

EK 25. BORU FABRİKASYON VE MONTAJ İŞLERİ UYGULAMA PLANI (METHOD STATEMENT FOR FABRICATION AND INSTALLATION OF PIPEWORK) ÖRNEĞİ

METHOD STATEMENT for FABRICATION and INSTALLATION of PIPEWORK

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1. PURPOSE and SCOPE

This method statement explains the method of piping workshop fabrication and field erection works for above ground piping.

The execution of the work procedures or methods and suggestions contained in this document should be considered as the minimum requirements.

The following works are included in this procedure:

- * Materials' traceability, handling and transportation
- * Piping workshop fabrication
- * Sand blasting / painting
- * Inspection, NDT
- * Aboveground piping installation, assembling at site
- * Support fabrication and installation
- * Pressure (hydrostatic or pneumatic) test (as per relevant procedure)
- * Documentation.

2. DEFINITIONS

Pipework : Assembly of various piping components (pipes, fittings and pipe supports).

Fabrication : Cutting, threading, grooving, forming, bending and joining of piping components to prepare pipe spools, at the workshop.

Spool : Subassemblies of transportable pipework to be fabricated as one piece.

Butt Weld : A weld, joining two pipes aligned approximately in the same plane.

Fillet Weld : A weld of approximately triangular cross section joining two surfaces approximately at right angles to each other, such as tee joint or corner joint.

Weld Pass : A single progression of welding along a joint, such as root pass, intermediate pass or cap pass. The result of a pass is a weld bead.

NDT : Non Destructive Test.

3. APPLICABLE CODES, STANDARDS, SPECIFICATIONS and PROCEDURES

ASME SECTION II PART C

ASME SECTION IX

ANSI/ASME B 31.1

ASME/ANSI B 31.3 (whenever applicable)

ASME SECTION V

AWS Standards

Project Piping Specification

Project Material Specification

Project HSE Plan

Project QC Plan

Project General Welding Procedure

Project Flushing & Hydrostatic Testing of Pipework

4. WORK PROCEDURE

4.1 Piping material traceability, handling and transportation

- Material handling and transportation activity shall be carried out by Material Group and material will be stored and protected by arehouse personnel.
- Materials will be stored in accordance with the applicable project procedures and specifications. Protective measures will be taken during transportation and handling of materials. Handling and transportation of piping materials shall be done by experienced field personnel and riggers.
- During the time of material receiving, the receiver shall verify that the materials are free of any damage, at correct size, as per the relevant packing list and as per purchase order.
- Flanges, fittings, bolting and gaskets shall especially be checked for quantity, defects, damages, rust, stain, etc.
- Raw material (especially pipes) will be stored at open storage areas considering their identification, marking and/or tagging system. Stocking will be done as per relevant specifications and vendor recommendations.
- When the time comes, materials shall be taken from Main Warehouse and transported to the workshop and/or site erection place.
- At the painting workshop, before blasting pipes, heat number or relevant indications (if any, and if required) shall be transferred to the inner edge surface of the pipe with suitable permanent paint markers. If this is not possible, to the each end of exterior surface of the pipes.
- During blasting, the pipe ends shall be well protected from the blasting effect by the use of caps or covered by any other suitable means.
- During fabrication process, if any cutting is carried out, stamps will be transferred to the cut portion as its original, with the permanent paint marker.
- Flanges and threads will be covered by suitable caps. Machined finish surfaces will be protected from physical damage and kept away from soil.
- Prefabricated spools and valves will be protected from water and soil entrance. Piping material will be stored off ground.
- Material handling group will transport materials to working areas after blasting and painting activity have been completed.
- Material traceability activity will be monitored by QA/QC Inspectors.

4.2 Piping workshop / field fabrication

- Prior to starting to fabrication and erection of any pipework, following shall be performed:
 - Related isometric (ISO) drawings to be issued as "For Construction".
 - Spool drawings to be produced in accordance with ISO drawings.
 - Materials indicated in the drawings should be available and their size, quantity and quality shall confirm the requirements given in the related drawings.
 - All materials to be used in pipework should have manufacturers' material certificates.
 - All materials to be used in the fabrication and erection shall be visually examined for any damage and internal cleanness.
- All linear dimensions locating positions of branches, bosses, flanged ends, instrument connections and changes in direction shall be maintained within a tolerance of +/- 3.0 mm.
- All angular dimensions of bends and branches shall be maintained within 0.25 degrees.
- Misalignment of flanges at the outside edge shall not be greater than 1.5 mm.
- Stainless steel prefabrication work including material storage shall be well separated from carbon steel prefabrication works, to avoid contamination such as zinc and chlorine to stainless and high Ni-Cr steel.
Below counter measures shall be taken during handling, storage, fabrication and field assembly of stainless steel material :
 - Suitable tools and equipment shall be selected for cutting, beveling, grinding and brushing works of stainless steel. Tools and equipment to be used for stainless steel and alloys shall be identified and separated from the tools and equipment to be used for carbon steel materials.
 - Stainless steel piping material mechanical cutting might be done by stainless steel disc and/or plasma cutting. After plasma cutting, approximately 1.5 mm of material shall be removed from the cut surface, by grinding.
 - Abrasive disc used for cutting and grinding of austenitic stainless or other high Ni-Cr steel shall not be used for carbon steels. Stainless steel pipework shall be cut to size and beveled generally by machining or grinding.
 - Stainless steel material storing place shall be well separated from painting area.
 - Stainless steel material shall be avoided from direct contact to ground, by using suitable separation such as wood or vinyl supports.
 - Edge preparation will be done in accordance with the specifications for piping work.
- Welding activities will be carried out in accordance with the project welding procedures specifications (WPS).
- All traceability identification for the weld joints and spooling shall be marked as per the project specifications, by the field production piping teams and checked by QC group.
- Handling of pipes shall be by slings. Soft-faced hooks may also be used for lifting.
- Welding activity will be performed by qualified welders (qualified in accordance with Section IX of the ASME Code and will be inspected, reported by field welding QA/QC inspectors, in accordance with the approved QA/QC procedures).
- Filler material will be selected in accordance with relevant WPS.
- Filler material will be stored in dry condition, delivered to welder by authorized filler material keeper in accordance with the related codes, standards or project specifications.
- Pipes over 2" will be fixed by external clamps for fit up. Pipes equal to or below 2" will be fixed by direct tack welding and/or bridges.
- Where external pipe clamps are used, at least root and second (hot pass) passes of the circumferential portion of the welded joint, which is not obstructed by the clamp, shall be completed before the pipe clamps are moved. Where internal pipe alignment clamps are utilized it shall not be removed until root and hot passes have been completed.
- During fit up, the longitudinal pipe welds shall be offset by at least 150 mm or 45° of rotation, whichever is greater.
- If used, reinforcing pads shall be provided with 6 mm hole for venting and testing purposes, which shall be suitably sealed after completion of pressure testing.
- Tack welding will also be done by qualified welders and welding electrodes for tack welding shall be the same as of actual welding electrodes.
- If used, materials for bridges will be the same material of the base metal.
- Protective facilities (tent, canvas) will be provided against the negative weather conditions such as wind, sand storm and rain, etc.

- Welding shall be stopped if wind speed exceeds 10 m/s for SMAW and 3 m/s for GTAW, (and if any dew-fall on the welded material are observed) unless appropriate measures are taken.
- If the ambient temperature drops below 5 degrees, preheating will be done for welding.
- Before welding fit-up, protections and weather conditions will be inspected by the Piping Supervisor and/or QC Welding Inspector.
- After welding, "Visual Inspection" shall be done as per ruling procedures.
- After completion of prefabrication and before releasing of spools, all the details related to identification shall be written and tagged.
- After QA/QC inspection completed, a relevant form "Internal Control Form for General and Dimensional Check of Prefabricated Piping Spools" shall be prepared together with the "Visual Inspection Form" and "NDT Request Form".
- After successful completion of non destructive test, a release form called "Painting Release Form" shall be issued by NDT Section to the Piping / Painting Group.
- Blasting and painting activity will be inspected by QA/QC inspectors, in accordance with the project specification requirements and piping painting procedure.
- Weld joints shall not be painted till the completion of relevant pressure test, unless otherwise officially approved by the Client.

4.3 Aboveground piping installation and assembly at site

Above ground piping installation and assembly will be done in accordance with the project specifications.

During the erection, utmost attention will be shown to protect the pipes and/or pipe rack, against damages and/or scratches.

Temporary pipe lanching stations will be required, when pipes to be lunched inside the pipe rack.

Whenever and wherever required, scaffoldings and work platforms shall be erected and used during piping installation.

Scaffolding will be done by qualified erectors and will be inspected and approved by the safety personnel, before use.

4.4 Heat treatment

Weld joints shall be preheated in accordance with related WPS. The preheat treatment shall be maintained over a distance of 75 mm each side of the weld.

Welds shall be subject to post weld heat treatment (PWHT) if so required in the related specifications and line lists.

Preheat and post heat operation will be done by qualified professionals and records will be well kept.

4.5 Support fabrication and installation

Pipe supports will be fabricated in accordance with the relevant drawings and/or specifications, at pipe support or steel structure workshop.

Fabricated supports will be marked and stored properly, for future use.

At the beginning of the piping activity, piping installation will be proceeded with temporary supports for pipe shoes, spring hangers, etc. At a later stage, permanent supports will be installed as per the relevant and/or applicable specifications and drawings.

Permanent support installation shall be done by the piping installation crew before pressure test, as per the relevant project specifications.

Support welding activity will be done by qualified pipe welders with respect to the relevant WPS and as per the project specifications.

Adjustment of adjustable type supports shall be done in accordance with the project specifications and vendor recommendation.

4.6 NDT and Pressure Tests

Visual inspection, RT(radiographic), LPT (liquid penetrant test) shall be completed in accordance with the project specifications before the pneumatic or hydro tests.

All piping NDT work executions in the field shall be recorded in the suitable welding/piping matrix to ensure the inspection activities have been carried out as per the Piping Specifications. After preparing the test packages, line checkers will do the punching and punch list will be prepared.

After the required punch items are cleared and the line is released for test by the QC department, pressure test shall be implemented in accordance with the specifications and standards.

After the pressure test; final punch clearance, reinstatement, paint touch-up, insulation works, etc. shall be completed as per the project requirements.

5. INSTALLATION of PIPEWORK

Above ground pipes:

- All pipes shall be examined before erection, to ensure that they are internally clean and free from rust scale and any other debris. Please refer to attached Build it Clean Procedure for details.
- During erection of pipework, suitable additional temporary supports shall be provided to ensure that no extra stresses are imposed on the pipe, or connected equipment.
- Where possible, pipework shall be erected on permanent supports designated for the line.
- All flanged joints shall be brought up flush and square so that the entire mating surfaces bear uniformly on the gasket. Then bolting to be done with uniform bolt tension.
- When bolting flange joints with spiral wound gaskets, the gasket shall be compressed evenly to the thickness of the guide ring. Gasket compression shall be spot checked during bolt tensioning.
- Flanges connecting to strain sensitive mechanical equipment, e.g. pumps, shall be fitted up in close parallel and lateral alignment prior to tightening the bolts. Tightening of bolt shall only take place with dial gauges fitted to the equipment's drive shaft coupling, in order to detect strain, to avoid permanent damage. To achieve this true alignment, advantage of "cut to fit" allowances and loose flanges shall be used. Flange connections to strain sensitive equipment shall be the last connection. It will be done with permanent supports.
- During installation, force shall not be used to align pipes to support locations.
- All openings in equipments which will be connected to the pipework, shall be clean and free from obstruction prior to being connection.
- Gaskets and mating flanges, seal rings and hubs also to be clean and free from defects.
- It shall be ensured that gaskets do not, under any circumstances, protrude into the bore of the pipe.
- All flange bolting shall be checked for correct grade and that they are free from damage. They shall be free to move through mating flange's holes.
- Each stud bolt shall be assembled with a projection of no more than one full thread beyond the nut at one end.
- All bolting shall be re-checked for tightness and correct tension, before pressure testing.
- Valves to be cleaned and stroked, prior to installation.
- Permanent pipe supports shall, where possible, be installed before the erection of the associated pipework.
- Heavy valves and fittings shall be adequately supported before the pipework is erected or subjected to pressure test.
- Metallic surfaces of supports, which will be inaccessible after erection, shall be prepared and coated before assembly of the component.
- Hanger rods shall be adjusted to hang correctly after tightening of all component parts, surplus threading may be removed.
- Spring support units shall be installed in accordance with the manufacturer's instructions and shall not have "stops" removed until completion of hydrotesting.
- All temporary supports shall be removed after the pipework has been pressure tested.

- In-line instruments shall not be installed prior to pressure testing of the pipework. During piping erection, dummy spools shall be fitted in place of in-line instruments, to facilitate pressure testing.
- Bolt torquing should be executed as below:
 - Align component parts and hold down,
 - Lubricate stud (or bolt) threads and area of nut engagement,
 - Lubricate face of nuts (or bolt head) using a suitable lubricant,
 - Install all bolts and nuts, finger tight.
 - Number bolts so that torquing requirements can be followed.
 - Apply torque in 25 % steps of the required final torque, loading all bolts at each step before proceeding to next step.
 - Tighten bolts in sequential order 0°, 180°, 90°, 270°, 45°, 225°, 135°, 315°. At each step, reach to the final torque value.
 - Use rotational tightening, until all bolts are stable at final torque level (two complete checks around is required.)
- Mechanical equipments' flange covers shall be kept until ready to connect the mating piping. During piping erection, a thin metal plate shall be inserted in between, to protect the equipment against ingress of debris.

Under ground pipes:

- All buried pipework shall be erected either on ground or in trench, whichever is suitable and applicable for wrapping of pipework.
- Coating and wrapping of pipework shall be performed according to related specification and manufacturers' instructions.
- Buried piping shall be examined prior to installation to ensure that they are undamaged and internally clean.
- Pipes shall not be subjected to shock loads during, lifting, transporting, or lowering into the trench bottom.
- Before lowering into the trench, bedding shall be completed by approved material.
- After the installation is completed, trench shall be backfilled with approved backfilling material. This material should be free from rocks or unnecessary materials for protecting pipe coating against any damage.

Field run pipes:

Field run pipes will be handled as below:

- Field run lines shall normally be restricted to non-critical pipework of 1.5" nominal bore and below. Galvanised pipe will be field run at size 3" NB and below.
- All fields run lines shall be installed in an orderly manner, consistent with good operation, neatness of appearance, safety of personnel, economy and usage of the minimum number of fittings consistent with provision for expansion and flexibility.
- All piping shall be arranged to facilitate supporting and shall be planned for ease of removal of equipment for inspection and servicing.

6. RESOURCES (DURING PEAK PERIOD)

6.1 Manpower

Manpower figures will be given based on the size and the nature of the Project.

Piping Supervisor for fabrication: X

Piping Supervisor for field erection: X

Piping Supervisor for hydrotest: X

Piping Team Leader: X

Pipe Fitter: X

Welder for piping: X

Welder for support fabrication: X

Helper: X

Painter: X

Reporter staff: X

Material Handling / Transport Staff: X
Pressure Test Technician: X
Painter: X
NDT and HSE staff and personnel : X

6.2 Equipment and machinery

Equipment and machinery figures will be given based on the size and the nature of the Project.
Welding machines (different types): X ea. (+ X ea. spare)
Welding rod, wire or electrodes: X ton (approximately)
Welding rod oven: X ea (+ X spare)
Welder portable oven (heated quiver): X ea.
Scaffolding material: (to be defined)
Grinding machine (big): X ea.
Grinding machine (small): ea.
Grinding machine (finger): X ea.
Oxyacetylene cutting set: X ea.
Pipe cutting machine: X ea.
Plasma cutting set: X ea.
Crane details: X ea. (with operators)
Crane mounted truck: X ea. (with the operator)
Forklift: X ea. (with the operator)
Trailer: X ea. (with the driver)
Others:

7 INSPECTION & QUALITY CONTROL

Site Quality Plan and all relevant specifications shall be followed by the whole personnel who takes part in the piping works.
Necessary registration of the tests and relevant forms shall be done by the QA/QC department and all records shall be kept in the traceable files.

A pipework data book which will be submitted to the Client after the completion shall be produced by QC department. It will be prepared as two copies.

Data book shall include the following:

- a) Test package of each test circuit (including welding and NDT reports),
- b) Manufacturer certificates of all materials supplied by the Contractor,
- c) Welding Procedure Specifications,
- d) Welding Procedure Qualification Records,
- e) Welder Performance Qualification Records,
- f) Related Drawings: "Red marked (as built)" copies,
- g) All issued QA/QC forms given in Quality Plan,
- h) Welding wire and electrode manufacturer certificates.

8 WORK SAFETY

In this regard, the "Health, Safety and Environment (HSE) Plan" and the terms and conditions of the Contract shall be followed very closely.

The maximum attention shall be given to the safe work during the execution of the work.

All employees shall be trained, controlled and warned in order to keep the maximum level of work safety at the site and using PPE (Personal Protection Equipment) supplied to them.

1.5 meters above from ground level, safety harnesses with shock absorber and 2 lanyards will be used.

Strong and sound scaffolding and work platforms shall be erected as per relevant specifications, by certified scaffolders, whenever needed.

Scaffolding erection activity shall be implemented by the experienced scaffold erectors.

Scaffoldings shall be inspected by safety personnel and green tagged before the use. The red tagged scaffolding will not be used.

Safety barriers shall be used for working areas, where necessary.

Power cables will be protected against any damage.

Permit to Work System (PTW) will be applied as per Contract conditions
Accident and Incident Management plan will be followed.
The risk analysis specific to each Method Statement shall be given.

9 ATTACHMENT

Build it Clean Procedure

ÖRNEK