



## 1.0 ACTIVITY DESCRIPTION

- 1.1 This document provides basic safety guidelines for the safety of all personnel and the general public during pressure (e.g., hydrostatic, pneumatic) testing operations.
- 1.2 Plan and implement each pressure-testing event in a manner that mitigates unnecessary exposure to procedural hazards.
- 1.3 All pressure tests must be conducted with due regard for the safety of life and property.
- 1.4 All personnel have, and should use, "Stop Work" authority whenever there is concern for safety during pressure testing operations.
- 1.5 This document is not meant to supersede or replace regulatory requirements, nor is it intended to be all inclusive of the applicable regulatory requirements. It is intended to be supportive and complimentary to such requirements.

## 2.0 HAZARD ASSESSMENT

- 2.1 Hazard assessments are performed to identify and mitigate perceived and actual environmental and operational hazards.
- 2.2 A Job or Test Plan, including procedures and controls related to safety, is prepared prior to conducting pressure testing.
- 2.3 Hazard assessments are performed at the beginning of each shift.
- 2.4 Review and update hazard assessments when:
  - Each new task is begun.
  - There is a change in how a task is performed.
  - Changes in site or environmental conditions occur.
  - A specific need or concern is identified (i.e., as needed to ensure the safety of personnel or property).

## 3.0 ROLES AND RESPONSIBILITIES

- 3.1 **Management Responsibilities** *(includes all personnel with a supervisory role)*
  - 3.1.1 Empower all personnel with the authority to "Stop Work" whenever hazardous conditions or potentially hazardous conditions are identified.



# Pressure Testing (Hydrostatic / Pneumatic) Safety Guidelines

- 3.1.2 Provide for and require that signs, barricades or other protective barriers are placed in a manner and at a distance sufficient to demarcate a safe zone to protect personnel and the public from unanticipated pressure release or equipment failure.
- 3.1.3 Provide for and require the installation of devices that mark the limits of the exclusion zone.
- 3.1.4 Keep unauthorized personnel out of the test area.
- 3.1.5 Inform all affected site and community personnel of the planned test.
- 3.1.6 Provide for and require that equipment and materials are arranged to give unobstructed access/egress during testing and in the event of an emergency.
- 3.1.7 Establish lines of communication between the Owner/Facility, Contractor, and local authorities.
- 3.1.8 Provide for and require the use of reliable transportation and communication systems during all aspects of the testing event.

## 3.2 Health & Safety (H&S) Responsibilities

- 3.2.1 A Health and Safety Professional is involved with performing the hazard assessment.
- 3.2.2 Provide technical support for interpretation of pressure testing safety guidelines.
- 3.2.3 Evaluate the effectiveness of the job-specific safety plan (or equivalent).
- 3.2.4 Immediately stop and correct any safety related non-compliant activities.

## 3.3 Employee Responsibilities

- 3.3.1 Do not enter or otherwise be present at a pressure-testing event unless you are part of the testing team.
- 3.3.2 Personnel performing the test should approach the pressured line only in the performance of their duties. Where possible, personnel should use safety barriers for protection from the pressurized line and position the testing equipment in such a manner so as to minimize potential hazards.
- 3.3.3 Review safety requirements of the site-specific test plan (see Section 4.6).
- 3.3.4 Do not work over or near where pressure testing is being conducted.
- 3.3.5 Wear the PPE as appropriate for the task being performed.
- 3.3.6 Attend required training before working on the task (see Section 5).
- 3.3.7 Report any non-compliant H&S activities to a Supervisor.



## 4.0 HAZARD MITIGATION

### 4.1 General

- 4.1.1 Suspend a test when the testing personnel (including but not limited to: contractor, contractor's agents) or equipment are not working in a safe manner.
- 4.1.2 Consider the forces that would be present if any portion of the system failed while filling, under test, depressurizing or dewatering. Also consider potential for water hammer, potential for leakage of isolation valves, variable system pressures, potential for fill and dewatering pig velocity changes and other site specific conditions.
- 4.1.3 When performing pneumatic tests, the piping shall be inspected to determine if the inside surfaces are contaminated with a combustible or flammable material (e.g., iron oxide, condensate). If found, remove such materials prior to air testing.
- 4.1.4 Never tamper with or tighten any fittings (i.e., connections, bolts, hoses) while component is under any pressure.
- 4.1.5 Never tighten connections that are under pressure. If a leak develops, you must depressurize to a safe level and then re-tighten.
- 4.1.6 Wear hearing protection (which may include double hearing protection) that is adequate to reduce the noise below 80 decibels.
- 4.1.7 The pressure recorders and deadweight gauge shall be located at a safe distance least 100 feet from the facility being tested.

### 4.2 General Worksite Safety

- 4.2.1 Incorporate general worksite safety precautions and procedures, as applicable.
- 4.2.2 Verify that test equipment and materials are rated to withstand the test pressures.
  - Verify that all supply lines and hose connections are secure with retaining devices before and during the test.
  - Visually inspect and ensure soundness and proper installation and valve positioning of all equipment used.
- 4.2.3 Adequate lighting shall be available throughout testing operations.
- 4.2.4 Safety equipment and supplies should be readily available and should include, but are not limited to:
  - Emergency spill kit.
  - Fire extinguisher.
  - Ladders.
  - Mobile light plants.
  - Whip checks.



# Pressure Testing (Hydrostatic / Pneumatic) Safety Guidelines

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- Warning signs and barricades.

4.2.5 Install mats or utilize secured ladders for access to test header valves. If using mat bridges across the excavation, handrails must be installed if elevated 6' above a lower level.

4.2.6 Restrain or otherwise secure fill and discharge lines and/or hoses.

4.2.7 Verify the pressure ratings of hoses, fittings, gaskets, and other manifold materials.

4.2.8 Verify pressure rating of facility being tested.

### 4.3 Signage

4.3.1 During pressure testing events, distinct warning signs, such as DANGER – HIGH PRESSURE TESTING IN PROGRESS must be posted at the test site and additional locations identified in the job specific safety plan.

4.3.2 When testing in a populated area, an extensive public relations campaign (e.g., warning signs, barricade tape, strobe lights, and/or security guards) may be required to inform and protect the public from hazards associated with testing activities.

### 4.4 Exclusion Zone

4.4.1 Precautions should be taken to see that persons not directly engaged in the testing operations remain out of the test area during the test period.

4.4.2 A minimum distance of 100 feet shall be maintained between facilities that are being tested and the personnel conducting the test. The safe distance may be increased and the temperature probe, manifold and recorders may have to be set back further than 100 feet due to potential projectiles or extreme volume/pressure.

4.4.3 Restrict access to the immediate area involving the pressure test (i.e., test shelter, manifolds, pressure pumps, instruments, etc.) to only those persons actively engaged in the testing operation.

### 4.5 Notification

4.5.1 Residents within close proximity of the facility being tested, and state and local enforcement agencies, if applicable, shall be advised by the Owner/Operator of the testing program and kept informed of the progress, as necessary.

### 4.6 Safety Planning / Site-Specific Test Plan

4.6.1 Develop and deploy a site-specific test plan including descriptions of safety procedures and requirements.

4.6.2 Before attempting any test, the Testing Supervisor will review the test specifications and procedures with the Test Inspector, Chief Inspector, and any other relevant personnel to be certain that all equipment is adequate and duties are organized and understood.

4.6.3 Inform all personnel of assignments, responsibilities, and test requirements.

4.6.4 Precautions associated with potential weather extremes should be considered and addressed in the site-specific test plan.



## 4.7 Pre-Test Checks and Inspections

- 4.7.1 Prior to commencing testing operations, the Company Representative and /or Contractor shall inspect test heads to confirm all components are in good condition and meet working pressure requirements.
- 4.7.2 Confirm that the following conditions are checked prior to testing:
- There are no unrestrained or Victaulic™ (or equivalent) coupled fill lines.
  - Fill lines are able to contain initial water pack pressure.
  - Manifolds and other facilities are properly installed and will be adequately protected from damage in the event that violent failures or water surges occur.
  - Methods of isolating facilities being tested from test equipment and pumps are adequate.
  - Adequate methods for verification of pig position in the manifolds are in use. The exact location of the pig(s) shall be measured when loaded in the test header. The position, type, and direction of the pig(s) shall be indicated with a permanent type marker on the outside of the test header.
  - Dewatering discharge lines are properly restrained, cribbed or anchored.
- 4.7.3 Inspect and x-ray all temporary welds on test headers subject to test pressures.

## 4.8 Pressure Testing Safety Issues and Mitigation Recommendations

### Test Manifold Construction

- 4.8.1 A welded connection is recommended as the first connection to the test manifold.
- 4.8.2 Prior to commencing hydrostatic testing operations, the Company Representative and /or Contractor shall inspect test heads to confirm all components are in good condition and meet working pressure requirements. This will include an inspection and test of heads / manifolds to ensure that no components (e.g., gaskets, o-rings, fittings, valves) will leak or cause loss of test water and that the components conform to specified safety requirements.
- 4.8.3 If the 1<sup>st</sup> connection to the manifold is screwed, the following should be performed after each test:
- Break apart the manifold equipment.
  - Reassemble the manifold with new equipment.
  - Inspect/test the equipment to confirm all pieces are structurally sound and functioning properly.
- 4.8.4 High-pressure pipe and fittings shall be used for connection of the pressure pump, manifolds, and test equipment.
- 4.8.5 If the testing manifold contains a longitudinal seam, the test equipment shall be located on the side opposite the seam, if possible.



# Pressure Testing (Hydrostatic / Pneumatic) Safety Guidelines

- 4.8.6 Inspect the make-up of all screwed connections.
- 4.8.7 Material certifications should be confirmed as appropriate for use in pressure testing operations.
- 4.8.8 Vent valves shall be installed and opened at the appropriate time when stored energy can be isolated and/or trapped between two points such as valves, skilllets, etc.
- 4.8.9 When using a pressure relief valve (pop-off valve), it should be set to a pressure just above maximum test pressure. This will ensure that the pipeline and testing equipment will not exceed its maximum pressure ratings.
- 4.8.10 During pneumatic tests, a regulator shall be installed in line to protect testing equipment and the facility being tested.

## **Depressurizing / Dewatering**

- 4.8.11 All temporary fill and dewater piping should be connected with welded/screwed joints.
- 4.8.12 Verify the length and integrity of welded/screwed connections prior to depressurizing.
- 4.8.13 Properly de-pressurize connecting lines before attempting to seal or break joint components.
- 4.8.14 When bleeding the pressure from a section of the line, use extreme caution, especially when deflectors such as ells are used. Slowly bleed pressure following a test.
- 4.8.15 Confirm that the diversion of water and/or gas will follow a safe pathway (e.g., use of 90° or 45° angles).
- 4.8.16 Always verify that complete depressurization has occurred through the use of pressure gauges and visible checks.
- 4.8.17 The atmosphere shall be monitored for safety during any blow down, bleed off or depressurization.
- 4.8.18 During the initial planning stage of a de-watering operation, an analysis of the existing and temporary piping system should be performed to identify the pressure associated with fluids and other forces that could adversely affect the integrity of the pipeline or the stability of the drainage and its components.
- 4.8.19 Securely support and tie down dewatering lines at the discharge end to prevent uncontrolled movement during dewatering.
- 4.8.20 The following guidelines should be followed in de-watering activities:
  - **Anchor the de-watering lines.** It is accepted industry practice to adequately anchor or secure de-watering piping to prevent movement and separation of the piping. Establish effective anchoring systems based on expected forces and ensure that the systems are used during de-watering projects.
  - **Ensure condition of couplings and parts.** All couplings and parts of the de-watering system need to be properly selected for their application. The associated piping which the couplings connect is a significant variable in the entire mechanical piping system.



# Pressure Testing (Hydrostatic / Pneumatic) Safety Guidelines

The couplings are manufactured in a controlled environment, and variations in the quality of the couplings should be limited. Ensure that couplings are within manufacturer's tolerances and free of damage that may result in connection failure.

4.8.21 Notify all personnel that the area is all clear.

## 5.0 TRAINING

- 5.1 Employee training should highlight the hazards of hydrostatic testing, dewatering facility designs and techniques, piping coupling and anchoring methods, hazard identification and mitigation.
- 5.2 For individuals involved with de-watering activities, provide adequate employee training on de-watering installation designs and techniques, including proper coupling and anchoring methods. Ensure that personnel understand the potential hazards of improperly installed de-watering systems, provide personnel a means of determining whether the pipe groove meets manufacturer's tolerances, and the procedures they should implement to protect themselves and others working around them.

## 6.0 REFERENCES

Current versions of the reference automatically supersede the reference listed below.

### 6.1 Occupational Safety and Health Administration (OSHA)

- 6.1.1 *Hazards Associated with De-Watering Pipe Lines*, Safety and Health Bulletin SH 1B 06-21-2004 / Advisory Bulletin ADB-04-01

## 7.0 HISTORY OF REVISIONS

Number	Date	Description
0	September 2012	Initial publication of this INGAA Foundation Construction Safety Consensus Guidelines document.