

August 9, 2018

PRESSURE TESTING-PNEUMATIC**PURPOSE/APPLICATION**

To provide guidance and direction on the safe completion of a pneumatic test. All personnel must be deemed competent to participate in and perform a pneumatic test.

Note: that pneumatic tests are significantly more dangerous than other forms of pressure testing and should only be undertaken when other alternatives are not possible. *Tests over 1677 require additional approvals from ABSA only for tests under 1677 kJ.*

PPE

- Strike minimum requirements
- Face shields for all workers actively involved in checking the line for leaks

ADDITION RESOURCES

- ABSA guideline (AB-522)
- CP-Q-02 Guideline for Pneumatic Pressure Testing
- COP 06 Fall Protection
- Engineered Pressure calculation

TRAINING**TOOLS/EQUIPMENT**

- High Pressure Hose
- Pressure Gauges
- Compressed Gas Bottles
- Pressure Safety Valve (PSV)
- Approved Leak Test solution
- Test Manifold

HAZARD SOURCES**PRIOR ACTIVITIES**

1. Assess the work according to the HIAC process, completing the Pre-Job or Site HIAC, ensuring that the site hazard sources have been controlled (i.e. – Motion – overhead loads, vehicles in the area controlled).
2. Communicate the estimated timing of the test, the purpose of the safe zone and hazards associated to all workers at the pretest meeting (This meeting should be documented on a tailgate document); ensure that all other contractors on site do the same.
3. Inspect all tools and equipment – complete daily pre-use inspection of all tools and equipment.
4. Obtain/issue Safe Work Permit and /or agreement.
5. During the pretest stage it is critical to develop a plan to prevent other workers from entering the test zone. The best option is to test at times where no other workers are present and access to the site can be restricted. If this is not feasible then an individual should be designated to stand outside the test zone to help prevent other workers from entering the area.

NOTE: These are basic procedural steps on the safe setup and execution of a pneumatic pressure test. It does not contain all the specific technical specifications and guidance on performing the test. This procedure should be used in conjunction with the Strike Quality Control Hydrostatic Testing Guideline CP-Q-02.

(Guideline only – Always Consult Owner or Design Engineer for Test Pressures)

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#	Job Steps	Hazards	Control Measures
*	Establish test plan	<ul style="list-style-type: none"> ❖ Increased risk associated with Pneumatic testing ❖ Pressure – Test pressures higher than allowed by standard 	<ul style="list-style-type: none"> ▪ Hydrostatic is always the preferred test process, and must be ruled out prior to deciding on completing a pneumatic test (See flow chart Appendix 2) ▪ Calculate potential stored energy. (See Appendix 1) Any tests over 1677 kJ requires ABSA approval
1	Conduct pretest hazard assessment and meeting	<ul style="list-style-type: none"> ❖ Human Factors – Lack understanding of the procedures/hazard 	<ul style="list-style-type: none"> ▪ All workers must attend the pre-job meeting, review the HIAC and SWP ▪ Complete pretest HIAC and pressure test checklist ▪ Review the muster location and signal prior to beginning test, ensure there is a clear route for egress ▪ Ensure a Safe Work Permit (If required) has been completed and approved by both the test supervisor and the most senior Strike supervisor on the site (where Strike is the prime contractor) or appropriate customer designate (where Strike is not the prime contractor) ▪ Ensure the (M)SDS for the test medium is available on the work site
2	Inspect work site and system being tested	<ul style="list-style-type: none"> ❖ Pressure – Lack of available safe distance, components rated for differing pressures ❖ Gravity – Slip or trip hazards, working at heights ❖ Nature – Extreme weather conditions ❖ Motion – Congested work area, mobile equipment in area ❖ Human Factors – Other workers entering the “safe zone” 	<ul style="list-style-type: none"> ▪ Set up 30 meter “safe zone” around the test with red ribbon and set up warning signs (unless specified otherwise by an engineer) ▪ Check all ratings of attached components ▪ Ensure all other workers in the area have been informed of the test and are aware of the associated risks ▪ Walk the line to ensure all plugs, blinds, and relief valves are in place and that all valves are set up as per test package. Ensure all check valve components are removed, if required. ▪ Secure all compressed gas cylinders ▪ Inspect all equipment and PPE to be used during the test including aerial lifts and fall protection equipment

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#	Job Steps	Hazards	Control Measures
3	Check test system and manifold	<ul style="list-style-type: none"> ❖ Pressure – Test pressures higher than pressures ratings on system ❖ Motion – Line of fire of an unplanned pressure release 	<ul style="list-style-type: none"> ▪ Verify that all hoses, connections, fittings, gauges, blinds etc. are rated for the Pneumatic Test Pressure ▪ Only use test manifolds which have been designed for the test pressure. Other than where the fittings are attached, the header must be fully welded. ▪ Verify that the manifold is equipped with a calibrated PSV with a test pressure set no higher than the lesser of 50 psi or 10% over the final test pressure ▪ Ensure all pressure safety valves exhaust in such a way that the manifold's operator and all other test personal are protected in the event of a pressure release
4	Preliminary "Low" Pressure Test (if applicable)	<ul style="list-style-type: none"> ❖ Pressure – Unintended pressure release, pressurized lines, compressed gas cylinders ❖ Motion – Failure of manifold or test components, flying debris (in the event of a failure), failure of system being tested ❖ Gravity – Work at heights, slipping hazards, falling material 	<ul style="list-style-type: none"> ▪ Do not exceed the preliminary test pressure ▪ As per Strike's CP-Q-02 block the pressure supply and hold the preliminary test pressure for 5 minutes (unless otherwise specified in the test plan) before entering the test area ▪ Only authorized workers who participated in the pre-job meeting and have reviewed and signed onto the HIAC may enter the test area ▪ All workers involved in checking for leaks must wear CSA approved face and eye protection ▪ If any leaks are found or the pressure drops, return system to 0 psi before tightening or adjusting ▪ Once test exceeds 25psi (170kpa) the 30 metre test zone must be implemented
5	Pressure Test System	<ul style="list-style-type: none"> ❖ Pressure – Unintended pressure release, pressurized lines, over pressurizing the line compressed gas cylinders ❖ Motion – Failure of 	<ul style="list-style-type: none"> ▪ Pressure the system in stages as per the process in Strike's CP-Q-02. Hold each stage for 5 minutes or the time specified in the pressure testing plan ▪ At the specified stages hold the pressure for 5 minutes before anyone enters the "safe zone" to

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#	Job Steps	Hazards	Control Measures
		manifold or test components, flying debris (in the event of a failure), failure of system being tested ❖ Gravity – Work at heights, slipping hazards, falling material	snoop or check the line ▪ Ensure all individuals involved in the test are accounted for and have exited the test zone before proceeding to the next stage ▪ The system must be returned to 0 psi before proceeding with any repairs
6	Depressurize System	❖ Pressure – Depressurizing too quickly	▪ Release pressures in stages as specified by the pressure test plan ▪ Hold each stage for 5 minutes (unless otherwise specified by the test plan) ▪ Verify that pressure is at 0 psi before proceeding to disassembly
7.	Disassemble system	❖ Gravity – Working at heights, falling tools and equipment ❖ Motion – Hand tools and material in area ❖ Human Factors - Ergonomics	▪ Follow proper lifting procedures including tandem lifts and use of mobile equipment ▪ Maintain proper hand and body placement out of the line of fire and be conscious of the direction of release for any stored pressure.

REFERENCES/REGULATIONS

Unless otherwise stated, the following reference documents are the latest published edition(s)

- Strike’s Alberta Quality System Manual
- American Society of Mechanical Engineers: ASME B31.1 and/or B31.3
- Canadian Standards Association: CSA Z662
- Alberta Boilers Safety Association (ABSA): AB 519 & AB 522
- Alberta Safety Codes Act (ASCA)
- Pressure Equipment Safety Regulations (PESR)
- Strike CP-Q-02 Guideline for Pneumatic Pressure Testing

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August 9, 2018**PRESSURE TESTING-PNEUMATIC****APPENDIX 1**

The stored energy for the pneumatic test may be calculated using the method provided in PCC-2, Part 5, Article 5.1 Mandatory Appendix II:

If the calculated E is > 1677 kJ, the pneumatic test procedure must be submitted to Design Survey for review and acceptance prior to conducting the test.

The stored energy may be calculated using the following formula providing that nitrogen or air is used as the test medium:

$$E=2.5 \times Pat \times V [1 - (Pa/Pat)^{0.286}]$$

Where:

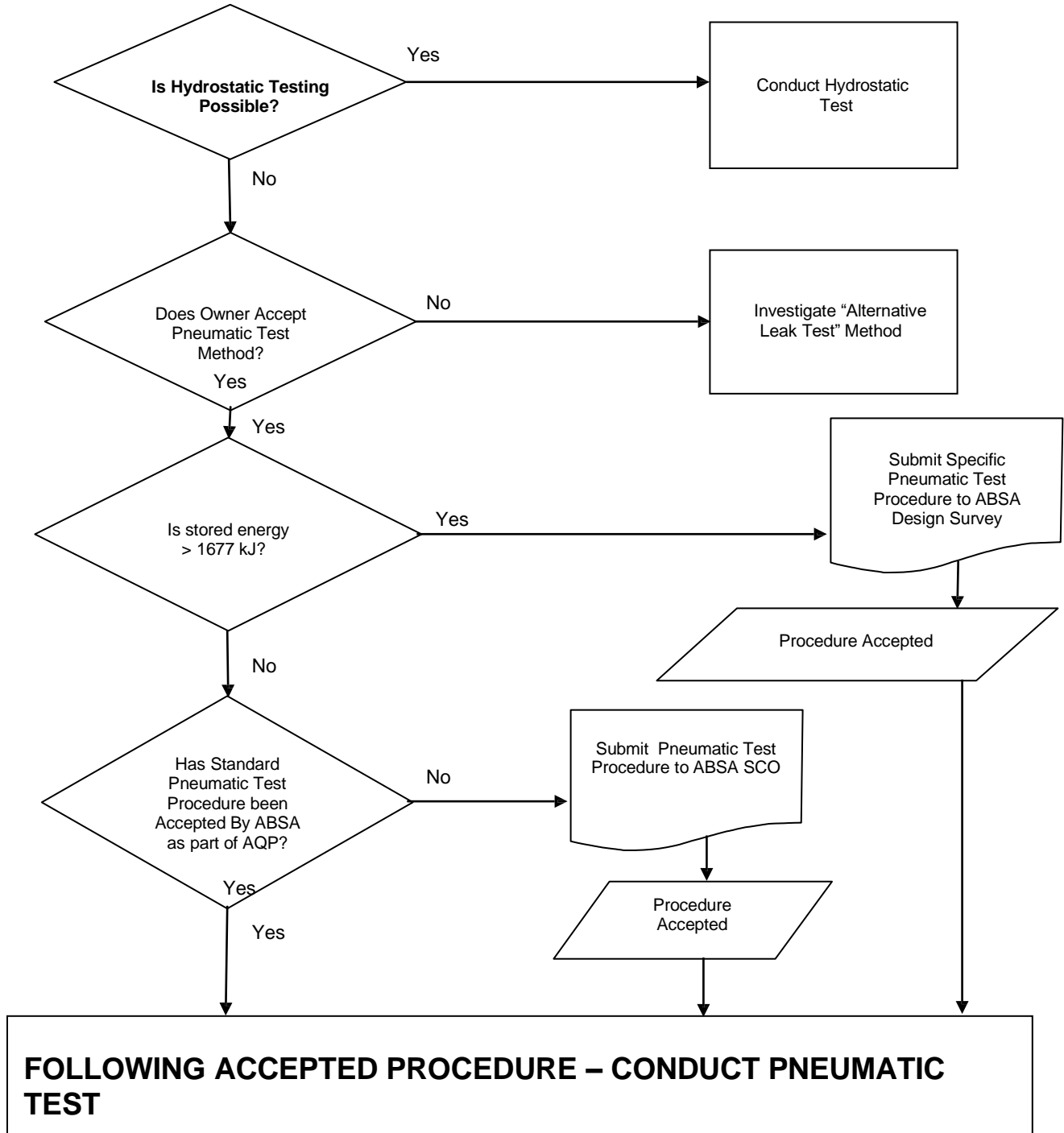
E = stored energy in kJ

Pa = absolute atmospheric pressure, 101 kPa Pat = absolute test pressure in kPa

V = total volume under test pressure in m³

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Appendix 2



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