
10CFR50.55a Condition for Pressure Testing of Mechanical Joints

Category 2 Public Meeting
June 4, 2020

Purpose, Outcome, Process

- Purpose: Understand the industry concern on the revision of 10 CFR 50.55a(b)(2)(xxvi)-Pressure Testing Mechanical Joints
- Outcome: Supply NRC staff sufficient information to consider next steps
- Process: See meeting agenda

Meeting Agenda

Time	Topic	Speaker
9:00am-9:05am	Introduction	NRC
9:05am-9:20am	History/Intent of Condition 10 CFR 50.55a(b)(2)(xxvi)	NRC
9:20am-10:00am	Industry Position	NEI/ASME
10:00am-10:45am	Discussion of Condition	NRC/NEI/ASME
10:45am-11:00am	Public comment	All
11:00am	Adjourn	NRC

Original Condition – 2001/2003 Rule

- 10 CFR 50.55a(b)(2)(xxvi)-Pressure Testing Mechanical Joints
 - *Section XI condition: Pressure testing Class 1, 2 and 3 mechanical joints.* The repair and replacement activity provisions in IWA–4540(c) of the 1998 Edition of Section XI for pressure testing Class 1, 2, and 3 mechanical joints must be applied when using the 2001 Edition through the latest edition and addenda incorporated by reference in paragraph (a)(1)(ii) of this section.

IWA-4540 PRESSURE TESTING OF CLASS 1, 2, AND 3 ITEMS

(a) After welding on a pressure retaining boundary or installation of an item by welding or brazing, a system hydrostatic test shall be performed in accordance with IWA-5000.

(b) The following may be exempted from the system hydrostatic tests:

- (1) cladding repair/replacement activity
- (2) heat exchanger tube plugging and sleeving
- (3) piping, pump, and valve welding that does not penetrate through the pressure boundary
- (4) pressure vessel welding, when the welded cavity does not exceed 10% of the minimum design wall thickness
- (5) component connections, piping, and associated valves NPS³ 1 and smaller
- (6) tube-to-tubesheet welds when such welds are made on the cladding
- (7) seal welds

(c) Mechanical joints made in installation of pressure retaining items shall be pressure tested in accordance with IWA-5211(a). Mechanical joints for component connections, piping, tubing (except heat exchanger tubing), valves, and fittings, NPS-1 and smaller, are exempt from the pressure test.

Statements of Consideration – 2001/2003 Rule

- Several comments on this proposed rule
 - mechanical joint leakage is not prohibited by Section XI
 - Section XI does not provide leakage acceptance criteria
 - 1998 Edition and earlier editions and addenda of Section XI, testing is to monitor for leakage not verify the structural integrity of the pressure boundary
 - Section III does not prohibit leakage at mechanical connections
 - post maintenance test programs specify requirements for leak testing mechanical connections following reassembly

Statements of Consideration – 2001/2003 Rule

- NRC statement:
 - After consideration of public comments, the NRC finds that **Code pressure testing of mechanical joints after repair and replacement activities is still warranted**, and that reliance on programs which are not under Code jurisdiction is not an appropriate substitute for specifying Code repair and replacement requirements.
- Rule was published as is
- **NRC position:** pressure test of mechanical joints after repair/replacement activities are required. NPS-1 and smaller are excluded

Condition Revision – 2015/2017 Rule

- During the ASME Section XI 2015-2017 rule making, the staff revised this condition due to confusion on what code edition was required for NDE qualification, etc.
- Initial condition wording
 - When using the 2001 Edition through the latest edition and addenda incorporated by reference in paragraph (a)(1)(ii) of this section, licensees shall pressure test mechanical joints in Class 1, 2, and 3 piping and components greater than NPS–1 which are disassembled and reassembled during the performance of a Section XI activity (e.g., repair/replacement activity), in accordance with IWA–5211(a). The pressure test and examiners shall meet the requirements of the licensee’s/applicant’s current ISI code of record.

Condition Public Comment – 2015/2017 Rule

- This condition is not necessary because the current practice of leakage testing and quality assurance (QA) program activities is adequate
- List repair or replacement activities for which the NRC requires a pressure test following assembly or reassembly of a mechanical joint
- This condition should not apply to installed items rotated from stock

NRC Response – 2015/2017 Rule

- The NRC's continued position is that it should be a requirement that Class 1, 2, and 3 mechanical joints affected by repair or replacement activities be pressure tested in accordance with IWA-4540(c), as described in the 1998 Edition of ASME BPV Code, Section XI
- The NRC agrees with the comment that the condition should not apply to items rotated from stock

Published Condition – 2015/2017 Rule

- Section XI condition: Pressure testing Class 1, 2, and 3 mechanical joints. When using the 2001 Edition through the latest edition and addenda incorporated by reference in paragraph (a)(1)(ii) of this section, licensees shall pressure test in accordance with IWA–5211(a) mechanical joints in Class 1, 2, and 3 piping and components greater than NPS–1 which are disassembled and reassembled during the performance of a Section XI repair/replacement activity **requiring documentation on a Form NIS–2**. The system pressure test and NDE examiners shall meet the requirements of the licensee’s/applicant’s current ISI code of record
- NRC Position has not changed: pressure test of mechanical joints after repair/replacement activities are required. NPS-1 and smaller and parts rotated from stock are excluded

Pressure Test Exemptions in Code

- IWA-4540(b) describes items that are exempt from all pressure tests
- In the 1995 edition with 1996, 1997 addendum that list contained 7 items

(b) The following may be exempted from the system hydrostatic tests:

- (1)* cladding repair/replacement activity
- (2)* heat exchanger tube plugging and sleeving
- (3)* piping, pump, and valve welding that does not penetrate through the pressure boundary
- (4)* pressure vessel welding, when the welded cavity does not exceed 10% of the minimum design wall thickness
- (5)* component connections, piping, and associated valves NPS³ 1 and smaller
- (6)* tube-to-tubesheet welds when such welds are made on the cladding
- (7)* seal welds

Pressure Test Exemptions in Code

- By the 2017 edition, that list increased to 10 items
- Note (b)(4) and (b)(10)

(b) The following are exempt from any pressure test:

- (1) cladding
- (2) heat exchanger tube plugging and sleeving
- (3) welding or brazing that does not penetrate through the full thickness of the pressure-retaining material
- (4) flange seating surface when less than half the flange axial thickness is removed and replaced
- (5) components or connections NPS 1 (DN 25) or smaller
- (6) tube-to-tubesheet welds when such welds are made on the cladding
- (7) seal welds
- (8) welded or brazed joints between non-pressure-retaining items and the pressure-retaining portion of the components
- (9) valve discs or seats
- (10) bolts, studs, nuts, or washers

Pressure Test Questions

- Based on the understanding of the staff's intent, what exemptions do the industry interpret as excluded? Basis?
- Based on the original condition and revised version, what specific text revised the intent of the condition such as to result in an emergent issue for Owners? What is driving the timeliness of this issue?
- Per public comments, leak testing (are those done at operating pressure?) would be required by the QA program. If so, are there other impacts of the condition beyond VT-2 qualification?

Path Forward

- Staff will consider input from industry
- Staff will re-examine the condition
 - Public feedback is always welcome
- Staff will consider communication to clarify intent and path forward
- Staff are open to alternatives to 10CFR50.55a related to this topic

Backup Slides

ASME Section XI Code Language

- 1995 edition with 1996, 1997 addendum

IWA-4540 PRESSURE TESTING OF CLASS 1, 2, AND 3 ITEMS

(a) After welding on a pressure retaining boundary or installation of an item by welding or brazing, a system hydrostatic test shall be performed in accordance with IWA-5000.

(b) The following may be exempted from the system hydrostatic tests:

- (1) cladding repair/replacement activity
- (2) heat exchanger tube plugging and sleeving
- (3) piping, pump, and valve welding that does not penetrate through the pressure boundary
- (4) pressure vessel welding, when the welded cavity does not exceed 10% of the minimum design wall thickness
- (5) component connections, piping, and associated valves NPS³ 1 and smaller
- (6) tube-to-tubesheet welds when such welds are made on the cladding
- (7) seal welds

(c) Mechanical joints made in installation of pressure retaining items shall be pressure tested in accordance with IWA-5211(a). Mechanical joints for component connections, piping, tubing (except heat exchanger tubing), valves, and fittings, NPS-1 and smaller, are exempt from the pressure test.

- 1998 edition with 2000, 2001 addendum

A99 IWA-4540 PRESSURE TESTING OF CLASS 1, 2, AND 3 ITEMS A00

(a) Unless exempted by (b) below, repair/replacement activities performed by welding or brazing on a pressure-retaining boundary shall include (a)(1) or (a)(2) below.

(1) A system hydrostatic test shall be performed in accordance with IWA-5000 prior to, or as part of, returning to service.

(2) The following requirements shall be met.

(a) The nondestructive examination methodology and acceptance criteria of the 1992 Edition or later of Section III shall be met prior to return to service.

(b) The Owner's Requirements shall be met prior to return to service.

(c) A system leakage test shall be performed in accordance with IWA-5000.

(b) The following are exempt from any pressure test:

- (1) cladding
- (2) heat exchanger tube plugging and sleeving
- (3) piping, pump, and valve welding or brazing that does not penetrate through the pressure boundary
- (4) flange seating surface when less than half the flange axial thickness is removed and replaced
- (5) pressure vessel welding when the remaining wall thickness, after metal removal, is at least 90% of the minimum design wall thickness

- (6) components or connections NPS³ 1 and smaller
- (7) tube-to-tubesheet welds when such welds are made on the cladding
- (8) seal welds
- (9) welded joints between non-pressure-retaining items and the pressure-retaining portion of the components
- (10) valve discs or seats

- 2017 edition

IWA-4540 PRESSURE TESTING OF CLASS 1, 2, AND 3 ITEMS FOLLOWING REPAIR/REPLACEMENT ACTIVITIES (17)

(a) Unless exempted by (b), repair/replacement activities performed by welding or brazing on a pressure-retaining item shall include a pressure test in accordance with Article IWA-5000, prior to, or as part of, returning to service. Only brazed joints and welds made in the course of a repair/replacement activity within the boundaries of IWB-5222(b), IWC-5222, or IWD-5222, require pressurization and VT-2 visual examination during the test.

(b) The following are exempt from any pressure test:

- (1) cladding
- (2) heat exchanger tube plugging and sleeving
- (3) welding or brazing that does not penetrate through the full thickness of the pressure-retaining material
- (4) flange seating surface when less than half the flange axial thickness is removed and replaced
- (5) components or connections NPS 1 (DN 25) or smaller
- (6) tube-to-tubesheet welds when such welds are made on the cladding
- (7) seal welds
- (8) welded or brazed joints between non-pressure-retaining items and the pressure-retaining portion of the components
- (9) valve discs or seats
- (10) bolts, studs, nuts, or washers

(c) Replacement components and appurtenances shall be pressure tested in accordance with the Construction Code selected for use in accordance with IWA-4221.

(d) Brazed joints and welds in pressure-retaining replacement parts and piping subassemblies, other than valve discs or seats, fabricated by the Repair/Replacement Organization, or fabricated in accordance with the Construction Code without a hydrostatic or pneumatic pressure test, shall be pressure tested as required by (a).