

JOB METHODOLOGY FOR FABRICATION & ERECTION OF TANK

1. SCOPE:

This procedure covers detailed activities for fabrication, erection and testing of the Storage tanks, and also equipment & manpower required for the same. All the tasks / Activities need to be accomplished with at most care with good workmanship and in Accordance with the specifications to achieve satisfactory completion of the whole activities

2. PURPOSE:

The purpose of this document is to follow proper methodology to achieve the activities in a proper sequence for fabrication, Erection and Testing of the storage tanks

3. REFERENCE:

API 650
ASME Sec IX
ASME Sec V
Approved Drawing / Specification

4. METHOD OF CONSTRUCTION:

4.1 IDENTIFICATION OF MATERIALS

Each Piece of Plates, fittings or any other component of tankage system shall be clearly identified by marking heat no. on the parts using hard punching.
Each weld joint shall be marked with joint Number with Welder Number.

5.2 FABRICATION WORK

All fabrication work involving material identification, marking, cutting, rolling and

Welding shall be done in accordance with this job method, API 650 (Latest

Edition). The workmanship shall be good in every respect meeting all safety, QC & NDT requirements, with the coordination of Engineer-In-Charge.

* Lay all the plates, Structural & pipes in such a way prior to fabrication to facilitate proper checking of dimensions & heat no.

* Mark the components as per the drawings.

5.2.1 ANNULAR & BOTTOM PLATE FABRICATION:

_ Mark the plates as per drawing

_ Carry out the cutting operation after proper inspection.

_ All the cutting operation shall be carried out by Gas Cutting.

_ Grind the cut edges smooth to remove burrs and slag.

_ Stack the plates at designated place in the fabrication yard in proper Sequence.

_ Backing – strip shall be fitted and tacked with annular plate as per drawing.

_ after completion of the fabrication under side of annular and bottom plates shall be blast cleaned and painted as per the specification to the satisfaction of the Engineer-in-charge.

_ Check the Joint Position, Root gap for welding after welding Inspection by weld visual & NDT as per API 650

. 5.2.2 SHELL PLATE FABRICATION

_ lay all the plates in the open area such a way easy for marking and cutting.

_ Mark the plates as per drawing and to the satisfaction of Engineer-in-charge.

_ the cutting operation includes beveling shall be carried out by gas cutting method on all the four sides.

_ Grind the cut edges smooth to remove slag and burr.

_ The edge prepared plates shall be shifted by crane to the rolling area.

_ The plates shall be fed to rolling machine. by means of crane & proper lifting tools and tackles.

- _ The plate shall be rolled as per drawing details and the radius shall be checked using Template.
- _ Proper care shall be taken for the smooth curvature.
- _ 36" Long (5 to 6mm thk.) Template shall be used to check rolling curvature accurately.
- _ The Template shall be checked and cleared by inspection authority.
- _ The rolled plates shall be inspected and shall be within 03mm. of tolerance limit.
- _ The rolled plates shall be shift to shot blasting yard to carry out the shot blast as per specification.
- _ Final profile and dimensions check shall be carried out before sent for erection

5.2.3 ROOF PLATE FABRICATION

- _ Mark the roof plate as per drawing
- _ All the cutting operation as per requirement shall be carried out after getting the clearance from the inspection authority.
- _ All the cutting operation shall be carried out by gas cutting method on all the four side.
- _ Grind the cut edges smooth to remove burrs &slag.
- _ Structural item of the roof shall be fabricated as per drawing.
- _ These roof plates shall be shifted to blasting yard to carry out the blasting and painting

5.2.4 APPURTENANCES

- _ Mark the required items of the Appurtenances as per the drawing. All the cutting operation as per requirement shall be carried out after getting the clearance from inspection authority.
- _ All the cutting operation shall be carried out by gas cutting method.
- _ Grind the cut edges smooth to remove burrs & slag.

- _ Flanges face to be covered with a suitable cover to protect from damage during handling, fabrication and transportation.
- _ The entire shell nozzle, roof appurtenance, i.e. flanges, flanges to pipe joint and other requirements etc. Shall be fabricated as per approved drawings.
- _ All the fabrication and welding activities shall be carried out after the stage wise inspection wherever required.
- _ The N.D.T requirements as per code specification

5.2.5 SPIRAL STAIRWAY, HAND RAILING

- _ All the structural items shall be straightened before marking and cutting.
- _ Mark the components as per drawing.
- _ All the cutting operation, as per requirement shall be carried out after getting the clearance from inspection authority.
- _ All the cutting operation shall be carried out by gas cutting method.
- _ Grind the cut edges smooth to remove burrs & slag.
- _ Fabrication such as fitting, welding, drilling, etc. Shall be carried out as per drawing and after the clearance from inspection authority.
- _ After fabrication all these structural items shall be blasted and painted as per requirement

5.3 ERECTION:

5.3.1. ANNULAR PLATE LAYING

Check the level of foundation as per specification API 650 clause 8.4.2. Latest edition.

After getting clearance for annular plate laying, mark the 0o, 90o, 180o, 270o coordinates on the foundation from the reference point.

Lay the annular plate as per approved drawing.

Out radius of the annular plate shall be in positive side (5 to 10 mm.) in order to achieve the final required radius after weld shrinkage.

- _ Orientation of the annular plate joint shall be as per approved - drawing.
- _ Fit up of annular plate's joints shall be carried out using proper jigs and fixtures as shown in drawing.
- _ Care shall be taken while fit-up, such that there should not any gap between annular plate and backing-strip.
- _ Annular plates joints welding shall be carried out by welding alternative joint at four quadrants.
- _ Qualified welders shall be engaged for the welding work according to WPS.
- _ If any defect found the defect weld shall be removed by grinding and re-weld and Conduct the LPT check test. Repeat the sequence until the defect cleared.
- _ Complete the welding, clean the final weld surface by wire brushing and grinding.
- _ Remove the jigs and fixtures which were used for fit-up of the annular joint and grind the tack.
- _ Radiography shall be taken as per API-650 Sec-6.

5.3.2 BOTTOM PLATE LYING:

- _ Lay the center plate on the foundation top as per drawing.
- _ With co-ordination of Centre plate lay the bottom plates consecutively as per drawing.
- _ Laps shall be maintained while the fit-up of short seam and long seam as per drawing.
- _ Temporary tack weld to be carry out on the Long-seam to avoid uneven movements, while the fit-up and welding of short-seam.
- _ Short seam welding will be carried out alternatively to avoid distortion.
- _ After the completion of short-seam welding, remove the temporary tacks on the Long- seam by grinding to facilitate the long-seam fit-up.
- _ Short seam welding will be carried out alternatively to avoid distortion.
- _ After the completion of short-seam welding, remove the temporary tacks on the Long- seam by grinding to facilitate the long-seam fit-up.

- _ Minimum laps shall be maintained while the fit-up of long-seam as per approved drawing.
- _ Joggling shall be carried out by hammering wherever it necessary. (Three plate Joining junction.)
- _ Before starting the welding, channels shall be tacked along the long-seam to avoid the distortion.
- _ After completion of shot seam welding long seam welding will be carried out alternatively to avoid distortion.
- _ Qualified welder shall be engaged and welding shall be carry out as per approved WPS.
- _ After Completion of welding thoroughly clean the weld 'joint by wire brushing and grinding.
- _ Sketch to annular plate joint shall be welded only after shell to bottom joint welding.
- _ All the bottom plate's joints vacuum box test shall be carried out as per approved Process and code specification.
- _ If any defect found the defect weld shall be removed by grinding and re-weld and conduct the vacuum box test. Repeat the sequence until the defect cleared

5.3.3. SHELL COURSE ERECTION

- _ After the completion of welding of Annular plates and bottom plates, mark the tank inner radius on the annular plates.
- _ Fix 25 Nos. of erection tools at the equal interval on the annular plates & transfer the inside tank diameter on the stools.
- _ The first shell courses shall be erected by conventional method.
- _ Balance shell courses shall be erected by conventional method.
- _ The rolled shell plates shall be shifted to the tank foundation area stacked around the periphery by using crane.
- _ Proper care shall be taken while handling the rolled plates.
- _ Care shall be taken that the shell plate erected to the diameter marked on the annular plate.
- _ Jigs and fixtures shall be use to align the shell plates.
- _ Complete the fit up except the final joint which shall be fitted and weld after completion of the welding of the other joints. (To avoid the shrinkage)
- _ Peaking shall be checked at top, middle and bottom of the vertical joints using a Sweep board of 36" long.

_ Plumpness shall be checked for the verticality of the shell course at every 60° and shall be within the tolerance (tolerance 1/200 of the total shell height)

_ For perfect verticality, channels shall be provided at the regular interval inside of the shell course (3 to 5 meters) Providing the channels shall be facilitates the alignment shell course.

_ Tack welds of the fitted vertical joints shall be grinded smooth.

_ Offer for inspection and get clearance from Engineer-in-charge for the vertical

fit-up Complete the first side welding by using qualified welders.

_ Care shall be taken while the welding to avoid the peaking and the roundness distortion

_ After completion of first side welding, back-chip shall be carried out for sound metal from other side of the weld by grinding.

_ Back-chipped grooves shall be offered for inspection before starting the welding.

_ Complete the 2nd side welding using qualified welders.

_ Joint Nos. & welder No. shall be marked on both side of the weld joint.

_ Care shall be taken to avoid the peaking and roundness distortion.

_ Clean weld joints from both sides by wire brushing and grinding.

_ After completion of welding from both sides remove all the temporary jigs and

fixtures and flush grind the tacks. (Do the weld fill up wherever required) and the

portion checked by M.P.T

_ Check the , plumpness, circumference and the radius, offer for inspection to the satisfaction of the Engineer-in-Charge.

_ Erect second shell course plate on top of the erected shell plate, 3mm thick spacers shall be kept between first and last but one shell course plates to maintain horizontal seam gap.

_ Erection channels shall be fixed between first and second shell course plates at regular intervals to align and hold the last shell in vertical position.

_ After all the shell plates for last shell course is erected, fit-up the vertical joint using jig plates which has been fixed during erection and tack weld the joints.

_ Check peaking at vertical joints of shell using a sweep board of 36" wide, acceptable tolerance shall be as per API-650

_ Complete welding of last course vertical seam inside after getting clearance from the Engineer-in-charge.

_ Back chip & welding shall be carried out following as same as for other shell course to the satisfaction of Engineer - in - Charge.

_ After completion of welding, weld visual, verticality & circumference shall be checked out and recorded to the satisfaction of Engineer - in-Charge.

_ Fit up the Horizontal seam between top shell courses and tack welded, remove the spacers provided during erection, tack weld shall be grinded smooth and ensure that the tacks are sound and there are no defects like cracks and porosity etc. .or better to be removed

_ Check Verticality of the last shell course, Verticality (plumb ness) tolerance shall be as per API - 650 clause 5.5.2 (max. out of plumpness at the top of the shell relative to the bottom of the shell not to exceed 1/200 of total shell height from top of last shell to Bottom)

_ While welding care shall be taken for banding and the roundness.

_ Back-chip shall be carried out by grinding for the sound metal and to the satisfaction of Engineer-in-Charge.

_ Complete the 2nd side welding and clean the joint thoroughly from both sides by grinding and wire brushing.

_ Check banding, plumb ness and recorded in the approved format to the satisfaction of Engineer - In-Charge.

_ Offer weld visual to the satisfaction of Engineer-In-Charge. .

_ Mark the RT spots as per the instruction of the Engineer -In-Charge, and complete the RT as per API - 650 Sec-6 requirements.

_ Offer the RT film for reviewing to the Engineer-In-Charge, and if any repair occurs the repair spot shall be repaired by grinding for the sound metal, Re- weld the repair spot as per code API -650 sec-6 requirements.

_ Take the repair spot RT and re offer for the inspection to the satisfaction of Engineer-In- Charge

_ Spiral staircase Erection shall be carried out as per drawing including brackets.

_ Remove all the temporary cleats and tacks by grinding.

_ If any defect found the defect shall be repaired by grinding the defect area for the sound metal plus 150mm from both end of the defect.

_ Conduct the chalk - diesel test on the repair spot. Carry out the whole process until the repair cleared to the satisfaction of Engineer - In – Charge.

_ After completion of shell to bottom out side welding visual inspection will be carried out to the satisfaction of the Engineer-In-Charge.

_ On completion of shell to bottom welding / NDT and having completed all erection and welding work on the tank inside related to the roof and roof structure, all unwanted materials and scrap shall be removed from inside of the tank.

_ RT of vertical and horizontal joint shall be completed.

_ Sketch to annular plate joint fit up shall be carried out and complete the welding.

_ Vacuum box test shall be carried out for the bottom plate short seam, long seam and sketch to annular plate joint.

_ If any repair occurs the same shall be repaired and re-tested as per the approved procedure and API-650.

5.3.4 ERECTION OF CONE ROOF PLATES AND STRUCTURES

_ After completion of the Top two shell courses erection, fit up, welding and curb ring fit up & welding shall be done.

_ Erect the fabricated Centre Drum, Roof Truss, and cross girders as per drawing.

_ Complete the welding of Roof structure by approved welders and as per approved WPS.

_ Erect and Lay the Roof plates on the structure as per the Drawing.

_ While fit up of the short seams and long seams Lap to be maintained as per Drawing

_ Weld the short seams by welding alternative joint or sequence mentioned in the drawing .to prevents the distortion.

_ Provided proper support lengthwise of the long seam and weld the joints as per drawing. sequence.

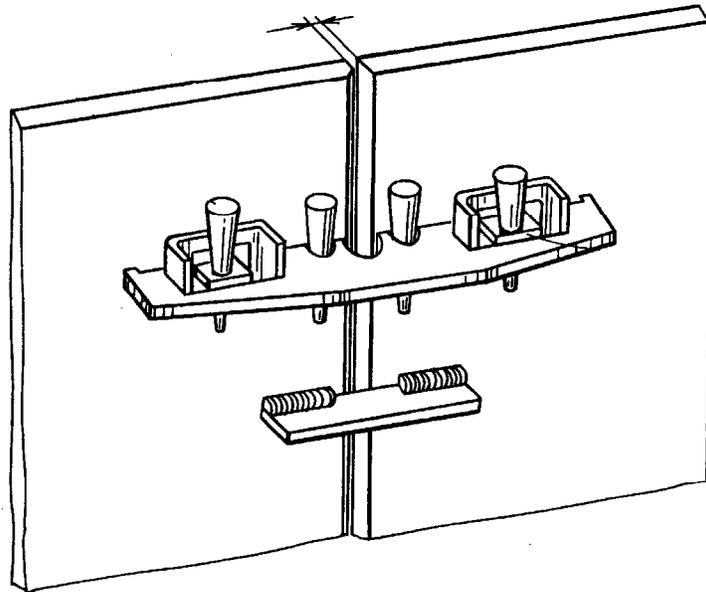
_ Roof Nozzles and top shell nozzles fit-up and welding shall be carryout as per the approved drawing and subsequently it has to be correlated with the concern piping drawing

5.3.5 APPURTENANCES INSTALLATION

- _ Flanges to pipe joint shall be prefabricated and required NDT shall be completed before erection.
- _ Mark the nozzle location as per drawings. Cut the openings by gas cutting after proper Inspection-by-inspection authority.
- _ Erect the nozzles as per the orientation & the elevation shown in the drawing.
- _ Install RF. pads wherever required before nozzle erection
- _ Suitable jigs & fixtures shall be provided to prevent the distortion during the welding.
- _ After completion of bottom shell course welding shell nozzles shall be marked as per drawing and offer for inspection.
- _ Cut open the nozzle opening, install the RF. Pads and erect the nozzles (prefabricated) as per drawing.
- _ Orientation, elevation & projection shall be maintained as per drawing and offer for the inspection clearance.
- _ Proper care shall be taken for the welding by providing jigs & Fixtures to prevent distortion.
- _ Welding shall be as per WPS and to be welded by the qualified welder.
- _ Man-Hole neck shall be fabricated and the longitudinal joint shall be radiographed.
- _ All the RF Pad weld shall be pneumatically tested at an pressure of 1.05 Kg/Cm²
- _ RF. Pad pneumatic test shall be carried out to the satisfaction of the engineer-in charge.
- _ All the shell nozzles final weld from both sides and RF. Pads welds shall be inspected by visually and by LPT, to the satisfaction of the engineer-in-charge.



General view of storage tank constructed on site



Tools of shell and annular plate aligning



View of tank under construction and the safe scaffolding for job performing

