# U.S. NUCLEAR REGULATORY COMMISSION

## REGULATORY GUIDE 1.147, REVISION 20

**Issue Date: December 2021**
**Technical Lead: Bruce Lin**

# INSERVICE INSPECTION CODE CASE ACCEPTABILITY, ASME SECTION XI, DIVISION 1

## A. INTRODUCTION

### Purpose

This regulatory guide (RG) lists the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (BPV) Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components" (Ref. 1), Code Cases that the U.S. Nuclear Regulatory Commission (NRC) has approved for use as voluntary alternatives to the mandatory ASME BPV Code provisions that are incorporated by reference into Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities" (Ref. 2).

### Applicability

This RG applies to reactor licensees and applicants subject to 10 CFR Part 50, Section 50.55a, "Codes and standards."

### Applicable Regulations

- General Design Criterion (GDC) 1, "Quality Standards and Records," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 requires, in part, that structures, systems, and components important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed. Where generally recognized codes and standards are used, GDC 1 requires that they be identified and evaluated to determine their applicability, adequacy, and sufficiency and be supplemented or modified as necessary to ensure a quality product in keeping with the required safety function.

- 10 CFR Part 50, Appendix A, GDC 30, "Quality of Reactor Coolant Pressure Boundary," requires, in part, that components that are part of the reactor coolant pressure boundary be designed, fabricated, erected, and tested to the highest quality standards practical.

---

Written suggestions regarding this guide or development of new guides may be submitted through the NRC's public Web site in the NRC Library at https://nrcweb.nrc.gov/reading-rm/doc-collections/reg-guides/, under Document Collections, in Regulatory Guides, at https://nrcweb.nrc.gov/reading-rm/doc-collections/reg-guides/contactus.html.

Electronic copies of this RG, previous versions of this guide, and other recently issued guides are available through the NRC's public Web site under the Regulatory Guides document collection of the NRC Library at https://nrcweb.nrc.gov/reading-rm/doc-collections/reg-guides/. This RG is also available through the NRC's Agencywide Documents Access and Management System (ADAMS) at http://www.nrc.gov/reading-rm/adams.html, under Accession No. ML21181A222. The regulatory analysis may be found in ADAMS under Accession No. ML21196A096. The associated draft guide DG-1367 may be found in ADAMS under Accession No. ML20120A631, and the staff responses to the public comments on DG-1367 may be found in ADAMS under Accession No ML21196A100.

---

- 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Processing Plants," requires, in part, a program for the inspection of activities that affect quality to verify its conformance with documented instructions and procedures.

- 10 CFR 50.55a(g) requires, in part, that Class 1, 2, 3, metal containment (MC), and concrete containment (CC) components and their supports meet the requirements of ASME BPV Code, Section XI, or equivalent quality standards.

- 10 CFR 52.79(a)(11) (Ref. 3) requires the final safety analysis report to include "a description of the program(s), and their implementation, necessary to ensure that the systems and components meet the requirements of the ASME Boiler and Pressure Vessel Code and the ASME Code for Operation and Maintenance of Nuclear Power Plants in accordance with 50.55a of this chapter."

**Related Guidance**

- RG 1.84, "Design, Fabrication, and Materials Code Case Acceptability, ASME Section III" (Ref. 4), lists the ASME BPV Code Section III "Rules for Construction of Nuclear Power Plant Components" Code Cases that the NRC has approved for use as voluntary alternatives to the mandatory ASME BPV Code provisions that are incorporated into 10 CFR 50.55a.

- RG 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code" (Ref. 5), lists the ASME Operation and Maintenance Code (OM Code) Code Cases that the NRC has approved for use as voluntary alternatives to the mandatory ASME OM Code provisions that are incorporated into 10 CFR 50.55a.

- RG 1.193, "ASME Code Cases Not Approved for Use" (Ref. 6), lists the ASME BPV Code, Sections III and XI Code Cases, and the ASME OM Code, Code Cases, that the NRC has not approved for generic use.

**Purpose of This Regulatory Guide**

The NRC incorporated this RG into 10 CFR 50.55a by reference. The RG contains new Code Cases and revisions to existing Code Cases that the NRC staff has approved for use, as listed in Tables 1 and 2 of this guide. The RG also states the requirements governing the use of Code Cases. Licensees may voluntarily use Code Cases approved by the NRC as an alternative to compliance with the ASME Code provisions that have been incorporated by reference into 10 CFR 50.55a. Because the status of Code Cases continually changes, the staff plans to periodically update 10 CFR 50.55a and this guide to accommodate new Code Cases and any revisions of existing Code Cases.

**Paperwork Reduction Act**

This RG provides voluntary guidance for implementing the mandatory information collections in 10 CFR Parts 50 and 52 that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et. seq.). These information collections were approved by the Office of Management and Budget (OMB), under control numbers 3150-0011 and 3150-0151, respectively. Send comments regarding this information collection to the FOIA, Library, and Information Collections Branch ((T6-A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0011 and 3150-0151), Office of Management and Budget, Washington, DC, 20503.

**Public Protection Notification**

The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

# B. DISCUSSION

**Reason for Revision**

RG 1.147, Revision 20, includes information reviewed by the NRC on the Section XI Code Cases listed in Supplements 0 through 7 to the 2015 Edition, Supplements 0 through 7 to the 2017 Edition, and Supplements 0 and 1 to the 2019 Edition of the ASME BPV Code. This revision updates and supersedes RG 1.147, Revision 19, which included information from Supplement 11 to the 2010 Edition, Supplements 0 through 7 to the 2013 Edition and selected Code Cases from the 2015 and 2017 Editions of the ASME BPV Code.

**Background**

Provisions of the ASME BPV Code have been used since 1971 as one part of the framework to establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety in nuclear power plants. Among other things, ASME standards committees develop improved methods for the construction and inservice inspection (ISI) of ASME Class 1, 2, 3, MC, and CC nuclear power plant components. A broad spectrum of stakeholders participates in the ASME process to help ensure consideration of the various interests.

ASME publishes a new edition of the BPV Code, which includes Section XI, every 2 years. In 10 CFR 50.55a(a)(1)(ii), the NRC references the latest edition of Section XI, that the agency has approved for use. ASME also publishes Code Cases quarterly. Code Cases provide alternatives developed and approved by ASME. This RG identifies the Code Cases that the NRC has determined to be acceptable alternatives to applicable parts of Section XI. Under 10 CFR 50.55a(z), a licensee or applicant may request authorization to use Section XI Code Cases that the NRC has not yet endorsed. In 10 CFR 50.55a(z), the NRC permits the use of alternatives to the Code requirements referenced in 10 CFR 50.55a provided that the proposed alternatives result in an acceptable level of quality and safety and their use is authorized by the Director of the Office of Nuclear Reactor Regulation.

The NRC incorporated the ASME BPV Code by reference into 10 CFR 50.55a. NRC approved Code Cases provide an acceptable voluntary alternative to the mandatory ASME Code provisions. The regulation at 10 CFR 50.55a(b)(5) provides requirements related to the implementation of ASME Section XI Code Cases. When a licensee initially applies a Code Case listed in Table 1 or 2 of this guide, it must implement the most recent version of that Code Case incorporated by reference in 10 CFR 50.55a.

ASME may annul a Code Case because its provisions have been incorporated into the Code, the application for which it was specifically developed no longer exists, or experience has shown that an examination or testing method is no longer adequate. After ASME annuls a Code Case and after the NRC amends 10 CFR 50.55a and this guide, licensees may not implement that Code Case for the first time. However, a licensee that implemented the Code Case before its annulment may continue to use that Code Case through the end of the present ISI interval. An annulled Code Case cannot be used in the subsequent ISI interval unless it is implemented as an approved alternative under 10 CFR 50.55a(z). If the NRC incorporated a Code Case by reference into 10 CFR 50.55a and ASME later annulled it because experience has shown that an examination or testing method is inadequate, the NRC will amend 10 CFR 50.55a and this guide to remove its approval of the annulled Code Case. Licensees should not begin to implement such annulled Code Cases in advance of the rulemaking. Notwithstanding these requirements, the Commission may impose new or revised Code requirements, including implementation schedules, that it determines are consistent with 10 CFR 50.109, “Backfitting.”

ASME may revise a Code Case, for example, to incorporate user experience. The licensee or applicant cannot apply the older or superseded version of the Code Case for the first time. If an applicant or a licensee applied a Code Case before it was listed as superseded, it may continue to use the Code Case until it updates its Construction Code of Record (an applicant would update its application) or until the licensee's 120-month ISI/inservice testing (IST) update interval expires, after which the NRC prohibits the continued use of the Code Case unless the agency approves its use under 10 CFR 50.55a(z). If the NRC incorporates a Code Case by reference into 10 CFR 50.55a and if ASME later issues a revised version of the Code Case because experience has shown that the design analysis, construction method, examination method, or testing method is inadequate, the NRC will amend 10 CFR 50.55a and the relevant RG to remove its approval of the superseded Code Case. Applicants and licensees should not begin to implement such superseded Code Cases in advance of the rulemaking.

With regard to the use of any Code Case, the user is responsible for ensuring that the provisions of the Code Case do not conflict with licensee commitments or regulatory requirements.

# C. REGULATORY POSITION

For RG 1.147, Revision 20, the NRC reviewed the Section XI Code Cases listed in Supplements 0 through 7 to the 2015 Edition, Supplements 0 through 7 to the 2017 Edition, and Supplements 0 and 1 to the 2019 Edition of the ASME BPV Code. RG 1.147, Revision 20 supersedes the information in Revision 19. Appendix A to this guide lists the supplements reviewed by the NRC, the editions, the supplement numbers, and the numerical listing of Section XI Code Cases in each supplement. Appendix B to this guide lists all current Section XI Code Cases and table where each code case is listed. The following five tables list the Code Cases addressed by this RG:

a. Table 1, "Acceptable Section XI Code Cases," lists the Code Cases that are acceptable to the NRC for implementation in the ISI of light-water-cooled nuclear power plants.

b. Table 2, "Conditionally Acceptable Section XI Code Cases," lists the Code Cases that are acceptable as long as they are used with the identified conditions (i.e., the Code Case is generally acceptable; however, the NRC has determined that the requirements in the Code Case, which are alternative requirements to the BPV Code, must be supplemented to provide an acceptable level of quality and safety).

c. Table 3, "Annulled Unconditionally Approved Section XI Code Cases," lists ASME annulled- Code Cases that the NRC previously determined to be fully acceptable.

d. Table 4, "Annulled Conditionally Acceptable Section XI Code Cases," lists Code Cases that the NRC found to be acceptable as long as the licensee used them with the identified conditions; however, they were subsequently annulled by ASME.

e. Table 5, "Section XI Code Cases That Have Been Superseded," lists Code Cases that have been superseded through revision.

## 1. Acceptable Section XI Code Cases

The NRC determined that the Code Cases listed in Table 1 are acceptable for application in licensee Section XI ISI programs. RG 1.193 lists the ASME Code Cases that the NRC determined to be unacceptable. To assist users, new and revised Code Cases are shaded in grey to distinguish them from those approved in previous versions of this guide. For Code Cases previously listed in this guide, the third column of Table 1 lists the dates of ASME approvals. For new or revised Code Cases, the third column of Table 1 lists the supplement and edition in which each Code Case was published (e.g., "5/17E" means Supplement 5 to the 2017 Edition of the ASME BPV Code).

**Table 1. Acceptable Section XI Code Cases**

| CODE CASE NUMBER | TABLE 1<br>ACCEPTABLE SECTION XI CODE CASES | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| N-432-1 | *Repair Welding Using Automatic or Machine Gas Tungsten-Arc Welding (GTAW) Temper Bead Technique, Section XI, Division 1* | 3/28/01 |
| N-460 | *Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1* | 2/14/03 |
| N-494-4 | *Pipe Specific Evaluation Procedures and Acceptance Criteria for Flaws in Class 1 Ferritic Piping that Exceed the Acceptance Standards of IWB-3514.2 and in Class 1 Austenitic Piping that Exceed the Acceptance Standards of IWB-3514.3, Section XI, Division* | 1/12/05 |
| N-517-1 | *Quality Assurance Program Requirements for Owners, Section XI, Division 1* | 3/28/01 |
| N-526 | *Alternative Requirements for Successive Inspections of Class 1 and 2 Vessels, Section XI, Division 1* | 8/20/02 |
| N-528-1 | *Purchase, Exchange, or Transfer of Material Between Nuclear Plant Sites, Section XI, Division 1* | 4/19/02 |
| N-532-5 | *Repair/Replacement Activity Documentation Requirements and Inservice Inspection Summary Report Preparation and Submission, Section XI, Division 1* | 1/4/11 |
| N-537 | *Location of Ultrasonic Depth-Sizing Flaws, Section XI, Division 1* | 3/28/01 |
| N-561-3 | *Alternative Requirements for Wall Thickness Restoration of Class 2 and High Energy Class 3 Carbon Steel Piping, Section XI, Division 1* | 0/19E |
| N-566-2 | *Corrective Action for Leakage Identified at Bolted Connections, Section XI, Division 1* | 3/28/01 |
| N-586-1 | *Alternative Additional Examination Requirements for Classes 1, 2, and 3 Piping, Components, and Supports, Section XI, Division 1* | 5/4/04 |
| N-600 | *Transfer of Welder, Welding Operator, Brazer, and Brazing Operator Qualifications Between Owners, Section XI, Division 1* | 9/18/01 |
| N-609-1 | *Alternative Requirements to Stress-Based Selection Criteria for Category B-J Welds, Section XI, Division 1* | 9/17/10 |
| N-613-2 | *Ultrasonic Examination of Full Penetration Nozzles in Vessels, Examination Category B-D, Reactor Nozzle-To-Vessel Welds, and Nozzle Inside Radius Section Figs. IWB-2500-7(a), (b), (c), and (d), Section XI, Division 1* | 12/10/10 |
| N-624 | *Successive Inspections, Section XI, Division 1* | 4/19/02 |
| N-638-10 | *Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique, Section XI, Division 1* | 1/19E |

| CODE CASE NUMBER | TABLE 1<br>ACCEPTABLE SECTION XI CODE CASES | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| N-641 | *Alternative Pressure-Temperature Relationship and Low Temperature Overpressure Protection System Requirements, Section XI, Division 1* | 2/3/03 |
| N-643-2 | *Fatigue Crack Growth Rate Curves for Ferritic Steels in PWR Water Environment, Section XI, Division 1* | 5/4/04 |
| N-649 | *Alternative Requirements for IWE-5240 Visual Examination, Section XI, Division 1* | 3/28/01 |
| N-651 | *Ferritic and Dissimilar Metal Welding Using SMAW Temper Bead Technique Without Removing the Weld Bead Crown for the First Layer, Section XI, Division 1* | 8/14/01 |
| N-652-2 | *Alternative Requirements to Categorize B-G-1, B-G-2, and C-D Bolting Examination Methods and Selection Criteria, Section XI, Division 1* | 9/3/10 |
| N-653-2 | *Qualification Requirements for Full Structural Overlaid Wrought Austenitic Piping Welds, Section XI, Division 1* | 2/15E |
| N-658 | *Qualification Requirements for Ultrasonic Examination of Wrought Austenitic Piping Welds, Section XI, Division 1* | 4/4/02 |
| N-661-3 | *Alternative Requirements for Wall Thickness Restoration of Class 2 and 3 Carbon Steel Piping for Raw Water Service Section XI, Division 1* | 4/25/16 |
| N-663 | *Alternative Requirements for Classes 1 and 2 Surface Examinations, Section XI, Division 1* | 9/17/02 |
| N-664 | *Performance Demonstration Requirements for Examination of Unclad Reactor Pressure Vessel Welds, Excluding Flange Welds, Section XI, Division 1* | 8/20/02 |
| N-665 | *Alternative Requirements for Beam Angle Measurements Using Refracted Longitudinal Wave Search Units, Section XI, Division 1* | 2/28/03 |
| N-683 | *Method for Determining Maximum Allowable False Calls When Performing Single-Sided Access Performance Demonstration in Accordance with Appendix VIII, Supplements 4 and 6, Section XI, Division 1* | 2/28/03 |
| N-685 | *Lighting Requirements for Surface Examination, Section XI, Division 1* | 2/28/03 |
| N-686-1 | *Alternative Requirements for Visual Examinations, VT-1, VT-2, and VT-3, Section XI, Division* | 1/10/07 |
| N-694-2 | *Evaluation Procedure and Acceptance Criteria for PWR Reactor Vessel Head Penetration Nozzles, Section XI, Division 1* | 1/16/13 |
| N-697 | *Pressurized Water Reactor (PWR) Examination and Alternative Examination Requirements for Pressure Retaining Welds in Control Rod Drive and Instrument Nozzle Housings, Section XI, Division 1* | 11/18/03 |
| N-700 | *Alternative Rules for Selection of Classes 1, 2, and 3 Vessel Welded Attachments for Examination, Section XI, Division 1* | 11/18/03 |
| N-702-1 | *Alternative Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-to-Shell Welds, Section XI, Division 1* | 1/19E |
| N-706-1 | *Alternative Examination Requirements of Table IWB-2500-1 and Table IWC-2500-1 for PWR Stainless Steel Residual and Regenerative Heat Exchangers, Section XI, Division 1* | 1/10/07 |
| N-712 | *Class 1 Socket Weld Examinations, Section XI, Division 1* | 5/12/04 |
| N-716-2 | *Alternative Piping Classification and Examination Requirements, Section XI, Division 1* | 0/17E |

| CODE CASE NUMBER | TABLE 1<br>ACCEPTABLE SECTION XI CODE CASES | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| N-730-1 | *Roll Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs, Section XI, Division 1* | 7/16/12 |
| N-731 | *Alternative Class 1 System Leakage Test Pressure Requirements, Section XI, Division 1* | 2/22/05 |
| N-733 | *Mitigation of Flaws in NPS 2 (DN 50) and Smaller Nozzles and Nozzle Partial Penetration Welds in Vessels and Piping by Use of a Mechanical Connection Modification, Section XI, Division 1* | 7/1/05 |
| N-735 | *Successive Inspection of Class 1 and 2 Piping Welds, Section XI, Division 1* | 10/12/06 |
| N-739-1 | *Alternative Qualification Requirements for Personnel Performing Class CC Concrete and Post-Tensioning System Visual Examinations, Section XI, Division 1* | 1/21/07 |
| N-747 | *Reactor Vessel Head-to-Flange Weld Examinations, Section XI, Division 1* | 1/13/06 |
| N-753 | *Vision Tests, Section XI, Division 1* | 7/14/06 |
| N-762-1 | *Temper Bead Procedure Qualification Requirements for Repair/Replacement Activities Without Postweld Heat Treatment, Section XI, Division 1* | 10/21/13 |
| N-765 | *Alternative to Inspection Interval Scheduling Requirements of IWA-2430, Section XI, Division 1* | 1/26/09 |
| N-768 | *Alternative Volumetric Coverage Requirements for Ultrasonic Examination of Class 1 and 2 Pressure Vessel Weld Joints Greater Than 2 in. (50 mm) in Thickness, Section XI, Division 1* | 0/19E |
| N-769-2 | *Roll Expansion of Class 1 In-Core Housing Bottom Head Penetrations in BWRs, Section XI, Division 1* | 7/16/12 |
| N-771 | *Alternative Requirements for Additional Examinations of Class 2 or 3 Items, Section XI, Division 1* | 9/8/11 |
| N-773 | *Alternative Qualification Criteria for Eddy Current Examinations of Piping Inside Surfaces, Section XI, Division 1* | 1/26/09 |
| N-775 | *Alternative Requirements for Bolting Affected by Borated Water Leakage, Section XI, Division 1* | 6/24/10 |
| N-776 | *Alternative to IWA-5244 Requirements for Buried Piping, Section XI, Division 1* | 4/9/10 |
| N-786-3 | *Alternative Requirements for Sleeve Reinforcement of Class 2 and 3 Moderate-Energy Carbon Steel Piping, Section XI, Division 1* | 1/17E |
| N-789-3 | *Alternative Requirements for Pad Reinforcement of Class 2 and 3 Moderate Energy Carbon Steel Piping for Raw Water Service, Section XI, Division 1* | 1/17E |
| N-798 | *Alternative Pressure Testing Requirements for Class 1 Piping Between the First and Second Vent, Drain, and Test Isolation Devices, Section XI, Division 1* | 12/20/10 |
| N-800 | *Alternative Pressure Testing Requirements for Class 1 Piping Between the First and Second Injection Valves, Section XI, Division 1* | 12/20/10 |
| N-803 | *Similar and Dissimilar Metal Welding Using Ambient Temperature Automatic or Machine Dry Underwater Laser Beam Welding (ULBW) Temper Bead Technique, Section XI, Division 1* | 2/25/11 |

| CODE CASE NUMBER | TABLE 1<br>ACCEPTABLE SECTION XI CODE CASES | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| N-805 | *Alternative to Class 1 Extended Boundary End of Interval or Class 2 System Leakage Testing of the Reactor Vessel Head Flange O-Ring Leak-Detection System, Section XI, Division 1* | 2/25/11 |
| N-809 | *Reference Fatigue Crack Growth Rate Curves for Austenitic Stainless Steels in Pressurized Reactor Water Environments, Section XI, Division 1* | 2/15E |
| N-823-1 | *Visual Examination, Section XI, Division 1* | 1/23/14 |
| N-825 | *Alternative Requirements for Examination of Control Rod Drive Housing Welds, Section XI, Division 1* | 10/2/13 |
| N-839 | *Similar and Dissimilar Metal Welding Using Ambient Temperature SMAW Temper Bead Technique, Section XI, Division 1* | 9/4/14 |
| N-842 | *Alternative Inspection Program for Longer Fuel Cycles, Section XI, Division 1* | 1/28/14 |
| N-845-1 | *Qualification Requirements for Bolts and Studs, Section XI, Division 1* | 6/15E |
| N-848-1 | *Alternative Characterization Rules for Quasi-Laminar Flaws, Section XI, Division 1* | 0/17E |
| N-851 | *Alternate Method for Establishing the Reference Temperature for Pressure Retaining Materials, Section XI, Division 1* | 0/15E |
| N-853 | *PWR Class 1 Primary Piping Alloy 600 Full Penetration Branch Connection Weld Metal Buildup for Material Susceptible to Primary Water Stress Corrosion Cracking, Section XI, Division 1* | 6/27/16 |
| N-854 | *Alternative Pressure Testing Requirements for Class 2 and 3 Components Connected to the Class 1 Boundary, Section XI, Division 1* | 4/15/15 |
| N-858 | *Alternative Volumetric Coverage Requirements for Ultrasonic Examination of Class 1 Nozzle-to-Vessel Welds, Section XI, Division 1* | 2/17E |
| N-865 | *Alternative Requirements for Pad Reinforcement of Class 2 and 3 Atmospheric Storage Tanks, Section XI, Division 1* | 2/17E |
| N-867 | *Clarification of NDE Practical Examination Requirements, Section XI, Division 1* | 0/17E |
| N-873 | *Examination Requirements for the Core Makeup Tanks, Section XI, Division 1* | 1/17E |
| N-874 | *Temporary Acceptance of Leakage Through Brazed Joints of Class 3 Copper, Copper-Nickel, and Nickel-Copper Moderate Energy Piping, Section XI, Division 1* | 7/17E |
| N-877 | *Alternative Characterization Rules for Multiple Subsurface Radially Oriented Planar Flaws, Section XI, Division 1* | 2/17E |
| N-882 | *Alternative Requirements for Attaching Nonstructural Electrical Connections to Class 2 and 3 Components, Section XI, Division 1* | 6/17E |
| N-885 | *Alternative Requirements for Table IWB-2500-1, Examination Category B-N-1, Interior of Reactor Vessel, Category B-N-2, Welded Core Support Structures and Interior Attachments to Reactor Vessels, Category BN-3, Removable Core Support Structures, Section XI, Division 1* | 0/19E |
| N-892 | *Alternative Requirement for Form OAR-1, Owner's Activity Report, Completion Time, Section XI, Division 1* | 0/19E |

## 2. Conditionally Acceptable Section XI Code Cases

The NRC determined that the Code Cases listed in Table 2 are acceptable for application in licensee Section XI ISI programs within the limitations imposed by the NRC staff. Unless otherwise stated, limitations imposed by the NRC are in addition to the conditions specified in the Code Case. To assist users, new and revised Code Cases are shaded in grey to distinguish them from those approved in previous versions of this guide. For Code Cases previously listed in this guide, the third column of Table 1 lists the dates of ASME approvals. For new or revised Code Cases, the third column of Table 1 lists the supplement and edition in which each Code Case was published (e.g., "5/17E" means Supplement 5 to the 2017 Edition of the ASME BPV Code).

**Table 2. Conditionally Acceptable Section XI Code Cases**

| CODE CASE NUMBER | TABLE 2<br>CONDITIONALLY ACCEPTABLE SECTION XI CODE CASES<br>CONDITION | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| N-498-4 | *Alternative Requirements for 10-Year System Hydrostatic Testing for Class 1, 2, and 3 Systems, Section XI, Division 1*<br>Prior to conducting the VT-2 examination of Class 2 and Class 3 components not required to operate during normal plant operation, a 10 minute holding time is required after attaining test pressure. Prior to conducting the VT-2 examination of Class 2 and Class 3 components required to operate during normal plant operation, no holding time is required, provided the system has been in operation for at least 4 hours for insulated components or 10 minutes for non-insulated components. | 4/8/02 |
| N-504-4 | *Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping, Section XI, Division 1*<br>The provisions of Section XI, Nonmandatory Appendix Q, "Weld Overlay Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping Weldments," must also be met. In addition, the following conditions shall be met: (1) the sum of laminar flaw length in any direction shall be less than 10 percent of the overlay with a total reduction in area equal to or less than that in Table IWB-3514-3, (2) the finished overlay surface shall be 250 micro-in (6.3 micrometers) root mean square or smoother, (3) the surface flatness shall be adequate for ultrasonic examination, and (4) radiography shall not be used to detect planar flaws under, or masked by, laminar flaws. | 7/14/06 |
| N-508-4 | *Rotation of Serviced Snubbers and Pressure Retaining Items for the Purpose of Testing, Section XI, Division 1*<br>When Section XI requirements are used to govern the examination and testing of snubbers and the ISI Code of Record is earlier than the Section XI, 2006 Addenda, Footnote 1 shall not be applied. | 1/26/09 |
| N-513-5 | *Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping and Gate Valves, Section XI, Division 1*<br>(1) For the purposes of Section 5 of Code Case N-513-5, a "flaw" is a non-through-wall planar flaw or a non-through-wall nonplanar flaw with a wall thickness less than 87.5 percent of the nominal wall thickness of the pipe or the design minimum wall thickness.<br>(2) For the purposes of section 5 of Code Case N-513-5, the term "significant flaw" means any flaw found during augmented examinations performed per Section 5 of N-513-5 that has a depth greater than 75 percent of the | 6/17E |

| CODE CASE NUMBER | TABLE 2<br>CONDITIONALLY ACCEPTABLE SECTION XI CODE CASES<br>CONDITION | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| | pipe wall thickness or that does not satisfy the applicable requirements of the flaw evaluation per Section 3 of N-513-5. If a significant flaw as defined above is present, then the licensee must perform the additional augmented examination specified in Section 5. | |
| N-516-5 | *Underwater Welding, Section XI, Division 1*<br>The provisions of 10 CFR 50.55a(b)(2)(xii)(A) and (B) must be met when applying this Code Case. | 6/15E |
| N-552-1 | *Alternative Methods—Qualification for Nozzle Inside Radius Section from the Outside Surface, Section XI, Division 1*<br>To achieve consistency with the 10 CFR 50.55a rule change published September 22, 1999 (64 FR 51370), incorporating Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," to Section XI, add the following to the specimen requirements:<br>"At least 50 percent of the flaws in the demonstration test set must be cracks and the maximum misorientation must be demonstrated with cracks. Flaws in nozzles with bore diameters equal to or less than 4 inches may be notches."<br>Add to detection criteria, "The number of false calls must not exceed three." | 6/22/12 |
| N-557-1 | *In-Place Dry Annealing of a PWR Nuclear Reactor Vessel, Section XI, Division 1*<br>The secondary stress allowable of $3S_m$, shown in Figure 1 of the Code Case, must be applied to the entire primary plus secondary stress range during the anneal. | 8/20/02 |
| N-562-2 | *Alternative Requirements for Wall Thickness Restoration of Class 3 Moderate Energy Carbon Steel Piping, Section XI, Division 1*<br>(1) In Paragraph 5(b), for repairs performed on a wet surface, the overlay is only acceptable until the next refueling outage.<br>(2) In Paragraph 7(c), if the cause of the degradation has not been determined, the repair is only acceptable until the next refueling outage.<br>(3) The area where the weld overlay is to be applied must be examined using ultrasonic methods to demonstrate that no crack-like defects exist.<br>(4) Piping with a wall thickness less than the diameter of the electrode shall be depressurized before welding. | 1/22/07 |
| N-569-1 | *Alternative Rules for Repair by Electrochemical Deposition of Class 1 and 2 Steam Generator Tubing, Section XI, Division 1*<br>Note: Steam generator tube repair methods require prior NRC approval through technical specifications. This Code Case does not address certain aspects of this repair (e.g., the qualification of the inspection and plugging criteria necessary for staff approval of the repair method). In addition, if the user plans to "reconcile," as described in Footnote 2, the user must perform the reconciliation in accordance with the 1995 Edition and 1996 Addenda of the ASME Code, Section XI, IWA-4200. | 4/19/02 |

| CODE CASE NUMBER | TABLE 2<br>CONDITIONALLY ACCEPTABLE SECTION XI CODE CASES<br>CONDITION | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| N-576-2 | *Repair of Class 1 and 2 SB-163, UNS N06600 Steam Generator Tubing, Section XI, Division 1*<br>Note: Steam generator tube repair methods require prior NRC approval through technical specifications. This Code Case does not address certain aspects of this repair (e.g., the qualification of the inspection and plugging criteria necessary for staff approval of the repair method). | 3/16/12 |
| N-593-2 | *Alternative Examination Requirements for Steam Generator Nozzle to Vessel Welds, Section XI, Division 1*<br>(1) Essentially 100 percent (not less than 90 percent) of the examination volume A-B-C-D-E-F-G-H must be inspected.<br>(2) The examination volume specified in Section XI, Table IWB-2500-1, Examination Category B-D, must be used for the examination of steam generator nozzle-to-vessel welds at least once before using the reduced examination volume allowed by Code Case N-593-2. | 11/8/11 |
| N-597-3 | *Evaluation of Pipe Wall Thinning, Section XI*<br>(1) The use of Code Case N-597-3 for any degradation mechanisms other than flow -accelerated corrosion is not authorized unless an alternative is proposed and approved in accordance with 10 CFR 50.55a(z).<br>(2) Use of Code Case N-597-3 to mitigate flow accelerated corrosion is authorized subject to the following conditions:<br>a. The Code Case must be supplemented by the provisions of the EPRI/Nuclear Safety Analysis Center Report (NSAC) report EPRI/NSAC-202L-R2,"Recommendations for an Effective Flow Accelerated Corrosion Program," issued April 1999 (Ref. 7), for developing the inspection requirements, the method of predicting the rate of wall -thickness loss, and the value of the predicted remaining wall thickness. As used in EPRI/NSAC-202L-R2, the term "should" is to be applied as "shall" (i.e., a requirement).<br>b. Components affected by flow-accelerated corrosion to which this Code Case is applied must be repaired or replaced in accordance with the Construction Code of Record and the owner's requirements or a later NRC -approved edition of Section III before the value of $t_p$ reaches the allowable minimum wall thickness, $t_{min}$, as specified in Figure-3622-1 of this Code Case. Alternatively, use of the Code Case is subject to NRC review and approval in accordance with 10 CFR 50.55a(z).<br>(3) For those components that do not require immediate repair or replacement, the rate of wall -thickness loss is to be used to determine a suitable inspection frequency so that repair or replacement occurs prior to reaching allowable minimum wall thickness, $t_{min}$.<br>(4) The evaluation criteria in Code Case N-513-4 may be applied to Code Case N-597-3 for the temporary acceptance of wall thinning (until the next refueling outage) for moderate-energy Class 2 and 3 piping.<br>(5) Code Case N-597-3 shall not be used to evaluate through-wall leakage conditions. | 5/7/14 |

| CODE CASE NUMBER | TABLE 2<br>CONDITIONALLY ACCEPTABLE SECTION XI CODE CASES<br>CONDITION | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| N-606-2 | *Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique for BWR CRD Housing/Stub Tube Repairs, Section XI, Division 1*<br>Prior to welding, an examination or verification must be performed to ensure proper preparation of the base metal, and that the surface is properly contoured so that an acceptable weld can be produced. This verification is to be required in the welding procedure. | 6/21/13 |
| N-619 | *Alternative Requirements for Nozzle Inner Radius Inspections for Class 1 Pressurizer and Steam Generator Nozzles, Section XI, Division 1*<br>In lieu of an ultrasonic examination, licensees may perform a VT-1 examination in accordance with the Code of Record for the ISI program using the allowable flaw length criteria of Section XI, Table IWB-3512-1, with limiting assumptions on the flaw aspect ratio. | 4/8/02 |
| N-639 | *Alternative Calibration Block Material, Section XI, Division 1*<br>Chemical ranges of the calibration block may vary from the materials specification if (1) it is within the chemical range of the component specification to be inspected and (2) the phase and grain shape are maintained in the same ranges produced by the thermal process required by the material specification. | 8/20/02 |
| N-647 | *Alternative to Augmented Examination Requirements of IWE-2500, Section XI, Division 1*<br>A VT-1 examination is to be used in lieu of the "detailed visual examination." (Note: RG 1.164, "Dedication of Commercial-Grade Items for Use in Nuclear Power Plants" (Ref. 8), which endorses, in part, EPRI Technical Report 3002002982, provides acceptable guidelines for sampling criteria.) | 11/18/03 |
| N-648-2 | *Alternative Requirements for Inner Radius Examination of Class 1 Reactor Vessel Nozzles, Section XI, Division 1*<br>This Code Case shall not be used to eliminate the preservice or inservice volumetric examination of plants with a combined operating license under 10 CFR Part 52, or a plant that receives its operating license after October 22, 2015. | 9/4/14 |
| N-660 | *Risk-Informed Safety Classification for Use in Risk-Informed Repair/Replacement Activities, Section XI, Division 1*<br>This Code Case must be applied only to ASME Code Classes 2 and 3 and non-Code Class pressure -retaining components and their associated supports. | 7/23/02 |
| N-662-1 | *Alternative Repair/Replacement Requirements for Items Classified in Accordance with Risk-Informed Processes, Section XI, Division 1*<br>This Code Case must be applied only to ASME Code Classes 2 and 3 and non-Code Class pressure-retaining components and their associated supports. | 7/15/11 |
| N-666-1 | *Weld Overlay of Class 1, 2, and 3 Socket Welded Connections, Section XI, Division 1*<br>A surface examination (magnetic particle or liquid penetrant) must be performed after installation of the weld overlay on Class 1 and 2 piping socket welds. Fabrication defects, if detected, must be dispositioned using the surface examination acceptance criteria of the construction code identified in the repair/replacement plan. | 3/13/12 |

| CODE CASE NUMBER | TABLE 2<br>CONDITIONALLY ACCEPTABLE SECTION XI CODE CASES<br>CONDITION | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| N-695-1 | *Qualification Requirements for Dissimilar Metal Piping Welds, Section XI, Division 1*<br>Examiners qualified using the 0.25 RMS error for measuring the depths of flaws using Code Case N-695-1 are not qualified to depth-size inner-diameter (ID) surface-breaking flaws greater than 50-percent through-wall in dissimilar metal welds 2.1 inches or greater in thickness. If an examiner qualified using Code Case N-695-1 measures a flaw as greater than 50-percent through-wall in a dissimilar metal weld from the ID, the flaw shall be considered to have an indeterminate depth. | 12/31/14 |
| N-696-1 | *Qualification Requirements for Mandatory Appendix VIII Piping Examinations Conducted from the Inside Surface Section XI, Division 1*<br>Examiners qualified using the 0.25 RMS error for measuring the depths of flaws using Code Case N-696-1 in dissimilar metal or austenitic welds are not qualified to depth-size ID surface-breaking flaws greater than 50-percent through-wall in dissimilar metal or austenitic welds 2.1 inches or greater in thickness. If an examiner qualified using Code Case N-696-1 measures a flaw as greater than 50 -percent through-wall in a dissimilar metal or austenitic weld from the ID, the flaw shall be considered to have an indeterminate depth. | 5/7/14 |
| N-705-1 | *Evaluation Criteria for Temporary Acceptance of Degradation in Moderate Energy Class 2 or 3 Vessels and Tanks, Section XI, Division 1*<br>The ASME Code repair or replacement activity temporarily deferred under the provisions of this Code Case must be performed during the next scheduled refueling outage for through-wall flaws. | 2/17E |
| N-711-1 | *Alternative Examination Coverage Requirements for Examination Category B-F, B-J, C-F-1, C-F-2, and R-A Piping Welds, Section XI, Division 1*<br>Code Case N-711-1 shall not be used to redefine the required examination volume for preservice examinations or when the postulated degradation mechanism for piping welds is primary water stress-corrosion cracking or crevice-corrosion degradation mechanisms. | 11/7/16 |
| N-749 | *Alternative Acceptance Criteria for Flaws in Ferritic Steel Components Operating in the Upper Shelf Temperature Range, Section XI, Division 1*<br>In lieu of the upper shelf transition temperature, $T_c$, as defined in the Code Case, the following shall be used:<br>$T_c = 154.8\ °F + 0.82 \times RT_{NDT}$ (in U.S customary units).<br>$T_c = 82.8\ °C + 0.82 \times RT_{NDT}$ (in the International System of Units).<br>$T_c$ is the temperature above which the elastic plastic fracture mechanics (EPFM) method must be applied. Additionally, the NRC defines temperature $T_{c1}$ below which the linear elastic fracture mechanics (LEFM) method must be applied:<br>$T_{c1} = 95.36\ °F + 0.703 \times RT_{NDT}$ (in U.S customary units).<br>$T_{c1} = 47.7\ °C + 0.703 \times RT_{NDT}$ (in international system of units). | 3/16/12 |

| CODE CASE NUMBER | TABLE 2<br>CONDITIONALLY ACCEPTABLE SECTION XI CODE CASES<br>CONDITION | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| | Between $T_{c1}$ and $T_c$, although the fracture mode is in transition from LEFM to EPFM, users should consider whether it is appropriate to apply the EPFM method. Alternatively, the licensee may use a different $T_c$ value if it can be justified by plant -specific Charpy curves. | |
| N-751 | *Pressure Testing of Containment Penetration Piping, Section XI, Division 1*<br>When a 10 CFR 50, Appendix J, Type C test is performed as an alternative to the requirements of IWA-4540 (IWA-4700 in the 1989 edition through the 1995 edition) during repair and replacement activities, nondestructive examination must be performed in accordance with IWA-4540(a)(2) of the 2002 Addenda of Section XI. | 8/3/06 |
| N-754-1 | *Optimized Structural Dissimilar Metal Weld Overlay for Mitigation of PWR Class 1 Items, Section XI, Division 1*<br>(1) The conditions imposed on the optimized weld overlay design in the NRC's safety evaluation for the topical report, "Materials Reliability Program (MRP): Technical Basis for Preemptive Weld Overlays for Alloy 82/182 Butt Welds in PWRs (MRP-169)," Revision 1-A, Electric Power Research Institute (ADAMS Accession Nos. ML101620010 and ML101660468), must be satisfied.<br>(2) In lieu of the preservice and inservice examinations, as specified in Section 3(c) of the Code Case, the optimized weld overlay must be examined in accordance with 10 CFR 50.55a(g)(6)(ii)(F). | 2/28/13 |
| N-766-3 | *Nickel Alloy Reactor Coolant Inlay and Onlay for Mitigation of PWR Full Penetration Circumferential Nickel Alloy Dissimilar Metal Welds in Class 1 Items, Section XI, Division 1*<br>(1) Credit cannot be taken to reduce preservice and ISI requirements specified by this Code Case on an inlay or onlay if an inlay or onlay is applied to an Alloy 82/182 dissimilar metal weld that contains an axial indication that has a depth of more than 25 percent of the pipe wall thickness and a length of more than one-half of the axial width of the dissimilar metal weld or a circumferential indication that has a depth of more than 25 percent of the pipe wall thickness and a length of more than 20 percent of the circumference of the pipe.<br>(2) In lieu of Paragraph 2(e) of the Code Case, pipes with any thickness of inlay or onlay must be evaluated for weld shrinkage, pipe system flexibility, and additional weight of the inlay or onlay.<br>(3) If an inlay or onlay is applied to an Alloy 82/182 dissimilar metal weld that contains an indication that exceeds the acceptance standards of Section XI, IWB-3514, and that is accepted for continued service in accordance with Section XI, IWB-3132.3 or IWB-3142.4, the subject weld must be inspected in three successive examinations after inlay or onlay installation.<br>(4) Any detectable subsurface indication discovered by eddy current testing in the inlay or onlay during acceptance examinations is prohibited to remain in service.<br>(5) The flaw analysis of Paragraph 2(d) of the Code Case must also consider primary water stress corrosion cracking growth in the circumferential and axial directions in accordance with Section XI, IWB-3640. | 2/17E |

| CODE CASE NUMBER | TABLE 2<br>CONDITIONALLY ACCEPTABLE SECTION XI CODE CASES<br>CONDITION | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| N-778 | *Alternative Requirements for Preparation and Submittal of Inservice Inspection Plans, Schedules, and Preservice and Inservice Inspection Summary Reports, Section XI, Division 1*<br>Licensees must submit the following reports to the regulatory authority:<br>(1) The preservice inspection summary report must be submitted prior to the date of placement of the unit into commercial service<br>(2) The inservice inspection summary report must be submitted within 120 calendar days of the completion of each refueling outage. | 12/25/09 |
| N-795 | *Alternative Requirements for BWR Class 1 System Leakage Test Pressure Following Repair/Replacement Activities, Section XI, Division 1*<br>(1) The use of nuclear heat to conduct the BWR Class 1 system leakage test is prohibited (i.e., the reactor must be in a noncritical state), except during refueling outages in which the ASME Section XI Category B-P pressure test has already been performed or at the end of midcycle maintenance outages 14 days or less in duration.<br>(2) The test condition holding time, after pressurization to test conditions and before the visual examinations commence, shall be 1 hour for noninsulated components. | 9/17/10 |
| N-799 | *Dissimilar Metal Welds Joining Vessel Nozzles to Components, Section XI, Division 1*<br>(1) Ultrasonic examination procedures, equipment, and personnel shall be qualified by performance demonstration in accordance with Section XI, Appendix VIII, Supplement 10. When applying the examination requirements of Figure IWB-2500-8, the examination volume shall be extended to include 100 percent of the weld.<br>(2) Examination requirements of Section XI, Mandatory Appendix I, Paragraph I-3200(c), must be applied.<br>(3) Ultrasonic depth and sizing qualifications for cast austenitic stainless steel components must follow Appendix VIII, Supplement 10, using representative cast austenitic stainless steel mockups containing representative cracks and be independent of other Supplement 10 qualifications.<br>(4) Cracks detected and not depth sized to Appendix VIII type performance-based procedures, equipment, and personnel qualifications shall be repaired or removed. | 12/20/10 |
| N-824 | *Ultrasonic Examination of Cast Austenitic Piping Welds From the Outside Surface, Section XI, Division 1*<br>(1) Instead of Paragraph 1(c)(1)(–c)(–2), licensees shall use a search unit with a center frequency of 500 kHz with a tolerance of plus or minus 20 percent for piping greater than 1.6 in (41 mm) thick.<br>(2) Instead of Paragraph 1(c)(1)(–d), the search unit must produce angles, including those at, but not limited to, 30 to 55 degrees with a maximum increment of 5 degrees. | 10/16/12 |

| CODE CASE NUMBER | TABLE 2<br>CONDITIONALLY ACCEPTABLE SECTION XI CODE CASES<br>CONDITION | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| N-829 | *Austenitic Stainless Steel Cladding and Nickel Base Cladding Using Ambient Temperature Machine GTAW Temper Bead Technique, Section XI, Division 1*<br>The provisions of Paragraph 3(e)(2) or 3(e)(3) may only be used when it is impractical to use the interpass temperature measurement methods described in Paragraph 3(e)(1), such as in situations where the weldment area is inaccessible (e.g., internal bore welding) or when there are extenuating radiological conditions. | 12/28/12 |
| N-830 | *Direct Use of Master Fracture Toughness Curve for Pressure Retaining Materials of Class 1 Vessels, Section XI, Division 1*<br>Use of Code Case N-830, Paragraph (f), which provides an alternative to limiting the lower shelf of the 95-percent lower tolerance bound Master Curve toughness, $K_{JC\text{-lower }95\%}$, to a value consistent with the current $K_{IC}$ curve, is prohibited. | 9/4/14 |
| N-831-1 | *Ultrasonic Examination in Lieu of Radiography for Welds in Ferritic or Austenitic Pipe, Section XI, Division 1*<br>Code Case N-831-1 is prohibited for use in new reactor construction. | 7/17E |
| N-838 | *Flaw Tolerance Evaluation of Cast Austenitic Stainless Steel Piping, Section XI, Division 1*<br>Code Case N-838 shall not be used to evaluate flaws in cast austenitic stainless steel piping where the delta ferrite content exceeds 25 percent. | 8/3/15 |
| N-843 | *Alternative Pressure Testing Requirements Following Repairs or Replacements for Class 1 Piping between the First and Second Inspection Isolation Valves, Section XI, Division 1*<br>If the portions of the system that requires pressure testing are associated with more than one safety function, the pressure test and visual examination VT-2 shall be performed during a test conducted at the higher of the operating pressures for the respective system safety functions. | 1/23/14 |
| N-847 | *Partial Excavation and Deposition of Weld Metal for Mitigation of Class 1 Items, Section XI, Division 1*<br>(1) Use of Code Case N-847 is limited to installation of full 360-degree excavation and weld repairs (EWR).<br>(2) When implementing Figure 1A, "Cross Section of Typical Dissimilar Metal EWR," and Figure 1B, "Cross Section of Typical Similar Metal EWR," of the Code Case for the design of an EWR, intersection points at the interface between EWR metal and existing base metal must be rounded to mitigate weldability issues.<br>(3) The evaluation in section 2(d)(1) of the Code Case must include evaluation of crack growth into the Alloy 690 weld material, including the dilution zones and allowing change in flaw growth direction.<br>(4) Residual stress values in section 2 of the Code Case must be developed and validated consistent with NUREG-2228, "Weld Residual Stress Finite Element Analysis Validation: Part II—Proposed Validation Procedure." (Ref. 10)<br>(5) With respect to Table 1, including notes (1), (3), and (4): | 0/17E |

| CODE CASE NUMBER | TABLE 2<br>CONDITIONALLY ACCEPTABLE SECTION XI CODE CASES<br>CONDITION | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| | a. The first inservice inspection examinations for Inspection Item EWR-2A EWRs must be performed during the second refueling outage. For normal water chemistry plants, 100 percent of all EWRs must be inspected every 10 years. For hydrogen water chemistry/noble metal chemical addition plants, 25 percent of the EWRs must be inspected every 10 years.<br>b. The first inservice inspection examinations for Inspection Item EWR-1B EWRs must be performed during the second refueling outage. Regardless of water chemistry mitigative actions, 100 percent of the EWRs must be inspected every 10 years.<br>c. The first inservice inspection examinations for Inspection Item EWR-2B EWRs must be performed during the second refueling outage.<br>(6) For the purposes of Table 1, Note (1), licensees must not use an alternative other than those specified in Note (1). | |
| N-849 | *In-situ VT-3 Examination of Removable Core Support Structures Without Removal, Section XI*<br>(1) The use of Code Case N-849 is limited to plants that are designed with accessible core support structures to allow for in situ inspection.<br>(2) Before the initial plant startup, a VT-3 examination shall be performed with the core support structure removed, as required by ASME Section XI, IWB-2500-1, and shall include all surfaces that are accessible when the core support structure is removed, including all load bearing and contact surfaces. | 9/4/14 |
| N-864 | *Reactor Vessel Threads in Flange Examinations, Section XI, Division 1*<br>(1) Reactor pressure vessel threads-in-flange examinations (ASME Section XI, Examination Category B-G-1, Item No. B6.40) must be performed in at least every third 10-year ISI interval. Facilities that received NRC approval for an alternative under 10 CFR 50.55a(z) that authorized the licensee not to perform the examinations on Item No. B6.40 before Code Case N-864 was incorporated into NRC regulations are not permitted to apply Code Case N-864 in a manner that would result in the examinations on Item No. B6.40 not being performed in more than two consecutive ISI intervals.<br>(2) Monitoring and maintenance activities must be performed and documented to monitor the condition of the reactor pressure vessel threads in flange for signs of degradation and to mitigate any degradation that occurs. Performing and documenting the facility's maintenance procedures for removal, care, and visual inspection of the reactor head closure studs and threads in flange during each refueling outage is sufficient to satisfy this condition. | 2/17E |
| N-869 | *Evaluation Criteria for Temporary Acceptance of Flaws in Class 2 or 3 Piping, Section XI, Division 1*<br>(1) For the purposes of Section 5 of Code Case N-869, a “flaw” is a non-through-wall planar flaw or a non-through-wall nonplanar flaw with a wall thickness less than 87.5 percent of the nominal wall thickness of the pipe or the design minimum wall thickness. | 6/17E |

| CODE CASE NUMBER | TABLE 2<br>CONDITIONALLY ACCEPTABLE SECTION XI CODE CASES<br>CONDITION | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| | (2) For the purposes of section 5 of Code Case N-869, the term "significant flaw" means any flaw found during augmented examinations performed per Section 5 of N-869 that has a depth greater than 75 percent of the pipe wall thickness or that does not satisfy the applicable requirements of the flaw evaluation per Section 3 of N-869. If a significant flaw as defined above is present, then the licensee must perform the additional augmented examination specified in Section 5. | |
| N-876 | *Austenitic Stainless Steel Cladding and Nickel Base Cladding Using Ambient Temperature Automatic or Machine Dry Underwater Laser Beam Welding (ULBW) Temper Bead Technique, Section XI, Division 1*<br>(1) The provisions of 10 CFR 50.55a(b)(2)(xii)(A) and (B) must be met when applying this Code Case.<br>(2) This Code Case must not be used for repairs of the ferritic base material, or for cladding repairs where less than 1/8" of cladding remains. | 2/17E |
| N-878 | *Alternative to QA Program Requirements of IWA-4142, Section XI, Division 1*<br>(1) For ASME Section III items, this condition applies only for the licensees that implemented ASME Code, Section III design requirements for their original construction code and/or the licensees that have upgraded their original design requirements to ASME Code, Section III. The Licensee must verify the design and testing activities associated with qualification of non-welded fittings performed by the fabricator as follows:<br>(a) Review the fabricator's design documentation and methods to ensure the fittings design is in compliance with the Licensee's design specifications, and ASME Section III NB/NC/ND-3671.7 requirements; and either<br>(i) Supervise and monitor the performance qualification tests of the fittings to ensure the design is in compliance with the Licensee's design specifications and ASME Section III NB/NC/ND-3671.7; or<br>(ii) The Licensee or Repair/Replacement Organization conducts qualification tests of the fittings or conducts design analyses to ensure the design is in compliance with the Licensee's design specifications and ASME Section III NB/NC/ND-3671.7.<br>(2) The Licensee must give the Authorized Nuclear Inservice Inspector (ANII) an opportunity to review the design report prior to installation. | 1/17E |
| N-880 | *Alternative to Procurement Requirements of IWA-4143 for Small Nonstandard Welded Fittings, Section XI, Division 1*<br>(1) For ASME Section III items, this condition applies only for the licensees that implemented ASME Code, Section III design requirements for their original construction code and/or the licensees that have upgraded their original design requirements to ASME Code, Section III. The Licensee must verify the design and testing activities associated with qualification of welded fittings performed by the fabricator as follows:<br>(a) Review the fabricator's design documentation and methods to ensure the fittings design is in compliance with the Licensee's | 2/17E |

| CODE CASE NUMBER | TABLE 2<br>CONDITIONALLY ACCEPTABLE SECTION XI CODE CASES<br>CONDITION | DATE OR SUPPLEMENT/ EDITION |
|---|---|---|
| | design specifications, and ASME Section III NB/NC/ND-3671.7 requirements; and either<br>(i) Supervise and monitor the performance qualification tests of the fittings to ensure the design is in compliance with the Licensee's design specifications and ASME Section III NB/NC/ND-3671.7; or<br>(ii) The Licensee or Repair/Replacement Organization conducts qualification tests of the fittings or conducts design analyses to ensure the design is in compliance with the Licensee's design specifications and ASME Section III NB/NC/ND-3671.7.<br>(3) The Licensee must give the ANII an opportunity to review the design report prior to installation. | |
| N-889 | *Reference Stress Corrosion Crack Growth Rate Curves for Irradiated Austenitic Stainless Steel in Light-Water Reactor Environments, Section XI, Division 1*<br>(1) The code case must not be used for fluence levels greater than 20 dpa.<br>(2) For neutron fluences less than or equal to 0.75 dpa ($5x10^{20}$ n/cm2), the crack growth rates (CGR) of N-889 must not be used unless they result in a higher crack growth rate than the CGR calculated using the method of the ASME Code, Section XI, Nonmandatory Appendix C, Article C-8520.<br>(3) For cold-worked non-Molybdenum (Mo) bearing stainless steel (SS) materials (including Type 304 and 347 SS), the irradiated yield stress model for cold-worked Mo-bearing materials must be used. | 7/17E |
| N-890 | *Materials Exempted From G-2110(b) Requirement Section XI, Division 1*<br>Figure G-2110-1 must not be used to characterize the toughness of SA-533 Type B, Class 2 material without satisfying the requirements of Section III, Subsection NB, NB-2300 and Section III, Nonmandatory Appendix G, G-2110(b). | 0/19E |

## 3. Annulled Unconditionally Approved Section XI Code Cases

The NRC had previously approved the Code Cases listed in Table 3 unconditionally; however, they have been annulled by ASME. To assist users, new annulled Code Cases are shaded in grey to distinguish them from those listed in previous versions of this guide.

**Table 3. Annulled Unconditionally Approved Section XI Code Cases**

| CODE CASE NUMBER | TABLE 3<br>ANNULLED UNCONDITIONALLY APPROVED SECTION XI CODE CASES | ANNULMENT DATE |
|---|---|---|
| N-34<br>(1551) | *Inservice Inspection of Welds of Nuclear Components, Section XI* | 11/20/81 |
| N-72<br>(1646) | *Partial Postponement of Category B-C Examination for Class 1 Components, Section XI* | 1/1/81 |
| N-73<br>(1647) | *Partial Postponement of Category B-D Examination for Class 1 Components, Section XI* | 1/1/81 |
| N-98<br>(1705-1) | *Ultrasonic Examination—Calibration Block Tolerances, Section XI, Division 1* | 8/9/96 |
| N-112<br>(1730) | *Acceptance Standards for Class 2 and 3 Components, Section XI, Division 1* | 7/1/79 |
| N-113-1 | *Basic Calibration Block for Ultrasonic Examination of Weld 10 in. to 14 in. Thick, Section XI, Division 1* | 8/9/96 |
| N-167<br>(1804) | *Minimum Section Thickness Requirements for Repair of Nozzles, Section XI, Division 1* | 1/14/80 |
| N-198-1 | *Exemption from Examination for ASME Class 1 and 2 Piping Located at Containment Penetrations, Section XI, Division 1* | 3/28/01 |
| N-211 | *Recalibration of Ultrasonic Equipment Upon Change of Personnel, Section XI, Division 1* | 4/30/93 |
| N-216 | *Alternative Rules for Reactor Vessel Closure Stud Examination, Section XI, Division 1* | 5/7/90 |
| N-234 | *Time Between Ultrasonic Calibration Checks, Section XI, Division 1* | 12/3/90 |
| N-235 | *Ultrasonic Calibration Checks per Section V, Section XI, Division 1* | 8/9/96 |
| N-236-1 | *Repair and Replacement of Class MC Vessels, Section XI, Division 1* | 8/5/97 |
| N-288 | *Hydrostatic Test Requirements for Class 1 and Class 2 Components, Section XI, Division 1* | 5/25/83 |
| N-306 | *Calibration Block Material Selection, Appendix 1, 1-3121, Section XI, Division 1* | 5/7/90 |
| N-307-3 | *Revised Ultrasonic Examination Volume for Class 1 Bolting, Table IWB-2500-1, Examination Category B-G-1, When the Examinations Are Conducted from the End of the Bolt or Stud or from the Center-Drilled Hole, Section XI, Division 1* | 1/21/07 |
| N-308 | *Documentation of Repairs and Replacements of Components in Nuclear Power Plants, Section XI, Division 1* | 9/30/90 |
| N-311 | *Alternative Examination of Outlet Nozzle on Secondary Side of Steam Generators, Section XI, Division 1* | 11/18/03 |
| N-322 | *Examination Requirements for Integrally Welded or Forged Attachments to Class 1 Piping at Containment Penetrations, Section XI, Division 1* | 2/14/03 |

| CODE CASE NUMBER | TABLE 3<br>ANNULLED UNCONDITIONALLY APPROVED SECTION XI CODE CASES | ANNULMENT DATE |
|---|---|---|
| N-323-1 | *Alternative Examination for Welded Attachments to Pressure Vessels, Section XI, Division 1* | 1/21/07 |
| N-334 | *Examination Requirements for Integrally Welded or Forged Attachments to Class 2 Piping at Containment Penetrations, Section XI, Division 1* | 7/14/06 |
| N-335-1 | *Rules for Ultrasonic Examination of Similar and Dissimilar Metal Piping Welds, Section XI, Division 1* | 5/11/97 |
| N-343 | *Alternative Scope of Examination of Attachment Welds for Examination Categories B-H, B-K-1, and C-C, Section XI, Division 1* | 12/3/90 |
| N-355 | *Calibration Block for Angle Beam Ultrasonic Examination of Large Fittings in Accordance with Appendix III-3410, Section XI, Division 1* | 8/9/96 |
| N-356 | *Certification Period for Level III NDE Personnel, Section XI, Division 1* | 8/5/97 |
| N-375-2 | *Rules for Ultrasonic Examination of Bolds and Studs, Section XI, Division 1* | 5/7/90 |
| N-389-1 | *Alternative Rules for Repairs, Replacements, or Modifications, Section XI, Division 1* | 4/19/02 |
| N-401-1 | *Eddy Current Examination, Section XI, Division 1* | 5/11/97 |
| N-402-1 | *Eddy Current Calibration Standards, Section XI, Division 1* | 5/11/97 |
| N-406 | *Alternative Rules for Replacement, Section XI, Division 1* | 5/7/90 |
| N-408-3 | *Alternative Rules for Examination of Class 2 Piping, Section XI, Division 1* | 4/19/02 |
| N-409-3 | *Procedure and Personnel Qualification Requirements for Ultrasonic Detection and Sizing of Flaws in Piping Welds, Section XI, Division 1* | 4/30/96 |
| N-415 | *Alternative Rules for Testing Pressure Relief, Section XI, Division 1* | 8/14/94 |
| N-419 | *Extent of VT-1 Examinations, Category B-G-1 of Table IWB-2500-1, Section XI, Division 1* | 5/13/94 |
| N-424 | *Qualification of Visual Examination Personnel, Section XI, Division 1* | 7/18/88 |
| N-426 | *Extent of VT-1 Examinations, Category B-G-2 of Table IWB-2500-1, Section XI, Division 1* | 5/13/94 |
| N-427 | *Code Cases in Inspection Plans, Section XI, Division 1* | 12/16/94 |
| N-429-2 | *Alternative Rules for Ultrasonic Instrument Calibration, Section XI, Division 1* | 7/27/95 |
| N-435-1 | *Alternative Examination Requirements for Vessels With Wall Thickness 2 in. or Less, Section XI, Division 1* | 5/4/04 |
| N-436-1 | *Alternative Methods for Evaluation of Flaws in Austenitic Piping, Section XI, Division 1* | 12/3/90 |
| N-437 | *Use of Digital Readout and Digital Measurement Devices for Performing Pressure Tests, Section XI, Division 1* | 7/27/95 |
| N-444 | *Preparation of Inspection Plans, Section XI, Division 1* | 12/30/90 |
| N-445 | *Use of Later Editions of SNT-TC-1A for Qualification of Nondestructive Examination Personnel, Section XI, Division 1, 2, and 3* | 5/7/90 |
| N-446 | *Recertification of Visual Examination Personnel, Section XI, Division 1* | 5/7/90 |
| N-448 | *Qualification of VT-2 and VT-3 Visual Examination Personnel, Section XI, Division 1* | 4/30/96 |
| N-449 | *Qualification of VT-4 Visual Examination Personnel, Section XI, Division 1* | 4/30/96 |
| N-457 | *Qualification Specimen Notch Location for Ultrasonic Examination of Bolts and Studs, Section XI, Division 1* | 4/19/02 |
| N-458-1 | *Magnetic Particle Examination of Coated Materials, Section XI, Division 1* | 3/38/01 |

| CODE CASE NUMBER | TABLE 3<br>ANNULLED UNCONDITIONALLY APPROVED SECTION XI CODE CASES | ANNULMENT DATE |
|---|---|---|
| N-461-1 | *Alternative Rules for Piping Calibration Block Thickness, Section XI, Division 1* | 3/28/01 |
| N-463-1 | *Evaluation Procedures and Acceptance Criteria for Flaws in Class 1 Ferritic Piping That Exceed the Acceptance Standards of IWB-3514.2, Section XI, Division 1* | 3/28/01 |
| N-471 | *Acoustic Emission for Successive Inspections, Section XI, Division 1* | 4/19/02 |
| N-472 | *Use of Digital Readout and Digital Measurement Devices for Performing Pump Vibration Testing, Section XI, Division 1* | 8/14/97 |
| N-478 | *Inservice Inspection for Class CC Concrete Components of Light-Water Cooled Power Plants, Section XI, Division 1* | 3/2/98 |
| N-479-1 | *Boiling Water Reactor (BWR) Main Steam Hydrostatic Test, Section XI, Division 1* | 4/19/02 |
| N-481 | *Alternative Examination Requirements for Cast Austenitic Pump Casings, Section XI, Division 1* | 3/28/04 |
| N-485-1 | *Eddy Current Examination of Coated Ferritic Surfaces as an Alternative to Surface Examination, Section XI, Division 1* | 2/14/03 |
| N-489 | *Alternative Rules for Level III NDE Qualification Examinations, Section XI, Divisions 1, 2, and 3* | 4/19/02 |
| N-490-1 | *Alternative Vision Test Requirements for Nondestructive Examiners, Section XI, Divisions 1, 2, and 3* | 2/14/03 |
| N-491-2 | *Alternative Rules for Examination of Class 1,2,3, and NC Component Supports of Light-Water Cooled Power Plants, Section XI, Division 1* | 4/30/15 |
| N-495 | *Hydrostatic Testing of Relief Valves, Section XI, Division 1* | 4/19/02 |
| N-496-2 | *Helical-Coil Threaded Inserts, Section XI, Division 1* | 8/4/04 |
| N-503 | *Limited Certification of Nondestructive Examination Personnel, Section XI, Division 1* | 2/14/03 |
| N-514 | *Low Temperature Overpressure Protection, Section XI, Division 1* | 4/19/02 |
| N-515 | *Class 1 Mechanical Joint Pressure Tests, Section XI, Division 1* | 4/19/02 |
| N-521 | *Alternative Rules for Deferral of Inspections of Nozzle-to-Vessel Welds, Inside Radius Sections, and Nozzle-to-Safe End Welds of a Pressurized Water Reactor (PWR) Vessel, Section XI, Division 1* | 4/19/02 |
| N-522 | *Pressure Testing of Containment Penetration Piping, Section XI, Division 1* | 4/8/02 |
| N-523-2 | *Mechanical Clamping Devices for Class 2 and 3 Piping, Section XI, Division 1* | 3/28/04 |
| N-524 | *Alternative Examination Requirements for Longitudinal Welds in Class 1 and 2 Piping, Section XI, Division 1* | 4/19/02 |
| N-534 | *Alternative Requirements for Pneumatic Pressure Testing, Section XI, Division 1* | 5/9/03 |
| N-535 | *Alternative Requirements for Inservice Inspection Intervals, Section XI, Division 1* | 3/28/01 |
| N-538 | *Alternative Requirements for Length Sizing Performance Demonstration in Accordance with Appendix VIII, Supplements 2, 3, 10, 11, and 12, Section XI, Division 1* | 4/19/02 |
| N-541 | *Alternative Requirements for Performance Demonstration in Accordance with Appendix VIII, Supplements 4 and 6, Section XI, Division 1* | 3/28/01 |
| N-543 | *Alternative to Performing Periodic Calibration Checks, Section XI, Division 1* | 9/18/01 |

| CODE CASE NUMBER | TABLE 3<br>ANNULLED UNCONDITIONALLY APPROVED SECTION XI CODE CASES | ANNULMENT DATE |
|---|---|---|
| N-544 | *Repair/Replacement of Small Items, Section XI, Division 1* | 3/28/01 |
| N-545 | *Alternative Requirements for Conduct of Performance Demonstration Detection Test of Reactor Vessel, Section XI, Division 1* | 5/20/98 |
| N-553-1 | *Inservice Eddy Current Surface Examination of Pressure Retaining Pipe Welds and Nozzle-to-Safe End Welds, Section XI, Division 1* | 3/28/01 |
| N-554-3 | *Alternative Requirements for Reconciliation of Replacement Items and Addition of New Systems, Section XI, Division 1* | 2/14/03 |
| N-555 | *Use of Section II, V, and IX Code Cases, Section XI, Division 1* | 4/8/02 |
| N-556 | *Alternative Requirements for Verification of Acceptability of Replacements, Section XI, Division 1* | 4/19/02 |
| N-563 | *Grading of Examinations, IWA-2320, Section XI, Division 1* | 4/19/02 |
| N-567-1 | *Alternative Requirements for Class 1, 2, and 3 Replacement Components, Section XI, Division 1* | 4/19/02 |
| N-573 | *Transfer of Procedure Qualification Records Between Owners, Section XI, Division 1* | 2/14/03 |
| N-588 | *Attenuation to Reference Flaw Orientation of Appendix G for Circumferential Welds in Reactor Vessels, Section XI, Division 1* | 3/28/04 |
| N-592 | *ASNT Central Certification Program, Section XI, Division 1* | 3/28/04 |
| N-598 | *Alternative Requirements to Required Percentages of Examinations, Section XI, Division 1* | 3/28/04 |
| N-601 | *Extent and Frequency of VT-3 Visual Examination for Inservice Inspection of Metal Containments, Section XI, Division 1* | 3/28/04 |
| N-603 | *Alternative to the Requirements of IWL-2421, Sites with Two Plants, Section XI, Division 1* | 3/28/04 |
| N-604 | *Alternative to Bolt Torque or Tension Test Requirements of Table IWE-2500-1, Category E-G, Item E8.20, Section XI, Division 1* | 9/18/04 |
| N-605 | *Alternative to the Requirements of IWE-2500(c)* [sic, should state "IWE-2500(b)"] *for Augmented Examination of Surface Areas, Section XI, Division 1* | 3/28/04 |
| N-617 | *Alternative Examination Distribution Requirements for Table IWC-2500-1, Examination Category C-G, Pressure Retaining Welds in Pumps and Valves, Section XI, Division 1* | 4/19/02 |
| N-623 | *Deferral of Inspections of Shell-to-Flange and Head-to-Flange Welds of a Reactor Vessel, Section XI, Division 1* | 4/19/02 |
| N-627 | *VT-1 Visual Examination in Lieu of Surface Examination for RPV Closure Nuts, Section XI, Division 1* | 5/7/02 |
| N-629 | *Use of Fracture Toughness Test Data to Establish Reference Temperature for Pressure Retaining Materials, Section XI, Division 1* | 4/30/15 |
| N-640 | *Alternative Reference Fracture Toughness for Development of P-T Limit Curves, Section XI, Division 1* | 4/19/02 |

## 4. Annulled Conditionally Acceptable Section XI Code Cases

The NRC conditionally approved the Code Cases listed in Table 4; however, they were subsequently annulled by ASME. To assist users, new annulled Code Cases are shaded in grey to distinguish them from those listed in previous versions of this guide.

**Table 4. Annulled Conditionally Acceptable Section XI Code Cases**

| CODE CASE NUMBER | TABLE 4<br>ANNULLED CONDITIONALLY ACCEPTABLE SECTION XI, CODE CASES | ANNULMENT DATE |
|---|---|---|
| N-118<br>(1738) | *Examination—Acceptance Standards for Surface Indications in Cladding, Section XI*<br>The last sentence of the "Reply" is to be replaced with the following: "The provisions of this Code Case may not be applied for the examination of clad surfaces of nozzles, including the inner surface of the nozzle-to-vessel insert welds." | 12/3/90 |
| N-210 | *Exemption to Hydrostatic Tests After Repairs, Section XI, Division 1*<br>Paragraph (3) of the "Reply" is to be replaced with the following: "Repairs to piping, pumps, and valves where the depth of the repaired cavity does not exceed 25 percent of the wall thickness." | 3/20/81 |
| N-252 | *Low Energy Capacitive Discharge Welding Method for Temporary or Permanent Attachments to Components and Supports, Section III, Division 1, and Section XI*<br>The applicant should indicate in the safety analysis report the application, the material, and the thickness of the material to which the strain gage or thermocouple will be attached by CD welding. | 7/16/82 |
| N-278 | *Alternative Ultrasonic Calibration Block Configuration I-3131 and T-434.3, Section XI, Division 1*<br>(Note: Code Case N-278 was inadvertently allowed to expire because of an ASME administrative error on 3/17/83. The Code Case was reinstated without technical change on May 25, 1993. Thus, the NRC considered the Code Case to be in effect during the period from March 17, 1983, through May 25, 1993.)<br>When a universal calibration block is used and some or all of the reference holes are larger than the reflector holes at comparable depths recommended by the 1980 Edition of the ASME Code, Section V, Article IV, a correction factor should be used to adjust the DAC level to compensate for the larger reflector holes. In addition, if the reactor pressure vessel was previously examined using a conventional block, a ratio between the DAC curves obtained from the two blocks should be noted (for reference) with the significant indication data. | 2/19/92 |
| N-416-4 | *Alternative Pressure Test Requirement for Welded or Brazed Repairs, Fabrication Welds or Brazed Joints for Replacement Parts and Piping Subassemblies, or Installation of Replacement Items by Welding or Brazing, Classes 1, 2, and 3, Section XI, Division 1*<br>Nondestructive examination (NDE) must be performed on welded or brazed repairs and fabrication and installation joints in accordance with the methods and acceptance criteria of the applicable subsection of the 1992 Edition of Section III. | 1/4/16 |

| CODE CASE NUMBER | TABLE 4<br>ANNULLED CONDITIONALLY ACCEPTABLE SECTION XI, CODE CASES | ANNULMENT DATE |
|---|---|---|
| N-509 | *Alternative Rules for the Selection and Examination of Class 1, 2, and 3 Integrally Welded Attachments, Section XI, Division 1*<br>A minimum 10-percent sample of integrally welded attachments for each item in each Code Class per interval should be examined. | 5/20/01 |
| N-512-1 | *Assessment of Reactor Vessels with Low Upper Shelf Charpy Impact Energy Levels, Section XI, Division 1*<br>The material properties and transient selection must follow the guidance in RG 1.161, "Evaluation of Reactor Pressure Vessels with Charpy Upper-Shelf Energy Less Than 50 ft-lb" (Ref. 12), or an equivalent NRC-approved method. | 5/20/01 |
| N-533-1 | *Alternative Requirements for VT-2 Visual Examination of Class 1, 2, and 3 Insulated Pressure-Retaining Bolted Connections, Section XI, Division 1*<br>Prior to conducting the VT-2 examination of Class 2 and Class 3 components not required to operate during normal plant operation, a 10 minute holding time is required after attaining test pressure. Prior to conducting the VT-2 examination of Class 2 and Class 3 components required to operate during normal plant operation, no holding time is required, provided the system has been in operation for at least 4 hours for insulated components or 10 minutes for non-insulated components. | 1/4/16 |
| N-546 | *Alternative Requirements for Qualification of VT-2 Examination Personnel, Section XI, Division 1*<br>This Code Case only applies to the performance of VT-2 examinations and may not be applied to other VT-2 functions such as verifying the adequacy of procedures and training VT-2 personnel. | 9/18/04 |
| N-568 | *Alternative Examination Requirements for Welded Attachments, Section XI, Division 1*<br>This Code Case may only be used for examination of the accessible portions of lugs on piping where riser clamps (i.e., clamps on the vertical runs of pipes) obstruct access to welded surfaces. | 2/14/03 |
| N-583 | *Annual Training Alternative, Section XI, Division 1*<br>(1) Supplemental practice must be performed on material or welds that contain cracks or by analyzing prerecorded data from material or welds that contain cracks.<br>(2) The training must be completed no earlier than 6 months prior to performing ultrasonic examinations at a licensee's facility. | 1/4/16 |
| N-599 | *Alternatives to Qualification of Nondestructive Examination Personnel for Inservice Inspection of Metal (Class MC) and Concrete (Class CC) Containments, Section XI, Division 1*<br>This Code Case may not be used when a licensee updates to the 1992 or later edition of Section XI, which requires the use of ANSI/ASNT-CP-189, "Standard for Qualification and Certification of Nondestructive Testing Personnel" (Ref. 13). | 9/18/04 |
| N-616 | *Alternative Requirements for VT-2 Visual Examination of Classes 1, 2, 3 Insulated Pressure Retaining Bolted Connections, Section XI, Division 1*<br>(1) Insulation must be removed for VT-2 examination during the system pressure test for any 17-4 PH stainless steel of 410 stainless steel stud or bolt aged at a temperature below 1100 °F or with hardness above $R_c$ 30. | 1/4/16 |

| CODE CASE NUMBER | TABLE 4<br>ANNULLED CONDITIONALLY ACCEPTABLE SECTION XI, CODE CASES | ANNULMENT DATE |
|---|---|---|
| | (2) For A-286 stainless steel studs or bolts, the preload must be verified to be below 100 Ksi, or the thermal insulation must be removed and the joint visually examined.<br>(3) Prior to conducting the VT-2 examination of Class 2 and Class 3 components not required to operate during normal plant operation, a 10 minute holding time is required after attaining test pressure. Prior to conducting the VT-2 examination of Class 2 and Class 3 components required to operate during normal plant operation, no holding time is required, provided the system has been in operation for at least 4 hours for insulated components or 10 minutes for non-insulated components. | |
| N-630 | *Alternatives to VT-1C and VT-3C Visual Examination for Inservice Inspection of Concrete and VT-1 Visual Examination for Inservice Inspection of Anchorage Hardware and Surrounding Concrete for Concrete Containments, Section XI, Division 1*<br>The responsible engineer's written practice must define qualification requirements for concrete and tendon hardware examination personnel in accordance with Section XI, IWA-2300, in lieu of the owner-defined qualification requirements specified in Paragraph (c) of the Code Case. However, limited certification in accordance with Section XI, IWA-2350, is permitted. | 4/8/02 |

## 5. Section XI Code Cases That Have Been Superseded

Table 5 lists Code Cases that have been superseded by revision. The third column of the table indicates the date on which each Code Case was superseded. The versions of the Code Cases listed in Table 5 cannot be applied by the licensee or applicant for the first time after the effective date of this RG. To assist users, new superseded Code Cases are shaded in grey to distinguish them from those listed in previous versions of this guide. (Note: The NRC did not approve some of these Code Cases in previous versions of this guide.)

**Table 5. Section XI Code Cases That Have Been Superseded**

| CODE CASE NUMBER | TABLE 5<br>SECTION XI CODE CASES THAT HAVE BEEN SUPERSEDED | REVISION DATE |
|---|---|---|
| N-113<br>(1731) | *Basic Calibration Block for Ultrasonic Examination of Weld 10 in. To 14 in. Thick, Section XI, Division 1* | 12/31/82 |
| N-236 | *Repair and Replacement of Class MC Vessels, Section XI, Division 1*<br>(1) In the second sentence of Paragraph 1.0(a), the phrase, "while the plant is not in service," refers to a refueling outage.<br>(2) In the third sentence of Paragraph 1.0(a), the phrase, "the next scheduled plant outage," refers to the next scheduled refueling outage.<br>For clarification, the phrase, "repair and replacement of Class MC vessels," means "repair and replacement of Class MC vessels and components (systems)." Acceptance of this Code Case in no way provides/constitutes NRC approval to violate the technical specification or any NRC requirements with regard to breach of containment during repair and replacement procedures while the plant is in operation.<br>Where a numbered Code paragraph is not identified by a particular edition of the Code, the Code in effect at the time of the ASME meeting (November 3, 1978) that approved the Code Case should govern. | 9/5/85 |
| N-307<br>N-307-1<br>N-307-2 | *Revised Ultrasonic Examination Volume for Class 1 Bolting, Table IWB-2500-1, Examination Category B-G-1, When the Examinations Are Conducted from the Center-Drilled Hole, Section XI, Division 1* | 12/5/84<br>9/24/99<br>3/28/01 |
| N-335 | *Rules for Ultrasonic Examination of Similar and Dissimilar Metal Piping Welds, Section XI, Division 1* | 6/20/85 |
| N-375<br>N-375-1 | *Rules for Ultrasonic Examination of Bolds and Studs, Section XI, Division 1* | 4/14/83<br>4/5/84 |
| N-389 | *Alternative Rules for Repairs, Replacements, or Modifications, Section XI, Division 1*<br>The applicant should submit for approval the appropriate edition and addenda of the Code that is to be used for the repair, replacement, or modification before the start of the work. | 12/9/93 |
| N-401 | *Eddy Current Examination, Section XI, Division 1* | 5/4/88 |
| N-402 | *Eddy Current Calibration Standards, Section XI, Division 1* | 3/14/91 |
| N-408 | *Alternative Rules for Examination of Class 2 Piping, Section XI, Division 1* | 3/8/89 |
| N-408-1<br>N-408-2 | *Alternative Rules for Examination of Class 2 Piping, Section XI, Division 1*<br>The applicant for an operating license should define the Class 2 piping subject to volumetric and surface examination in the Preservice Inspection for determination of acceptability by the NRC staff. | 7/24/89<br>8/9/93 |

| CODE CASE NUMBER | TABLE 5<br>SECTION XI CODE CASES THAT HAVE BEEN SUPERSEDED | REVISION DATE |
|---|---|---|
| N-409 | *Procedure and Personnel Qualification Requirements for Ultrasonic Detection and Sizing of Flaws in Piping Welds, Section XI, Division 1* | 12/7/87 |
| N-409-1<br>N-409-2 | *Procedure and Personnel Qualification Requirements for Ultrasonic Detection and Sizing of Flaws in Piping Welds, Section XI, Division 1*<br>The applicant should give prior notification to the NRC of its intention to use the Code Case. | 7/27/88<br>4/30/93 |
| N-416<br>N-416-1<br>N-416-2<br>N-416-3 | *Alternative Pressure Test Requirements for Welded Repairs or Installation of Replacement Items by Welding, Class 1, 2, and 3, Section XI, Division 1* | 2/15/94<br>5/5/00<br>9/7/01<br>1/12/05 |
| N-429<br>N-429-1 | *Alternative Rules for Ultrasonic Instrument Calibration, Section XI, Division 1* | 2/23/87<br>7/27/92 |
| N-432 | *Repair Welding Using Automatic or Machine Gas Tungsten-Arc Welding (GTAW) Temper Bead Technique, Section XI, Division 1* | 3/28/01 |
| N-435 | *Alternative Examination Requirements for Vessels with Wall Thickness 2 in. or Less, Section XI, Division 1* | 7/30/86 |
| N-436 | *Alternative Methods for Evaluation of Flaws in Austenitic Piping, Section XI, Division 1* | 12/7/87 |
| N-458 | *Magnetic Particle Examination of Coated Materials, Section XI, Division 1* | 3/14/95 |
| N-461 | *Alternative Rules for Piping Calibration Block Thickness, Section XI, Division 1* | 3/14/95 |
| N-463 | *Evaluation Procedures and Acceptance Criteria for Flaws in Class 1 Ferritic Piping That Exceed the Acceptance Standards of IWB-3514.2, Section XI, Division 1* | 3/5/90 |
| N-479 | *Boiling Water Reactor (BWR) Main Steam Hydrostatic Test, Section XI, Division 1* | 12/3/90 |
| N-485 | *Eddy Current Examination of Coated Ferritic Surfaces as an Alternative to Surface Examination, Section XI, Division 1* | 8/14/91 |
| N-490 | *Alternative Vision Test Requirements for Nondestructive Examiners, Section XI, Divisions 1, 2, and 3* | 5/13/91 |
| N-491<br>N-491-1 | *Alternative Rules for Examination of Class 1, 2, 3, and MC Component Supports of Light-Water Cooled Power Plants, Section XI, Division 1* | 4/30/93<br>3/12/97 |
| N-494<br>N-494-1<br>N-494-2<br>N-494-3 | *Pipe Specific Evaluation Procedures and Acceptance Criteria for Flaws in Class 1 Ferritic Piping that Exceed the Acceptance Standards of IWB-3514.2, Section XI, Division 1* | 7/27/92<br>12/9/93<br>8/9/96<br>10/11/05 |
| N-496<br>N-496-1 | *Helical-Coil Threaded Inserts, Section XI, Division 1* | 5/11/94<br>9/18/01 |
| N-498<br>N-498-1<br>N-498-2<br>N-498-3 | *Alternative Rules for 10-Year System Hydrostatic Testing for Class 1, 2, and 3 Systems, Section XI, Division 1* | 5/11/94<br>6/9/95<br>5/20/98<br>2/15/99 |
| N-504<br>N-504-1<br>N-504-2<br>N-504-3 | *Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping, Section XI, Division 1* | 8/9/93<br>3/12/97<br>8/4/04<br>7/14/06 |

| CODE CASE NUMBER | TABLE 5<br>SECTION XI CODE CASES THAT HAVE BEEN SUPERSEDED | REVISION DATE |
|---|---|---|
| N-508<br>N-508-1<br>N-508-2<br>N-508-3 | *Rotation of Serviced Snubbers and Pressure Relief Valves for the Purpose of Testing, Section XI, Division 1* | 5/11/94<br>3/28/01<br>11/18/03<br>1/26/09 |
| N-512 | *Assessment of Reactor Vessels with Low Upper Shelf Charpy Impact Energy Levels, Section XI, Division 1* | 8/24/95 |
| N-513 | *Evaluation Criteria for Temporary Acceptance of Flaws in Class 3 Piping, Section XI, Division 1* | 3/28/01 |
| N-513-1<br>N-513-2 | *Evaluation Criteria for Temporary Acceptance of Flaws in Class 3 Piping, Section XI, Division 1*<br>(1) Specific safety factors in Paragraph 4.0 must be satisfied.<br>(2) Code Case N-513 may not be applied to the following:<br>(a) components other than pipes and tubes<br>(b) leakage through a gasket<br>(c) threaded connections that use nonstructural seal welds for leakage prevention (through seal weld leakage is not a structural flaw; thread integrity must be maintained)<br>(d) degraded socket welds | 2/20/04<br>1/26/09 |
| N-513-3 | *Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping, Section XI, Division 1*<br>The repair or replacement activity temporarily deferred under the provisions of this Code Case shall be performed during the next scheduled outage. | 5/7/2014 |
| N-513-4 | *Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping and Gate Valves, Section XI, Division 1* | 4/18/18 |
| N-516<br>N-516-1 | *Underwater Welding, Section XI, Division 1*<br>When welding is to be performed on high neutron fluence Class 1 material, then a mockup, using material with similar fluence levels, should be welded to verify that adequate crack prevention measures were used. | 12/31/96<br>1/17/00 |
| N-516-2<br>N-516-3 | *Underwater Welding, Section XI, Division 1*<br>Licensees must obtain NRC approval in accordance with 10 CFR 50.55a(z) regarding the method to be used in the weld repair or replacement of irradiated material underwater. | 4/8/02<br>5/7/13 |
| N-516-4 | *Underwater Welding, Section XI, Division 1*<br>(1) Licensees must obtain NRC approval in accordance with 10 CFR 50.55a(z) regarding the welding technique to be used prior to perform welding on ferritic material exposed to fast neutron fluence greater than 1x1017 n/cm2 (E > 1 MeV).<br>(2) Licensees must not perform welding on austenitic material other than P No. 8 material exposed to thermal neutron fluence greater than 1x1017 n/cm2 (E < 0.5 eV).<br>(3) Licensees must obtain NRC approval in accordance with 10 CFR 50.55a(z) regarding the welding technique to be used prior to perform welding on P No. 8 austenitic material exposed to thermal neutron fluence greater than 1x1017 n/cm2 (E < 0.5 eV) and measured or calculated helium concentration of the material greater than 0.1 atomic parts per million. | 4/25/16 |

| CODE CASE NUMBER | TABLE 5<br>SECTION XI CODE CASES THAT HAVE BEEN SUPERSEDED | REVISION DATE |
|---|---|---|
| N-517 | *Quality Assurance Program Requirements for Owners, Section XI, Division 1* | 7/30/98 |
| N-523<br>N-523-1 | *Mechanical Clamping Devices for Class 2 and 3 Piping, Section XI, Division 1* | 8/24/95<br>10/2/00 |
| N-528 | *Purchase, Exchange, or Transfer of Material Between Nuclear Plant Sites, Section XI, Division 1* | 5/7/99 |
| N-532<br>N-532-1<br>N-532-2<br>N-532-3<br>N-532-4 | *Alternative Requirements to Repair and Replacement Documentation Requirements and Inservice Summary Report Preparation and Submission as Required by IWA-4000 and IWA-6000, Section XI, Division 1* | 3/28/01<br>7/23/02<br>2/20/04<br>4/19/06<br>1/4/11 |
| N-533 | *Alternative Requirements for VT-2 Visual Examination of Class 1 Insulated Pressure-Retaining Bolted Connections, Section XI, Division 1* | 2/26/99 |
| N-552 | *Alternative Methods – Qualification for Nozzle Inside Radius Section from the Outside Surface, Section XI, Division 1*<br>To achieve consistency with the 10 CFR 50.55a rule change published September 22, 1999 (64 FR 51370), incorporating Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," to Section XI, add the following to the specimen requirements:<br>"At least 50 percent of the flaws in the demonstration test set must be cracks and the maximum misorientation must be demonstrated with cracks. Flaws in nozzles with bore diameters equal to or less than 4 inches may be notches."<br>Add to detection criteria, "The number of false calls must not exceed three." | 6/22/12 |
| N-553 | *Inservice Eddy Current Surface Examination of Pressure Retaining Pipe Welds and Nozzle-to-Safe End Welds, Section XI, Division 1* | 3/28/01 |
| N-554<br>N-554-1<br>N-554-2 | *Alternative Requirements for Reconciliation of Replacement Items, Section XI, Division 1* | 7/98E<br>2/25/00<br>2/14/03 |
| N-557 | *In-Place Dry Annealing of a PWR Nuclear Reactor Vessel, Section XI, Division 1* | 12/31/96 |
| N-560<br>N-560-1 | *Alternative Examination Requirements for Class 1, Category B-J Piping Welds, Section XI, Division 1* | 8/9/96<br>3/28/00 |
| N-561<br>N-561-1 | *Alternative Requirements for Wall Thickness Restoration of Class 2 and High Energy Class 3 Carbon Steel Piping, Section XI, Division 1* | 7/30/98<br>3/22/07 |
| N-561-2 | *Alternative Requirements for Wall Thickness Restoration of Class 2 and High Energy Class 3 Carbon Steel Piping, Section XI, Division 1*<br>(1) In Paragraph 5(b), for repairs performed on a wet surface, the overlay is only acceptable until the next refueling outage.<br>(2) In Paragraph 7(c), if the cause of the degradation has not been determined, the repair is only acceptable until the next refueling outage.<br>(3) The area where the weld overlay is to be applied must be examined using ultrasonic methods to demonstrate that no crack-like defects exist.<br>(4) Piping with a wall thickness less than the diameter of the electrode must be depressurized before welding. | 1/22/07 |
| N-566<br>N-566-1 | *Corrective Action for Leakage Identified at Bolted Connections, Section XI, Division 1* | 2/15/99<br>3/28/01 |

| CODE CASE NUMBER | TABLE 5<br>SECTION XI CODE CASES THAT HAVE BEEN SUPERSEDED | REVISION DATE |
|---|---|---|
| N-567 | *Alternative Requirements for Class 1, 2, and 3 Replacement Components, Section XI, Division 1* | 2/26/99 |
| N-569 | *Alternative Rules for Repair by Electrochemical Deposition of Class 1 and 2 Steam Generator Tubing, Section XI, Division 1* | 5/7/99 |
| N-576<br>N-576-1 | *Repair of Class 1 and 2 SB-163, UNS N06600 Steam Generator Tubing, Section XI, Division 1* | 5/7/99<br>3/16/12 |
| N-577 | *Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method A, Section XI, Division 1* | 3/28/00 |
| N-578 | *Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B, Section XI, Division 1* | 3/28/00 |
| N-586 | *Alternative Additional Examination Requirements for Class 1, 2, and 3 Piping, Components, and Supports, Section XI, Division 1*<br><br>The engineering evaluations addressed under item (a) and the additional examinations addressed under item (b) shall be performed during this outage. If the additional examinations performed under item (b) reveal indications that exceed the applicable acceptance criteria of Section XI, the engineering evaluations and the examinations shall be further extended to include additional evaluations and examinations at this outage. | 5/4/04 |
| N-589 | *Class 3 Nonmetallic Cured-in-Place Piping, Section XI, Division 1* | 7/23/02 |
| N-593<br>N-593-1 | *Alternative Examination Requirements for Steam Generator Nozzle to Vessel Welds, Section XI, Division 1* | 10/8/04<br>11/8/11 |
| N-597<br>N-597-1 | *Requirements for Analytical Evaluation of Pipe Wall Thinning, Section XI, Division 1* | 7/7/01<br>11/18/03 |
| N-597-2 | *Requirements for Analytical Evaluation of Pipe Wall Thinning, Section XI, Division 1*<br><br>(1) The Code Case must be supplemented by the provisions of EPRI Nuclear Safety Analysis Center Report 202L-R2, "Recommendations for an Effective Flow Accelerated Corrosion Program," April 1999, for developing the inspection requirements, the method of predicting the rate of wall thickness loss, and the value of the predicted remaining wall thickness. As used in NSAC-202L-R2, the term "should" is to be applied as "shall" (i.e., a requirement).<br><br>(2) Components affected by flow-accelerated corrosion to which this Code Case is applied must be repaired or replaced in accordance with the Construction Code of Record and the owner's requirements or a later NRC-approved edition of Section III (Ref. 14), before the value of $t_p$ reaches the allowable minimum wall thickness, $t_{min}$, as specified in Figure-3622.1(a)(1) of this Code Case. Alternatively, use of the Code Case is subject to NRC review and approval under 10 CFR 50.55a(z).<br><br>(3) For Class 1 piping that does not meet the criteria of Figure-3221, the use of evaluation methods and criteria is subject to NRC review and approval under 10 CFR 50.55a(z).<br><br>(4) For those components that do not require immediate repair or replacement, the rate of wall-thickness loss is to be used to determine a suitable inspection frequency so that repair or replacement occurs prior to reaching the allowable minimum wall thickness, $t_{min}$. | 5/7/2014 |

| CODE CASE NUMBER | TABLE 5<br>SECTION XI CODE CASES THAT HAVE BEEN SUPERSEDED | REVISION DATE |
|---|---|---|
| | (5) For corrosion phenomena other than flow-accelerated corrosion, use of the Code Case is subject to NRC review and approval. Inspection plans and wall-thinning rates may be difficult to justify for certain degradation mechanisms such as MIC and pitting.<br>(6) The evaluation criteria in Code Case N-513-2 may be applied to Code Case N-597-2 for temporary acceptance of wall thinning (until the next refueling outage) for moderate-energy Class 2 and 3 piping. Moderate-energy piping is defined as Class 2 and 3 piping whose maximum operating temperature does not exceed 200 °F (93 °C) and whose maximum operating pressure does not exceed 275 psig (1.9MPa). Code Case N-597-2 shall not be used to evaluate through-wall leakage conditions. | |
| N-606 | *Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique, Section XI, Division 1* | 9/24/99 |
| N-606-1 | *Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique for BWR CRD Housing/Stub Tube Repairs, Section XI, Division 1*<br>Prior to welding, an examination or verification must be performed to ensure proper preparation of the base metal, and that the surface is properly contoured so that an acceptable weld can be produced. This verification is to be required in the welding procedures. | 8/13/13 |
| N-609 | *Alternative Requirements to Stress-Based Selection Criteria for Category B-J Welds, Section XI, Division 1* | 9/17/10 |
| N-613<br>N-613-1 | *Ultrasonic Examination of Penetration Nozzles in Vessels, Examination Category B-D, Item Nos. B3.10 and B3.90, Reactor Nozzle-to-Vessel Welds, Figs. IWB-2500-7(a), (b), and (c), Section XI, Division 1* | 8/20/02<br>12/10/10 |
| N-638<br>N-638-1<br>N-638-2<br>N-638-3 | *Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique, Section XI, Division 1*<br>The Construction Code of Record acceptance criteria must be used for volumetric examinations. | 5/9/03<br>7/1/05<br>4/19/06<br>10/12/06 |
| N-638-4<br>N-638-5 | *Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique, Section XI, Division 1*<br>(1) Demonstration for ultrasonic examination of the repaired volume is required using representative samples that contain construction type flaws.<br>(2) The provisions of Paragraph 3(e)(2) or 3(e)(3) may only be used when it is impractical to use the interpass temperature measurement methods described in Paragraph 3(e)(1) such as in situations where the weldment area is inaccessible (e.g., internal bore welding) or when there are extenuating radiological conditions. | 4/27/09<br>6/25/11 |
| N-638-6<br>N-638-7 | *Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique, Section XI, Division 1*<br>Demonstration for ultrasonic examination of the repaired volume is required using representative samples that contain construction type flaws. | 5/17/13<br>11/5/14 |
| N-638-8<br>N-638-9 | *Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique, Section XI, Division 1* | 11/7/16<br>5/6/19 |

| CODE CASE NUMBER | TABLE 5<br>SECTION XI CODE CASES THAT HAVE BEEN SUPERSEDED | REVISION DATE |
|---|---|---|
| N-648 | *Alternative Requirements for Inner Radius Examination of Class 1 Reactor Vessel Nozzles, Section XI, Division 1* | 7/7/01 |
| N-648-1 | *Alternative Requirements for Inner Radius Examination of Class 1 Reactor Vessel Nozzles, Section XI, Division 1*<br><br>In lieu of an ultrasonic examination, licensees may perform a VT-1 examination in accordance with the Code of Record for the ISI program using the allowable flaw-length criteria of Table IWB-3512-1 with limiting assumptions on the flaw aspect ratio. | 9/4/14 |
| N-652<br>N-652-1 | *Alternative Requirements to Categorize B-G-1, B-G-2, and C-D Bolting Examination Methods and Selection Criteria, Section XI, Division 1* | 2/20/04<br>9/3/10 |
| N-653<br>N-653-1 | *Qualification Requirements for Full Structural Overlaid Wrought Austenitic Piping Welds, Section XI, Division 1* | 4/4/12<br>6/23/15 |
| N-661 | *Alternative Requirements for Wall Thickness Restoration of Classes 2 and 3 Carbon Steel Piping for Raw Water Service, Section XI, Division 1*<br><br>(1) If the root cause of the degradation has not been determined, the repair is only acceptable for one cycle.<br><br>(2) The weld overlay repair of an area can only be performed once in the same location.<br><br>(3) When through-wall repairs are made by welding on surfaces that are wet or exposed to water, the weld overlay repair is only acceptable until the next refueling outage. | 10/11/05 |
| N-661-1 | *Alternative Requirements for Wall Thickness Restoration of Class 2 and 3 Carbon Steel Piping for Raw Water Service, Section XI, Division 1* | 3/22/07 |
| N-661-2 | *Alternative Requirements for Wall Thickness Restoration of Classes 2 and 3 Carbon Steel Piping for Raw Water Service, Section XI, Division 1*<br><br>(1) In Paragraph 4(b), for repairs performed on a wet surface, the overlay is only acceptable until the next refueling outage.<br><br>(2) In Paragraph 7(c), if the cause of the degradation has not been determined, the repair is only acceptable until the next refueling outage.<br><br>(3) The area where the weld overlay is to be applied must be examined using ultrasonic methods to demonstrate that no crack-like defects exist.<br><br>(4) Piping with a wall thickness that is less than the diameter of the electrode shall be depressurized before welding. | 4/25/16 |
| N-662 | *Alternative Repair/Replacement Requirements for Items Classified in Accordance with Risk-Informed Processes, Section XI, Division 1* | 6/25/11 |
| N-666 | *Weld Overlay of Class 1,2,and 3 Socket Welded Connections, Section XI, Division 1* | 3/12/12 |
| N-686 | *Alternative Requirements for Visual Examinations, VT-1, VT-2, and VT-3, Section XI, Division 1* | 1/10/07 |
| N-694<br>N-694-1 | *Evaluation Procedure and Acceptance Criteria for PWR Reactor Vessel Upper Head Penetration, Section XI, Division 1*<br><br>(1) The maximum instantaneous through-thickness stress distribution along the crack front and in the crack-length path must be used to calculate the crack-driving force. | 2/20/04<br>1/16/13 |

| CODE CASE NUMBER | TABLE 5<br>SECTION XI CODE CASES THAT HAVE BEEN SUPERSEDED | REVISION DATE |
|---|---|---|
| | (2) The stress intensity factor expression Raju and Newman (Ref. 15), is only applicable to cylindrical products having a ratio of wall thickness to inside radius between 0.1 and 0.25. | |
| N-695 | *Qualification Requirements for Dissimilar Metal Piping Welds Section XI, Division 1* | 12/31/14 |
| N-696 | *Qualification Requirements for Appendix VIII Piping Examinations Conducted from the Inside Surface, Section XI, Division 1* | 5/7/14 |
| N-702 | *Alternative Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-to-Shell Welds, Section XI, Division 1*<br>The applicability of Code Case N-702 for the first 40 years of operation must be demonstrated by satisfying the criteria in Section 5.0 of NRC Safety Evaluation regarding BWRVIP-108 dated December 18, 2007 (ML073600374) or Section 5.0 of NRC Safety Evaluation regarding BWRVIP-241 dated April 19, 2013 (ML13071A240).<br>The use of Code Case N-702 in the period of extended operation is not approved.<br>If VT-1 is used, it must utilize Code Case N-648-2, "Alternative Requirements for Inner Radius Examination of Class 1 Reactor Vessel Nozzles, Section XI Division 1," with associated required conditions specified in this RG. | 4/18/19 |
| N-705 | *Evaluation Criteria for Temporary Acceptance of Degradation in Moderate Energy Class 2 or 3 Vessels and Tanks, Section XI, Division 1*<br>The ASME Code repair or replacement activity temporarily deferred under the provisions of this Code Case must be performed during the next scheduled refueling outage for through wall flaws. | 6/30/17 |
| N-706 | *Alternative Examination Requirements of Table IWB-2500-1 and Table IWC-2500-1 for PWR Stainless Steel Residual and Regenerative Heat Exchangers, Section XI, Division 1* | 1/10/07 |
| N-711 | *Alternative Examination Coverage Requirements for Examination Category B-F, B-J, C-F-1, C-F-2, and R-A Piping Welds* | 11/7/2016 |
| N-716<br>N-716-1 | *Alternative Piping Classification and Examination Requirements, Section XI, Division 1* | 1/27/13<br>11/7/16 |
| N-730 | *Roll Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs, Section XI, Division 1* | 7/16/12 |
| N-739 | *Alternative Qualification Requirements for Personnel Performing Class CC Concrete and Post-Tensioning System Visual Examinations, Section XI, Division 1* | 1/21/07 |
| N-754 | *Optimized Structural Dissimilar Metal Weld Overlay for Mitigation of PWR Class 1 Items, Section XI, Division 1* | 2/28/13 |
| N-762 | *Temper Bead Procedure Qualification Requirements for Repair/Replacement Activities without Postweld Heat Treatment, Section XI, Division 1* | 10/21/13 |
| N-766 | *Nickel Alloy Reactor Coolant Inlay and Onlay for Mitigation of PWR Full Penetration Circumferential Nickel Alloy Dissimilar Metal Welds in Class 1 Items, Section XI, Division 1* | 4/7/13 |

| CODE CASE NUMBER | TABLE 5<br>SECTION XI CODE CASES THAT HAVE BEEN SUPERSEDED | REVISION DATE |
|---|---|---|
| N-766-1<br>N-766-2 | *Nickel Alloy Reactor Coolant Inlay and Onlay for Mitigation of PWR Full Penetration Circumferential Nickel Alloy Dissimilar Metal Welds in Class 1 Items, Section XI, Division 1*<br>(1) Credit cannot be taken to reduce preservice and ISI requirements specified by this Code Case on an inlay or onlay if an inlay or onlay is applied to an Alloy 82/182 dissimilar metal weld that contains an axial indication that has a depth of more than 25 percent of the pipe wall thickness and a length of more than one half of the axial width of the dissimilar metal weld or a circumferential indication that has a depth of more than 25 percent of the pipe wall thickness and a length of more than 20 percent of the circumference of the pipe.<br>(2) In lieu of Paragraph 2(e) of the Code Case, pipes with any thickness of inlay or onlay must be evaluated for weld shrinkage, pipe system flexibility, and additional weight of the inlay or onlay.<br>(3) If an inlay or onlay is applied to an Alloy 82/182 dissimilar metal weld that contains an indication that exceeds the acceptance standards of Section XI, IWB 3514, and that is accepted for continued service in accordance with Section XI, IWB-3132.3 or IWB-3142.4, the subject weld must be inspected in three successive examinations after inlay or onlay installation.<br>(4) Any detectable subsurface indication discovered by eddy current testing in the inlay or onlay during acceptance examinations is prohibited to remain in service.<br>(5) The flaw analysis of Paragraph 2(d) of the Code Case shall also consider primary water stress corrosion cracking growth in the circumferential and axial directions in accordance with Section XI, IWB 3640. | 11/7/16<br>7/17/17 |
| N-769<br>N-769-1 | *Roll Expansion of Class 1 In-Core Housing Bottom Head Penetrations in BWRs, Section XI, Division 1* | 9/17/10<br>7/16/12 |
| N-786<br>N-786-1<br>N-786-2 | *Alternative Requirements for Sleeve Reinforcement of Class 2 and 3 Moderate-Energy Carbon Steel Piping, Section XI, Division 1* | 4/24/11<br>8/3/15<br>4/27/17 |
| N-789 | *Alternative Requirements for Pad Reinforcement of Class 2 and 3 Moderate-Energy Carbon Steel Piping, Section XI, Division 1*<br>Areas that contain pressure pads shall be visually observed at least once per month to monitor for evidence of leakage. If the areas that contain pressure pads are not accessible for direct observation, monitoring will be accomplished by the visual assessment of the surrounding areas or the ground surface areas above pressure pads on buried piping or by the monitoring of leakage collection systems, if available. | 11/13/13 |
| N-789-1<br>N-789-2 | *Alternative Requirements for Pad Reinforcement of Class 2 and 3 Moderate Energy Carbon Steel Piping for Raw Water Service* | 6/23/15<br>4/27/17 |
| N-823 | *Visual Examination, Section XI, Division 1* | 1/23/14 |
| N-831 | *Ultrasonic Examination in Lieu of Radiography for Welds in Ferritic Pipe, Section XI, Division 1*<br>Code Case N-831 is prohibited for use in new reactor construction. | 10/20/16 |
| N-845 | *Qualification Requirements for Bolts and Studs, Section XI, Division 1* | 4/25/16 |
| N-848 | *Alternative Characterization Rules for Quasi-Laminar Flaws, Section XI, Division 1* | 11/7/16 |

# D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide. This regulatory guide lists the ASME BPV Code, Section XI Code Cases that the NRC has approved for use as voluntary alternatives to the mandatory ASME BPV Code provisions that are incorporated by reference into 50.55a. The requirements addressing implementation of Section XI, Code Cases are contained in 10 CFR 50.55a(b)(5). An applicant's or a licensee's voluntary application of an approved Code Case does not constitute backfitting, inasmuch as there is no imposition of a new requirement or new position. No backfitting is intended or approved in connection with the issuance of this guide.

# REFERENCES[1]


1. American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," New York, NY.[2]

2. *Code of Federal Regulations* (CFR), "Domestic Licensing of Production and Utilization Facilities," Part 50, Chapter 1, Title 10, "Energy."

3. CFR, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Part 52, Chapter 1, Title 10, "Energy."

4. U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.84, "Design, Fabrication, and Materials Code Case Acceptability, ASME Section III," Washington, DC.

5. NRC, RG 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," Washington, DC.

6. NRC, RG 1.193, "ASME Code Cases Not Approved for Use," Washington, DC.

7. Electric Power Research Institute (EPRI)/Nuclear Safety Analysis Center (NSAC), EPRI/NSAC-202L-R2, "Recommendations for an Effective Flow Accelerated Corrosion Program," Palo Alto, CA, April 1999.[3]

8. NRC, RG 1.164, "Dedication of Commercial-Grade Items for Use in Nuclear Power Plants," Washington, DC.

9. NRC, Generic Letter 88-01, "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping," Washington, DC, January 1988. (ADAMS Accession No. ML031130463)

10. NRC, NUREG-2228 "Weld Residual Stress Finite Element Analysis Validation Part II - Proposed Validation Procedure," Washington, DC, July 2020. (ADAMS Accession No. ML2021L592)

11. EPRI, Boiling Water Reactor Vessel and Internals Project (BWRVIP)-75-A "Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules," Palo Alto, CA, October 2005


---

[1] Publicly available NRC published documents are available electronically through the NRC Library on the NRC's public Web site at http://www.nrc.gov/reading-rm/doc-collections/ and through the NRC's Agencywide Documents Access and Management System (ADAMS) at http://www.nrc.gov/reading-rm/adams.html. The documents can also be viewed online or printed for a fee in the NRC's Public Document Room (PDR) at 11555 Rockville Pike, Rockville, MD. For problems with ADAMS, contact the PDR staff at (301) 415-4737 or (800) 397-4209; fax (301) 415-3548; or e-mail pdr.resource@nrc.gov.

[2] Copies may of American Society of Mechanical Engineers (ASME) standards may be purchased from ASME, Two Park Avenue, New York, NY 10016-5990; telephone (800) 843-2763. Purchase information is available through the ASME Web-based store at https://www.asme.org/publications-submissions/publishing-information.

[3] Copies of Electric Power Research Institute (EPRI) documents may be obtained by contacting EPRI, 3420 Hillview Avenue, Palo Alto, CA 94304, telephone (800) 313-3734 or 650-855-2101.

12. NRC, RG 1.161, "Evaluation of Reactor Pressure Vessels with Charpy Upper-Shelf Energy Less Than 50 ft-lb," Washington, DC.

13. American National Standards Institute (ANSI)/American Society of Nondestructive Testing (ASNT), ANSI/ASNT-CP-189, "Standard for Qualification and Certification of Nondestructive Testing Personnel," Columbus, OH.[4]

14. ASME Boiler and Pressure Vessel Code, Section III, "Rules for Construction of Nuclear Power Plant Components," New York, NY.

15. Raju, I.S., and J.C., Newman. Jr., "Stress Intensity Factor Influence Coefficients for Internal and External Surface Cracks in Cylindrical Vessels," in Proceedings of the ASME Pressure Vessel and Piping Conference 58, "Aspects of Fracture Mechanics in Pressure Vessel and Piping," pp. 35–41, 1982.

[4] Copies of American Society for Nondestructive Testing (ASNT) documents may be obtained from ASNT, 1711 Arlingate Lane, Columbus, OH, 43228-0518; telephone (800) 222-2768 or (614) 274-6003; fax (614) 274-6899. Purchase information is available through the ASNT Web site at https://www.asnt.org/MajorSiteSections/Standards.aspx. -

# APPENDIX A

# SUPPLEMENTS ADDRESSED IN REVISION 20 OF REGULATORY GUIDE 1.147

| EDITION | SUPPLEMENT NUMBER | NUMERICAL LISTING OF SECTION XI CODE CASES IN SUPPLEMENT |
|---|---|---|
| 2015 | 0 | N-638-8, N-695-1, N-786-1, N-851 |
| 2015 | 1 | N-491-2[1], N-629[1], N-854 |
| 2015 | 2 | N-653-2, N-786-2, N-789-2, N-809, N-838, N-848 |
| 2015 | 3 | N-729-5[2] |
| 2015 | 4 | N-416-4[1], N-533-1[1], N-583[1], N-615[1], N-616[1], N-806-1[2] |
| 2015 | 5 | N-729-6[2] |
| 2015 | 6 | N-496-2[1], N-516-5, N-554-3[1], N-567-1[1], N-573[1], N-661-3, N-845-1, N-853 |
| 2015 | 7 | None |
| 2017 | 0 | N-638-9, N-711-1, N716-2, N-766-2, N-770-5[2], N-831, N-847, N-848-1, N-867, N-868[2] |
| 2017 | 1 | N-786-3, N-788-1[2], N-789-3, N-873, N-875[3], N-878 |
| 2017 | 2 | N-705-1, N-766-3, N-858, N-864, N-865, N-876, N-877, N-880 |
| 2017 | 3 | None |
| 2017 | 4 | None |
| 2017 | 5 | None |
| 2017 | 6 | N-513-5, N-729-7[2], N-869, N-882 |
| 2017 | 7 | N-831-1, N-874, N-889 |
| 2019 | 0 | N-561-3, N-768, N-871[4], N-885, N-890, N-892 |
| 2019 | 1 | N-638-10, N-702-1, N-729-8[2], N-770-6[2], N-831-1 |

[1] Annulled.

[2] This Code Case is not acceptable for use (See RG 1.193).

[3] This is a Division 3 code case and is not addressed in this RG.

[4] This Code Case will be considered in the next revision to this RG.

# APPENDIX B

# NUMERICAL LISTING OF CURRENT SECTION XI CODE CASES AND TABLE WHERE EACH CODE CASE IS LISTED

| Code Case Number | Approval Date | Table Where Code Case Is Listed |
|---|---|---|
| N-432-1 | 3/28/01 | Table 1 |
| N-460 | 2/14/03 | Table 1 |
| N-494-4 | 2/14/03 | Table 1 |
| N-498-4 | 4/8/02 | Table 2 |
| N-504-4 | 7/14/06 | Table 2 |
| N-508-4 | 1/26/09 | Table 2 |
| N-513-5 | 4/18/18 | Table 2 |
| N-516-5 | 4/25/16 | Table 2 |
| N-517-1 | 3/28/01 | Table 1 |
| N-526 | 8/20/02 | Table 1 |
| N-528-1 | 4/19/02 | Table 1 |
| N-532-5 | 1/4/11 | Table 1 |
| N-537 | 3/28/01 | Table 1 |
| N-552-1 | 6/22/12 | Table 2 |
| N-557-1 | 8/20/02 | Table 2 |
| N-560-2 | 3/28/00 | RG 1.193 |
| N-561-3 | 10/16/18 | Table 1 |
| N-562-2 | 1/22/07 | Table 2 |
| N-566-2 | 3/28/01 | Table 1 |
| N-569-1 | 4/19/02 | Table 2 |
| N-575 | 2/14/03 | RG 1.193 |
| N-576-2 | 3/16/12 | Table 2 |
| N-577-1 | 3/28/01 | RG 1.193 |
| N-578-1 | 2/14/03 | RG 1.193 |
| N-586-1 | 5/4/04 | Table 1 |
| N-589-1 | 7/23/02 | RG 1.193 |
| N-593-2 | 11/8/11 | Table 2 |
| N-597-3 | 5/7/14 | Table 2 |
| N-600 | 9/18/01 | Table 1 |
| N-606-2 | 6/21/13 | Table 2 |
| N-609-1 | 9/17/10 | Table 1 |
| N-613-2 | 12/10/10 | Table 1 |
| N-618 | 6/17/03 | RG 1.193 |
| N-619 | 4/8/02 | Table 2 |
| N-624 | 4/19/02 | Table 1 |
| N-638-10 | 5/6/19 | Table 1 |

| Code Case Number | Approval Date | Table Where Code Case Is Listed |
|---|---|---|
| N-639 | 8/20/02 | Table 2 |
| N-641 | 2/3/03 | Table 1 |
| N-643-2 | 5/4/04 | Table 1 |
| N-647 | 11/18/03 | Table 2 |
| N-648-2 | 9/4/14 | Table 2 |
| N-649 | 3/28/01 | Table 1 |
| N-651 | 8/14/01 | Table 1 |
| N-652-2 | 9/3/10 | Table 1 |
| N-653-2 | 6/23/15 | Table 1 |
| N-654 | 4/17/02 | RG 1.193 |
| N-658 | 4/4/02 | Table 1 |
| N-660 | 7/23/02 | Table 2 |
| N-661-3 | 4/25/16 | Table 1 |
| N-662-1 | 7/15/11 | Table 2 |
| N-663 | 9/17/02 | Table 1 |
| N-664 | 8/20/02 | Table 1 |
| N-665 | 2/28/03 | Table 1 |
| N-666-1 | 3/13/12 | Table 2 |
| N-683 | 2/14/03 | Table 1 |
| N-685 | 5/9/03 | Table 1 |
| N-686-1 | 1/10/07 | Table 1 |
| N-691 | 11/18/03 | RG 1.193 |
| N-694-2 | 1/16/03 | Table 1 |
| N-695-1 | 12/31/14 | Table 2 |
| N-696-1 | 5/7/14 | Table 2 |
| N-697 | 11/18/03 | Table 1 |
| N-700 | 11/18/03 | Table 1 |
| N-702-1 | 4/18/19 | Table 1 |
| N-705-1 | 6/30/17 | Table 2 |
| N-706-1 | 1/10/17 | Table 1 |
| N-711-1 | 11/7/16 | Table 2 |
| N-712 | 5/12/04 | Table 1 |
| N-713 | 11/10/08 | RG 1.193 |
| N-716-2 | 11/7/16 | Table 1 |
| N-722-2 | 9/8/11 | RG 1.193 |
| N-729-8 | 3/27/19 | RG 1.193 |

| Code Case Number | Approval Date | Table Where Code Case Is Listed |
|---|---|---|
| N-730-1 | 7/16/12 | Table 1 |
| N-731 | 2/22/05 | Table 1 |
| N-733 | 7/1/05 | Table 1 |
| N-735 | 10/12/06 | Table 1 |
| N-739-1 | 1/21/07 | Table 1 |
| N-740-2 | 11/10/08 | RG 1.193 |
| N-747 | 1/13/06 | Table 1 |
| N-749 | 3/16/12 | Table 2 |
| N-751 | 8/3/06 | Table 2 |
| N-753 | 7/14/06 | Table 1 |
| N-754-1 | 2/28/13 | Table 2 |
| N-762-1 | 10/21/13 | Table 1 |
| N-765 | 1/26/09 | Table 1 |
| N-766-3 | 7/17/17 | Table 2 |
| N-768 | 10/18/18 | Table 1 |
| N-769-2 | 7/16/12 | Table 1 |
| N-770-6 | 4/18/19 | RG 1.193 |
| N-771 | 9/8/11 | Table 1 |
| N-773 | 1/26/09 | Table 1 |
| N-775 | 6/24/10 | Table 1 |
| N-776 | 4/9/10 | Table 1 |
| N-778 | 12/29/05 | Table 2 |
| N-780 | 4/9/10 | RG 1.193 |
| N-784 | 4/9/10 | RG 1.193 |
| N-786-3 | 4/27/17 | Table 1 |
| N-788-1 | 3/6/17 | RG 1.193 |
| N-789-3 | 4/27/17 | Table 1 |
| N-795 | 9/17/10 | Table 2 |
| N-798 | 12/20/10 | Table 1 |
| N-799 | 12/20/10 | Table 2 |
| N-800 | 12/20/10 | Table 1 |
| N-803 | 2/25/11 | Table 1 |
| N-805 | 2/25/11 | Table 1 |
| N-806-1 | 12/15/15 | RG 1.193 |
| N-809 | 6/23/15 | Table 1 |
| N-813 | 10/24/11 | RG 1.193 |
| N-823-1 | 1/23/14 | Table 1 |
| N-824 | 10/16/12 | Table 2 |

| Code Case Number | Approval Date | Table Where Code Case Is Listed |
|---|---|---|
| N-825 | 10/2/13 | Table 1 |
| N-826 | 7/16/12 | RG 1.193 |
| N-829 | 12/28/12 | Table 2 |
| N-830 | 9/4/14 | Table 2 |
| N-831-1 | 7/25/18 | Table 2 |
| N-838 | 8/3/15 | Table 2 |
| N-839 | 9/4/14 | Table 1 |
| N-840 | 1/23/14 | RG 1.193 |
| N-842 | 1/28/14 | Table 1 |
| N-843 | 1/23/14 | Table 2 |
| N-845-1 | 4/25/16 | Table 1 |
| N-847 | 10/24/16 | Table 2 |
| N-848-1 | 11/7/16 | Table 1 |
| N-849 | 9/4/14 | Table 2 |
| N-851 | 11/5/14 | Table 1 |
| N-853 | 6/27/16 | Table 1 |
| N-854 | 4/15/15 | Table 1 |
| N-858 | 6/28/17 | Table 1 |
| N-864 | 7/28/17 | Table 2 |
| N-865 | 6/12/17 | Table 1 |
| N-867 | 11/7/16 | Table 1 |
| N-868 | 10/20/16 | RG 1.193 |
| N-869 | 7/5/18 | Table 2 |
| N-871 | 12/17/18 | Pending |
| N-873 | 5/10/17 | Table 1 |
| N-874 | 8/1/18 | Table 1 |
| N-875 | 5/11/17 | Division 3 |
| N-876 | 6/12/17 | Table 2 |
| N-877 | 6/30/17 | Table 1 |
| N-878 | 4/18/17 | Table 2 |
| N-880 | 7/25/17 | Table 2 |
| N-882 | 4/18/18 | Table 1 |
| N-885 | 12/4/18 | Table 1 |
| N-889 | 7/12/18 | Table 2 |
| N-890 | 10/16/18 | Table 2 |
| N-892 | 1/9/19 | Table 1 |