EK 27. STATİK HİDROTEST (HYDROTEST) PROSEDÜR ÖRNEĞİ

STATIC HYDROTEST PROSEDURE

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1.0 SCOPE AND PURPOSE

This work procedure specifies and covers the requirements and extent of hydrostatic strength test (hydrotesting) of above ground metallic piping works after field erection completion.

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

All personnel involved in the set-up, application and inspection of pressure testing shall be familiar with the Quality Control Procedure and other applicable Specifications, Standards, Procedures and/or Inspection Test Plans (ITP).

2.0 REFERENCE DOCUMENTS

ASME SECTION II PART C
ASME SECTION IX
ANSI/ASME B 31.1 , ANSI / ASME B31.8
ASME/ANSI B 31.3 (whenever applicable)
ASME SECTION IX , ASME SECTION V
AWS Standards
Quality Control, Inspection and Test Plans and Programs
Work Procedure for workshop, field fabrication and installation of aboveground piping.
Visual examination and inspection procedure for Piping Works.

3.0 TEST REQUIREMENTS

- Hydrostatic strength test shall be performed on all newly constructed plant piping, in accordance with the requirements of contractually referred standarts.
- All hydrostatic tests shall be carried out by calibrated pressure gauges.
- Only potable water (50 ppm chloride ion maximum) shall be used for pressure testing of austenitic stainless steel and/or alloy piping.
- The test water shall be drained and pipe to be dried without using any heat source, immediately after the test.
- The relevant test packages for the identified test loops shall be prepared by Contractor. The test package mínimum content or documentation shall be as follows :
    - Cover Sheet,
    - Check List for Release,
    - Piping Test Report Form,

- Layout of area, relevant to the Test,
- Extract of Line List for the portion to be tested,
- Relevant Marked-up P & ID,
- List of isometrics within the Test Package,
- Red Marked-up Isometric Drawings,
- Relevant Weld Log and NDT Summary Report,
- Construction Punch List,
- Precommissioning Punch List,
- Reinstatement Certificate.

4.0 PRESSURE TEST

4.1 Preparation for Pressure Test

- Prior to pressure test start, it shall be confirmed that NDT, heat treatment, other necessary inspection, line check, etc. as required, have been completed.
- Punch lists prior to testing shall be prepared and followed for completion or corrective action, and the lists shall be closed before testing.
- All spools and piping shall be clean and cleared of debris by blowing with air or flushing water (and drying) as appropriate.
- For preventing possible deformation of piping due to the weight of test water, temporary supports shall be provided when necessary.
- For pressure tests on a piping system provided with check valve, pressure shall be furnished from the upstream of the check valve, or the internal mechanism of the check valve shall be removed.
- Spring supports shall have their preset shipping locks, during pressure test.
- Filters shall be either blocked or have their internals removed.
- Necessary measures shall be taken not to allow air to remain in the high points of the piping system during hydrostatic test. For this purpose, the test fluid shall preferably be injected at the lowest point in the system and the wáter illing will be done till wáter comes from highset vent valve.
- The final gaskets shall be installed only on the valves that are included in the test.
- Temporary gaskets shall be used at the battery limits or on the equipment connection points.
- Direct welded supports should be completed before test.
- Punch lists prior to hydrostatic testing shall be prepared, shall be followed for completion or corrective action, and the lists shall be cleared, before testing.
- Equipment (columns, drums, heat exchangers, pumps, compressors, generators, etc) that is not to be tested, shall be either disconnected from the piping or isolated by blinds or other means, during the test.
- Allowable maximum period of the pressure gauges to be used for pressure test without calibration is 6 (six) months. Gauges shall be scaled to the range of 1.5 to 3 times the test pressure.
- A minimum of two gauges shall be used for one continuous blocked section of piping under test. Gauge shall be tagged by a serial number with the date last calibrated.
- The thickness of blind plates used for pressure test shall have sufficient thickness.
- When testing at a high elevation (minimum 2 meters above the ground level), strong and safe scaffolding shall be prepared.
- Filling and pressurizing shall normally be done with pumps. The flow capacity of the pump shall be adequate to provide a reasonable pressurizing rate. The pressure rating of the pump shall be higher than the anticipated maximum test pressure.
- The piping and weld joints, for example; tie-in point, final connection point, connection point with equipment and etc., which can not be subjected to hydrostatic test or other test, will not be hydro tested. These joints shall be examined by RT if Butt Weld (BW) and shall be examined by PT, if fillet weld joint or branch connection.

4.2 General

- All joints of piping including welds shall not be hot or cold insulated and/or wrapped until the satisfactory completion of pressure test, unless the opposite is approved by the Client.
- Touch-up and repair painting shall preferably be carried out after hydrostatic testing.
- Pressure tests on the piping system shall be executed with reference to the relevant P & ID, Line List and Isometric Drawings which specify the following items;
  1) Test pressure and test fluid (water),
  2) Location of blinds to be inserted,
  3) Valves to be opened or closed during the tests,
  4) Location of additional vents and drains other than indicated on the P&ID and isometric drawings, and/or piping lay-out drawings,
  5) Location of instruments which are to be dismounted or isolated (If not asked by the Client, Contractor shall make his own proposal).

- Piping Test Package including above and related welding/inspection record for weld joints to be tested, shall be provided and submitted by Contractor to Client for approval, prior to the test.
- If any repair or additional work is performed after the pressure test, the affected piping shall be subjected to additional pressure test, except for minor repairs or additional works approved by Client.
- The following instruments shall be removed or isolated by inserting blinds to protect them from pressurization:
  a) Relief valves,
  b) Control valves,
  c) Temperature or flow devices including orifice plates,
  d) Expansion joints,
  e) Level gauges and level controllers,
  f) Rupture disk,
  g) Pressure indicators

4.3 Application Procedure

- Filling and testing of the piping systems shall be carried out on the upstream side of check valves. The test water shall be entered at the lowest point to the system to minimize air being trapped. All vents to be left open during filling, while the drain valves are closed.
- All valves in the system not being used for isolation shall be left open.
- Minimum two calibrated manometers (gauges) shall be used for one continuous blocked section of piping under test.
- The test water shall be introduced to the system, by means of the test set-up and test pump.
- When the water reaches to the vents and starts to come from, without any air bubbles, vents shall be fully closed one by one.
- When the system is full of water, a reasonable time will be awaited for necessary temperature stabilization.
- After the hold time period, the test line shall be gradually pressurized at a uniform rate to the test pressure at the lowest point.
- When test pressure is reached and stabilized, a preliminary test hold period may commence for maximum 5 minutes. During this period, test medium may be added as required to maintain the minimum test pressure.
- After this period, and being sure that everything stabilized in the system, the test pump shall be disconnected or isolated from the piping system under test, by closing the isolation valve on the test set-up or between the pump and piping system.
- Test duration or test hold period shall be started right after the pump isolation and it shall be preferably minimum 10 (ten) minutes. During this time period, the pressure shall be monitored and the test section shall be checked for leakage.
- If, during the hold period, leakage is indicated, the pressure may be reduced while locating the leak. After the leak is repaired, a new hold period shall be started at the full test pressure.

- During the test period all welded parts shall be visually and by hand (if possible, to check for sweating), inspected.
- Client shall witness all pressure tests.
- All test data shall be registered in the “Hydrotest Data Book” for which necessary format shall be clarified by Client, otherwise it shall be proposed by Contractor.
- Traceability of the test package shall be supplied including the test records.

5.0 POST TEST ACTIVITIES

- Following acceptance of a successful piping test, pressure will be released from vent valves and piping system will be drained properly from drain valves af.
- It shall be thoroughly drained of water and no pockets of fluid shall be allowed inside the piping system.
- New gaskets are to be installed wherever piping connections are separated (broken) after testing. This shall be witnessed by the Client.
- Temporary test supports or any other means for hydrostatic testing shall be disconnected from the system.

6.0 INSPECTION & QUALITY CONTROL

Quality Control, Inspection and Test Plans shall be followed in connection with the all relevant specifications, procedures by the whole responsible personnel, taking a part in the piping erection activities.

Necessary registration of the tests and relevant forms shall be followed by the QA/QC department and all shall be kept in the full traceable files.

7.0 WORK SAFETY

- “Project Health, Safety and Environmental (HSE) Plan” and the terms and conditions of the Contract shall be followed very closely.
- The maximum attention shall be given to the work safety during the execution of the the work.
- It is of utmost importance that all the necessary equipment for the execution of the work shall be kept in safe operation mode, any risk of accident, hazard and/or danger shall be avoided and necessary measures shall be taken to prevent the accidents on the site. All employees shall strictly be controlled and warned in order to keep the maximum level of work safety at the site and, wearing and using of all personnel protection equipment.
- Strong and sound scaffolding and working platforms shall be erected by certified scaffolders, whenever the working on the scaffolding and/or platform is needed.
- The following HSE Plans and/or working instructions shall also be applicable and to be followed:
  i) Working at elevated places,
  ii) Construction Permit to Work System,
  iii) Accident and incident management,
  iv) and all others.
- The safety risk analysis specific to this procedure shall be read and implemented together with this document.
- To prevent mistakes and confusions in performing the test, an experienced person shall be appointed for opening and closing valves, and no other person shall be permitted to operate the valves, unless otherwise instructed.
- The test pumps shall be operated by the skilled and experienced personnel only.
- Necessary precautions shall be taken against the possible electrical hazard.
- Piping or test responsible shall participate in, administer and witness all activities.
- No flange bolts shall be tightened under pressure.
- The system test pressure shall not exceed the maximum allowable test pressure for the weakest component included in the test.
- The test lines shall be depressurized immediately after the successful completion of test.
- In disposing and/or evacuating the test air, maximum care shall be taken not to damage any other structure and/or equipment, etc.

- All pressure tests shall be conducted with due regard to the safety.
- Although the hydrotest is not as dangerous as air test, still some standards require a safety zone to be declared around the test head. This may be important when the pipes to be tested are with the big diameter and the water volume is high.
  Recommended safety zone for water test from the test heads is as below formula:

  Safety distance (**m**) = (0.15) x (**D**) x (**a**)^0.4 x (**p**)^0.6
  where ;

  D - internal diameter (m),

  a - length (m),

  p - test pressure (bar)
- For this purpose, Safety Department shall inform accordingly and necessary warning signs and safety barriers and/or barricades shall be arranged to identify the test area.