Purpose

1.1 The purpose of this procedure is to ensure controls, responsibilities and activities connected to inspection and repair of the welding & weldments.

2.0 RESPONSIBILITIES

2.1 Manager QA will be responsible for compliance of this procedure.

2.2 Welding Inspector shall be responsible to ensure that the inspection, acceptance and repair of the welding & the weldments is carried out as per this procedure

3.0 PRE-REQUISITES –

3.1 Welders need to ensure that all aspects of the operation are performed correctly.

3.2 At a minimum, welders should check the following areas:-

3.2.1 Base material is as specified.
3.2.2 Joint design is as specified and within required tolerances.

3.2.3 Filler metal type and size are correct.

3.2.4 Required welding equipment is available and operating satisfactorily.

3.2.5 Tooling has been adequately tested to determine that it will properly support the operation.

3.2.6 Parts have been properly cleaned.

3.2.7 Welder training or certification is sufficient for the weld operation.

3.2.8 Proper welding procedure is used and the welding equipment is set up properly for the operation.

3.2.9 Inspections and tests required during the welding operation are performed as specified.

3.2.10 Completed weld has been inspected to ensure that it will meet the visual requirements

4.0 INSPECTION PROCEDURE

4.1 All welded joint will be visually examined during Tagging stage (on random basis) to ensure that welding is being done as per specified drawing/map.
4.2 Variation in dimension, if any, is within the prescribed limits.

4.3 All finally welded components will be visually inspected for absence of the following defects-

• Under fill • undercut • overlap • Surface cracks • Crater cracks
• Surface porosity • Joint mismatch • Warpage

4.4 All weldments will be checked for –
Crown Height /Crown profile /weld size/ weld length / root side profile root side penetration / surface color (titanium welds) and has no discontinuity

4.5 Non Destructive Testing –

4.5.1 All welded joints will be verified for soundness through applicable NDT procedure wherever specified.

4.5.2 N DT examination will be carried out by a qualified NDT Level-II as per approved process.

5.0 WELDING TECHNIQUE –

5.1 All slag, excessive flux or glaze must be removed from the weld before continuing. A chipping hammer may be used to remove the slag.

5.2 Use wire brush between all passes.

5.3 Peening or deformation of the weld surface be avoided.

5.4 Remove excessive undercut areas by grinding or other suitable means.

5.5 Do not weld over porosity. Remove all porosity, pinholes or worm holes before depositing additional beads.

If a weldment fails inspection, the welding inspector will review it and --

- Determine the extent of damage that may be caused by repairing the weld
- Whether the weldment can fulfill its function if the defect is allowed to remain in place.
- If the function of the weldment is affected by the defect, the weldment must be discarded and replaced.
- If a part requires rework, same procedure used to create the original weld will be used for repair also. Ensuring –
- The condition of the base metal and weld is not damaged.
- Tooling required for the repair is identified and used.
- Repaired work passes through the same control of inspection as before.

6.0 REPAIRS & CORRCETIONS –

Defects shall be completely removed to sound metal by grinding, gouging or chipping

before continuing the welding operation. It may be necessary to resort to some form of NDE to ensure complete removal of cracks.

6.1 Dimensional Repairs -- Conditions that require dimensional repairs are as follows:

6.1.1 Crown height is too low -

- Add only enough new filler metal to build the crown to height requirements. Do not over weld.

6.1.2 Surfacing or overlay type weld height is too low,

- Add stringer beads to minimize dilution and distortion.

6.1.3 Fillet weld size is too small

- Remove the inadequate weld and re-weld to create the proper size fillet weld.

6.2 Surface Defect Repairs --Conditions that require surface defect repairs are –

6.2.1 Longitudinal, transverse, or crater cracks-

- use a small grinding wheel to remove cracks.
- Remove only the amount of metal required to eliminate the crack.

6.2.2 Porosity, or pores in the weld

- Remove multiple and linear (aligned in a row) pores by grinding or machining.
- Always fill the deepest part of the recessed area first.
- Keep each layer of weld level until the area is filled.

6.3 Manual or semi-automatic welding repair will be carried out for repair of a machine weld.

7.0 CALIBRATION OF WELDING MACHIINES & MONITORING INSTRUMENTS --

Calibration shall consist of checking output readings against known inputs from a pre-calibrated reference instrument.

7.1 Procedure –

7.1.1 Calibration records – Welding Inspector Sara Sae will maintain a record of instruments being used in the welds shop.

7.1.2 The record shall include –

7.1.2.1 Brief Description of the Instrument
7.1.2.2 Serial number
7.1.2.3 Calibration Frequency
7.1.2.4 Date of last calibration
7.1.2.5 Date due for calibration

7.1.3 Calibration records shall be maintained for a period of at least 5 Yrs or longer if warranted by standard / desired by customer.

7.1.4 The calibration Cert issued by the calibration agency must include –

7.1.4.1 Serial number of the machine/instrument calibrated.
7.1.4.2 Ref standard and serial number.
7.1.4.3 Calibration date.
7.1.4.4 Results of calibration.

7.1.4.5 Name of the person performing calibration.

7.1.5 Welding Inspector Sara Sae will ensure—

7.1.5.1 Correctness of entries in the documents.

7.1.5.2 Make sure the new calibration sticker has been fixed on the machine.

7.1.5.3 Sticker shows the date of calibration, due Date for recalibration and signature of the person performing calibration.

8.0 FREQUENCY OF CALIBRATIONS -

8.1 All welding machines and related equipment will be calibrated at an interval of 6 months.

8.2 All welding instruments shall be recalibrated if-

8.2.1 There is a major break down in the machine /instruments.

8.2.2 The panel meters fitted on the machine is repaired /changed.

8.2.3 If there is a reason to question their accuracy.

9.0 WELDER CONTINUITY LOG

Welder continuity is the idea that a welder must continue to weld using a given process within a six month period to remain a "qualified welder" (See ASME Sec. IX, QW-322). ASME Section IX states that if a welder "has not welded with a process during a period of six months or more" he must be re-qualified.

Procedures --

9.1 Each welder will be assigned a unique number.

9.2 All qualifications obtained by the welder will be recorded under his own assigned number.

9.3 The number assigned to a welder will not be re- assigned to any other welder even in the event of his leaving the job.

9.4 Product manager will maintain a running log of all welders qualified in various processes as per Annex. A. recording that a welder has used the welding process every six months.

9.5 If the welder has not welded a process for six months he will be re-qualified.

9.6 Refer Annex. B for welding process.

10.0 PROCUREMENT & INSPECTION OF WELDING ELECTRODES / FILLER WIRES

10.1 All electrodes / filler wires received at site stores shall be segregated for type and size of electrode.

10.2 Ensure that electrode packets received are free from physical damage.

10.3 Where electrodes are damaged, the same shall be removed from use.

10.4 Where filler metals are supplied by manufacturing unit, inspect for damages, if any.

10.5 Ensure availability of relevant test certificates

10.6 Endorse acceptance / rejection on the test certificate.

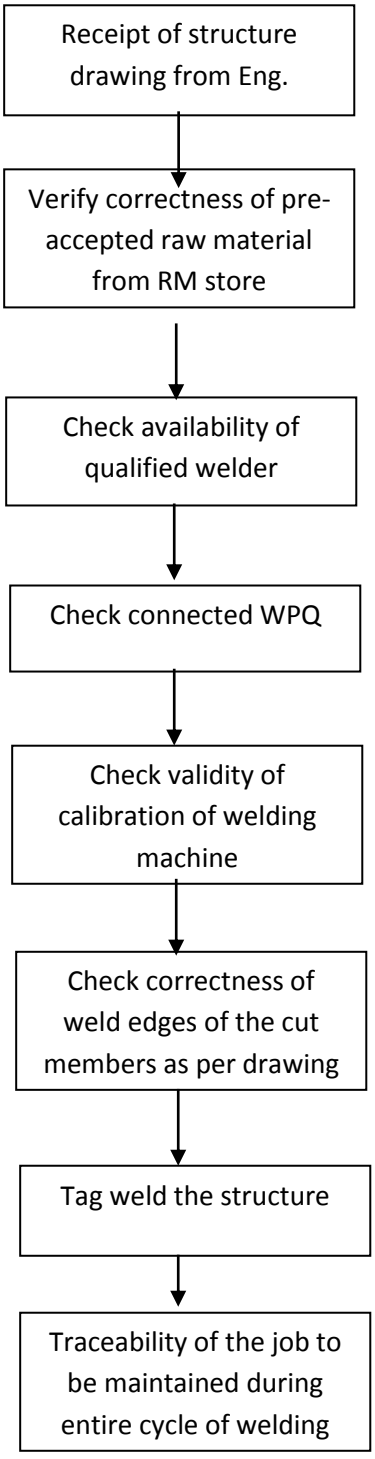
Annex. A

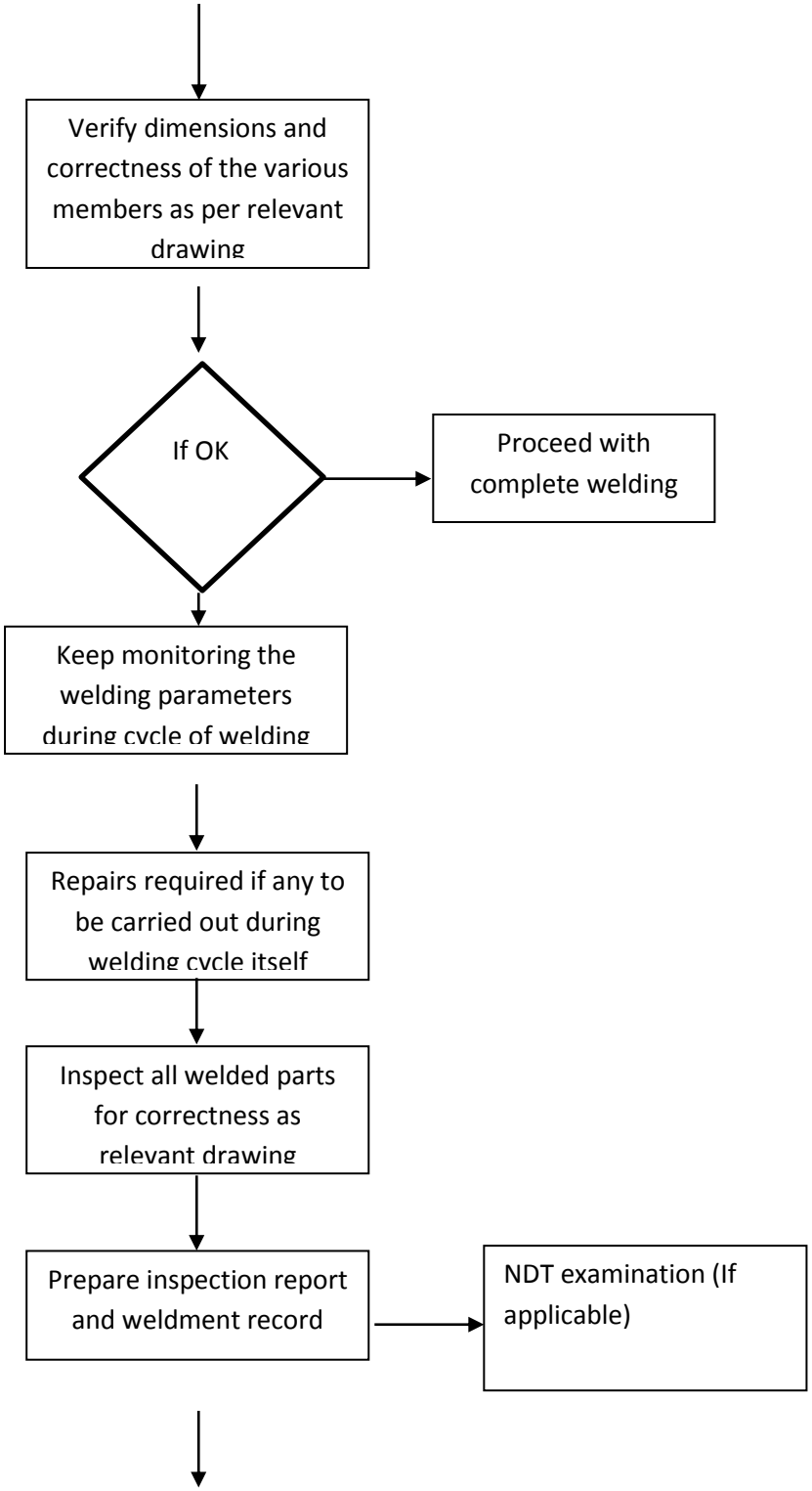
Welder Continuity Log

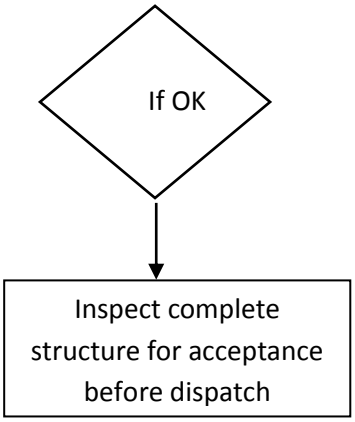
Sl No	WPS & Date	WPS Details(Process & Thickness)	PQR No. & Dt	WPQ No. & dt	Welder Name & No.	Dt of last welding performed	Component Welded	Supporting Doc Number (Drg No.)

Annex. B

PROCESS FLOW CHART -WELDING




Verify dimensions and correctness of the various members as per relevant drawing
If OK
Proceed with complete welding
Keep monitoring the welding parameters during cycle of welding
Repairs required if any to be carried out during welding cycle itself
Inspect all welded parts for correctness as relevant drawing
Prepare inspection report and weldment record
NDT examination (If applicable)



NOTE:

1) Deviations if any will have the prior approval of Eng.
2) Copy of the record of deviation will be maintained by the facility.
3) Final Documentation will also carry copy of such deviation for the info of the customer.

Revision Log

Revision Number	Date of rev.	Description of change	Prepared By	Reviewed By	Approved By
0	18 –Apr - 2014	Initial Release	Raviraj Thapa	J M Singh	Pratik Bhardwaj

Signature :	Created By:	Reviewed By.	Approved by
Department :	Raviraj Thapa (Welding inspector)	J M Singh (Manager Quality)	Pratik Bhardwaj (Welding Inspector AWS QC1)