





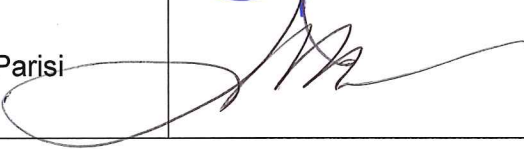


**Standard Operating Procedure**  
**Pressure Test for Process Piping**

**SOP #: 6.009 Rev. 2**

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**Approval**

<b>Approving Authority</b>	<b>Name</b>	<b>Signature</b>	<b>Date</b>
Process Systems Manager	Michael Delgado		10/3/14
Quality Assurance Manager	Steve Washington		10/3/14
V.P. Engineering	Steve Rusconi		10/3/14
Operations Manager	Steve Hansen		10/3/14
President	Joseph Parisi		10/3/14

**Revision History**

<b>Revision #</b>	<b>Description of Change</b>	<b>Effective Date</b>	<b>DCR#</b>
0	Original Document	9/23/03	03013
1	Data modifications	2/09/04	03062
2	Add Revision History, Revise Header	10/03/14	14008



**Standard Operating Procedure**  
**Pressure Test for Process Piping**

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- 1 Purpose
  - 1.1 To establish a standard procedure for pressure test of metallic process piping (e.g. pure/clean steam, water-for-injection, clean in place, sterilize in place, RO/DI, etc.).
- 2 Scope
  - 2.1 This procedure applies to all Therma projects requiring a pressure test for metallic process piping.
- 3 Responsibilities
  - 3.1 Therma's general foreman is responsible for performing the tasks listed herein.
- 4 Reference
  - 4.1 California Mechanical Code, Current Edition, Chapter 14.
- 5 Procedures
  - 5.1 Review the customer's pressure test requirements and the type of test medium to be used for each of the process piping.
  - 5.2 If required, use a calibrated one pound increment pressure gauge. Record calibration date of the pressure gauge in the comment section of pressure test log, form # FN 6.004.1.
    - 5.2.1 Ensure that the calibration is NIST traceable.
  - 5.3 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.
  - 5.4 Pre-test set-up and visual inspection.
    - 5.4.1 Inspect the piping systems to be tested for visual defects and ensure that all connections are tight.
    - 5.4.2 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.



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- 5.4.3 Attach "PRESSURE TEST IN PROGRESS" tags on all branch or bleed valves.
- 5.4.4 Whenever possible vent air from the high spots and fill from valves in the lower locations to force the air out of the system.
- 5.4.5 Fill piping system with an appropriate water (e.g. deionized water, RO, or clean city water) unless otherwise specified by the owner.
  - 5.4.5.1 If water cannot be used due to the adverse effects on the piping systems or the processes, and pneumatic testing is allowed, proceed to Pneumatic Pressure Hold Test, as described in Step 5.6. If hydraulic or pneumatic pressure test is not allowed, contact the engineering department for other recommendations.

#### 5.5 Hydraulic Pressure Hold Test

- 5.5.1 Attach an appropriate water supply (e.g. deionized water, RO, or clean city water) to the piping system. If the supply water cannot achieve the required test pressure, hook up a diaphragm pump to increase the pressure as needed.
- 5.5.2 Allow water to flow through system to remove air from the pipes; it's important to remove as much of the air as possible.
- 5.5.3 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 step 5.5.4.
- 5.5.4 Increase the test pressure at least 1.5 times the maximum designed operating pressure.

Example: If maximum designed operating pressure is 80 psig, calculated test pressure is 120 psig (i.e.  $1.5 \times 80 = 120$  psig).

Therefore, the test pressure shall be 120 psig.

#### 5.6 Pneumatic Pressure Hold Test

- 5.6.1 Attach an air supply source (e.g. nitrogen, argon, or oil-free compressed air) to the piping system.





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- 5.6.2 Fill and pressurize the piping to be tested, to approximately 25 psig or one-half (1/2) times maximum designed operating pressure, whichever is less.
- 5.6.3 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 step 5.6.4.
- 5.6.4 Increase the test pressure at least 1.1 times the maximum designed operating pressure.

Example: If maximum designed operating pressure is 80 psig, calculated test pressure is 88 psig (i.e.  $1.1 \times 80 = 88$  psig).

Therefore, the pneumatic test pressure shall be 88 psig.

- 5.7 Wait until the test pressure is stabilized (i.e. no continuous drop), record start time and initial test pressure on the pressure test log, form # FN 6.004.1.
- 5.8 Maintain the hydraulic or pneumatic test pressure for at least thirty (30) minutes.
  - 5.8.1 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 hydraulic or pneumatic pressure test per steps 5.5 or 5.6, respectively.

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

- 5.9 When the holding time is achieved, record end time and end pressure on the pressure test log, form # FN 6.004.1.
- 5.10 Be sure to notify the owner or owner representatives to witness and sign the pressure test log if required. Notify Therma's QC Manager if owner or owner's representative is not available to sign as witness to testing.
- 5.11 Replace all removed instrumentation and reconnect all equipment.
- 5.12 Remove all "PRESSURE TEST IN PROGRESS" tags.

## 6 Review and Approval



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- 6.1 Therma's general foremen shall submit the pressure test log, form # FN 6.004.1 to project manager for review.
- 6.2 Therma's project manager shall review the pressure test log, form # FN 6.004.1 and submit to owner for record.