Approval

Approving Authority	Name	Signature	Date
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VP Process Systems & Industrial Controls	Kerry Coltun		19 SEP 2023
Engineering Manager	Steve Rusconi	Steve Rusconi	19 SEP 2023
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Revision History

Revision #	Description of Change	Effective Date	DCR#
0	Original Issue	24MAR2003	03002
1	Add Revision History, Revise Header	02 OCT 2023	22003

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1 Purpose

1.1 To establish a standard procedure for pneumatic leak testing of piping assemblies.

2 Scope

2.1 This procedure applies to all Therma projects requiring pneumatic leak testing.

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 ANSI/ASME B31.3 Process Piping, Current Edition.

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.

5.2 **CAUTION**: Pneumatic testing involves the hazard of released energy stored in compressed gas. Particular care must therefore be taken to minimize the chance of brittle failure during pneumatic leak test.

5.2.1 If a pneumatic leak test would present unacceptable hazards, such as risk of brittle fracture at the metal test temperature, then a substitute for pressure testing should be developed.

5.2.2 See ASME PCC-2 for information regarding the need for risk analysis.

6 Procedures

6.1 Review the customer's pneumatic leak test requirements and the type of test medium to be used for each of the hydronic piping.

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6.2 Do not perform a pneumatic leak test unless the owner specifies or permits its use. It is recommended to implement hydrostatic leak testing method unless one or more of the following conditions applies:

6.2.1 The equipment, piping and/or supports, including foundations cannot adequately support the liquid weight.

6.2.2 When the equipment or piping cannot be dried, and traces of the testing liquid/medium may result in contamination of the system or it's contents after returning to service.

6.2.3 The equipment or piping contains internal lining that could be damaged by the test medium.

6.2.4 When piping size is 6" or larger and where city water pressure is too low to meet the required test pressure. It may be necessary to increase the test pressure with combination hydro-pneumatic test.

6.3 Pressure Relief Device. A pressure relief device shall be provided having a set pressure not higher than 110% of the test pressure, except that for test pressures below 100 psi (700 kPa), the set pressure may be as high as 10 psi (70 kPa) above the test pressure, but not higher than 1.5 times the rating of the weakest component in the system.

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

6.4.1 Use Nitrogen N_2 or Carbon Dioxide CO_2 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.

6.5 If required, connect to the test volume/boundary a calibrated test gauge with temperature compensation, one-pound increments and current Calibration Certificate from the Quality Control Department.

6.5.1 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.

6.5.2 The test gauge shall be a high accuracy test gauge verified to be tracking properly.

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6.5.3 Record test gauge ID#, calibration date, range and Manufacturer/Model on the Leak Test Report Form # FN 6.004.1.

6.5.4 Ensure that the calibration is NIST traceable.

6.6 Complete Leak Test Report Form # FN 6.004.1 as much as possible prior to Pre-Test and Test.

6.6.1 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.

6.7 Pre-test Preparation and Visual Inspection.

6.7.1 Inspect the piping systems to be tested for visual defects and ensure that all connections are tight.

6.7.2 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.

6.7.3 Attach “PRESSURE TEST IN PROGRESS” tags on all branch or bleed valves.

6.7.4 Be sure to notify the owner or owner representatives to witness and sign the pressure test log if required.

6.7.5 Attach test assembly as shown in Diagram 1.

6.7.6 Examine test equipment to ensure that it is tightly connected.

6.8 Pre-Test or Gross Leak Test - Pneumatic

6.8.1 Metallic Materials maximum pre-test pressure: 25 psig or one-half (½) the design pressure, whichever is less.

6.8.2 Non-Metallic materials maximum pre-test pressure: 2 psig

6.8.3 Slowly pressurize the system with test gas to raise pressure to pre-test pressure. Secure the supply and allow the system to stabilize for ten (10) minutes before inspecting for leaks.

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

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

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

6.8.7 Record results on Leak Test Report Form, FN 6.004.1.

6.8.8 Be sure to notify the owner or owner representatives to witness and sign the Leak Test Report Form if required.

6.8.9 If no leaks are found and there is no pressure drop, proceed to pressure hold test.

6.9 Pressure Hold Test

6.9.1 Test Pressure: The test pressure shall not be less than 1.1 times the design pressure and shall not exceed the lesser of:

6.9.1.1 1.33 times the Design Pressure

6.9.1.2 The pressure that would exceed 90% of the pressure described in 6.9.1.3.

6.9.1.3 Reduced Test Pressure: If the test pressure would produce a circumferential or longitudinal stress (based on the minimum pipe wall thickness) in excess of yield strength at test temperature or is greater than 1.5 times the component rating at test temperature, the test pressure may be reduced to the maximum pressure that will not exceed the lesser of the yield strength or 1.5 times a component rating at test temperature.

6.9.1.4 For metallic bellows expansion joints, contact project engineer for testing requirements.

6.9.2 Gradually increase the pressure in approximately 25 psig increments until the test pressure is reached. Allow the system to stabilize for ten (10) minutes before examining for leaks.

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6.9.2.1 Do Not Exceed 5 psig on Non-Metallic systems.

6.9.2.2 Maximum Pressure: The test pressure shall not exceed the maximum test pressure for any vessel, pump, valve or other component in the test.

6.9.3 Wait until the test pressure is stabilized (e.g. no continuous drop), record test start time, date, pressure and temperature on the Leak Test Report Form # FN 6.004.1.

6.9.3.1 Be sure to notify the owner or owner representatives to witness and sign the pressure test log if required.

6.9.4 Maintain the test pressure for minimum ten (10) minutes or as specified.

6.9.5 The pressure shall then be reduced to design pressure before examining for leakage.

6.9.6 Examine all joints for leaks using commercially available test leak solution or a soap and water mixture where allowed.

6.9.7 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.

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

6.9.8 When the holding time is achieved, record end time, date, pressure and temperature on the Leak Test Report Form # FN 6.004.1.

6.9.9 Be sure to notify the owner or owner representatives to witness and sign the pressure test log if required.

6.9.10 Once the system has been confirmed to be leak free, safely vent pressure.

6.10 Replace/restore all removed instrumentation and reconnect all equipment.

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6.11 Remove all “PRESSURE TEST IN PROGRESS” tags.

6.12 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.

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DIAGRAM 1 – General Pneumatic Leak Test Assembly

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