS-414 MPa.
- ✓ For 75K material Minimum UTS- 655 MPa.
- ✓ For 80K material Minimum UTS - 655 MPa.
- ✓ For 85K material Minimum UTS-724 MPa.
- ✓ For AISI-1040 material Minimum UTS- 586 MPa

h) **Bend Test:**

Transverse bend test shall be performed & samples shall be taken as per ASME section-IX. 2- Face bend, 2-Root bend (Or 4 Side bend shall be substituted if thickness of sample is greater than or equal to 10mm.

Acceptance Criteria:

- ✓ The guided-bend specimen shall have no open discontinuity in the weld or

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heat affected zone exceeding (3mm), measured in any direction on the convex surface of the specimen after bending.

- ✓ Open discontinuities occurring on the corners of the specimen during testing shall not be considered unless there is definite evidence that they result from lack of fusion, slag inclusions or other internal discontinuities.

i) Impact test:

Impact testing of weld metal, HAZ and Base metal as required by applicable API Standard (s) after PWHT if any. & testing shall be performed as per ASTM A370.

Acceptance Criteria:

- ✓ The average of three specimen shall be equal to or greater than the requirement of base metal impact value in transverse direction.
- ✓ No more than single value shall fall below the 2/3 of the specified minimum average value of base metal.
- ✓ Minimum average value in transverse direction shall be 20J.

j) Chemical analysis:

Chemical analysis of Base metal and filler metal shall be obtained by testing or by manufacturers test report.

If required by Applicable codes & standards, Weld Chemical analysis shall be done.

k) All the required parameter shall be record during procedure qualification test coupon and shall be part of PQR.

6.1.4. Qualification and Acceptance criteria's (Requirement of test, Examination and documents) for Corrosion resistance overlay or other weld overlay WPS shall be as follows.

a) Visual Examination of Joint surface

- ✓ Joint shall be free from Rust, Grease, Oil & any other visible discontinuities such as crack, laps, voids, Pits, Pores etc.

b) Visual examination of Weld Surface

Acceptance Criteria:

- ✓ Complete weld shall clean to free from spatter, slag.
- ✓ Weld shall be show complete fusion and free from under cut.
- ✓ No open surface porosity shall exist.
- ✓ All evidence of arc strike shall be ground and verified by LPE or MPI to ensure no crack caused by arc strike. If crack observe than removed and welded by as per PWPS.

c) NDE Examination of complete weld

After PWHT,NDE (DPT) shall be performed after machining weld to 3mm minimum thickness.

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Acceptance Criteria:

- ✓ No relevant linear indications.
- ✓ No relevant rounded indications greater than 3mm
- ✓ No four or more relevant rounded indications in a line separated by 1.5 mm or less(edge-to-edge).

d) **Hardness test**

After PWHT, Hardness test shall be conducted & location of hardness points shall be taken reference from API Fabrication codes or if Sour Service is required, NACE MR0175 shall be referred.

Acceptance Criteria:

- ✓ Minimum hardness value shall be as per respective material specification and API Standards for Base metal.
- ✓ Minimum hardness value for Overlay weld material shall be equal to or greater than 92 HRB.(For PSL-2,3 & 4).
- ✓ For Austenitic Stainless-steel weld metal -22HRC(248HV)max.
- ✓ For Ni Base Alloy UNS N006625 weld metal - 35HRC(332HV)Max.

e) **Bend test** as per requirement of ASME Sec-IX,Table-453 after PWHT.

Acceptance Criteria:

- ✓ For corrosion- resistant weld overlay cladding, no open discontinuity Exceeding 1/16in. (1. 5 mm) , measured in any direction, shall be permitted in the cladding, and no open discontinuity exceeding 1/8in. (3 mm) shall be permitted along the approximate weld interface.

f) **Charpy V Notch Impact test:**

Impact testing shall be performed on base material(After welding) & Weld material (If Overlay is considered as a part of Design criteria).

Acceptance Criteria:

- ✓ The average of three specimen shall be equal to or greater than the requirement of base metal impact value in transverse direction.
- ✓ No more than single value shall fall below the 2/3 of the specified minimum average value of base metal.
- ✓ Minimum average value in transverse direction shall be 20J

g) **Tensile test of base metal** with 0.2% Yield strength, % Elongation, % Reduction Area to ensure mechanical properties after welding if PWHT is applicable.

If Overlay has been considered a part of Design criteria, then All weld Tensile & All weld Impact to be done.

Acceptance Criteria:

- ✓ Tensile properties of PQR test coupon and All weld Tensile coupon shallbe equal to or greater than the specified minimum tensile properties of base metal.

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Tensile Properties Required value are as below

Material Designation	Min. YS 0.2%	Min. UTS	Elongation in 50mm GL	Reduction of Area
	MPa	MPa	%	%
36K	248	483	21	32
45K	310	483	19	32
60K	414	586	18	35
75K	517	655	18	35
85K	586	724	15	20

h) Weld metal chemical analysis at 3mm or less from the base metal after PWHT if any.
Acceptance Criteria:
- ✓ For Austenitic Stainless-Steel Overlay :- %C-0.08max., %Ni. 8min., %Cr-16min. other element shall be conform the requirement of NACE MR0175.
- ✓ For Ni-base Alloy:- For Class Fe5- %Fe-5max, For Class Fe-10-%Fe-10max. Other element shall be conform the requirement of NACE MR0175.

i) **All the required parameter shall be record during procedure qualification test coupon and shall be part of PQR.**

6.1.5. Welding Engineer/Inspector may conduct re-qualification/revision of WPS based on any change in Fabrication codes latest editions.

6.1.6. WPS bearing supporting PQR number shall be made available to the welder, at his workstation, before welding.

6.2. REPAIR WELD PROCEDURE & THEIR QUALIFICATION

6.2.1. If permitted by Fabrication code, Welding test coupon shall be prepared accordance with approved WPS & ASME Section-IX.

6.2.2. Welding shall be done accordance with applicable WPS and by qualified Welder, all processes shall be completed(Like PWHT,NDE).

6.2.3. After completion of all processes, Test coupon shall be sent for Mechanical & Metallurgical testing.& After successful results, PS will be approved for repairs in production welding.

6.3. WELDER/WELDING OPERATOR QUALIFICATION PROCESS:

6.3.1. Need for welder performance qualifications shall be identified by Welding Engineer / Inspector

6.3.2. **Training:**

6.3.2.1. Training of welders and performance qualification shall be organized by Production Engineer. This training shall include:

6.3.2.1.1. Use of WPS, Information about Welding parameters, Welding consumables & their use.

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6.3.2.1.2. Job training by verification of Weld metal and base metal as per WPS requirement.

6.3.2.1.3. If welder previously qualified by that welding process and having experience in

Group of base metal and weld metal being welded and having good performance history no need of further job training.

6.3.3. **Qualification:**

6.3.3.1. Welder shall be qualified for a given welding process, position etc. in accordance with ASME Section IX

6.3.3.2. Qualified WPS shall be provided to Weld shop by Welding Engineer/Inspector for Welder qualification test for arranging material/welding machine/welding consumables.

6.3.3.3. The WPQ shall include welder identification, WPS used, test date, essential variables, qualification range, and test results.

6.3.3.4. For performance qualification of groove weld shall be done as required by ASME Sec-IX and Welding Engineer/Welding Inspector prepare Welder certificate upon successfully qualification.

6.3.3.5. For qualification of overlay shall be done as require by ASME Sec-IX and Welding Engineer and Welding Inspector shall prepare Welder certificate upon successfully qualification.

6.3.3.6. Only those welders can be do tack welding in production job who has successfully Qualified the for-groove weld for that process, weld metal and base metal as per ASME Sec-IX.

6.3.4. **Retraining and Retesting for failure to pass Initial Qualification and revoked or discontinued qualification.**

6.3.4.1. Welder who fail to meet the qualification requirement for that process, welder shall be undergo for further training and practice of that welding process for a week.

6.3.4.2. Upon successfully completion of training welder go for welder qualification test.

6.3.4.3. For immediate retesting welder has to weld two consequent test coupons, and both the test coupons shall satisfy the qualification testing requirement.

6.3.5. **Monitoring of Qualification:**

6.3.5.1. List of Qualified Welders shall be made available by Welding Engineer/Inspector to

production department.

6.3.5.2. Welding engineer monitor the welder qualification by Review the welder qualification at least once in quarter and witnessing the in process 150mm weld of two welders once in a day.

6.3.6. **Updating Qualifications**

6.3.6.1. Welding engineer shall update the welder qualification by updating the list of

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qualified welder by adding of new qualification and/or removing the revoked and discontinued qualification.

6.3.6.2. Welding engineer/Inspector are responsible for this updated list distribution to weld shop.

6.3.7. **Continuity/Re-qualification:**

6.3.7.1. When a welder has not welded with a particular welding process during period of six months or more under supervision of qualified organization his qualification shall be considered as a discontinue and requalification are required. If welder has welded for that process by any qualified welding procedure specification than his qualification shall be considered as a continue for that process.

6.3.7.2. Welding Engineer/Inspector Shall maintain welder continuity record in Welder Continuity Log(Format No. SARA/QA/DOC/142 Annex 'A' Rev.01), this continuity record shall be review and update once in every Six months.

6.3.7.3. This continuity record shall maintain from the welding inspection records such as Welding log for Non pressure containing fabrication weld, Welding Record of Pressure containing production weld and ring groove overlay, Welding record of Auto-SPM and Welder Performance log.

6.3.8. **Revocation:**

6.3.8.1. Any specific reason to question the ability of welder to make welds that meet the specification or suitability of procedure for that process his qualification shall be treated as lapsed.

6.3.8.2. Welder performance shall maintained & recorded.

6.3.9. **Renewal of Discontinued Qualification**

6.3.9.1. Renewal of discontinued certificate may achieve for any process by welding of a single test coupon of either plate or pipe; of any material thickness or diameter in any position provided that having Qualified WPS for same. By successfully satisfying the qualification testing requirement shall renew the all previous qualification of that welding process, those material, thickness, diameters, positions and other variables for which he was previously qualified.

6.3.9.2. Re qualification of discontinue certificate may restore by first piece production weld.

6.3.9.3. If welder fails to meet the requirement of this procedure than he need to go for Further training and retesting for all the qualification for which welder was previously qualified.

6.3.10. **Renewal of Revoked certificate for poor performance**

6.3.10.1. Renewal of revoked certificate shall be achieved by test coupon welding as required to qualify the revoked qualification as per ASME Sec-IX. After successfully passing the testing requirement, welder restore the revoked qualification.

6.3.10.2. If welder fails to meet the qualification requirement, welder shall go for further training and retesting requirements of this procedure.

6.3.11. **Records:**

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6.3.11.1. For Failure, retraining and retesting shall maintain by Welding Engineer / Welding Inspector by maintaining Welder Qualification Test Log.

6.4. **Production Welding:**

6.4.1. Weld Shop supervisor shall assign qualified welders for the work based on the qualification range and give them instructions. Supervision of welder shall be done by Weld Shop Supervisor.

6.4.2. **Pressure containing Fabrication weldment (Including Load Bearing weldments) and Ring groove Overlay**

6.4.2.1. All pressure containing fabrication weldment, Load bearing weldments & Ring groove overlay shall be done as per qualified WPS and by qualified welders.

6.4.2.2. Welding parameters, welding consumable, welder detail, equipment & instrument detail a given in Welding Record for Pressure Containing Welding and Ring Groove overlay (Format No. SARA/QA/DOC/570 Rev.02) shall be maintain by weld shop supervisor.

6.4.2.3. During welding welder has to verify welding parameter such as current, voltage, travel speed, **preheat(With the help of Thermal Gun or Temperature chalks, Temp-sticks and inter-pass temperature** for each layer, also welding engineer/Inspector, weld shop supervisor has to witness minimum 150mm length welding of two welders per day and reference to be made in Welding Record for Pressure Containing Production Welding and Ring Groove overlay (Format No. SARA/QA/DOC/570 Rev.02) .

6.4.3. **Non-pressure containing Fabrication weldment**

6.4.3.1. All Non-pressure containing fabrication weldment shall be done accordance to qualified WPS and by qualified welder.

6.4.3.2. Weld shop supervisor shall maintain record for same in welding log For Non Pressure Containing Production Welding (Format No.SARA/QA/DOC/570 rev.02).

6.4.3.3. Tack welds, whether removed or left in place, shall be made by using a qualified welding procedure and qualified welder.

6.4.3.4. Temporary attachment welds to pressure parts shall be done by using an approved WPS.

6.4.4. **Weld Repair procedure**

6.4.4.1. Minor surface defect of weld may be removed by grinding provided there are smooth transition between the ground area and the original contour and the minimum wall thickness requirements are not affected.

6.4.4.2. Major Weld Defect other than as described in 5.6.1 of this procedure shall be excavated by grinding and complete removal of defect shall be verified by Liquid Penetrate Examination or Magnetic Particle Examination.
Preparation or excavation for weld repair shall be as describe in Clause 7.5.3 of API-6A/Clause 6.2.3 fig-12,13 of API-16A /Section -06,Clause 6.7 of API-16C or as specified by Welding Inspector for complete joint fusion.

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6.4.4.3. Repair of weld shall be done by weld repair WPS of same P. Number and Group Number Base metal as listed in ASME Sec. IX , and material for those not listed in ASME Sec. IX same base metal weld repair WPS shall be used. Weld repair WPS shall be supported by PQR.

6.4.4.4. Visual Examination, Surface Examination and Volumetric NDE (RT or UT) if applicable, shall be performing to ensure weld soundness after weld repair. This examination shall be cover repair weld plus minimum 13mm of adjacent surface of base metal on all side of Weld.

6.4.4.5. All weld repairs of weld other than corrosion resistance overlay shall be hardness tested.

6.4.4.6. Welding shall be done by qualified welder as describe in this procedure.

6.4.4.7. Weld repair of base metal that are not associate with the weld overlays are not allowed
for PSL-4 equipment's

6.4.5. **Post Weld Heat Treatment**

6.4.5.1. Post Weld Heat treatment shall be carried out as per WPS and Post Weld Heat Treatment Procedure SES-26-616.

6.4.6. **Measurement & Verification of Welding Parameters**

6.4.6.1. **Pre-Heat Temperature:** The minimum temperature in the weld preparation immediately prior to the welding; or in the case of Multi-pass welds, the minimum temperature in the section of the previously deposited weld metal, immediately prior to welding.Use of Thermal gun or Temperature chalks shall be done.

6.4.6.2. **Control of preheat temperature:** Welder has to preheat the job by Propane/LPG or oxy-Acetylene gas heating or resistance coil heating at temperature indicated in Welding procedure Specification (WPS), Also they have to check that the temperature shall not be less than the minimum preheat temperature through the welding operation. Distance set of for preheating torch shall 3" to 6" and only natural flame shall be use. Weld shop supervisor and Welding Engineer/Inspector required to verify the preheat temperature during welding for minimum two welders per day of at least 150mm of weld pass.

6.4.6.3. **Inter pass temperature:** The Highest temperature in the weld joint immediately prior to welding, or in case of multiple pass welds, the height temperature in the section of the previously deposited weld metal, immediately before the next pass is started.

6.4.6.4. **Control of Inter-pass temperature**: Welder has to verify inter-pass temperature before applying sub-sequent pass and it shall not be more than the temperature indicated in Welding procedure Specification (WPS), if temperature observed more than maximum limit specified in WPS, welder has to wait for cool down the job until values not reached within WPS limit. Weld shop supervisor and Welding

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Engineer/Inspector required to verify the inter pass temperature during welding for each and every welders per day of at least 150mm of weld pass.

6.4.6.5. **Measurement of Pre Heat and Inter pass temperature.**

Measurement of Preheat and Inter-pass temperature can be done by Temperature measuring instrument specified as below.

- Temperature Indicating Crayons (Temperature Chalk)
- Digital Pyrometers (Digital K- type thermometer)
- Infrared temperature Indicator (Infrared Thermometer)

Note: Preheat temperature shall be measured and maintained welding joint plus minimum 75mm all around joint area at where welding to be done. & Inter-pass temperature shall be measure and maintain at weld area plus maximum 25mm all around weld area.

6.4.6.6. **Control of Welding Current, Voltage & Travel Speed.**

6.4.6.6.1. **Welding Current & Voltage:** The range of Current and voltage during welding shall be as specified in WPS. Measurement of same shall be done by DC Analog type A-Meter & V- Meter connected with Welding machine or Digital clamp meter/Multi-meter/or Voltmeter.

6.4.6.6.2. **Travel Speed:** The travel speed is the length of welding pass per minute, and it shall be within range of WPS. Weld shop supervisor witness the travel speed and can establish minimum length of welding per electrode during welding

6.5. **Welding Consumable Control**

6.5.1. Requirement of Welding consumable shall be identified by Production supervisor/Welding Engineer/Inspector.

6.5.2. Procurement of welding consumable shall be done as per welding consumable AWS specification approved by Welding Engineer/Inspector.

6.5.3. Receiving inspection of welding consumables shall be as per welding consumable specification.

6.5.4. Welding consumables shall be requisitioned sufficiently in advance through Store Issue Note by Production Supervisor. This shall indicate consumable specification, size etc.

6.5.5. Store shall be issue electrode as specified in Store issue note and maintain the Batch wise/GRN wise issue record of the welding consumable.

6.5.6. Weld Shop supervisor shall put the required number of coated electrodes expected for production in drying and holding oven, as required, for drying and subsequent holding. The drying and holding temperature & time shall be as per this procedure.

6.5.7. Weld Shop Supervisor shall keep the record of electrode classification /name, size, quantity and type etc. at the time of issue in the Electrode Re-Drying & Holding register. Vacuum packed Welding electrode need not required to re-drying if packing not damaged, it can be directly issued to welder in portable oven by keeping record in

6.5.8. Holding oven register. Weld shop supervisor has to check vacuum condition of welding electrode before issuing to the welder. Vacuum pack electrode can be kept in direct to holding oven.

6.5.9. Maximum 50 No. of coated electrode shall be issued to the welder for once in time

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6.5.10. The different type/Brand electrode shall be kept separate in Re-drying and Holding oven to avoid mix up.

6.5.11. The maximum number of layer of coated electrode shall not be more than four in Re-drying and holding oven.

6.6. **Storage & Handling of Low Hydrogen Welding Consumable.**

Coated Electrode: Storage and handling of coated Electrode shall be as per Annexure-A

6.7. **Welding Machines and Auxiliaries**

6.7.1. Calibration of welding machines, Amperage and Voltage indicating instruments, Temperature Measuring Instruments, Time measuring Instruments, Travel speed measuring instruments and Electrode Re-Drying & Holding oven shall be under the control of Calibration Engineer/QC Manager and shall be serviced and calibrated periodically as per Procedure No. SDP-27-008.

6.7.2. Weld Shop Supervisor shall ensure that welding machines and auxiliaries are calibrated, are in good working condition, and have sticker indicating expiry date of calibration and error if any.

7. RECORDS & RESPONSIBILITY

S/N #	Document/ Format No:	Document / Format Title	Responsibility	
			Preparation	Verification
1	SARA/QA/DOC/ 570 Rev.02	Welding Log for Pressure & Non-Pressure Containing Production Welding	Weld Shop Supervisor	Welding Engineer/Welding Inspector
2	SARA/DOC/142 Annex "A' Rev.01	Welder's Continuity Log	Welding Engineer / Inspector	Welding Engineer/ Inspector
4	SARA/QA/ DOC/570- 1 Rev.0	Electrode Re-drying Register	Weld Shop Supervisor	Welding Engineer/ Inspector
5	--	List of Qualified WPS	Welding Engineer /Inspector	Welding Engineer/ Inspector
6	--	List of Qualified Welder	Welding Engineer /Inspector	Welding Engineer/ Inspector
7	SARA/QA/DOC/ 670-1 Rev.0	Weld Map record for API-16C products	Welding supervisor	Welding Engineer/Inspector

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ANNEXURE-A
STORAGE AND HANDLING REQUIREMENT OF WELDING ELECTRODES
STORAGE OF COVERED ELECTRODE
(BASIC COATED LOW HYDROGEN TYPE AND RUTILE COATED)

Storage of electrode shall be done in controlled atmosphere as described below.

- Temperature: 30-40°C.
- Humidity level: 50% Max.
- Ventilation: Ventilation shall be sufficient to air circulation.
- Maximum 5 No. of boxes shall be put on in one column.
- Electrode boxes shall not be contact with storage room wall.

Note: Welding electrode stored in controlled atmosphere as per above can be used for Maximum 3 years from the Date of Manufacturing and other shall be use up to one year from the date of manufacturing.
Welding Engineer/Inspector can allow to use after time period above provided there is no sign of corrosion and check by trial welding on test coupon.

***Electrode baking shall be done as per Manufacturer's recommendation & if not available, following can be followed.**

Re-Drying & Backing Requirement of Coated Electrode

S/N	AWS Class	Make	Re-Drying Temp	Re-drying Time	Holding Temp.	Holding Time
1	E6013	Ador/ D&H/ Starblaze	None	None	None	Up to use
2	E7018/ E7018-H4	Ador/ D&H/ Starblaze	300°C	1 hour	100 -150°C	Up to use
3	E10018-D2/ E10018-D2-H4	Ador/ D&H/ Starblaze	300°C	2 hour	100-150°C	Uptouse
4	E309, E309L, E309Mo, E309LMo E316, E316L, E308, E308L	EWAC/ Ador/ D&H/ Starblaze	150°C	1 hour	100 -150°C	Up to use
5	E309, E309L, E309Mo, E309LMo, E316, E316L, E308	Ador/ D&H / STARBLAZE	350°C	1 hour	100 -150°C	Up to use

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S/N	AWS Class	Make	Re-Drying Temp	Re-drying Time	Holding Temp.	Holding Time
6	ENiCrMo-3	Ador/ D&H/ Starblaze / Special Metal	300°C-330°C	1 hour	100 -150°C	Up to use
7	ENiCrMo-3	Superon	350°C	1 hour	100 -150°C	Up to use
8	ENiCrMo-3	StarBlaze	250°C-300°C	2 hour	100-150°C	Up to use
9	ENiCrMo-3	Stanvac	250°C-300°C	2 hour	100 -150°C	Up to use

Disposal of Electrodes:

- The end pieces and the partially used electrodes will be collected in the designated box in the welding shop.
- Supervisor welding will count the number of the disposed electrodes and return to store for further disposal.

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