Welding Procedure Specification

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Document Issue Purpose

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CONTENTS

1. PURPOSE

The purpose of this Procedure is to describe the manner in which welding procedures are qualified to meet the requirements of the welding, welding preparation and condition for **METAL WELD & ASSEMBLY General** Project.

2. SCOPE

This Procedure is applicable to the qualification of all welding and Non-destructive Testing (NDT) requirements for welding of piping and pipelines. It covers field and shop fabrication include butt, fillet & socket, tie-in, hot tap, structure steel and repair welds also.

3. DEFINITION

IFC	Issued for Construction
ANSI	American National Standards Institute
AISC	American Institute of Steel Construction
AWS	American Welding Society
ASTM	American Society For Testing And Materials
NMR	Non-Material Requirement
PPE	Personnel Protective Equipment
RFI	Request For Inspection
NCR	Non Conformance Report
Welder	One who performs welding operation
Peening	The mechanical working of metals using impact blows
PQR	A PQR is record of the welding data used to weld a test coupon
PASS	A single progression of a welding or surface operation along a joint, weld deposit or substrate.
WPS	A WPS is a written qualified welding procedure prepared to provide direction for making production welds to code requirements.

4. REFERENCE

SAES-W-011	Welding Requirements for On-Plot Piping
SAES-W-012	Welding Requirements for Pipelines
SAES-L-350	Construction Requirements for Metallic Plant Piping
SAES-M-001	Structural Design Criteria for Non-Building Structures
SAEP-310	Piping and Pipeline Repair
ASME SEC IX	Welding and Brazing Qualifications
ASME SEC IIC	Welding Rods, Electrodes and Filler Metals
ASME SEC V	Nondestructive Examination
AWS D1.1	Structural Welding Code – Steel
SAEP-324	Certification Review and Registration of Project Welders

API STD 1104	Welding of Pipelines & Related Facilities
SAEP-1160	Tracking and Reporting of Welding, NDT and Pressure Testing for Capital Projects.
SA 4758-ENG	Job Clearance Card
ASME B31.3	Process Piping

5. RESPONSIBILITY

(1) Project Manager

To ensure compliance by all parties to this procedure Quality Inspection Plans and other relevant Project Specifications and requirements.

(2) QC Manager

To ensure that welding procedure specification, Inspection Plans and other relevant Project Specifications /requirements are fulfilled.

(3) Construction Manager

To ensure compliance by all craftsmen to the content of this procedure, Quality Inspection Plans.

(4) Safety Supervisor/Officers

Ensure the relevant Safety Procedures/Precautions are in operation and work permits have been obtained. Barriers and warning signs are posted where necessary.

(5) Mechanical Engineer

Ensure compliance by all pipe fitters, welders and other associated craftsmen to this procedure and the Project Quality Plans. Ensure relevant permits are received by the authorized personnel prior to start of work.

(6) Welding Supervisor

The Welding Supervisor shall be responsible to:

a. Ensure that all Welding Procedure specifications (WPS) have been approved for use and have been qualified in accordance with ASME IX, API Standard 1104, SAES-W-011 & 012 and all referenced codes and standards.

b. Ensure that all welders are qualified and cleared for the job in accordance with procedure.

c. Ensure that all welding consumables have been given the pre-issue processing in accordance with approved procedure.

d. Organize and supervise all heat treatment operations, as appropriate.

(7) QC Piping Inspector

a. Check the piping and ensure that all inspection and test requirements are identified; the documents are complete where necessary.

b. Prepare and preserve all receiving inspection & issuance record as per IFC.

(8) Welding Inspector

The QC Welding Inspector shall be responsible to:

a. Carry out fit-up inspection on each weld joint for weld/welder identification clearance, alignment, hi-lo and cleanliness of joint.

b. Carry out in-process inspection to monitor pre-heat treatment (where required), root penetration and inter-pass temperatures.

c. Accomplish the Daily Weld job log.

d. Witness all heat treatment operations, where required, and document this activity.

e. Organize and supervise all Non-Destructive Examination (NDE) operations, including the preparation of all NDE reports/documents.

f. Ensure that radiography is carried out on the specified percentage of each welder's welds in accordance with the applicable specification as appropriate.

g. Carry out all in-process weld inspection and record all information in the daily weld job log.

h. Verify that Approved welding Procedures are available at site and Welders working at site and fabrication shop have valid JCC.

(9) NDT Coordinator

a. Prepare and maintains fabrication and welding records.

b. Communicate with section/site engineers to coordinate inspection/testing and piping installation activities.

c. Supervise inspection and test ensuring reporting and records compilation in line with project requirements.

d. Liaise with 3rd Party (NDT) contractor's representative for field inspection and test schedule.

e. Schedules inspection and test on a daily basis coordinating "hold point" witnessing by contractor/third party.

f. Checks NDT reports and establishes welding repair requirements.

g. Ensure the welding is carried in accordance with the approved welding procedures.

(10) Radiographic Test Film Interpretation (RTFI) Inspector

a. Monitor Daily RT activities being handled by 3rd Party NDT Agencies.

b. Evaluating the NDT Technicians with regards to the qualifications and experiences prior to client's evaluation.

c. Evaluating the RT results and signing off the RT reports.

d. Interpret the RT films.

e. Conducting audit of 3rd Party NDT company operations at times for evaluating the performance of 3rd parties with regards to procedural requirements specially Radiography.

f. Comply with the highest level of safety practice during all stages of work to avoid any type of incidents and or accidents. Takes reasonable care of own health and safety of others in the workplace.

g. Comply with all statutory requirements pertaining to the implementation of project.

6. WELDING PROCEDURE SPECIFICATION

- The Welding Engineer prepares a Proposed Welding Procedure Specification (PWPS), ensuring that all sections of the forms are completed and all Code / Client requirements are satisfied. Where a particular section of the form is not applicable, this is to be stated on the form.
- Under normal circumstances, all WPS are prepared in accordance with the requirements of ASME IX, API-1104, SAES-W-12 and BQ-ZUL-CON-QAC-PR-0XX supplemented by any additional requirements of the Client's Specifications.
- The WPS are submitted to the Client for approval, and the WPS are not to be used for any production welding until such approval has been granted by Client.

7. Material Receiving & issuance

- All Piping/ Pipeline material shall be received and inspected as per SAES-L-450, SAES-L-108, SAES -L-105 .
- All welding consumable shall be received and inspected as per SAES-W-011, SAES-W-012 and 600045091-QAC-QCP-004.
- QC inspector welding /piping will keep all receiving, inspection and issuance record.

8. GENERAL REQUIREMENTS

- The processes variables shall be as specified in the applicable WPS.
  - ✧ Shielded Metal Arc Welding (SMAW)
  - ✧ Gas Tungsten Arc Welding (GTAW)
  - ✧ Gas Metal Arc Welding (GMAW)
  - ✧ Flux Core Arc Welding (FCAW)
- Production welding shall be in accordance with Saudi Aramco approved welding procedures Specification (WPS) and carried out by Saudi Aramco approved welders.
- All pressure containing welds shall be made with multi-pass per approved WPS.
- Welded joints shall be made by completion each layer before the following layers are deposited.
- Weld passes shall not start or stop at the same point.
- Peening of welds is not permitted.
- Permanent backing rings and consumable inserts shall not be used.

(1) Weather Condition

a. Welding shall not be done when the quality of the weld would be impaired by the prevailing weather conditions, including airborne moisture, blowing sands or high winds or when the welders are exposed to inclement conditions.

b. Fire resistant windshields shall be used when practical.

c. If weather conditions become too severe, welding operations shall be stopped. No welding shall be done on wet base materials.

d. The wind velocity in the weld area for GTAW shall not exceed 2.2 m/s (8km/hr).

e. Sufficient wind shields shall be used to protect weld pool from wind flow.

(2) Control of Welding Consumables

a. Manufacturer's mill certificates of welding consumables shall be available in site for each heat, lot or batch. Mill certificates should show chemical and mechanical properties.

b. QA/QC welding inspector shall inspect all welding consumables and keep the mill certificate in the office.

c. Electrodes, filler wires and fluxes shall be kept clean and dry and properly stored according to manufacturer's recommendations.

d. No electrodes, filler wires or fluxes that are damaged, damp, greasy or oxidized may be used.

e. Low hydrogen electrodes will be dried, prior to use at 260-430°C for two hours minimum.

f. The drying step can be deleted if the electrodes have been supplied in hermetically sealed containers or vacuum packed sealed packets.

g. After drying, the electrodes must be continuously stored at 120°C minimum.

h. After removal from the holding ovens or the hermetically sealed containers, electrodes can be exposed to the atmosphere for a maximum of four hours. The exposing time can be extended up to eight hours. If the electrodes had been permanently kept in the portable ovens while maintaining the minimum temperature of 65°C within this time limit, the electrodes must be returned to the store and must be re-conditioned. Kept in holding oven at 120°C for minimum four hours If the exposing time of electrodes to the atmosphere or at work site has exceeded the allowable time permitted time limit, then the electrodes must be re-baked / re-dried in the baking oven for minimum two hours at 260-430°C.

i. The electrodes can be re-dried once only.

j. Welding consumables shall be controlled and issued by the welding material controller.

k. QC welding inspector shall monitor the welding consumable control system.

l. Approved Control of welding consumable procedure shall be utilized for consumable control process.

9. PROCEDURE

(1) Butt Weld (preparation)

a. Distance between Consecutive Welds

✧ Minimum distance between two successive girth welds shall not be less than 20mm or 3 times the wall thickness of the joint, whichever is greater.

✧ Attachments of non-pressure parts by welds which cross existing main or for which the minimum nominal distance between the toe of the attachment weld and the toe of the existing main welds or branch welds

is less than the smaller of twice the thickness of the pressure parts or 40mm should be avoided.

b. Edge preparation

- ✧ Weld bevels shall conform to the joint design used in the Welding Procedure Specification.
- ✧ The root opening shall be within the tolerance limits in the Saudi Aramco approved WPS.
- ✧ Double sided weld joints shall be cleaned back to sound metal and inspected by PT or MT prior to welding the other side if double V groove is to be used.
- ✧ Weld bevels shall be made by machining or grinding and the beveled ends shall be smooth and uniform.
- ✧ Gas cutting is only accepted on non-galvanized carbon steel materials and the hardened surface shall be removed by machining or grinding.
- ✧ Oil, moisture etc., must be removed from the weld surface at least 25mm (1”) from any adjacent base metal prior to welding.
- ✧ Bevel ends shall be free of any edge irregularities and uneven bevel end. Welding QC shall verify these requirements prior to fit-up.

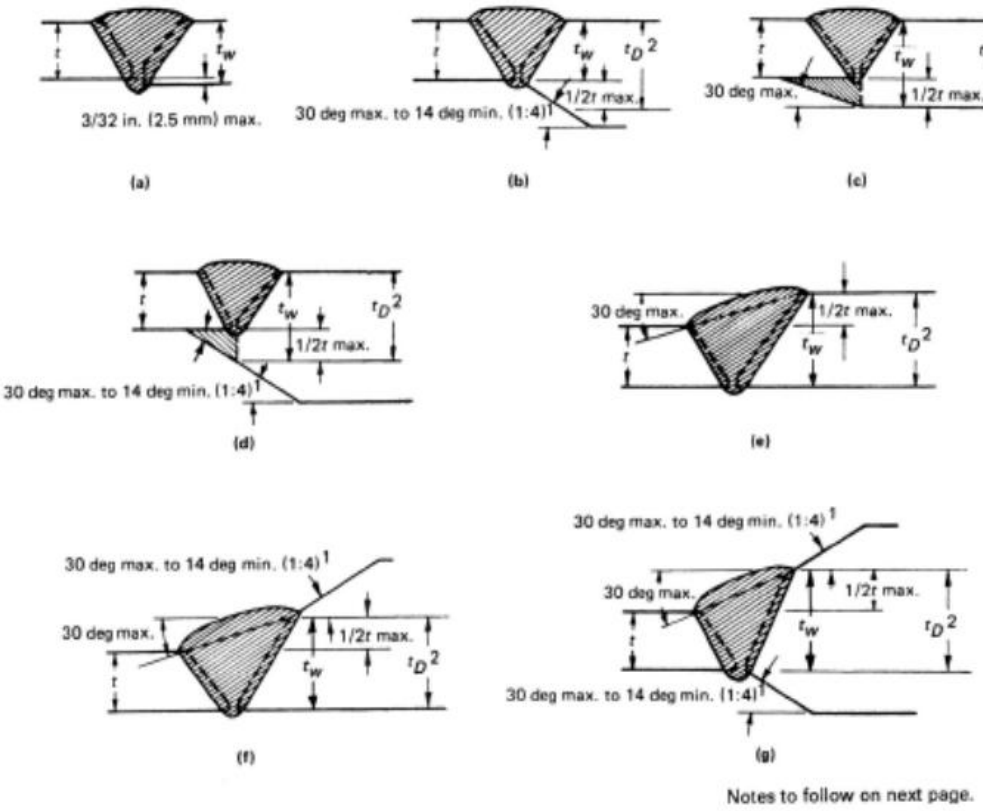
c. Cleaning

- ✧ Surfaces to be welded shall be clean and free from paint, oil, dirt, scale, oxides and other materials detrimental to welding.
- ✧ All foreign matter such as paint, oil, dirt, scale, rust shall be removed from the weld surface and at least 25mm of adjacent base metal from both sides (internal and external).
- ✧ Cleaning shall be done in a manner that will not lead to contamination of the weld or base metal.Upon completion of each weld pass, the weld shall be cleaned of spatter, slag and flux deposits.
- ✧ All pipes to be internally cleaned from any foreign material.
- ✧ Weld beads shall be controlled to permit complete fusion at the side of the bevel and to minimize slag inclusions.
- ✧ Ragged and irregular edges shall be ground or machine to bright metal. All holes cut for nozzles, bosses, or branch connections shall be ground smooth and true (-0, +3.2mm of the branch inside diameter for set-on nozzles and -0, +3.2mm of the nozzle outside diameter for set-in nozzles).
- ✧ Thermally cut or gouged surfaces for all materials, including carbon steels, shall be power brushed or ground prior to welding.
- ✧ Thermal cut surfaces of stainless and non-ferrous materials shall be ground to bright (unoxidized) material prior to welding.
- ✧ Fittings that are re-cut or re-beveled shall have the cut surface examined for laminations before welding by MT or PT.
- ✧ For All Pipes that require internal Coating of girth welds, cutback shall be girt blasted internally to obtain minimum cleanliness level of SA 2-1/2" and surface profile of 35-60 micrometer prior to fit up the pipelines. Abrasive used shall be dry and free of contaminates. After blasting abrasive materials shall be removed from cleaned internal

surface of pipe by blowing down with clean dry compressed air. Weld number traceability need to mark both side of joint prior to fit up.

d. Joint Alignment

- ✧ Full penetration groove joint with included angle less than 30 shall not be used without approval from the Client.
- ✧ Piping components shall be adequately supported and aligned by means of jigs, clamps, or their suitable devices during tacking. Cold pulling shall not be allowed to alignment.
- ✧ Internal misalignment for butt weld joints shall not exceed 1.5mm.
- ✧ If the large offset is caused by dimensional variations, it shall be equally distributed around the circumference of the pipe.
- ✧ Where parts with internal diameters differing by more than 1.5mm are joined concentrically, the inside of the smaller bore shall be tapered to match the larger bore within 1.5mm.
- ✧ Welding joining components of different material thickness shall be made in such a manner that the slope through the transition zone (1:4) ratio.
- ✧ The below attached figure shall be followed to join the uneven thickness material.



Notes to follow on next page.

Fig. 434.8.6(a)-(2) Acceptable Butt Welded Joint Design for Unequal Wall Thicknesses

e. Tack welds

✧ All tack welds shall be in accordance with approved welding procedure and shall be performed by qualified welders.

✧ All tacks or temporary welds shall be performed with the same care, materials, electrodes, minimum preheat, and procedures that are used for permanent welds.

✧ If the tack welds are to be incorporated into the final weld and are made with a different process or electrode than the root pass, then the desired tack weld process and electrode shall have been used for tacking in the procedure qualification.

✧ Tack welds shall be of sufficient size to maintain joint alignment. The recommended tack thickness is 3.2- 4.8 mm and length is 12.5-25.4 mm. The minimum numbers of tack welds according to SAES-W-011/SAES-W-012 are:

• Pipe diameter of 101.6mm or less: three equally spaced tacks.

• Pipe diameter above 101.6mm: minimum of four equally spaced tacks.

✧ Tack welds incorporated into the final weld shall be ground to a feather at each end to ensure adequate fusion on the root pass.

✧ Bridge tacks (located above the root area) are acceptable but such tacks must be made completely within the weld grove and shall be completely removed prior to completion of weld.

✧ Any temporary welded attachments or temporary tack welds shall be ground off. Attachments may be cut off no closer than 3mm to the base metal surface, prior to the required grinding (SAES-W-011 para-11.7).

✧ The temporary welds shall subsequently be removed and ground flushed with the base materials.

✧ The method of removing attachments shall not injure the metal surface.

✧ The metal surfaces shall be checked by MT or PT after the removal of attachment.

(2) Pre-Welding

a. A tool box meeting will be conducted prior to any welding activities.

b. Approved Welding Procedure(s) or WPS shall be available / posted at the weld site. All attachments (A, B) and cover pages to WPS are posted. Page A1 (WPS Approval Request) is signed by SA Inspection. WPS & Special Process Control Procedures are approved.

c. Welder(s) have been issued Job Clearance Card, and that range of qualification shown matches the application of WPS being used.

d. All weld joints shall be marked for identification as follows: SAEP-1160 & SAIC-W-2008.

• By weld number and by welder symbol.

• With suitable weather-proof marking material.

• Easy visibility location and durable for a time suitable to SAPID.

e. Weld number and Welder symbol are to be marked adjacent to welds. Use suitable weather-proof permanent markers & materials, such as certified low-chloride (50ppm) markers for Stainless steel. This is an

assigned unique weld ID number to be tracked by database & shall remain intact during the construction process.

f. All Isometric Piping Drawings for work have been reviewed & approved Process Control Procedure for Welding is followed relative to checks on materials (Traceability, marking, dimensional) using latest approved* drawing revisions. Document Control system exists.

• Fabrication shops have been approved per SAIC-L-2031.shops follow strict materials and consumable controls as outlined in Procedure

• Equipment checks for welders (checks are established) SAIC-L-2031 was utilized prior to kickoff of Construction.

g. Welding power supplies shall be calibrated as per standard requirement.

h. Welding QC shall verify the dimensional check-up tack weld quality, bevel angle, root face, root gap in accordance with approved WPS prior to preheating and shall mark as fit-up is accepted on adjacent to the weld joint.

(3) Preheating

a. Preheating shall be in accordance with SAES–W–011/SAES-W-012, ASME–B–31.3, 31.4 & 31.8, and the Client approved WPS.

b. The minimum preheat shall not be less than the greater of the following:

• 10^{0} C.

• The required or recommended preheat listed in ASME B31.3

c. Preheat shall be applied uniformly around the circumferential weld using gas or electrical means.

d. Temperature shall be measured using contact thermometer or indicating crayons of the melting type. Temperature indicating crayons shall not be used where FBE coating is going to be applied.

e. The preheat temperature shall be established over a minimum distance of 75mm on each side of the weld.

f. If the wall thickness exceeds 25mm and preheating is to be done from the same side of welding, then the heat source shall be removed for 1 minute to allow for temperature equalization prior to measuring the temperature.

g. Applied preheat approved WPS shall be note in the fit-up report.

(4) In-Process Welding

a. The welding inspector shall assure that the welding Technique, Workmanship and Preheat are implemented per approved WPS/ SAES-W-11, Sec-11 and SAES-12 section 10.

b. All tacks or temporary welds are performed with the same care, materials, electrodes, minimum preheat, & procedures that are used for permanent welds.

c. Prior to start assure that the tack welds are sufficient size to maintain joint alignment. The tack thickness is 3.2 to 4.8 mm and tack length is 12.5 to 25.4 mm.

d. Tack welds to be incorporated into the final weld are thoroughly cleaned, prepared at each end, & inspected for cracks.

e. Any cracked tacks shall be removed before welding joints.

f. Bridge tacks (located above the root area) are acceptable but such tacks must be made completely within the weld groove and shall be completely removed prior to completion of the weld.

g. Tacks made outside the groove require MT/PT examination.

h. Forced or accelerated cooling of welds is prohibited without the specific approval of CSD.

i. Each weld pass is thoroughly cleaned and all slag or other foreign matter removed before the next pass is deposited.

j. Root pass is deposited without backing for WPS qualified for single-sided groove welds.

k. GTAW process shall be used for root pass of butt welds without backing in piping and nozzles of 50.8mm nominal diameter or less.

l. The SMAW electrode size will be used as per approved WPS.

m. Remote Current controls are used if welding is more than 30 m from welding a power source or when welders work in "remote" areas.

n. Heat input (HI) of each production weld is calculated (using formula below) if Charpy impact is specified on the WPS, to confirm that heat input limits shall not exceed the values listed in the WPS's.

• HI (kj/cm) = Volt X Amp X 60/Travel Speed (cm/min)

o. QC Welding Inspector shall ensure that HI values as per WPS are maintained by each welder and will perform random monitoring of welders.

p. Interpass temperature shall be monitored by welding QC per approved WPS. The welding inspector shall ensure that the specified maximum Interpass temperatures are as per WPS.

q. Adjacent beads of a weld shall be staggered and not started in the same location.

r. Unless specified in the WPS, back welding is done using the same process, consumables and preheats as the fill passes.

s. All Interpass cleaning shall be done prior to deposit other passes.

t. All slag, flux, weld spatter, and undercuts are removed from the completed weld and surrounding areas.

(5) Post-welding

a. For production welding preparations that are edge preparation, types and sizes of electrodes, current/ voltages used and preheating requirements etc. shall be the same condition as those defined in the applicable WPS.

b. All surfaces to be welded shall be visually inspected and they shall contain no laminations or other injurious defects. If there is any doubt or as per clients request, PT or MT should be performed with, UT in case of lamination.

c. Fillet welds shall be made by minimum 2 passes.

d. Cleanliness shall be maintained after completion of welding. All stubs rods and foreign materials shall be removed from the equipment or piping.

e. All vertical welding shall be done vertical up (uphill position). As the normal practice of all plant, downhill is not allowed.

f. Only GTAW shall be used for pipe diameters less than 1".

g. All slag, flux and spatter is removed from the completed weld and surrounding area.

h. All arc strikes, gouges & other surface imperfections are removed by grinding.

i. Temporary attachments have been cut off no closer than 3mm to the base metal, then ground flush.

j. Grinding does not reduce the base metal thickness to less than the design thickness. Inspectors know their specs & mill tolerances.

k. Where temporary welds were removed, base metal repairs made, or arc strikes repaired by grinding, examination by MT or LT has been carried out.

l. Weld numbering & welder symbols are placed in a location so that they will remain visible for a time suitable to the authorized Saudi Aramco inspector (thru successful pressure test until coating).

m. Surface irregularities, including weld reinforcement, which inhibit accurate interpretation of specified method of NDT (including VT), are ground smooth.

n. Inspection of all welds includes a band of base metal at least 25mm wide on each side of the weld (includes 100% HAZ as needed).

o. Visual defects found in completed welds & at least 25mm wide on each side of the weld are within the allowable weld imperfections listed in ASME B31.3, Table 341.3.2. See Attachment 1.

p. Socket welds & seal welded threaded joints meet the requirements of SAIC-L-2015 & SAIC-W-2037.SA Requirements for these welds supersede ASME code.

q. All weld to be FBE coated either Internal or External shall be ground smooth and free from burrs, weld spatter, sharp edges. Weld toes shall be merged smoothly and rounded with no sharp undercuts. The weld cap or internal root protrusion shall not be more than 1.5 mm.

r. Visually inspect finished welds (including root profile) to confirm the height & width of reinforcement, technique of cap (multi-pass or weave), comply with WPS. {ASME B31.3, Para. 341.4.1, (a) (1)}, See Attachment-I for correct profile & acceptance limits.

s. Where accessible, welds shall be visually examined from the root side to ensure that proper penetration and fusion have been achieved.

t. Zero Cracks are accepted (Refer ASME B31.3, Para. 341.4.2) & any repair of cracks that are fabrication related shall require the approval of Saudi Aramco assigned inspector.

u. LOP & LOF shall be carefully examined against acceptance limit by visual examination (refer ASME B31.3, Para. 341.4.2)

v. Weld of corrosion-resistant material shall have weld surfaces and heat affected zones free of dark color and heavy 'sugary' oxidization, pinholes, cracks, crevices, undercut, lack of penetration and incomplete fusion.

w. If the root ID surface can be visually inspected, the stop/starts shall be examined. No crater defects, such as cracks, "suck-back," or shrinkage, are permitted.Visual inspection will be made in accordance with relevant code requirements (ASME B31.3, 31.4 & 31.8)

(6) Socket and fillet welding

a. When socket weld fittings or valves are used, the pipe face shall be spaced approximately 1.5mm to 3 mm clear from the root face of socket as per approved BQ-805-CON-QAC-PR-019 Procedure for socket gap control & threaded joints.

b. Socket welds shall be made with at least two passes.

c. Typical weld details for socket welding are shown in attachments.

d. Seal welds shall cover all exposed threads.

e. Seal welding shall only be carried out by qualified welders.

(7) Tie-In Welding

All Tie-in welding will be done as per the tie-in procedure approval.

(8) Structural Steel Welding

a. Structural steel welding will be done as per the approved welding procedure specification **(BQ-WPS-ABQ-XX , PQR – 0XX)**

b. SAES-M-001 requirements shall be followed for structural welding. All welded structural connections shall use weld filler material conforming to AWS D1.1 section 3.3 (including Table 3.1) with an electrode strength of 58 ksi (400 MPa) minimum yield strength and 70 ksi (40 MPa) tensile strength, unless otherwise required.

c. All structural strength welding shall be continuous.

d. The edges of all tightly contacting surfaces shall be completely seal welded.

10. Non destructive testing

- Non Destructive testing will be done by third party NDT service provider per approved NDT procedure.
- Acceptance criteria will be followed per the applicable code (ASME B-31.3, 31.4 & 31.8)
- After completion of NDE all film shall submit to OID for final review and acceptance.

(1) Repair and removal of defects

The contractor will follow approved welding repair procedure BQ-ZUL-CON-QAC-PR-0XXfor any repair and removal of defects.

11. Welding Inspection & Acceptance Criteria (Visual Inspection)

① Post welding visual inspection shall be made according to the checklist SAIC-W-2007 & SAICW-2048.

② ASME Sec 31.3 Para 341.3.2 and SAES-W-011 shall be followed as acceptance criteria for the welds.

③ All weld preparation, fit-up and weld assemblies will be visually inspected in accordance with approved ITP.

④ Visual inspection of all welds shall be done after cleaning and prior to any subsequent NDT.

⑤ Weld reinforcement shall be as required by the below table.

⑥ Weld finish shall not impair the interpretation of NDT results.

⑦ Weld surfaces shall be free of cracks, excessive porosity, slag inclusions and other defects indicative or poor workmanship.

Wall thickness: T, mm (in)	Height: h, mm (in)
T ≤6 (1/4)	h ≤1.5 (1/16)
6 < T ≤ 13 (1/2)	h ≤3 (1/8)
13 <T ≤ 25 (1)	h ≤4 (5/32)
T > 25 (1)	h ≤ 5 (3/16)

⑧ Arc strikes shall be avoided. Should this occur, however, the deposit shall be carefully removed by mechanical means.

⑨ Visual inspection shall include

⑩ Joint preparation & cleanliness

⑪ Fit-up and internal alignment prior to welding

⑫ Pre-heating

⑬ Welding position and other parameters in the WPS

⑭ Appearance of the finished weld

⑮ Non-destructive examination for welded joints shall be in accordance with the NDT procedures.

12. WELD IDENTIFICATION NUMBERING SYSTEM

① Welds fabricated in the field shall be prefixed with the letter 'F' and welds fabricated in a weld shop with the letter 'S'.

② The weld map attached shows the shop welds in written in circle whereas the field welds are shown in octagonal.

③ Each weld shall be identified by joint number, line number, and spool number.

④ In addition to the spool number and line number identification, each weld shall be identified as follows. The example of a first weld is used.

W-01	This number has been given to a weld prior to production welding. If required examinations area accepted no change is required.
W-01R1	The W-01 weld has been completed and examination has revealed an unacceptable discontinuity that was repaired. If subsequent examinations are accepted no change is required.
W-01R2	The W-01R1 weld repair has been completed and examination has revealed an unacceptable discontinuity. If subsequent examinations are accepted no change is required. No further repairs are permitted without express approval of the Client. If permitted the suffix R3 shall be used.
W-01RW	The unaccepted weld W-01R2 has been cut out and the joint has been re welded. The identification methodology above is to be applied should further weld repairs be necessary.
W-01T1	The W-01 weld has been completed and examination has revealed.
W-01T2	An unacceptable weld discontinuity or HT tests have been rejected. Progressive sampling is required in both cases and the "tracer" welds will be identified. If subsequent tests are accepted no change is required. Repairs on tracer welds will require further sampling in which case the suffix numbering system shall progress accordingly.

13. WELD JOINT TRACKING SYSTEM

Pipe welds are to be tracked and reported by line class as follows.

- Number of welds completed
- Number of welds subjected to NDT (excluding tracer welds)
- Number of welds rejected by each NDT method applied
- Number of welds repaired and rejected
- Number of repairs outstanding
- Report actual backlogs
- Completed Welds - Outstanding (backlog) NDT (by NDT method)
- Tracer Welds - Outstanding NDT
- Weld rejection rate by line class and NDT method (joint and linear basis).
- Tracer weld reject rate percentage
- Overall production weld rejection percentage
- Client RTFI results – to be reported by number of weld films reviewed, separate film quality and weld quality results, and percentage disagreement with initial film interpreter.

14. DOCUMENTATION

The daily welding Report should be issued for all welding joints in construction DWG and inputted in the SATR-W-2008 (Weld summary, Welder performance & special process Tracking System)

15. ATTACHMENTS

- NDT Request Form (SATR-NDE-2011)
- Assessment of Radiography Film Interpretation (SATR-NDE-2009)
- Weld Summary (SATR-W-2008)
- Welding consumable issuance record (SATR-W-2010)
- Weld Map