



Standard Operating Procedure
Leak Testing – Hydrostatic

SOP #: 6.004 Rev. 3
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Approval

Approving Authority	Name	Signature	Date
Quality Assurance Manager	Steve Washington		11 SEP 2023
VP Process Systems & Industrial Controls	Kerry Coltun		19 SEP 2023
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Revision History

Revision #	Description of Change	Effective Date	DCR#
0	Original Issue	22APR1999	-
1	Data modifications	26JUN2002	-
2	Data modifications	03JUL2003	03003
3	Add Revision History, Revise Header	02OCT2023	22002



- 1 Purpose
 - 1.1 To establish a standard procedure for hydrostatic leak testing of hydronic piping (e.g. heating and cooling piping).
- 2 Scope
 - 2.1 This procedure applies to all Therma projects requiring a hydrostatic leak test for the hydronic piping.
- 3 Responsibility
 - 3.1 Therma's general foreman is responsible for performing the tasks listed herein.
 - 3.2 Project Manager is responsible for coordination with Owner, GC & Jurisdictional Authority as required to witness testing start and finish.
- 4 Reference
 - 4.1 California Mechanical Code, Section 1201.2.8, Chapter 12, Current Ed.
- 5 Safety
 - 5.1 Foreman shall maintain safe working conditions throughout the process of leak testing including provisions for pre-task planning, hazard marking/signage and awareness, LOTO, pre-test inspections and barricades, etc.
- 6 Procedures
 - 6.1 Review the customer's hydrostatic leak test requirements and the type of test medium to be used for each of the hydronic piping.
 - 6.1.1 For austenitic stainless steels, the test medium shall be treated to address possibility of stress corrosion cracking issues resulting from exposure to chlorides and halides.
 - 6.2 If required, use a calibrated test gauge with temperature compensation, one-pound increments and current Calibration Certificate from the Quality Control Department.



- 6.2.1 Test Gauge Calibrated range should be approximately double the test pressure and shall have minimum range 1.5x test pressure and maximum range 4x the test pressure.
- 6.2.2 The test gauge shall be a high accuracy test gauge verified to be tracking properly.
- 6.2.3 Record test gauge ID#, calibration date, range and Manufacturer/Model on the Pressure Test Report Form # FN 6.004.1.
- 6.2.4 Ensure that the calibration is NIST traceable.
- 6.3 Complete Leak Test Report Form # FN 6.004.1 as much as possible prior to Pre-Test and Test.
 - 6.3.1 If required by project specifications, mark up a dedicated set of drawings (e.g. P&ID) showing the limits of the test, by using a colored marker. Indicate all removed devices on the P&ID with <R> next to the device.
- 6.4 Pre-test preparation and visual inspection.
 - 6.4.1 Inspect the piping systems to be tested for visual defects and ensure that all connections are tight.
 - 6.4.2 Remove any instrumentation or equipment, which may be damaged by higher test pressures. This includes gauges, sensors, tank rupture disks, regulators, etc. Open and cap all valves and ports.
 - 6.4.3 Attach “PRESSURE TEST IN PROGRESS” tags on all branch or bleed valves.
 - 6.4.4 Be sure to notify the owner or owner representatives to witness and sign the pressure test log if required.
 - 6.4.5 Examine test equipment to ensure that it is tightly connected.
 - 6.4.6 Pre-Test or Gross Leak Test - Pneumatic
 - 6.4.6.1 If ‘press’ type fittings are within test boundary, preliminary pneumatic testing is required, see SOP 6.010.



6.4.6.2 Metallic Materials maximum pre-test pressure: 25 psig

6.4.6.3 Non-Metallic materials

- **Maximum Pre-test Pressure:** 5 psig

6.4.6.4 Test Fluid. The gas used as test fluid, if not air, shall be nonflammable and nontoxic.

- 6.4.6.4.1 Use Nitrogen N₂ or Carbon Dioxide CO₂ gas as test medium. For High Purity or Hygienic piping, use only certified high purity gas for testing, record cylinder # and attach certificate of purity to the test report.

6.4.6.5 Slowly pressurize the system with test gas to raise pressure to pre-test pressure.

6.4.6.6 Allow system pressure to stabilize for a minimum of 1 hours.

6.4.6.7 If system pressure has dropped, add more air to maintain pre-test pressure.

6.4.6.8 If the system pressure continues to drop, inspect all joints for leaks using commercially available test leak solution or a soap and water mixture.

- 6.4.6.8.1 Identify leaks found, safely vent system and make repairs to leaking joints. Repeat until leak free.

6.4.7 Once the system has been confirmed to be leak free, safely vent pneumatic pre-test pressure and prepare for filling, venting, etc.

6.4.8 Whenever possible vent air from the high spots and fill from valves in the lower locations to force the air out of the system.

6.4.9 Fill piping system with tap or industrial cold water unless otherwise specified by the owner.

6.4.10 If water cannot be used due to the adverse effects on the piping systems or the processes, and pneumatic testing isn't allowed, contact the engineering department for other recommendations.



6.5 Pressure Hold Test

- 6.5.1 Attach a water supply to the piping system. If the supply water cannot achieve the required test pressure, hook up a testing pump to increase the pressure as needed.
- 6.5.2 Allow water to flow through system to remove air from the pipes; it's important to remove as much of the air as possible.
- 6.5.3 Fill and pressurize the piping to be tested, to approximately 20 psig and hold for at least ten (10) minutes. Perform a visual inspection and repair any leaks if required. Repeat the test. If there is no pressure loss proceed to next step.
- 6.5.4 Gradually increase the test pressure to the minimum specified in the approved plans and jurisdictional requirements. Typical ASME B31 Codes require minimum hydrostatic test pressure that is not less than 1.5 times the design pressure

Example # 1:

Design Pressure: 30, 60, 100, 200

Min. Test Pressure: 45, 90, 150, 300

- 6.5.4.1 Maximum Pressure: The test pressure shall not exceed the maximum test pressure for any vessel, pump, valve or other component in the test.
- 6.5.5 Wait until the test pressure is stabilized (i.e. no continuous drop), record test start time, date, pressure and temperature on the Leak Test Report Form # FN 6.004.1.
 - 6.5.5.1 Be sure to notify the owner or owner representatives to witness and sign the pressure test log if required.
- 6.5.6 Maintain the test pressure for minimum thirty (30) minutes or as specified.
 - 6.5.6.1 Observe the test pressure reading displayed on the pressure gauge. If the test pressure continuously drops, stop the test and relieve pressure. Perform visual inspection and repair any leaks. Repeat pressure test per steps 5.5.3 through 5.5.6.



Note: The test pressure may fluctuate due to many reasons, such as air dissolves in water, temperature expansion/contraction, chemical reaction, etc.

- 6.5.7 When the holding time is achieved, record end time, date, pressure and temperature on the Leak Test Report Form # FN 6.004.1.
- 6.5.8 Be sure to notify the owner or owner representatives to witness and sign the pressure test log if required.
- 6.6 Replace/restore all removed instrumentation and reconnect all equipment.
- 6.7 Remove all “PRESSURE TEST IN PROGRESS” tags.
- 6.8 Apply signature, print name and date the ‘System Restoration Completed By:’ section of the Leak Test Report Form # FN 6.004.1.
- 7 Review and Approval
 - 7.1 Therma’s General Foremen shall submit the Leak Test Report, Form # FN 6.004.1 to project manager for review.
 - 7.2 Therma’s Project Manager shall review the Leak Test Report, Form # FN 6.004.1 and submit to QC Manager and/or Owner for record.