EK 28. HAVA TESTİ (PNEUMATIC TEST) PROSEDÜRÜ ÖRNEĞİ

GENERAL PNEUMATIC TEST PROCEDURE for PIPING

INDEX

1.0 SCOPE AND PURPOSE

This work procedure specifies and covers the requirements and extent of pneumatic strength test of piping works. Test will be done after completing field erection of piping.

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 Inspection Test Plans (ITP).

Due to the danger and risks of air test, test will be limited to the lines, which, hydrostatic test is not feasible or practicable. One of the main reason for air test is, if the line to be tested is large and due to amount of the test water, weight of the water cannot be supported by existing structures or supports. Another reason can be, if the line to be tested is at very high elevation and the water filling is impracticable.

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

ASME SECTION IX
ASME SECTION V
AWS Standards
The Contract
Quality Control Manual
Inspection and Test Plans
Non-Destructive Examinations or Tests Plan
Visual Examination and Inspection Procedure for Piping Fabrication and Welding Works
Line lists

3.0 TEST REQUIREMENTS

Pneumatic strength test shall be performed prior to initial operation, in accordance with the requirements of ASME B31 Code, unless otherwise stated.
All pneumatic tests shall be carried out by calibrated pressure gauges.
Client shall supply **"Identified Test Lines and/or Loops with Test Limits" (**in other words; **"Test Loop Identification" Study on the relevant P & ID's)**. Contractor shall prepare test packages and relevant documentation, based on this information.
The relevant test packages for the identified test loops and/or circuits shall be prepared by Contractor. The test package 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, it shall be confirmed that NDT, heat treatment, other necessary inspection, line check, etc. as required have been completed.
- Punch lists prior to pneumatic 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 (oil free) dry-air as appropriate before and/or after erection.
- 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 from the test or have their internals removed.
- 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.
- 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.

- Pressure gauges to be used for pressure test will have calibration certificate for maximum 6 (six) months. Gauge shall be tagged by a serial number with the date last calibrated.
- Gauges shall be scaled to the range of 1.5 to 3 times the test pressure.
- Minimum two gauges shall be used for one continuous blocked section of piping under test.
- It will be assured that 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.
- Pressurizing shall normally be done with air compressors (and/or compressed nitrogen gas tubes). The flow capacity of the compressor shall be adequate to provide a reasonable pressurizing rate. The pressure rating of the compressor shall be higher than the anticipated maximum test pressure.
- The pneumatic test pressure shall be 110% of design pressure, except specifically instructed that air piping shall be tested with compressed air at the maximum operating pressure
- Non-pressure piping system during operation such as vent line, drain line and etc., will not be tested, with the approval of Client.
- 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 pneumatic test or other test will be controlled as;
    - Butt Weld (BW) shall be examined by RT.
    - Fillet weld joint and branch connection shall be examined by PT.

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.
- Touch-up and repair painting shall be carried out after pneumatic testing, if not instructed otherwise.
- 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 (air),
    2) Location of blinds to be inserted,
    3) Valves to be opened or closed during the tests,
    4) Location of additional vents and drains (on the test set-up) 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.

    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

- Air filling and testing of the piping systems shall be carried out on the upstream side of check valves.
- All valves in the system not being used for isolation shall be left open.
- A pressure relief device shall be provided having a set pressure, plus 10% of the test pressure on the test section.
- Minimum two calibrated manometers (gauges) shall be used for one continuous blocked section of piping under test.
- The test compressor supplying oil free dry-air shall be introduced to the system.
- Pressure shall be increased gradually, in stages. In the course of raising up the test pressure, the first check shall be performed at the stage where the pressure does not exceed 2 kg/cm^2 (air leakage shall be checked by the application of soapy water to the joints).
- The pressure in the test section shall be raised to not more than 80% of anticipated test pressure (if necessary, temperature stabilization shall be provided) and it shall be held for a time period to determine that no major leaks exist.
- During this time period, the pressure shall be monitored and the test section shall be checked for air leakage. In case any major leaks found, test will be hold and it shall be repaired.
- After the hold time period, the test line shall be pressurized at a uniform rate to the test pressure at the lowest point.
- When test pressure is reached and stabilized from pressuring operations, a preliminary test hold period may commence for minimum 10 minutes. This is to achieve uniform stress in the piping system and also for checking leakage.
- After this period, and being sure that everything stabilized in the system, the test compressor shall be disconnected or isolated from the piping system under test by closing the isolation valve on the test set-up or between the compressor and piping system.
- Test duration or test hold period shall be started right after the compressor isolation and it shall be kept until all joints are checked one by one.
- If, during the hold period, leakage is indicated, the pressure may be reduced while locating the air 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 soap tested and visually inspected.
- Client and Contractor shall witness all pressure tests, unless otherwise stated.
- All test data shall be registered in the “Pressure Test Data Book” for which necessary format shall be given 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, the tested lines shall immediately be depressurized and vented in a gradual and safe manner.
- New gaskets are to be installed wherever piping connections are separated (broken) after testing.
- Temporary test supports or any other means for pneumatic 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 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 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 project and 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/or using of personnel protection safety equipment.
- Strong and sound scaffolding and working platforms shall be erected whenever the working on the scaffolding and/or platform is needed for the test and inspection.
- The safety risk analysis specific to this procedure shall be given separately; it will directly refer to the procedure and shall be read and implemented together with this document.
- All pressure tests shall be conducted with due regard for the safety of people and property. Appropriate precautions shall be taken to keep people not engaged in the testing operations out the testing area while conducting the pneumatic test. Test safety zone will be calculated in accordance with related standards and specifications. Since the pipes under pneumatic test, behave as pressurized vessel, there is a big danger and risk of explosion. Therefore, different than the hydrotest, safety zone during pneumatic test is very large and during the test, all this area to be completely emptied, the work has to be totally suspended at this zone. Due to this large safety zone requirement and suspension of the work, pneumatic test is considered as a last option for strength test.
- Test affected zone will be clearly marked and / or barrierred to avoid the entrance of people not working in the test process.
- For this purpose, Contractor Safety Department shall be informed accordingly, necessary warning signs and safety barriers and/or barricades shall be arranged to identify the test area.
- 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 compressor(s) shall be operated by the skilled and experienced personnel only. If the compressor is electrically driven, necessary precautions shall be taken against the possible electrical hazard.
- Piping or test responsible shall participate in, and shall witness all activities for the pneumatic testing.
- No flange bolts shall be tightened under pressure.
- 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.
- The risk analysis specific to this procedure shall be given separately; it will directly refer to the procedure and shall be read and implemented together with this document.