U.S. NUCLEAR REGULATORY COMMISSION

DRAFT REGULATORY GUIDE DG-1344

Proposed Revision 6 to Regulatory Guide RG 1.193

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ASME CODE CASES NOT APPROVED FOR USE

A. INTRODUCTION

Purpose

This regulatory guide (RG) lists the American Society of Mechanical Engineers (ASME) Code Cases that the U.S. Nuclear Regulatory Commission (NRC) has determined not to be acceptable for use on a generic basis. *This regulatory guide does not approve the use of the Code Cases listed herein.*

Applicable Rules and Regulations

- Title 10, Part 50, of the *Code of Federal Regulations* (10 CFR Part 50), "Domestic Licensing of Production and Utilization Facilities" (Ref. 1).
    - Section 50.55a(c) (10 CFR 50.55a(c)), "Reactor Coolant Pressure Boundary," requires, in part, that components of the reactor coolant pressure boundary be designed, fabricated, erected, and tested in accordance with the requirements for Class 1 components of Section III, "Rules for Construction of Nuclear Power Plant Components," of the ASME Boiler and Pressure Vessel (BPV) Code or equivalent quality standards.
    - 10 CFR 50.55a(f), "Inservice Testing Requirements," requires, in part, that Class 1, 2, and 3 components and their supports meet the requirements of the ASME "Operation and Maintenance of Nuclear Power Plants" (OM Code) or equivalent quality standards.
    - 10 CFR 50.55a(g), "Inservice Inspection Requirements," requires, in part, that Class 1, 2, 3, MC (metal containment), and CC (concrete containment) components and their supports meet the requirements of Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the ASME BPV Code or equivalent quality standards.
- 10 CFR 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants" (Ref. 2), Section 10 CFR 52.79(a)(11) requires that, "[The final safety analysis report shall include the following information:] 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. 3), lists the ASME BPV Code, Section III, 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 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1" (Ref. 4), 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 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) (Ref. 6) 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.

Purpose of This Regulatory Guide

This RG is issued to provide information to applicants and licensees regarding those Code Cases that the NRC has determined not to be acceptable for use on a generic basis. A brief description of the basis for the determination is provided with each Code Case. Applicants or licensees may submit a request to implement one or more of the Code Cases listed below through 10 CFR 50.55a(z), which 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. Applicants or licensees must submit a plant-specific request that addresses the NRC's concerns about the Code Case at issue. The NRC will revise this regulatory guide as needed to address subsequent new or revised Code Cases.

Paperwork Reduction Act

This RG provides 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. Send comments regarding this information collection to the Information Services Branch, 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, 3150-0151), Office of Management and Budget, Washington, DC 20503.

Office of the Chief Information Officer (OCIO) will review this paragraph to ensure that the correct control number is being used. The list of OCIO control numbers are located here: http://fusion.nrc.gov/ois/team/CSD/FPIB/ICT/Shared Documents/Clearance List.xlsx

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 of Revision

Revision 6 of RG 1.193 includes new information reviewed by the NRC of Section III and Section XI BPV Code Cases listed in Supplement 11 to the 2010 Edition and Supplements 0 through 7 to the 2013 Edition, and the OM Code Cases listed in the 2015 and 2017 Editions. This is an update to RG 1.193, Revision 5, that included information from Supplement 11 of the 2010 Edition and Supplements 1 through 10 to the 2010 Edition (Sections III and XI), and the 2009 Edition through the 2012 Edition of the OM Code.

Background

The ASME publishes a new edition of the BPV and OM Codes every 2 years. The latest editions and addenda of the ASME BPV Code, Section III and Section XI, and the ASME OM Code that the NRC has approved for use by applicants and licensees are referenced in 10 CFR 50.55a(a). The ASME also publishes Code Cases for Section III and Section XI quarterly and Code Cases for the OM Code biennially. Code Cases provide alternatives developed and approved by the ASME.

The NRC staff reviewed Section III and Section XI Code Cases listed in Supplement 11 to the 2010 Edition and Supplements 0 through 7 to the 2013 Edition. Revision 38 of Regulatory Guide 1.84 and Revision 19 of Regulatory Guide 1.147 have been published concurrently with this guide to identify the Code Cases that the NRC has determined to be acceptable alternatives to applicable parts of Section III and Section XI. The NRC staff also reviewed the OM Code Cases listed in the 2015 Edition through the 2017 Edition. Revision 3 of Regulatory Guide 1.192 has also been published concurrently with this guide to identify the Code Cases that the NRC has determined to be acceptable alternatives to applicable parts of the OM Code.

C. STAFF REGULATORY GUIDANCE

Licensees should not implement Code Cases from the Section III and Section XI Codes listed in Supplement 11 to the 2010 Edition, Supplements 0 through 7 to the 2013 Edition, and the OM Code Cases listed in the 2015 Edition through the 2017 Edition of the OM Code, that are listed in this guide, without prior NRC approval. The Code Cases addressed by this regulatory guide are listed in three tables:

(1) Table 1, "Unacceptable Section III Code Cases," contains Section III Code Cases that are unacceptable for use by licensees in their Section III design and construction programs.

(2) Table 2, "Unacceptable Section XI Code Cases," contains Section XI Code Cases that are unacceptable for use by licensees in their Section XI inservice inspection programs.

(3) Table 3, "Unacceptable OM Code Cases," contains OM Code Cases that were determined to be unacceptable for use by licensees in their inservice testing programs.

1. Unacceptable Section III Code Cases

The NRC determined that the following Section III Code Cases are unacceptable for use by licensees in their Section III design and construction programs. To assist users, new Code Cases are shaded to distinguish them from those listed in previous versions of this guide.

Table 1. Unacceptable Section III Code Cases

CODE CASE NUMBER	TABLE 1 UNACCEPTABLE SECTION III CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
N-201-6	*Class CS Components in Elevated Temperature Service, Section III, Division 1* Code Case is applicable for high temperature applications beyond that of light water reactors.	10/18/10
N-284-1	*Metal Containment Shell Buckling Design Methods, Section III, Division 1, Class MC* (1) The following errata, misprints, recommendations, and errors have been identified: ▪ Fig. 1511.1, The curve for $\alpha_{\theta L}$ should not exceed 0.8 for any value of (R/t). ▪ -1512, The statement "See Fig. 1512-1 then see -1713.1.2 for method of calculating M" should be rephrased as: "See -1713.1.2 for method of calculating M, then see Fig. -1512-1." ▪ -1513, Recommend "Use the value of α_{il} given for spherical shells in accordance with -1512." ▪ -1521, (i) In *(a) Axial Compression,* "$\alpha_{\theta G} = \alpha_{\theta L}$" should be changed to "$\alpha_{\varphi G} = \alpha_{\varphi L}$." (ii) The source of the equations shown under *"(a) Axial Compression"* provided separate instability equations for stringer-stiffened and ring-stiffened cylindrical shells. The Code Case adopted	5/9/03 5/9/03

CODE CASE NUMBER	TABLE 1 UNACCEPTABLE SECTION III CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
	the instability equations pertaining to ring-stiffened shells, which are less conservative than those for stringer instability, for both ring and/or stringer stiffened cylindrical shells. The Code Case should use the most limiting case (that gives a lower allowable stress for instability based on a smaller value of capacity reduction factor), or provide separate equations for the stringer stiffened case and ring stiffened case. ▪ -1712.1.1, The equation "$C_{\theta h} = 0.92/(M_\theta - 0.636)$" should be changed to "$C_{\theta h} = 0.92/(M_\varphi - 0.636)$." ▪ -1712.1.1-1, The leftmost curve should be labeled $C_{\theta h}$. ▪ -1712.2.2, *(a) Axial Compression*, (i) In the formula for $\sigma_{\varphi ej}$, the denominator should be $(m\pi/L_j)^2$ X t_φ. (ii) The expressions for C_φ and C_θ should be separated. ▪ -1712.2.3, (i) The factor 1.944 in an older edition has been changed to 2.00. No basis is apparent. (ii) The misprint "$t_1^{1/4}$." should be corrected to "$t_1^{1/4}$." ▪ -1713.1.1, (i) The equation "$\sigma_{\tau a}=\alpha_{\varphi\theta}X\sigma_{\varphi\theta el}/FS$" should be changed to "$\sigma_{\tau a}=\alpha_{\varphi\theta L}X\sigma_{\varphi\theta el}/FS$." (ii) The title of (c) should be changed to *"Axial Compression Plus In-Plane Shear."* ▪ -1713.1-1, In (b), the lower value "$K_s=\sigma_{ra}$" on the vertical axis should be changed to "$K_s=\sigma_{ha}$." ▪ -1713.2.1, (i) The headings for (b) and (c) should include the words *"In-Plane."* (ii) In (b) "Axial Compression Plus Shear," "σ_θ" should be changed to "σ_φ." (2) Applicants intending to use Code Case N-284-1 shall submit a request to the NRC staff for its review and approval on a plant-specific basis. (3) The rules applicable to evaluate the buckling and instability of containment shells for Section III, Division 3, are under development. Currently, use of Code Case N-284-1 by licensees for storage canisters and transportation casks is permissible provided it has been reviewed and approved by the NRC.	
N-483-2 N-483-3	*Alternative Rules to the Provisions of NCA-3800, Requirements for Purchase of Material, Section III, Divisions 1 and 3* The Code Case lacks sufficient detail to ensure that the supplied material is as represented by the Certified Material Test Report.	5/7/99 2/25/02
N-510 N-510-1	*Borated Stainless Steel for Class CS Core Support Structures and Class 1 Component Supports, Section III, Division 1* No technical basis was provided for expanding the Code Case to include borated stainless steel Types 304B, 304B1, 304B2, and 304B3. A considerable amount of information was required to support the types presently contained in the Code Case.	12/9/93 8/14/01

CODE CASE NUMBER	TABLE 1 UNACCEPTABLE SECTION III CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
	The revised Code Case would permit borated stainless steel to be used for component supports within the reactor vessel. The technical basis to support the Code Case only addresses the use of these materials as component supports in spent fuel racks and transportation casks.	
N-519	*Use of 6061-T6 and 6061-T651 Aluminum for Class 1 Nuclear Components* Code Case is applicable to only one DOE aluminum vessel.	Annulled 2/3/03
N-530	*Provisions for Establishing Allowable Axial Compressive Membrane Stresses in the Cylindrical Walls of 0-15 Psi Storage Tanks, Classes 2 and 3 Section III, Division 1* There are numerous errors in the equations. The errors must be corrected before the Code Case can be approved for use.	2/3/03
N-565	*Alternative Methods of Nozzle Attachment for Class 1 Vessels Section III, Division 1* The Code Case essentially requires a design using a seal to protect the threads from the contained fluid, and seals are not a Code item. The seal, which plays a very important part in the integrity of the joint, imposes too great a vulnerability in the design. The supporting information for the Code Case does not demonstrate the resulting threaded nozzle configuration is equivalent in integrity to that of a welded connection.	12/3/99
N-595 N-595-1 N-595-2 N-595-3 N-595-4	*Requirements for Spent Fuel Storage Canisters, Section III, Division 1* Regulatory approval for the use of multi-purpose casks is presently addressed by the NRC Spent Fuel Project Office Interim Staff Guidance No. 4 (ISG-4), Rev. 1, "Cask Closure Weld Inspections" (Ref. 7), and NRC Spent Fuel Storage and Transportation Division Interim Staff Guidance No. 18 (ISG-18) Rev. 1, "The Design and Testing of Lid Welds on Austenitic Stainless Steel Canisters as Containment Boundary for Spent Fuel Storage" (Ref. 8). The interim staff guidance provides a framework to ensure that the cask system, as designed, and when fabricated and used in accordance with the conditions specified in its Certificate of Compliance, meets the requirements of 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste" (Ref. 9). It should be noted that Code Case N-717 replaces Code Case N-595-X.	2/26/99 9/24/99 12/8/00 04/08/02 Annulled 10/14/11
N-645 N-645-1	*Use of Rupture Disk Devices on Nuclear Fuel Storage Canisters, Class 1, Section III, Division 1*	6/14/00 2/3/03

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	The NRC does not permit the use of rupture disk devices in spent nuclear fuel storage canister designs.	
N-659 N-659-1	*Use of Ultrasonic Examination in Lieu of Radiography for Weld Examination, Section III, Division 1* The NRC conditionally approved Code Case N-659 in Revision 34 of Regulatory Guide 1.84. The NRC's issues and proposed conditions were discussed in the statement of considerations for the proposed rule. The public comments discussed a number of concerns with the proposed conditions. Given the number of issues raised by NRC staff and the concerns expressed in the public comments, the NRC determined that a more effective approach for developing a suitable performance demonstration program was to work with ASME International to resolve the issues. Accordingly, the NRC is not going to endorse Code Case N-659 or Code Case N-659-1 at this time. NRC staff continue to interact with the cognizant ASME committees, and the industry is working to provide additional data and information.	9/17/02 11/18/03
N-659-2	*Use of Ultrasonic Examination in Lieu of Radiology for Weld Examination, Section III, Divisions 1 and 3* The NRC is not going to endorse Code Case N-659-2 at this time. Research is currently being conducted on a number of issues with respect to using ultrasonic testing (UT) to replace radiographic testing (RT). While preliminary results suggest that replacement of RT with UT may be feasible, the interchangeability of these techniques has not yet been fully demonstrated, UT acceptance criteria for fabrication/construction weld inspection have not yet been adequately defined, and the applicability of UT in the presence of high levels of acoustic noise such as that found in austenitic materials is not fully understood. The impact and implications of the expanded examination volume (full-thickness) required for UT for fabrication/construction must also be addressed. In addition, the Code Case would allow the examinations to be performed in accordance with Section V, Article 5 up to and including the 2001 Edition or Article 4 for later edition and addenda. The reliability UT performed to the provisions of Section V has been shown to be inferior to UT techniques developed through a program where the performance characteristics have been shown to be sufficient and reliable. Furthermore, the qualification specimens do not specify an adequate number of flaws required to be in the sample set, the required flaw distribution within the specimen, nor the required	6/09/08

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	size distribution within the specimen. Therefore, performance demonstration requirements including acceptance criteria for UT equipment, procedures, and personnel used for construction/fabrication activities must be addressed. Until studies are complete that demonstrate the ability of UT to replace RT for fabrication/construction, the NRC will not endorse UT in lieu of RT Code Cases or generically allow the substitution of UT in lieu of RT for fabrication/construction examinations.	
N-670	*Use of Ductile Cast Iron Conforming to ASTM A 874/ A 874M-98 or JIS G5504-1992 for Transport Containments, Section III, Division 3* The NRC has not yet endorsed Section III, Division 3, "Containments for Transportation and Storage of Spent Nuclear Fuel and High Level Radioactive Material and Waste." Thus, it would not be appropriate to approve a Code Case that is an alternative to the Section III, Division 3, provisions.	7/01/05
N-673	*Boron Containing Power Metallurgy Aluminum Alloy for Storage and Transportation of Spent Nuclear Fuel, Section III, Division 1* The Code Case does not address the following: (1) Corrosion properties of this material in spent fuel pool chemistry and/or clean water. (2) Impact properties for use as a structural material. (3) Uniform distribution of boron carbide in the aluminum matrix. (4) Mechanical properties for the use of the material in high-temperature conditions.	8/7/03
N-693	*Alternative Method to the Requirements of NB-3228.6 for Analyzing Piping Subjected to Reversing Dynamic Load, Section III, Division 1* The Code Case would permit the use of the design, service, and test limits in Paragraph NB-3656(b) for Level D Service Limits. The limits in Paragraph NB-3656(b) are prohibited per 10 CFR 50.55a(b)(1)(iii).	5/21/03
N-707	*Use of SA-537, Class 1 Plate Material for Spent-Fuel Containment Internals in Non-pressure Retaining Applications Above 700°F (370°C), Section III, Division 3* The NRC has not yet endorsed Section III, Division 3, "Containments for Transportation and Storage of Spent Nuclear Fuel and High Level Radioactive Material and Waste." Thus, it would not be appropriate to approve a Code Case that is an alternative to the Section III, Division 3, provisions.	11/02/04

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N-717	*Requirements for Construction of Storage Containments for Spent Nuclear Fuel and High Level Radioactive Waste and Material, Section III, Division 3* The NRC has not yet endorsed Section III, Division 3, "Containments for Transportation and Storage of Spent Nuclear Fuel and High Level Radioactive Material and Waste." Thus, it would not be appropriate to approve a Code Case that is an alternative to the Section III, Division 3, provisions. The provisions of the Code Case are copied from the July 1, 2005, addenda to Section III, Division 3. The changes to the ASME Code contained in the addenda are scheduled to be reviewed by the NRC staff in FY 2009. The Code Case is listed in this guide pending the results of the NRC staff review.	5/04/04
N-721	*Alternative Rules for Linear Piping Supports, Section III, Division 1* Code Case N-721 allows the use of ANSI/AISC N690L-03, "Load and Resistance Factor Design (LRFD) Specification for Safety-Related Steel Structures for Nuclear Facilities." ANSI/AISC N690L-03 provides an alternative method of design to that given in ANSI/AISC N690-1994, "Specification for the Design, Fabrication, and Erection of Safety-Related Steel Structures for Nuclear Facilities," including Supplement No. 2, which is based on Allowable Stress Design (ASD) specification. The LRFD method is a probabilistic method developed to provide uniform practice in the design of steel structures for nuclear facilities. The LRFD method uses many factors including one factor per resistance, and one factor for each of the different load types whereas the ASD method uses one factor of safety. The ASD method is a deterministic and normally conservative method and has been approved by the NRC for use in the design of new reactors. The LRFD method continues to undergo development. Code Case N-721 was developed based on N690L-03 which has subsequently been superseded by N690L-06. Thus, the Code Case is not up-to-date. In addition, questions regarding uncertainty remain with regard to the probabilistic treatment of loads and resistances. Thus, the LRFD method has not yet been approved by the NRC for use in the design of new reactor facilities.	9/09/08
N-728	*Use of ASTM B 932-04 Plate Material for Nonpressure Retaining Spent Fuel Containment Internals to 650°F (343°C), Section III, Division 3*	10/11/05

CODE CASE NUMBER	TABLE 1 UNACCEPTABLE SECTION III CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
	The NRC has not yet endorsed Section III, Division 3, "Containments for Transportation and Storage of Spent Nuclear Fuel and High Level Radioactive Material and Waste." Thus, it would not be appropriate to approve a Code Case that is an alternative to the Section III, Division 3, provisions.	
N-755 N-755-1 N-755-2	*Use of Polyethylene (PE) Plastic Pipe, Section III, Division 1 and XI* Issues have been raised regarding materials, fusion qualification requirements, nondestructive examination (NDE), crack growth and lack of data to support operating experience.	3/22/07 7/15/11 1/13E
N-761	*Fatigue Design Curves for Light Water Reactor (LWR) Environments, Section III, Division 1* Research has shown that the effect of environment on reactor components exposed to reactor water is not bounded by the current air fatigue curves. Bounding curves and a series of other curves for known strain rates have been developed to account for the reduction of fatigue life. • The proposed curves in Code Case N-761 for carbon and low alloy steels (as shown in Fig. 2 & Table 1 of the Code Case, and the curves for austenitic stainless steels (as shown in Fig. 3 & Table 2 of the Code Case) are not acceptable as sufficient technical basis has not been provided. • These curves are developed based on a factor of 10 on cycles and a factor of 2 on stress, which are not in agreement with the factor of 12 on cycles and a factor of 2 on stress as established in NUREG/CR-6909, "Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials" (Ref. 10). The factor of 10 on cycles is technically inconsistent with the factor of 12 in NUREG/CR-6909. The proposed curves are non-conservative relative to the estimates based on NUREG/CR-6909 procedure. The use of a different set of factors for the consideration of the LWR coolant environmental effects (i.e., a factor of 10 on cycles and a factor of 2 on stress) for the environmental fatigue correction factor (F_{en}) approach versus the environmental fatigue curves approach is inconsistent from technical and regulatory perspective. • The technical basis document for the proposed Code Case does not describe the process step by step from beginning to end as to how final design curves for LWR environment are obtained. The basis document does not provide the expression for the best-fit S-N curve of the experimental data, and the details of the mean stress correction for each curve, and how the proposed design curves were obtained.	9/20/10 9/20/10

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	• The proposed Code Case contains five environmental fatigue curves for carbon and low-alloy steels and five for stainless steels. These are the air curve, and the worst case environmental curve, and three other curves for different strain rates. These environmental curves are not consistent with the experimental data. The strain rate dependence for the first three curves is much lower than that observed in experimental data on smooth cylindrical or tube specimens or even the recent Electric Power Research Institute sponsored component tests in Germany. • There is no information provided in the basis document about the operating conditions that were used to represent the worst case environmental curve. Also, no information is provided in the basis document regarding the equation for the best-fit curve of the experimental data. • The technical basis document for the code case should address the effect of strain threshold and tensile hold time in fatigue evaluations.	
N-791	*Shear Screw and Sleeve Splice, Section III, Division 2* There is no slip criterion for this code case. The staff believe that ASTM A 1034/A1034M-05b, "Standard Test Methods for Testing Mechanical Splices for Steel Reinforcing Bars" (Ref. 11), could be used as a good model to develop definition and test methods for slip. Concrete containments in nuclear power plants are important structures and therefore their criteria for mechanical splices should not be less stringent than that of other seismic Category I structures, as defined in ACI 349-06, "Code Requirements for Nuclear Safety-Related Concrete Structures & Commentary" (Ref. 12). The design criterion for concrete containment structures is based on allowable strains for the steel reinforcing bars. The purpose of this strain criterion is partially to prevent the tearing of steel liner plates, which are attached to the inside face of the containment and serve as a leak tight pressure boundary, by limiting strains in both concrete and steel reinforcing bars in containment. The mechanical splices should not be allowed to have a significant slip that would cause the strain from the steel reinforcing bars to be transferred to the steel liner plates. Therefore, the code case needs to develop a slip criterion for mechanical splices. Concrete and Commentary," Section 21.1.6.1, classifies mechanical splices in two types: Type 1 and 2. The criterion for Type 1 mechanical splices is that a mechanical splice shall develop no less than 125% of the specified minimum yield strength of the	9/20/10

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	spliced bar, as stated in Section 12.14.3.2 of the Code. Type 1 mechanical splices are not allowed to be used in regions that may experience steel yielding. The criterion for Type 2 mechanical splices is that a mechanical splice shall develop the specified tensile strength of the spliced bar, as stated in Section 21.1.6.1 of the Code. The specified, or actual tensile strength of the steel reinforcing bars are used to calculate the ultimate capacity of concrete containment structures against the internal pressure, as a measure of the safety margin above the design basis accident pressure. Consequently, Type 2 mechanical splices must be used in concrete containment structures. Therefore, the criterion in Section 2.3 of N-791 code case is the equivalent criterion for Type 1 mechanical splices of ACI 318, "Building Code Requirements for Structural Concrete and Commentary" (Ref. 13), which is not an adequate criterion for qualifying mechanical splices for use in concrete containment structures. Therefore, the code case should develop a more stringent strength criterion, and the same criterion should also be used for continuing splices performance tests in the field, as stated in Section 5 of the code case.	
N-792 N-792-1	*Fatigue Evaluations Including Environmental Effects, Section III, Division 1* This code case does not implement the latest methodology developed from NRC/RES research activities. That methodology was presented to ASME in May 2012, as reflected in the material posted in ADAMS at ML13008A005. There are also further adjustments to that information based on the finalization of our research efforts. To be more specific, the six most significant differences betweenthe code case and the latest NRC research are shown below: a. Carbon and Low Alloy Steel Fatigue Curve: Figure -2100-1 (and -1M) and Table -2100-1 of the code case define the design fatigue air curve for carbon and low alloy steels. Both material types are combined into one fatigue curve, whereas the NRC approach defines a separate fatigue curve for each material type. The code case fatigue curve matches the design fatigue air curve currently in Appendix I of Section III (2011 Addenda). The code case fatigue curve does not matchthe carbon or low alloy steel design fatigue air curves from the initial revision of NUREG/CR-6909 (which are the same curves NRC intends to use in Rev. 1 of NUREG/CR-6909) because the code case fatigue curve utilizes a margin of 20 on cycles whereas the NRC curves use a margin of 12. The code case design fatigue air curve is conservative with respect to the NRC fatigue	9/20/10 11/10E

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	design air curves; however, Item (b) below must also be considered when evaluating the adequacy of Fen usage factors calculated using the design curve. b. Carbon and Low Alloy Steel Fen Expression: Equation (1) of the code case uses the carbon steel Fen expression from the initial revision of NUREG/CR-6909 adjusted to account for the difference in the margin term used to develop the ASME and NRC design fatigue curves. This equation is different than the Fen expression recently developed by the NRC, and the equations for the transformed environmental parameters are different, so the Fen equation may yield non-conservative values of Fen because: a. The use of average temperature with the code case Fen expression may be non-conservative (see Item (f)). b. The code case Fen expression was adjusted to account for the difference in margin used for to develop the design curve, i.e., the factor of 20 vs. 12 discussed under Item (a) above. As a result, the constant in the Fen expression is 0.121 compared to 0.632 for carbon steel material in the initial revision to NUREG/CR-6909. Such adjustment is not appropriate and may be non-conservative for Fen application to the portion of the fatigue design air curve that is controlled by the factor of 2 on stress rather than the factor of 20 .on cycles. c. The code case Fen expression is for carbon steel material, and it is used for application to both carbon and low alloy steel materials. Use of this expression for low alloy steel may be non-conservative since the constant is higher for low alloy steel compared to carbon steel (0.702 vs. 0.632). d. The code case Fen expression is nonconservative for some environmental conditions compared to the new NRC expressions, i.e., for T < 200°C, strain rate = 0.001 %/sec, and dissolved oxygen values higher than 0.04 ppm. c. Stainless Steel Fatigue Curve: Figure -2100-2 (and -2M) and Table -2100-2 of the code case define the design fatigue air curve for stainless steels. The code case fatigue curve matches the design fatigue air curve currently in Appendix I of Section III (2011 Addenda). The code case fatigue urve matches the stainless steel design fatigue air curve from the initial revision of NUREG/CR-6909 (which	

CODE CASE NUMBER	TABLE 1 UNACCEPTABLE SECTION III CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
	is the same curve NRC intends to use in Rev. 1 of NUREG/CR-6909). However, Item (d) below must also be considered when evaluating the adequacy of Fen usage factors calculated using the design curve. d. Stainless Steel Fen Expression: Equation (2) of the code case uses the stainless steel Fen expression from the initial revision of NUREG/CR-6909. This equation is different than the Fen expression recently developed by the NRC, and the equations for the transformed environmental parameters are different, and the Fen equation may yield non-conservative values of Fen in cases where the average temperature is used (see Item (f)). e. Ni-Cr-Fe Steel: The same observations under Item (c) applies for Ni-Cr-Fe steels since the stainless steel fatigue curve is used for Ni-Cr-Fe materials. Equation (3) of the code case uses the Ni-Cr-Fe steel Fen expression from the initial revision of NUREG/CR-6909. This equation is the same as the Fen expression recently developed by the NRC, but the equations for the transformed environmental parameters are different, and the Fen equation may yield non-conservative values of Fen in cases where the average temperature is used (see Item (f)). f. -2420 Determination of Transformed Temperature: a. -2421 of the code case states that the transformed temperature is based on, "…the average of the highest and lowest metal temperatures of the surface in contact with the fluid in the transients constituting the stress cycle…" NRC disagrees with this approach as it is not consistent with the Fen methodology, and it can be non-conservative. i. To be consistent with the Fen methodology, an average temperature for the transient should consider the threshold temperature to estimate Fen during a load cycle, which may be significantly higher than the minimum temperature of the transient. ii. Limited NRC calculations indicate that using either an average transient temperature or an average of the transient maximum temperature and the Fen threshold temperature does not always yield a conservative Fen estimate when compared to the results obtained from an integrated Fen using the modified rate approach.	

CODE CASE NUMBER	TABLE 1 UNACCEPTABLE SECTION III CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
	b. -2422 defines the transformed temperature for carbon and low alloy steels for temperatures up to 350°C (660°F). NRC's updated research only includes data up to 325°C (615°F), so the updated Fen expression for carbon and low alloy steels is only applicable for temperatures up to 325°C. c. -2423 defines the transformed temperature for wrought and cast austenitic stainless steels for temperatures above 325°C (615°F) as constant (T* = 1). NRC's updated research only includes data up to 325°C (615°F), and the updated Fen expression for wrought and cast austenitic stainless steels does not plateau at temperatures above 325°C. Therefore, the code case may provide non-conservative estimates of Fen for temperatures above 325°C. g. -2424 defines the transformed temperature for Ni-Cr-Fe steels for temperatures above 325°C (615°F) as constant (T* = 1). NRC's updated research only includes data up to 325°C (615°F), and the updated Fen expression for Ni-Cr-Fe steels does not plateau at temperatures above 325°C. Therefore, the code case may provide non-conservative estimates of Fen for temperatures above 325°C. NRC recommends that Code Case N-792-1 be revised to reflect NUREG/CR-6909 Rev. 1 after it is published. The NRC staff abstained from voting on this item at Standards Committee and commented that the staff does not support the Code Case based on NRC sponsored research that is on-going.	
N-793	*Extruded Steel Sleeves With Parallel Threaded Ends, Section III, Division 2* See comments for N-791.	9/20/10
N-794	*Swaged Splice With Threaded Ends, Section III* See comments for N-791.	9/20/10
N-796	*Alternative Preheat Temperature for Austenitic Welds in P-No. 1 Material Without PWHT, Section III, Division 1* See comments for N-791.	10/18/10
N-804	*Alternative Preheat Temperature for Austenitic Welds in P-No. 1 Material Without PWHT, Section III, Division 1* The NRC believes that the test data provided is insufficient to support a reduction in the ASME Code required preheat of 200°F. Data for the welds in the production valve bodies tested indicate the presence of martensite resulting in unacceptably high hardness	10/14/11

CODE CASE NUMBER	TABLE 1 UNACCEPTABLE SECTION III CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
	values. Hydrogen cracking of the welds could result in the absence of proper preheat.	
N-807	*Use of Grades 75 and 80 Reinforcement in Concrete Containments, Section III, Division 2* The NRC considers the higher grades of steel to be unacceptable for the reinforcement of containment construction. Higher grades will reduce the ductility of the steel reinforcement, and thus the overall ductility of the containment, which is undesirable.	4/20/11
N-812 N-812-1	*Alternate Creep-Fatigue Damage Envelope for 9Cr-1Mo-V Steel, Section III, Division 1* Code Case N-812 utilizes Section III, Division, Subsection NH, "Class 1 Components in Elevated Temperature Service." Subsection NH is not approved for use by the NRC.	8/5/11 1/13E
N-818 N-818-1	*Alternative Requirements for Preservice Volumetric and Surface Examination, Section III, Division 1* Code Case N-818-1 contains provisions for applying the results of nondestructive examinations and fracture mechanics calculations to accept flaws in full penetration butt welds of ferritic vessels and austenitic and ferritic piping in lieu of repair in accordance with the ASME Code, Section III, when the radiography indicates that the welds cannot satisfy NB-5000 or NC-5000 of Section III during preservice examinations. The NRC staff has following concerns regarding the provisions of UT and other issues in this code case. 1. The code case applies to ferritic, austenitic stainless steel, and dissimilar metal welds. However, UT in lieu of radiograph testing (RT), at this time, has only been qualified as described ASME Code Case N-831) for ferritic materials. The NRC staff has reviewed and approved relief requests for UT in lieu of RT that utilized the qualification approach described in CC N-831 for ferritic materials only. To date, the technical basis for the use of UT in lieu of RT for austenitic welds has not been sufficiently developed to allow The NRC staff to accept UT in lieu of RT on austenitic stainless steel or dissimilar metal welds. 2. Single side access in not acceptable for fabrication examinations because some flaws are only detectable from one direction. 3. Second leg of UT V-path may be acceptable to use on a limited basis for ferritic material, but will not be acceptable for austenitic stainless steel or dissimilar metal welds.	12/6/11 7/13E

CODE CASE NUMBER	TABLE 1 UNACCEPTABLE SECTION III CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
	4. Surface preparation needs to be addressed. Welds must be conditioned without any gap more than 1/32-inch between transducer and weld. 5. Paragraph (g) of the code case seems to be the discussion of a calibration block, not a qualification block. 6. Paragraph I-3.2(d) states that "…Examination procedures, equipment, and personnel are qualified for depth-sizing when the RMS [root-mean-square] error of the flaw depth measurements, as compared to the true flaw depths, does not exceed 0.125 in. (3 mm)…" The RMS error was meat for depth sizing of service-induced surface connected flaws. The NRC staff does not find using this RMS error is appropriate for measurements of fabrication defects. 7. The location of the fabrication defect is important in that if the fabrication defect is located closer to the inside surface vs outside surface of the pipe. 8. The depth of the maximum flaw permitted by the code case for the preservice examination is 20 percent through wall. The concept of such fabrication defect permitted to remain in the component prior to service is contrary to the fundamental design philosophy of ASME Code, Section III which is that a component is not designed to have flaws. In addition, the allowable limits for primary and secondary stresses and cumulative fatigue usage factors in NB-3000 and NC-3000 are based on a component without flaws. 9. Permitting a 20 percent depth flaw to remain in a component prior to service reflects a tacit approval of a lower quality of the product and subpar workmanship.	
N-820	*Twisting of Horizontal Prestressing Tendons, Section III, Division 2* New reactor designs will utilize stranded wire sizes up to 0.6 inch. The Office of New Reactors will determine the appropriate regulatory approach for approving Code Case N-820 through the licensing process.	12/6/11
N-828	*Alternative Nonmetallic Material Manufacturer's and Constituent Suppliers Quality System Program Requirements, Section III, NCA-3900, 2010 Edition, and Earlier Editions and Addenda, Section III, Divisions 1 and 2*	4/27/12

CODE CASE NUMBER	TABLE 1 UNACCEPTABLE SECTION III CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
	Code Case N-828 was developed to support new nuclear plant construction. The NRC plans to address this Code Case in Regulatory Guide 1.136, "Design Limits, Loading Combinations, Materials, Construction, and Testing of Concrete Containments."	
N-837	*Alternative to the Registered Professional Engineer Requirements, Section III, Divisions 1, 2, 3, and 5* This Code Case is only for non-U.S. nuclear facilities, and therefore, is not applicable to U.S. nuclear facilities regulated by the U.S. NRC.	3/13E

2. Unacceptable Section XI Code Cases

The NRC determined that the following Section XI Code Cases are unacceptable for use by licensees in their Section XI inservice inspection programs. To assist users, new Code Cases are shaded to distinguish them from those listed in previous versions of this guide. The shading will assist in focusing attention during the public comment period on the changes to the guide.

Table 2. Unacceptable Section XI Code Cases

CODE CASE NUMBER	TABLE 2 UNACCEPTABLE SECTION XI CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
N-465 N-465-1	*Alternative Rules for Pump Testing, Section XI, Division 1* The draft standard referenced in the Code Case is outdated. The requirements contained in the OM Code, "Code for Operation and Maintenance of Nuclear Power Plants," should be used.	11/30/88 Annulled 2/14/03
N-473 N-473-1	*Alternative Rules for Valve Testing, Section XI, Division 1* The draft standard referenced in the Code Case is outdated. The requirements contained in the OM Code, "Code for Operation and Maintenance of Nuclear Power Plants," should be used.	3/8/89 Annulled 2/14/03
N-480	*Examination Requirements for Pipe Wall Thinning Due to Single Phase Erosion and Corrosion, Section XI, Division 1* Code Case has been superseded by Code Case N-597, "Requirements for Analytical Evaluation of Pipe Wall Thinning," implemented in conjunction with NSAC-202L, "Recommendations for an Effective Flow-Accelerated Corrosion Program" (Ref. 14).	Annulled 9/18/01
N-498-2 N-498-3	*Alternative Requirements for 10-Year System Hydrostatic Testing for Class 1, 2, and 3 Systems, Section XI, Division 1*	6/9/95 5/20/98
N-532-2	*Alternative Requirements to Repair and Replacement Documentation Requirements and Inservice Summary Report Preparation and Submission as Requested by IWA-4000 and IWA-6000, Section XI, Division 1* The following concerns were identified during review of the Code Case: (1) The Code Case references new paragraph IWA-6350, which has not yet been incorporated into the ASME Code. (2) NRC staff had difficulty reconciling Footnote 1 and Table 4 regarding the applicable edition and addenda. (3) Submission of Form OAR-1 is at the end of each inspection period, rather than 90 days following the outage.	7/23/02

CODE CASE NUMBER	TABLE 2 UNACCEPTABLE SECTION XI CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
N-542	*Alternative Requirements for Nozzle Inside Radius Section Length Sizing Performance Demonstration, Section XI, Division 1* Code Case N-542 was subsumed by Code Case N-552, "Alternative MethodsBQualification for Nozzle Inside Radius Section from the Outside Surface," which is being implemented by licensees. Thus, there is no need to approve Code Case N-542.	Annulled 3/28/01
N-547	*Alternative Examination Requirements for Pressure Retaining Bolting of Control Rod Drive (CRD) Housings, Section XI, Division 1* Code Case N-547 states that the examination of CRD housing bolts, studs, and nuts is not required. However, 10 CFR 50.55a(b)(2)(xxi)(B) required the examination of CRD bolting material whenever the CRD housing is disassembled and the bolting material is to be reused. Examination of CRD bolting material is required to verify that service-related degradation has not occurred, or that damage such as bending and galling of threads has not occurred when performing maintenance activities that require the removal and reinstallation of bolting.	Annulled 5/20/01
N-560 N-560-1 N-560-2	*Alternative Examination Requirements for Class 1, Category B-J Piping Welds, Section XI, Division 1* (1) The Code Case does not address inspection strategy for existing augmented and other inspection programs such as intergranular stress corrosion cracking (IGSCC), flow-assisted corrosion (FAC), microbiological corrosion (MIC), and pitting. (2) The Code Case does not provide system-level guidelines for change in risk evaluation to ensure that the risk from individual system failures will be kept small and dominant risk contributors will not be created.	8/9/96 2/26/99 2/14/03
N-561 N-561-1	*Alternative Requirements for Wall Thickness Restoration of Class 2 and High Energy Class 3 Carbon Steel Piping, Section XI, Division 1* Neither the ASME Code nor the Code Case have criteria for determining the rate or extent of degradation of the repair or the surrounding base metal. Reinspection requirements are not provided to verify structural integrity since the root cause may not be mitigated.	12/31/96 3/28/01
N-562 N-562-1	*Alternative Requirements for Wall Thickness Restoration of Class 3 Moderate Energy Carbon Steel Piping, Section XI, Division 1* Neither the ASME Code nor the Code Case have criteria for determining the rate or extent of degradation of the repair or the surrounding base metal. Reinspection requirements are not provided to verify structural integrity since the root cause may not be mitigated.	12/31/96 3/28/01
N-574	*NDE Personnel Recertification Frequency, Section XI, Division 1* Based on data obtained by the NRC staff during its review of Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," to Section XI, the NRC staff noted that proficiency decreases over time. The data do not support recertification examinations at a frequency of every 5 years.	Annulled 7/14/06

CODE CASE NUMBER	TABLE 2 UNACCEPTABLE SECTION XI CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
N-575	*Alternative Examination Requirements for Full Penetration Nozzle-to-Vessel Welds in Reactor Vessels with Set-On Type Nozzles, Section XI, Division 1* The supporting basis for the Code Case applies to the specific configuration of one plant and is not applicable on a generic basis. In addition, there are insufficient controls on stress and operating conditions to permit a generic reduction in examination volume. Finally, the boundaries of the volume of the weld, cladding, and heat affected zone from Figure 2 are ambiguous.	2/14/03
N-577 N-577-1	*Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method A, Section XI, Division 1* (1) The Code Case does not address inspection strategy for existing augmented and other inspection programs such as IGSCC, FAC, MIC, and pitting. (2) The Code Case does not provide system-level guidelines for change in risk evaluation to ensure that the risk from individual system failures will be kept small and dominant risk contributors will not be created.	9/2/97 2/14/03
N-578 N-578-1	*Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B, Section XI, Division 1* (1) The Code Case does not address inspection strategy for existing augmented and other inspection programs such as IGSCC, FAC, MIC, and pitting. (2) The Code Case does not provide system-level guidelines for change in risk evaluation to ensure that the risk from individual system failures will be kept small and dominant risk contributors will not be created.	9/2/97 2/14/03
N-587	*Alternative NDE Requirements for Repair/Replacement Activities, Section XI, Division 1* The NRC believes this Code Case is in conflict with the review process for approval of alternatives under 10 CFR 50.55a(z). The Code Case would permit a licensee and the Authorized Nuclear Inspector to choose unspecified alternatives to regulatory requirements.	Annulled 2/14/03
N-589 N-589-1	*Class 3 Nonmetallic Cured-in-Place Piping, Section XI, Division 1* (1) The installation process provides insufficient controls on wall thickness measurement. (2) There are no qualification requirements for installers and installation procedures such as those for welders and welding procedures. (3) Fracture toughness properties of the fiberglass are such that the cured-in-place piping (CIPP) could crack during a seismic event. (4) Equations 4 and 5 in the Code Case contain an “i” term [a stress intensification factor] that is derived from fatigue considerations. Stress intensification factors, however, have not been developed for fiberglass materials.	4/19/02 7/23/02

CODE CASE NUMBER	TABLE 2 UNACCEPTABLE SECTION XI CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
N-590	*Alternative to the Requirements of Subsection IWE, Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Plants, Section XI, Division 1* The provisions of the Code Case were incorporated into the 1998 Edition, which has been approved by the NRC. Thus, the Code Case is no longer needed and was annulled by the ASME.	Annulled 4/8/02
N-591	*Alternative to the Requirements of Subsection IWL, Requirements for Class CC Concrete Components of Light-Water Cooled Plants, Section XI, Division 1* The provisions of the Code Case were incorporated into the 1998 Edition which has been approved by the NRC. Thus, the Code Case is no longer needed and was annulled by the ASME.	Annulled 4/8/02
N-593-1	Examination Requirements for Steam Generator Nozzle-to-Vessel Welds, Section XI, Division 1 The Code Case eliminates the requirement to examine the steam generator nozzle inner radius. Specifically, the examination volume for the nozzle inner radius was removed from Section XI, Figures IWB-2500-7(a) through IWB-2500-7(d). The action is applicable from the 1974 Edition through the 2004 Edition with the 2005 Addenda. A similar action was taken regarding Code Case N-619. The NRC did not take exception to Code Case N-619 because 10 CFR 50.55a(b)(2)(xxi)(A) required licensees to perform the examination in accordance with the 1998 Edition, which includes figures containing the examination volume. However, Code Case N-593-1 applies to editions prior to the 1998 Edition which do not have the appropriate figures.	10/08/04
N-613	*Ultrasonic Examination of Full Penetration Nozzles in Vessels, Examination Category B-D, Item No's. B3.10 and B3.90, Reactor Vessel-To-Nozzle Welds, Fig. IWB-2500-7(a), (b), and (c), Section XI, Division 1* The Code Case conflicts with and unacceptably reduced the requirements of 10 CFR 50.55a(b)(2)(xv)(K)(2)(i). A revision to the Code Case has been developed to address the concerns.	7/30/98
N-615	*Ultrasonic Examination as a Surface Examination Method for Category B-F and B-J Piping Welds, Section XI, Division 1* The Code Case requires that the ultrasonic technique used be demonstrated capable of detecting certain size flaws on the outside diameter of the weld, but it does not specify any demonstration requirements. To be acceptable, Section XI, Appendix VIII, type rules for performance demonstration need to be developed and applied.	7/28/01
N-618	*Use of a Reactor Pressure Vessel as a Transportation Containment System, Section XI, Division 1* The Code Case was developed as a potential option for shipping and disposal of a reactor pressure vessel (RPV). The NRC staff determined, however, that the Code Case was not applicable to the review and approval process for transportation packages. The use of RPVs as a transportation package has been addressed under 10 CFR Part 71, "Packaging and Transportation of Radioactive Material" (Ref. 15).	6/17/03

CODE CASE NUMBER	TABLE 2 UNACCEPTABLE SECTION XI CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
N-622	*Ultrasonic Examination of RPV and Piping, Bolts, and Studs, Section XI, Division 1* The Code Case was published in May 1999. Industry Performance Demonstration Initiative efforts since that time have made this Code Case obsolete. Issues associated with supplements to Appendix VIII are being addressed individually in separate Code Cases.	Annulled on 1/12/05
N-653	*Qualification Requirements for Full Structural Overlaid Wrought Austenitic Piping Welds, Section XI, Division 1* (1) Section XI, Appendix VIII, Supplement 11, requires a personnel performance qualification as part of the procedure qualification. The detection acceptance criteria in the Code Case do not require personnel performance qualification as part of the procedure qualification. Personnel qualification is necessary to validate the effectiveness of the procedure qualification. (2) The minimum grading unit is 1.0 inch in the circumferential direction. The acceptance tolerance, however, is 0.75 inch root mean square error. Thus, the length sizing acceptance criteria do not adequately prevent the use of testmanship rather than skill to pass length sizing tests.	9/7/01
N-654	*Acceptance Criteria for Flaws in Ferritic Steel Components 4 in. and Greater in Thickness, Section XI, Division 1* Licensees intending to apply the rules of this Code Case must obtain NRC approval of the specific application in accordance with 10 CFR 50.55a(z).	4/17/02
N-691	*Application of Risk-Informed Insights to Increase the Inspection Interval for Pressurized Water Reactor Vessels, Section XI, Division 1* A response to the NRC staff=s request for additional information has not yet been received and therefore, insufficient information has been provided for the staff to make a determination relative to the acceptability of this Code Case.	11/18/03
N-711	*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* The Code Case would permit each licensee to independently determine when achievement of a coverage requirement is impractical, and when Code-required coverage is satisfied. As a result, application of the Code Case for similar configurations at different plants could result in potentially significant quantitative variations. Furthermore, application of the Code Case is inconsistent with NRC's responsibility for determining whether examinations are impractical, and eliminates the NRC's ability to take exception to a licensee's proposed action and impose additional measures where warranted in accordance with 10 CFR 50.55a(g)(6)(i).	1/05/06

CODE CASE NUMBER	TABLE 2 UNACCEPTABLE SECTION XI CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
N-713	*Ultrasonic Examination in Lieu of Radiography, Section XI, Division 1* The requirements of Code Case N-713 were based largely on the requirements contained in Code Case N-659. The NRC has not approved Code Cases N-659, N-659-1, nor N-659-2. Refer to the discussion on Code Case N-659-2 in Table 1 above, "Unacceptable Section III Code Cases," for more information.	11/10/08
N-716	*Alternative Piping Classification and Examination Requirements, Section XI, Division 1* The NRC has approved risk-informed inservice inspection (RI-ISI) programs based, in part, on methods described in Code Case N-716. The NRC has approved programs for Grand Gulf Nuclear Station 1 (September 21, 2007; ML072430005), Donald C. Cook Nuclear Plant (September 28, 2007; ML072620553), and Waterford Steam Electric Station (April 28, 2008; ML080980120). The approvals were specific to these units and relied on several changes to the methodology described in Code Case N-716. The NRC is reviewing EPRI Topical Report 1021467, "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-service Inspection Programs." The purpose of the topical report, in part, is to provide guidance on determining the technical adequacy of probabilistic risk assessments used to develop a "streamlined" RI-ISI program in accordance with Code Case N-716. The staff will consider the revised Code Case for generic approval when its review of the topical report has been completed.	4/10/06
N-722-2	*Visual Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated With Alloy 600/82/182 Materials, Section XI, Division 1* Code Case N-722 has been superseded by Revisions 1 and 2 to the Code Case. N-722-1 is conditionally approved directly in 10 CFR 50.55a and not through Regulatory Guide 1.147. Code Case N-722-2 has been dispositioned as Unacceptable.	9/8/11
N-729-3 N-729-4	*Alternative Examination Requirements for PWR Reactor Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Nozzles, Section XI, Division 1* Code Case N-729 has been superseded by Revisions 1, 2, and 3 to the Code Case. N-729-1 is conditionally approved directly in 10 CFR 50.55a and not through Regulatory Guide 1.147. Code Case N-729-4 is addressed directly in 10 CFR 50.55a.	4/4/12 11/10E

CODE CASE NUMBER	TABLE 2 UNACCEPTABLE SECTION XI CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
N-740 N-740-1 N-740-2	*Dissimilar Metal Weld Overlay for Repair of Class 1, 2, and 3 Items, Section XI, Division 1* The NRC staff identified many technical issues regarding the provisions of Revisions 0 and 1. The issues were communicated to the cognizant Section XI committees, and the staff continues to work with the committees to resolve the issues. Due to the total number of issues and the nature of some (e.g., lack of certain fundamental design details), the staff determined that it would be inappropriate to attempt to conditionally approve either version 0 or 1 in Regulatory Guide 1.147. Code Case N-740-2 has been approved and published by the ASME. While Revision 2 addresses some of the NRC staff concerns, significant issues remain. For example, the definition of nominal weld and base material appear to be inconsistent with the provisions of Section III. Also, additional detail is required on how to perform the flaw growth or design analysis. Finally, additional detail is required on how the overlays are designed.	10/12/06 12/25/09 11/10/08
N-766	*Nickel Alloy Reactor Coolant Inlay and Onlay for Mitigation of PWR Full Penetration Circumferential Nickel Alloy Dissimilar Metal Welds of Class 1 Items, Section XI, Division 1* (1) Paragraph 1.(c)(1) of Code Case N-766 would potentially allow a 75-percent through wall flaw to remain in service in the original Alloy 82/182 dissimilar metal weld, in accordance with IWB-3600. The NRC staff finds it is unacceptable to allow such a large flaw to remain in service in Class 1 piping. (2) Paragraphs 2.(c)(1) and 2.(c)(2) of Code Case N-766: The postulated and as-left flaws need to be evaluated because the postulated flaws are supposed to represent the capabilities of the non-destructive examination techniques applied. For example, if a 15-degree circumferential flaw that is 11% through-wall is detected, this would be evaluated instead of a 360-degree, 10% through-wall flaw. A 360-degree, 10% through-wall flaw should be analyzed to determine the fatigue and stress corrosion cracking degradation mechanisms. *(3)* Paragraph 2.(f) of Code Case N-766 should be revised to include the following: "The flaw growth calculation due to stress corrosion cracking should include the welding residual stresses. The flaw growth calculation shall be performed in accordance with IWB-3640 and/or Appendix C to the ASME Code, Section XI."	12/20/10
N-770-3 N-770-4	*Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated With UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities Section XI, Division 1* The NRC requires the N-770-2 examinations to be performed as an augmented inspection program under 50.55a(g)(6)(ii)(F). The latest version of N-770-2 approved by the NRC is incorporated by reference in 50.55a. Once the review of the topical report on the technical basis for peening is complete, the staff expects to review the latest ASME Code approved version of Code Case N-770 for incorporation directly in 10 CFR 50.55a, under § 50.55a(g)(6)(ii)(F).	1/13E 5/13E

CODE CASE NUMBER	TABLE 2 UNACCEPTABLE SECTION XI CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
N-780	*Alternative Requirements for Upgrade, Substitution, or Reconfiguration of Examination Equipment When Using Appendix VIII Qualified Ultrasonic Examination Systems, Section XI, Division 1* At this time, the NRC will review application of Code Case N-780 on a case-by-case basis. The Code Case is a new alternative to the current requirements in Section XI, Appendix VIII. The technical justification for the alternative is based largely on the expertise of nondestructive examination experts and laboratory testing. While the laboratory testing was well conducted, it was not bounding. The NRC believes that industry experience in applying the alternative is needed to ensure generic applicability and demonstrate reliability before the alternative can be approved in RG 1.147.	4/9/10
N-784	*Experience Credit for Ultrasonic Examiner Certification* Code Case N-784 reduces the requirements for training and experience regarding examination personnel. Examination personnel would receive less training and experience with respect to the detection of representative flaws in materials and configurations found in nuclear power plants. In addition, the Code Case would allow personnel without nuclear ultrasonic examination experience to qualify without exposure to the variety of defects, components, examination conditions, and regulations to be encountered. The impact of reduced training and experience has not been evaluated.	4/9/10
N-806	*Evaluation of Metal Loss in Class 2 and 3 Metallic Piping Buried in a Back-Filled Trench* NRC staff advised ASME during consideration of Code Case N-806 that the NRC had concerns and intended to review and approve the Code Case on a case-by-case basis. Following are the NRC's concerns: (1) The rules applicable to determining corrosion rates which lead to the definition of the evaluation period and re-examination schedules are currently under development. Accordingly, the Code Case does not define the method of determining the wall loss rates, the time period for length of the evaluation, and the reexamination period/frequency. (2) The ASME Section XI appendices used to calculate some of the important values are nonmandatory. Licensees intending to use Code Case N-806 must submit a plant-specific request to the NRC staff for review and approval prior to implementation.	6/22/12

CODE CASE NUMBER	TABLE 2 UNACCEPTABLE SECTION XI CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
N-813	*Alternative Requirements for Preservice Volumetric and Surface Examination, Section XI, Division 1* Code Case N-813 is an alternative to the provisions of the 2010 Edition of the ASME Code, Section XI, paragraph IWB-3112. IWB-3112 does not allow the acceptance of flaws detected in the preservice examination by analytical evaluation. Code Case N-813 would allow the acceptance of these flaws through analytical evaluation. Per paragraph IWB-3112, any preservice flaw that exceeds the acceptance standards of Table IWB-3410-1 must be removed. While it is recognized that operating experience has shown that large through wall flaws and leakages have developed in previously repaired welds as a result of weld residual stresses, the NRC has the following concerns regarding the proposed alternative in Code Case N-813: (1) The requirements of paragraph IWB-3112 were developed to ensure that defective welds were not placed in service. A preservice flaw detected in a weld that exceeds the acceptance standards of Table IWB-3410-1 demonstrates poor workmanship and/or inadequate welding practice and procedures. The unacceptable preservice flaw needs to be removed and the weld needs to be repaired before it is placed in service. (2) Under Code Case N-813, large flaws would be allowed to remain in service because paragraph IWB-3132.3, via paragraph IWB-3643, allows a flaw up to 75 percent through wall to remain in service. Larger flaws could grow to an unacceptable size between inspections reducing structural margin and potentially challenging the structural integrity of safety-related Class 1 and Class 2 piping. Paragraph C-3112(a)(3) of Code Case N-813 provides the same alternatives for Class 2 piping as that of Paragraph B-3122(a)(3). The staff has the same concerns for Class 2 piping as for Class 1 piping.	10/24/11

CODE CASE NUMBER	TABLE 2 UNACCEPTABLE SECTION XI CODE CASES SUMMARY	DATE OR SUPPLEMENT/ EDITION
N-826	*Ultrasonic Examination of Full Penetration Vessel Weld Joints in Fig. IWB-2500-1 Through Fig. IWB-2500-6* Reduction of the inspection volume from ½ t to ½ inch is in conflict with 10 CFR 50.61a, "Alternate Fracture Toughness Requirements for Protection against Pressurized Thermal Shock Events." Licensees implementing 10 CFR 50.61a must first examine the volume described in the ASME Code, Section XI, Figures IWB-2500-1 and IWB-2500-2 using Appendix VIII qualified procedures, equipment, and personnel to obtain the necessary data on flaws to ensure the flaw density requirements of 10 CFR 50.61a are met. Although under Code Case N-826, a licensee would have examined the full ½ t volume at least once in accordance with Appendix VIII, the NRC staff finds it unacceptable to allow reduction of the examination volume for later inservice examinations due to concerns about detection and sizing accuracy for smaller flaws using the current UT technology. Current UT technology cannot reliably detect and accurately size smaller flaws which affects the validity of the comparison with the flaw density requirement of 10 CFR 50.61a. In addition, recent experiences at operating plants regarding missed defects during examinations using qualified methods and conducted in compliance with Section XI, Appendix VIII, has raised concerns regarding the reliability of ultrasonic examinations. Finally, the reduction from ½ t to ½ inch originated with Code Case N-613. The purpose of the reduction in examination volume was to reduce the number of relief requests caused by the inability to examine the required volume for typical geometries of nozzle-to-vessel welds. The full-penetration vessel welds addressed by Code Case N-826 do not generally have similar geometric restrictions that would prevent examination of the full ½ t volume.	7/16/12
N-840	*Cladding Repair by Underwater Electrochemical Deposition in Class 1 and 2 Applications Section XI, Division 1* This code case was developed specifically to address erosion/corrosion concerns in a Korean nuclear facility, in a location where cladding damage in the RPV has exposed low alloy steels. If this were to occur in a US nuclear facility the NRC staff would want to review the particular circumstances on a case by case basis. Any licensee desiring to utilize Code Case N-840 should submitted it for review and approval in accordance with 10 CFR 50.55a(z).	4/13E

3. Unacceptable OM Code Cases

The following OM Code Cases were determined to be unacceptable for use by licensees in their inservice testing programs. The ASME issues OM Code Cases annually with publication of a new edition or addenda. To assist users, new and revised Code Cases are shaded to distinguish them from those approved in previous versions of this guide. The shading will assist in focusing attention during the public comment period on the changes to the guide.

Table 3. Unacceptable OM Code Cases

CODE CASE NUMBER	TABLE 3 UNACCEPTABLE OM CODE CASES SUMMARY OF BASIS FOR EXCLUSION	EDITION/ ADDENDA
OMN-10	*Requirements for Safety Significance Categorization of Snubbers Using Risk Insights and Testing Strategies for Inservice Testing of LWR Power Plants* The method used for categorizing snubbers could result in certain snubbers being inappropriately categorized as having low safety significance. These snubbers would not be adequately tested or inspected to provide assurance of their operational readiness. In addition, unexpected extensive degradation in feedwater piping has occurred which would necessitate a more rigorous approach to snubber categorization than presently contained in this Code Case. Note: Pages C-31 through C-34 were not included in the 2006 Addenda.	2000 Addenda Reaffirmed 2001 Edition Reaffirmed 2003 Addenda Reaffirmed 2004 Edition Reaffirmed 2006 Addenda (see Note) Reaffirmed 2009 Edition Reaffirmed 2012 Edition Reaffirmed 2015 Edition Reaffirmed 2017 Edition

CODE CASE NUMBER	TABLE 3 UNACCEPTABLE OM CODE CASES SUMMARY OF BASIS FOR EXCLUSION	EDITION/ ADDENDA
OMN-15	*Requirements for Extending the Snubber Operational Readiness Testing Interval at LWR Power Plants* Following is a summary of the issues that have been identified: (1) The basis for the snubber degradation rate that is assumed in the White Paper for the Code Case is not clear. (2) The Code Case does not address snubber service life monitoring requirements when using the 1995 Edition of the OM Code. (3) The Code Case does not address the assignment of unacceptable snubbers in the Failure Mode Group. (4) The Code Case does not address treatment of isolated snubber failures. (5) The Code Case does not address how unacceptable snubbers are accounted for during the extended test interval. For example, unacceptable snubbers could be indentified during maintenance, service life monitoring, and visual examination activities conducted during the extended test interval. Note: OMN-15 Revision 2 (2017 Edition) is approved for use in Regulatory. Guide 1.192 Revision 3.	2004 Edition Revised 2006 Addenda Reaffirmed 2009 Edition Reaffirmed 2012 Edition

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 does not approve the use of the Code Cases listed herein.* Applicants or licensees may submit a plant-specific request to implement one or more of the Code Cases listed in this regulatory guide. The request should address the NRC's concerns about the Code Case at issue.

REFERENCES[1]

1. *Code of Federal Regulations* (CFR), Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities" (10 CFR Part 50), U.S. Nuclear Regulatory Commission, Washington, DC.

2. CFR, Title 10, *Energy*, Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, Washington, DC

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

4. RG 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," NRC, Washington, DC.

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

6. ASME Operation and Maintenance of Nuclear Power Plants, American Society of Mechanical Engineers (ASME), New York, NY.[2]

7. NRC Spent Fuel Project Office Interim Staff Guidance No. 4 (ISG-4), Revision 1, "Cask Closure Weld Inspections," NRC, Washington, DC (ADAMS Accession No. ML051520313).

8. NRC Spent Fuel Storage and Transportation Division Interim Staff Guidance No. 18 (ISG-18) Revision 1, "The Design and Testing of Lid Welds on Austenitic Stainless Steel Canisters as Containment Boundary for Spent Fuel Storage," NRC, Washington, D.C. (ADAMS Accession No. ML031250620).

9. CFR, Title 10, *Energy*, Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste" (10 CFR Part 72), NRC, Washington, DC.

10. NUREG/CR-6909, Revision 1, "Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials." NRC, Washington, DC.

11. ASTM A 1034/A1034M-05b, "Standard Test Methods for Testing Mechanical Splices for Steel Reinforcing Bars," ASTM International, West Conshohocken, PA.[3]

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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 of American Society of Mechanical Engineers (ASME) standards may be purchased from ASME, Two Park Avenue, New York, New York 10016-5990; Telephone (800) 843-2763. Purchase information is available through the ASME Web site store at http://www.asme.org/Codes/Publications/.

3 The American Society for Testing and Materials (ASTM) is now know as ASTM International. Their standards may be purchased from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, Pennsylvania

12. ACI 349-06, "Code Requirements for Nuclear Safety-Related Concrete Structures & Commentary," American Concrete Institute, Farmington Hills, MI. [4]

13. ACI 318, "Building Code Requirements for Structural Concrete and Commentary," American Concrete Institute, Farmington Hills, MI.[4]

14. "Recommendations for an Effective Flow-Accelerated Corrosion Program" (NSAC-202L-R3), Electric Power Research Institute, Palo Alto, CA.[5]

15. CFR, Title 10, *Energy*, Part 71, "Packaging and Transportation of Radioactive Material" (10 CFR Part 71), U.S. Nuclear Regulatory Commission, Washington, DC.

19428-2959; telephone (877) 909-2786. Purchase information is available through the ASTM Web site at http://www.astm.org.

4 Documents from the American Concrete Institute (ACI) are available from their bookstore Web site (http://www.concrete.org/BookstoreNet/bookstore.htm); or by contacting the corporate office at ACI, P.O. Box 9094, Farmington Hills, MI 48333; telephone (248) 848-3700, fax (248) 848-3701.

5 Copies of Electric Power Research Institute (EPRI) documents may be obtained by contacting the Electric Power Research Institute, 3420 Hillview Avenue, Palo Alto, CA 94304, Telephone: 650-855-2000 or on-line at http://my.epri.com/portal/server.pt.