

ASME B31.5

Fabrication and Field Testing of Refrigerant Piping

Fabrication and Assembly

527 WELDING

527.4 Responsibility

Each employer is responsible for

(a) the welding and brazing performed by personnel of his organization

(b) conducting the qualification tests required to qualify the **Welding Procedure Specifications (WPSs)** and **Brazing Procedure Specifications (BPSs)** used by personnel in his organization, except as provided in para. 527.4.3

(c) conducting the qualification tests required to qualify the welders and welding operators

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527 WELDING

527.4.1 Qualification Requirements

WPSs and BPSs to be followed in production welding shall be prepared and qualified.

Welders, brazers, and operators shall be **QUALIFIED** as required by Section IX of the *ASME Boiler and Pressure Vessel Code*, except as modified in paras. 527.4.2, 527.4.3, and 527.4.4.

527.4.2 Standard Welding Procedures

Standard Welding Procedure Specifications (SWPSs) published by the American Welding Society and listed in Appendix E of ASME Section IX are permitted within the limitations established by Article V of ASME Section IX. **BEFORE BEING USED**, the employer shall either

1. qualify one welder following each SWPS or
2. make demonstration welds as provided by Section IX, Article V

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527 WELDING

527.5 Qualification Records

The employer shall maintain copies of the **procedure and performance qualification records** specified by ASME Section IX, which shall be available to the owner or the owner's agent and the Inspector **at the location where welding is being done.**

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527 WELDING

527.5 Qualification Records

After completing a welded joint, the

welder or welding operator shall

IDENTIFY IT AS HIS OR HER WORK by

applying his or her assigned **LETTER,**

NUMBER, OR SYMBOL as a permanent

record in a manner specified by his or

her employer.



Field Testing of Refrigerant Piping

538.4.1 General Requirements

Refrigerant piping ERECTED ON THE PREMISES, except piping components that are **factory tested**, SHALL BE PRESSURE TESTED AND LEAK TESTED after installation and BEFORE operation.

Field Testing of Refrigerant Piping

538.4.2 Pressure Test

(a) Piping shall be **EXAMINED BEFORE PRESSURE IS APPLIED** to ensure that it is tightly connected. **ALL** items NOT subject to the pressure test **SHALL BE DISCONNECTED OR ISOLATED** by valves, blanks, plugs, or other suitable means.

(b) A preliminary test at a gauge pressure of up to 25 psig (170 kPa) may be applied, prior to other testing, as a means of locating major leaks.

(c) The **TEMPERATURE OF THE PIPING SYSTEM DURING TESTING SHALL BE ABOVE THE DUCTILE-BRITTLE TRANSITION TEMPERATURE.**

CAUTION: Take **MEASURES TO PROTECT PERSONNEL** from the potential of rupture of piping components during **PNEUMATIC TESTING** of systems.

(d) The means used to furnish the TEST PRESSURE shall have either

1. a pressure limiting device **OR**
2. a pressure reducing device **AND** a pressure relief device **AND** gage on the **OUTLET SIDE.**

The pressure relief device shall be set ABOVE the test pressure, **but low enough** to prevent permanent deformation of any of the system components.

Field Testing of Refrigerant Piping

Continued

(e) The **PNEUMATIC** test pressure used shall be AT LEAST 110% of the design pressure. The test pressure shall NOT exceed 130% of the design pressure of any component in the system.

(f) For large systems that are **NOT COMPLETELY VISIBLE to the testing operator**, the pressure in the system **SHALL BE gradually increased to ONE-HALF (1/2) of the test pressure**, after which the pressure shall be increased in **STEPS OF APPROXIMATELY ONE-TENTH (1/10) OF THE TEST PRESSURE UNTIL THE REQUIRED TEST PRESSURE HAS BEEN REACHED**. The test pressure shall be continuously maintained for **AT LEAST 10 MIN**. It may then be reduced to the leak test pressure per para. 538.4.3(c).

(g) Mechanical joints at which blanks or plugs are inserted to blank off or facilitate removal of equipment during the pressure test need NOT be pressure tested after removal of the blank or plug **provided the joint passes a subsequent leak test**.

Field Testing of Refrigerant Piping

538.4.3 Leak Test

AFTER the pressure test in para. 538.4.2 is COMPLETED, a leak test **SHALL** be performed.

(a) Examination for leaks shall be by the **GAS AND BUBBLE FORMATION TESTING** as detailed in Article 10, Section V of the ASME Boiler and Pressure Vessel Code, or by other methods of **EQUAL SENSITIVITY**.

EXCEPTION: Refrigerant vapor detection methods shall be used when the refrigerant is used in the test medium.

Comply with environmental regulations when venting refrigerants.

(b) The examination shall be made of **ALL JOINTS AND CONNECTIONS**. The piping system shall show **NO EVIDENCE OF LEAKING**.

(c) The **pressure used for leak tests** shall be either

1. the design pressure, **OR**
2. a pressure specified in the engineering design

Field Testing of Refrigerant Piping

538.5 Testing Medium for Refrigerant Piping

(a) A **SUITABLE DRY GAS** such as nitrogen or air shall be used for pressure testing per para. 538.4.2 (i.e. pressure testing). **TOXIC GASES** shall **NOT** be used unless personnel are **ADEQUATELY PROTECTED FROM HARMFUL EXPOSURE** should leaks occur during testing.

(b) **OXYGEN** or any medium with a LFL or LEL **BELOW 13%** shall **NOT** be used for pressure testing.

(c) The system refrigerant **MAY BE USED** for leak testing per para. 538.4.3.

CAUTION: Comply with environmental regulations when testing with refrigerants.

(d) Water or water solutions should not be used in testing refrigerant piping.

Field Testing of Refrigerant Piping

538.7 Pressure Gages

Pressure gages shall be checked for accuracy prior to use in testing, either by comparison with master gages or by setting the pointer as determined by a dead-weight pressure gage tester.

538.8 Repair of Joints

- (a) **ALL leaking joints shall be repaired.**
- (b) Solder joints that leak shall be disassembled, cleaned, refluxed, reassembled, and resoldered. Solder joints shall not be repaired by brazing.
- (c) Brazed joints that leak may be repaired by cleaning the exposed area, refluxing, and rebrazing.
- (d) Welded joints that leak shall have the defective areas of the **WELD REMOVED AND REWELDED**.
- (e) After joints have been repaired, the **JOINTS SHALL BE RETESTED** in accordance with paras. 538.3 and 538.4.

Field Testing of Refrigerant Piping

What your piping contractor should provide you for your PSM/RMP piping installation(s)

539.1 Definition

Records are the reduction to writing or film image of performances, evaluations, or data required by the Code.

539.2 Responsibility

It is the **RESPONSIBILITY OF THE PIPING DESIGNER, MANUFACTURER, FABRICATOR, AND ERECTOR** as applicable to prepare the records required by this Code.

*The pipe installation records for a PSM/RMP covered process need to be maintained for the life of the process

Field Testing of Refrigerant Piping

What your piping contractor should provide you for your PSM/RMP piping installation(s)

539.3 Extent and Retention of Records

The following records shall be maintained for 3 years*:

- (a) [welding] **PROCEDURE SPECIFICATION**, procedure qualification, and **PERFORMANCE QUALIFICATION RECORDS**
- (b) results of **weld examinations OTHER THAN VISUAL**
- (c) records of the testing of **EACH** piping system, which shall include the following information:
 - (1) date
 - (2) identification of piping system tested
 - (3) testing medium
 - (4) test pressure
 - (5) signature of examiner and inspector

*The pipe installation records for a PSM/RMP covered process need to be maintained for the life of the process