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October 15, 2018.

SAFETY INFORMATION BULLETIN: SB05-02 Rev 2

Hot Tap and Line Stopping for Pressure Equipment

The attachment of branch connections to in-service pressure equipment constitutes an alteration as defined in the Ontario Regulation for Boilers and Pressure Vessels¹ (O.Reg. 220/01). This bulletin applies to all hot tap and line stopping operations performed on pressure equipment regulated by O.Reg.220/01.

DEFINITION

A hot tap is a method of making connections to piping (or other pressure equipment) by attaching a fitting to the system, usually by welding, followed by cutting through the pipe wall at the point of attachment utilizing an appropriate hot tapping machine. The operation is generally carried out on a live system without decommissioning or interrupting flow. A hot tap may include a line stopping operation.

BACKGROUND

The various codes for piping systems and in-service requirements e.g. ASME B31.1, ASME B31.3 and the National Board Inspection Code do provide general rules but not specific rules for hot taps. See ASME code Interpretations B31.1, Interpretation 20-7, which provides some general guidance for power piping, and ASME B31.3, Interpretation 13-04, which states that the code does not apply to hot taps on existing piping.

The preferred method for adding branch connections to pressure equipment is with the use of the appropriate branch fitting, in accordance with the code of construction, while the system is not under pressure. However, when this is not possible, the owner is responsible for deciding if a hot tap can be safely performed.

This document provides requirements, guidelines and references applicable to hot tap or line stopping operations that an owner or contractor should refer to prior to starting any hot tap or line stopping work.

This document does not provide all the information required to perform a hot tap on pressurized equipment. It is the responsibility of the owner, or any other organization performing hot tap work, to ensure that all the necessary engineering, installation and safety requirements are addressed for any given hot tap operation. The guideline documents listed below may assist in this regard.

HOT TAP ACTIVITIES

Hot tap activities may be handled in several different ways such as:

- a) All the work may be performed in house by the pressure system owner/user who holds a valid TSSA Certificate of Authorization to perform the work.

¹ <https://www.ontario.ca/laws/regulation/010220>

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- b) Turnkey operations, where all the work may be performed by a subcontracted hot tap organization holding a valid TSSA Certificate of Authorization to perform the work.
 - c) Various portions of the work may be done by different qualified organizations holding valid TSSA Certificate of Authorization to perform the work

Where more than one organization is involved in the various activities required for the hot tap, the owner shall ensure that all organizations to be involved are coordinated and advised of their responsibilities to ensure that no important steps in the operation are missed.

Facility Owner/User Requirements

The decision to perform a hot tap is the responsibility of the owner. Determination of the suitability of the application² area for the hot tap operation shall be performed and documented by the owner prior to any work being commenced. This documentation shall be made available to the TSSA Inspector³.

Prior to a hot tap or line stopping operation being performed, a site safety meeting shall be convened by the owner or user to ensure that all personnel involved in the attachment of the branch connection and the hot tap or line stopping operation are familiar with their responsibilities and the applicable safety procedures. The Inspector shall be invited to each of these meetings. The Inspector shall have access to the work area where the hot tap or line stopping operation is to be performed and all documentation related to the work shall be available for the Inspector's review.

Organization Performing Hot Tap Requirements

All parts of a hot tap operation shall be performed in accordance with written procedures that include all the necessary safety precautions. This includes inspection prior to commencement, preparation and welding in the area where the hot tap branch connection is to be made before attaching the hot tap machine, and after removal of the machine from the branch connection.

Organizations involved with the pressure boundary shall have a Certificate of Authorization from TSSA for the scope of work they are performing. Organizations installing hot tap fittings to a pressure boundary prior to the hot tap operation or attaching the hot tap machine and performing a hot tap or line stopping operation, shall hold a Certificate of Authorization that includes in the scope of work hot tapping and/or line stopping. The quality program shall address all the steps necessary to ensure that the hot tap or line stopping activities to be performed by the organization are properly planned, performed and documented. Welding requirements for hot tap branch connections shall clearly outline any additional requirements that are applicable for procedure and personnel qualification.

Control of welding is critical to the success of the hot tap operation. Welding procedures and welders shall be qualified and registered⁴ to meet the requirements of the following welding standards and the attachment of hot tap fittings to a pressure boundary:

- a) ASME Section IX, and
- b) PCC-2 Article 2.10 and/or for oil and gas applications, CSA Z662 clause 7.17.

² Refer to ASME PCC-2 for service limitations including oxygen, hydrogen or other mixtures in a flammable explosive range or temperature-sensitive or chemically reactive materials.

³ TSSA inspector shall be referred to in this document as Inspector.

⁴ Welding procedures are registered with TSSA. Please see website guidelines.

It is the responsibility of the owner and/or the contractor to ensure that personnel performing a hot tap or line stopping operation are qualified or competent in the safe operation and maintenance of hot tap and line stopping equipment.

DESIGN REGISTRATION

Hot tapping and line stopping require design registration with TSSA. The drawing and specifications shall include the following information:

- 1) Application form for piping registration
 - a) Add "Hot Tap" on the application form⁵
 - b) Add the existing piping registration number (as applicable)

- 2) Drawing and Specifications
 - a) Code of construction and edition, e.g. ASME B31.1, ASME B31.3, ASME Section VIII Division 1
 - b) Service fluid
 - c) Design conditions including: design pressure, design temperature, minimum design metal temperature
 - d) Operating conditions including: operating pressure, operating temperature, flow rate
 - e) Location of the hot tap on the equipment
 - f) Material specifications including: pipe, fittings, reinforcing pads, valves, bolting
 - g) Minimum required base metal thickness and confirmation of actual measured thickness
 - h) Weld joint details including: configuration, minimum weld sizes
 - i) Leak test of the hot tap fitting attachment weld, e.g. hydrostatic or pneumatic, test pressure and test temperature. Caution - The leak test pressure should not exceed the operating internal pressure of the pipe or vessel by more than 10% to avoid possible internal collapse of the pipe or vessel wall due to external pressure.
 - j) Hot tap and line stopping fitting details including: Canadian Registration Number (CRN), size, material, thickness, class or rating
 - k) Non-destructive testing requirements
 - l) Hardness testing requirements
 - m) Modifications to pipe supports / restraints

- 3) Analysis / Calculations (as applicable) to address the following:
 - a) To demonstrate that the actual pipe metal thickness and the supports are adequate for the design pressure and temperature conditions, the weight of the hot tap machine and the loads imposed during the cutting operation
 - b) Reinforcement of the opening shall be considered when required by the Code of Construction
 - c) External pressure calculations to demonstrate that the pipe or vessel wall can withstand the loading from the external pressure imposed during the leak test of the hot tap fitting attachment welds

⁵ Refer to TSSA website:

https://www.tssa.org/en/boilers-pressure-vessels/register-a-design.aspx?_mid_=413

REGULATION REFERENCES

Under O.Reg.220/01, section 4(4) required designs and specifications to be submitted for design review and registration before beginning to make the change. Section 7(1) states that no person shall alter a boiler, pressure vessel, fitting or piping unless the alteration is registered and is inspected by an Inspector.

Other acts and regulations may apply e.g. the Occupational Health and Safety Act and Regulations. The owner or any other organizations performing hot tap or line stopping work are responsible for ensuring all legal requirements are met.

GUIDELINE DOCUMENTS

The following documents are referenced as part of this guideline document because they contain important information related to hot tap work. They should be referred to for assistance in the development of techniques and procedures to be used for each hot tap operation, to ensure a safe and reliable installation takes place.

API 510 Pressure Vessel Inspection Code; Maintenance Inspection, Rating, Repair, and Alteration.

API 570 Piping Inspection Code; Inspection, Repair, Alterations, and Repairing of In-Service Piping Systems

API 653 Tank Inspection, Repairs, Alteration & Reconstruction

API 1104 Pipeline Maintenance Welding Practices

API 1107 In Service Welding

API 2201 Procedures for Welding or Hot Tapping on Equipment Containing Flammables

API RP2009 Safe Welding, Cutting and Hot Work Practices

API RP2201-Safe Hot Tapping Practices in Petroleum and Petrochemical Industries

ASME PCC-2 Repair of pressure equipment and piping article; 2.10 In-service Welding

CSA Z662 Oil & Gas Pipeline Systems Section 7.17 Welding on in-service piping, Section 10.13 - Maintenance Welding, Section 10.14 - Pipeline Hot Taps.

UK Hazardous Installations Directorate, Safety Report Assessment Guidance Technical Measures (Website: www.hse.gov.uk/comah/sragtech/index.htm)

Original Signed

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