REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: **129-8085**

SRP Section: **3.8.1 – Concrete Containment**

Application Section: **3.8.1**

Date of RAI Issue: **08/05/2015**

Question No. 03.08.01-4

Appendix A to 10 CFR Part 50, GDC 1 requires that the generally recognized codes and standards used shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product.

DCD Tier 2, Section 3.8.1.2, “Applicable Codes, Standards, and Specifications,” presents DCD Table 3.8-1, “Codes, Standards, Specifications, and Regulations,” which lists the codes, standards, specifications, and regulations used in the design of the concrete containment. However, the identification of the codes, standards, and specifications applicable to the individual DCD sections or applicable to the different types of structures, i.e., concrete containment, containment internal structures, other Category I structures such as the Auxiliary building, and the foundation, is not clear to the staff. Generally, the individual DCD sections reference DCD Table 3.8-1 without indication of what sections or structures they apply to. Standard Review Plan (SRP) 3.8.1, Section II.2, states that the design, materials, fabrication, erection, inspection, testing, and inservice surveillance of concrete containment are covered by codes, standards, specifications, and regulatory guides that are either in their entirety or in part. It then lists the various applicable codes that are acceptable. A similar statement is given in the other SRP Sections 3.8.2, 3.8.3, 3.8.4, and 3.8.5.

In accordance with SRP 3.8.1 through 3.8.5, and GDC 1, the applicant is requested to provide information in the applicable sections of the DCD, regarding the codes, standards, specifications, and regulations, which will enable the staff to determine whether the design of the APR 1400 is in accordance with SRP 3.8.1 through 3.8.5, or explain why not. In addition, the applicant is requested to address the following:

a. The version/edition of some of the codes provided in the DCD is not consistent (e.g., ASME III, Subsection CC 2001 Edition with 2003 Addenda and ASME III, Subsection NE 2007 Edition with 2008 Addenda). The staff also noted that DCD Table 3.8-1 does not provide the editions; however, some of the editions are identified in the list of references. The applicant is requested to identify the version/edition of the various

codes, standards, specifications, and regulations, and in the case of the ASME Code Section III, provide the consistent editions or justify why they are not consistent.

b. Some specifications and standards are listed in DCD Table 3.8-1 without the full title andedition (e.g., AISC ASD, AISC LRFD, ACI 301). In the case of AISC LRFD, it is not discussed in DCD Section 3, so it's not clear how this code was used. Since the LRFD code is not identified in SRP 3.8.1 and has not been endorsed by the NRC staff, its use would need to be reviewed on a case-by-case basis. The applicant is requested to provide complete titles and editions of the codes, standards, and specifications listed in DCD Table 3.8-1. Since this table is referenced by DCD Sections 3.8.2 through 3.8.5, the above requested information should be provided that is applicable to the other DCD sections. It should be clear from the text within each section of DCD Sections 3.8.1 through 3.8.5 or from DCD Table 3-1, which codes, standards, and specifications are applicable to the particular sections. Also, a description of how or where the AISC LRFD code is used in the design of the APR 1400 structures should be provided, and if utilized will have to be reviewed on a case-by-case basis.

c. Some of the codes and standards used in the individual DCD Sections 3.8.1 through 3.8.5, e.g., AISC N690 and Supplement No. 2, are not listed in DCD Section 3.8.7 "References." Therefore, the applicant is requested to include in DCD Section 3.8.7, all of the codes, standards, specifications, and regulations, as well as other references cited in DCD Section 3.8.

Response

DCD Tier 2, Subsections 3.8.2.2.1, 3.8.3.2.1 and 3.8.4.2.1 will be revised to clearly identify the applicable primary design codes used in individual DCD sections.

a. The design of the concrete containment is performed to ASME Section III, Division 2, Subsection CC, "Code for Concrete Containment," 2001 Edition with 2003 Addenda, in accordance with RG 1.136 (Rev.3). The design of MC components is performed to ASME Section III, Division 1, Subsection NE, "Class MC Components," in accordance with RG 1.57 (Rev.2). The ASME MC Component design for APR1400 used the 2007 Edition with 2008 Addenda in accordance with 10 CFR 50.55a because RG 1.57 does not endorse the applicable edition of ASME Section III, Division 1, Subsection NE. Therefore, two separate code editions of ASME Section III are used in the design of the APR 1400 containment structure, in accordance with RG 1.136 and 100 CFR 50.55a.

The two code editions of ASME Section III, Division 1, Subsection NE are compared in order to verify the appropriateness of the basis of MC component design in the APR1400, as shown in the Attachment 2 to this response. The comparison shows that the design rules in the 2001 Edition with 2003 Addenda does not affect the safety on APR1400 MC component design, which applies the 2007 Edition (including 2008 Addendum) of ASME Section III, Division 1, NE-3000. Thus, the MC component design for the APR1400 will apply the 2007 Edition (including 2008 Addendum) of ASME Section III, Division 1, Subsection NE, in accordance with 10 CFR 50.55a. Attachment 2 to this response provides the aforementioned comparison.

DCD Table 3.8-1 will be revised to clearly identify the version/edition and complete title of the various codes, standards and specifications, as described in the response to RAI 227-8274, Question 03.08.04-3.

b. The APR 1400 design does not use AISC LRFD as a design code. Accordingly, AISC LRFD will be deleted in Table 3.8-1. DCD Table 3.8-1 will be revised to clearly identify the version/edition and complete title of the various codes, standards and specifications as described in the response to RAI 227-8274, Question 03.08.04-3.

c. DCD Tier 2, Subsection 3.8.7 will be revised to clearly identify the version/edition and complete title of the various codes, standards and specifications used. DCD Tier 2, Table 3.8-1 will be revised as described in the response to RAI 227-8274, Question 03.08.04-3.

Impact on DCD

DCD Tier 2, Subsections 3.8.2.2.1, 3.8.3.2.1, 3.8.4.2.1, and 3.8.7 will be revised as indicated in the attachment associated with this response. DCD Tier 2, Table 3.8-1 will be revised as described in the response to RAI 227-8274, Question 03.08.04-3.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

functionally grouped into medium-voltage power, low-voltage power, low-voltage control, and instrument cable penetration assemblies. Figure 3.8-9 shows a typical electric penetration assembly in place within the containment wall. An assembly is sized to be inserted into sleeves in the containment wall.

3.8.2.1.3.2 Component Classification

The penetration sleeve is designed as a class MC component in accordance with ASME Section III, Division 1, Subsection NE.

All penetration head fittings (penetration Type 1 of Figure 3.8-8) are classified as piping components and, as such, they have the same classification as the process pipe and are designed in accordance with ASME Section III, Division 1, Subsection NB, NC, or ND as applicable. The other head fittings are designed as ASME Class MC components.

3.8.2.1.4 Fuel Transfer Tube Sleeve and Bellows

The fuel transfer tube sleeve and bellows is designed as a class MC component in accordance with ASME Section III, Division 1, Subsection NE.

3.8.2.2 Applicable Codes, Standards, and Specifications

The following regulations, codes, standards, and specifications are used in the design of the class MC components.

3.8.2.2.1 Design Codes, Standards, Specifications, and Regulations

The design codes, standards, specifications, and regulations are listed in Table 3.8-1.

3.8.2.2.2 NRC Regulatory Guides

Conformance to each NRC Regulatory Guide is described in Section 1.9. NRC RG 1.57 (Reference 21) is applicable to the design of the ASME Class MC components.

The primary design code for ASME Class MC components is ASME Section III, Division 1, Subsection NE (Reference 2).

3.8.3.1.11 Interior Concrete Fill Slab

The interior concrete fill slab is located on the surface of liner plate of the reactor containment building basemat for protection of pressure boundary structures.

3.8.3.1.12 Polar Crane Supports

A large capacity of polar crane is supported by brackets installed in the containment shell, and the bracket is a steel structure consisting of cantilever beam.

3.8.3.2 Applicable Codes, Standards, and Specifications

The following codes, standards, and specifications are applied to the design of internal concrete and steel structures.

3.8.3.2.1 Design Codes and Standards

The design codes, standards, and regulations are listed in Table 3.8-1.

3.8.3.2.2 NRC Regulatory Guides

Conformance to each NRC RG is described in Section 1.9. The NRC RGs applicable to the design of the concrete and steel structures are 1.60, 1.61, 1.92, 1.122, 1.142, and 1.199 (References 22 through 27).

3.8.3.2.3 Industry Standards

The primary design codes for concrete internal structures are ACI 349 (Reference 41) and ANSI/AISC N690 (Reference 42).

Nationally recognized industry standards, such as those published by ASTM, will be used whenever possible to describe material properties, testing procedures, and fabrications and construction methods.

3.8.3.3 Loads and Load Combinations

The typical loads and load combinations used for the internal structures are detailed in Subsection 3.8.4.3.

d. Maintain the store fuel in a coolable geometry

3.8.4.2 Applicable Codes, Standards, and Specifications

The following design codes, standards, specifications, regulations, Regulatory Guides, and other industry standards are used in the design, fabrication, construction, testing, and inspection of all seismic Category I structures other than the reactor containment building.

3.8.4.2.1 Design Codes and Standards

The primary design codes for other seismic category I structures are ACI 349 (Reference 41) and ANSI/AISC N690 (Reference 42).

The design codes, standards, and regulations are listed in Table 3.8-1.

3.8.4.2.2 Regulatory Guides

The conformance of other seismic Category I structures to the applicable NRC RGs is addressed in Section 1.9. The NRC RGs that are applicable to the design of all seismic Category I structures other than the reactor containment building are NRC RGs 1.29 (Reference 28), 1.60, 1.61, 1.69 (Reference 29), 1.91 (Reference 30), 1.92, 1.115 (Reference 31), 1.122, 1.142, 1.143 (Reference 32), and 1.199.

3.8.4.2.3 Industry Standards

Nationally recognized industry standards, such as those published by ASTM, are used where practicable to define material properties, testing procedures, and fabrication and construction methods.

3.8.4.3 Loads and Load Combinations

This section presents the structural design load information for the APR1400 seismic Category I structures other than the reactor containment building. This load information consists of a summary list of major loads and load combinations. These load combinations are categorized on the basis of their nature, the probability of occurrence of each of the individual loads, and the probability of simultaneous occurrence of these loads to form a loading combination.

30. Regulatory Guide 1.91, “Evaluations of Explosions Postulated to Occur on Transportation Routes Near Nuclear Power Plants,” Rev. 2, U.S. Nuclear Regulatory Commission, April 2013.

31. Regulatory Guide 1.115, “Protection Against Low-Trajectory Turbine Missiles,” Rev. 2, U.S. Nuclear Regulatory Commission, January 2012.

32. Regulatory Guide 1.143, “Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants,” Rev. 2, U.S. Nuclear Regulatory Commission, November 2001.

33. ASCE 7-05, “Minimum Design Loads for Buildings and Other Structures,” American Society of Civil Engineering/Structural Engineering Institute, 2006.

34. GTSTRUDL User Guide, GTSTRUDL Version 31, Georgia Institute of Technology, August 2010.

35. Research Council on Structural Connections, “Specification for Structural Joints Using ASTM A325 or A490 Bolts,” 2004.

36. AWS D1.1, “Structural Welding Code,” American Welding Society, 2010.

37. ASTM C191, “Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle,” American Society for Testing and Materials.

38. ASTM C109, “Standard Test Method for Compressive Strength of Hydraulic Cement Mortars,” American Society for Testing and Materials.

39. ASTM A36, “Standard Specification for Carbon Structural Steel,” American Society for Testing and Materials.

40. APR1400-E-S-NR-14006-P, “Stability Check for NI Common Basemat” Rev. 0, KHNP, November 2014.

Add next two pages

41. ACI 349, “Code Requirements for Nuclear Safety Related Concrete Structures,” American Concrete Institute, 1997.

42. ANSI/AISC N690 including Supplement 2 (2004), “Specification for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities,” American Institute of Steel Construction, 1994.

43. ASME NQA-1, “Quality Assurance Requirements for Nuclear Facility Applications, American Society of Mechanical Engineers, 2008 Edition with 2009 Addendum.

44. AISC 360, “Specification for Structural Steel Buildings”, American Institute of Steel Construction, 2005

45. ACI 318,”Building code requirements for reinforced concrete”, American Concrete Institute, 2008.

46. ACI 301,”Specifications for Structural Concrete for Building”, American Concrete Institute, 2010.

47. AWS D1.3, “Structural Welding Code-Sheet Steel Structure”, American Welding Society, 2008.

48. AISI S100, “Specification for the Design of Cold-Formed Steel Structural Members”, American Iron and Steel Institute, 2012

49. ACI 211.1, “Standard Practice for Selecting Proportions for Normal, Heavy Weight, and Mass Concrete”, American Concrete Institute, 1991(R2007)

50. ACI 214, “Recommended Practice for Evaluation of Strength Test Results of Concrete”, American Concrete Institute, 1991(R1997).

51. ACI 304 R, “Guide for Measuring, Mixing, Transporting, and Placing Concrete”, American Concrete Institute, 2000(R2009).

52. ACI 305 R,” Hot Weather Concreting”, American Concrete Institute, 1999

53. ACI 306 R,”Cold Weather Concreting”, American Concrete Institute, 1998(R2002)

54. ACI 308, “Standard Practice for Curing Concrete”, American Concrete Institute, 1992(R1997)

55. ACI 309 R,” Guide for Consolidation of Concrete”, American Concrete Institute, 2005

56. ACI 311.1 R,” ACI Manual of Concrete Inspection”, American Concrete Institute, 1999.

57. ACI 315, “Details and Detailing of Concrete Reinforcement”, American Concrete Institute, 1999.

58. ACI 347,” Guide to Formwork for Concrete”, American Concrete Institute, 2004.

59. ANSI/ANS 8.1.," Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors", American Nuclear Society, 1988

60. ANSI/ANS 8.17, "Criticality Safety Criteria for Handling, Storage, and Transportation of LWR Fuel Outside Reactors", American Nuclear Society, 1984

61. ASTM C750,"Standard Specification for Nuclear Grade Boron Carbide Power", American Society for Testing and Materials

62. ASTM E3,"Preparation of Metallographic Specimems", American Society for Testing and Materials

63. ASTM E190,"Guided Bend Test for Ductility of Weld", American Society for Testing and Materials

64. ANSI/ANS 57.2, "Design Requirements forLlight Water Reactor Spent Fuel Storage Facilities at Nuclear Power Plants", American Nuclear Society, 1983

65. 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," U.S. Nuclear Regulatory Commission.

66. 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," U.S. Nuclear Regulatory Commission

The comparison of two editions in ASME Section III, Division 1, Article NE-3000

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3100	General Design				
NE-3110	Loading Criteria				
NE-3111	Loading Conditions	Same	Same	No	
NE-3112	Design Loadings	Same	Same	No	
NE-3112.1	Design Pressure	Same	Same	No	
NE-3112.2	Design Temperature	Same	Same	No	
NE-3112.3	Desgn Mechanical Loads	Same	Same	No	
NE-3112.4	Allowable Stress Intensity and Stress Values	~. The material shall not be used at metal and design temperatures **above those for** which stress intensity values are listed. The values in the Tables may be interpolated for intermediate temperatures.	~. The material shall not be used at metal and design temperatures **that exceed the temperature limit in the applicability column for** which stress intensity values are listed. The values in the Tables may be interpolated for intermediate temperatures.	No	The meanings of changed sentence has not impact to the design of MC components.
NE-3113	Service Limits	Same	Same	No	
NE-3113.1	Level A Service Limits	Same	Same	No	
NE-3113.2	Level B Service Limits	Same	Same	No	
NE-3113.3	Level C Service Limits	Same	Same	No	
NE-3113.4	Level D Service Limits	Same	Same	No	
NE-3113.5	Level E Service Limits	Same	Same	No	
NE-3114	Testing Conditions	Same	Same	No	
NE-3120	Special Considerations				

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3121	Corrosion	Same	Same	No	
NE-3122	Cladding	Same	Same	No	
NE-3122.1	Primary Stress	Same	Same	No	
NE-3122.2	Design Dimensions	Same	Same	No	
NE-3122.3	Bearing Stresses	Same	Same	No	
NE-3122.4	Maximum Allowable Stress Values	Same	Same	No	
NE-3122.5	Maximum Allowable Temperature	Same	Same	No	
NE-3123	Welds Between Dissimilar Metals	Same	Same	No	
NE-3125	Comfigurations	Same	Same	No	
NE-3130	General Design Rules				
NE-3131	Genral Requirements	Same	Same	No	
NE-3132	Dimensional Standards doe Standard Products	Dimensions of standard products shall comply with the standards and specifications listed in **Table NE-3132-1** when the standard or specification is eferenced in the specific design Subarticle. ~.	Dimensions of standard products shall comply with the standards and specifications listed in **Table NCA-7100-1** when the standard or specification is referenced in the specific design Subarticle. ~.	No	Table reference revised
NE-3133	Component Under External Loading				
NE-3133.1	General	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3133.2	Nomenclature	S = pthe lesser of 2 times the allowable stress at design metal temperature from Section II, Part D, Subpart 1, Tables 1A and 1B or 0.9 times the tabulated yield strength at design metal temperature from Section II, Part D, **Subpart 2**, Table Y-1, psi (kPa)	S = the lesser of 2 times the allowable stress at design metal temperature from Section II, Part D, Subpart 1, Tables 1A and 1B or 0.9 times the tabulated yield strength at design metal temperature from Section II, Part D, **Subpart 1**, Table Y-1, psi (MPa)	No	Corrected by errta
NE-3133.3	Cylindrical Shells	Same	Same	No	
NE-3133.4	Spherical Shells and Formed Heads	Same	Same	No	
NE-3133.5	Stiffening Rings for Cylindrical Shells	Same	Same	No	
NE-3133.6	Cylindrical Under Axial Compression	Same	Same	No	
NE-3133.7	Conical Heads	Same	Same	No	
Table NE-3132-1	Dimensional Standards	**It maintains a table.**	**Deleted**	No	Table deleted
NE-3134	Material Properties	Same	Same	No	
NE-3134.1	Yield Strength Values	The values of yield strength Sy shall be those given in Section II, Part D, **Subpart 2**, Table Y-1.	The values of yield strength Sy shall be those given in Section II, Part D, **Subpart 1**, Table Y-1.	No	Corrected by errta
NE-3134.2	Ultimate Tensile Strength Values	The values of ultimate tensile strength shall be those given in Section II, Part D, **Subpart 2**, Table TCD.	The values of ultimate tensile strength shall be those given in Section II, Part D, **Subpart 1**, Table U.	No	Corrected by errta
NE-3134.3	Coefficients of Thermal Conductivity and Thermal Diffusivity	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3134.4	Coefficients of Thermal Expansion	Same	Same	No	
NE-3134.5	Modulus of Elasticity Values	Same	Same	No	
NE-3134.6	Allowable Stress Intensity and Stress Values	Same	Same	No	
NE-3135	Attachments	Same	Same	No	
NE-3200	Design by Analysis				
NE-3210	Design Criteria				
NE-3211	Genral Requirements for Applicability	Same	Same	No	
NE-3212	Basis for Determining Stresses	Same	Same	No	
NE-3213	Terms Relating to Stress Analysis	Same	Same	No	
NE-3213.1	Stress Intensity	~~Stress intensity is the equivalent intensity of combined stress, or, in short,~~ the stress intensity is defined as twice the maximum shear stress. ~~In other words, the stress intensity~~ is the difference between the algebraically largest principal stress and the algebraically smallest principal stress at a given point. Tensile stresses are considered positive and compressive stresses are considered negative.	Stress intensity is defined as twice the maximum shear stress, which is the difference between the algebraically largest principal stress and the algebraically smallest principal stress at a given point. Tensile stresses are considered positive and compressive stresses are considered negative.	No	The meanings of changed sentence has not impact to the design of MC components.
NE-3213.2	Gross Structural Discontinuity	Same	Same	No	
NE-3213.3	Local Structural Discontinuity	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3213.4	Normal Stress	Normal stress is the component of stress normal to the plane of reference. This is also referred to as direct stress. Usually the distribution of normal stress is not uniform through the thickness of a part, so this stress is considered to ~~be made up in turn of~~ two components, one ~~of which is~~ uniformly distributed and equal to the average value of stress across the thickness under consideration, and the other of which varies from this average value with the location across the thickness.	Normal stress is the component of stress normal to the plane of reference. This is also referred to as direct stress. Usually the distribution of normal stress is not uniform through the thickness of apart, so this stress is considered to have two components, one uniformly distributed and equal to the average stress across the thickness under consideration, and the other varying from this average value across the thickness.	No	The meanings of changed sentence has not impact to the design of MC components.
NE-3213.5	Shear Stress	Same	Same	No	
NE-3213.6	Membrane Stress	Membrane stress is the component of normal stress **which** is uniformly distributed and equal to the average of stress across the thickness of the section under consideration.	Membrane stress is the component of normal stress that is uniformly distributed and equal to the average of stress across the thickness of the section under consideration.	No	The meanings of changed sentence has not impact to the design of MC components.
NE-3213.7	Bending Stress	**Bending stress is the variable component of normal stress described in NE-3213.4.** The variation may or may not be linear across the thickness.	Bending stress is the component of normal stress that varies across the thickness. The variation may or may not be linear across the thickness.	No	The meanings of changed sentence has not impact to the design of MC components.
NE-3213.8	Primary Stress	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3213.9	Secondary Stress	Same	Same	No	
NE-3213.10	Local Primary Membrane stress	Same	Same	No	
NE-3213.11	Peak Stress	Same	Same	No	
NE-3213.12	Load Stress	Same	Same	No	
NE-3213.13	Thermal Stress	Same	Same	No	
NE-3213.14	Total Stress	Same	Same	No	
NE-3213.15	Service Cycle	Same	Same	No	
NE-3213.16	Stress Cycle	Same	Same	No	
NE-3213.17	Fatigue Strength Reduction Factor	Same	Same	No	
NE-3213.18	Shakedown	Same	Same	No	
NE-3213.19	Free End Dispalcement	Same	Same	No	
NE-3213.20	Expansion Stresses	Same	Same	No	
NE-3213.21	Limit Analysis - Collapse Load	Same	Same	No	
NE-3213.22	Collapse Load - Lower Bound	Same	Same	No	
NE-3214	Stress Analysis	Same	Same	No	
NE-3215	Derivation of Stress Intensities	Same	Same	No	
NE-3216	Derivation of Stress Differences	Same	Same	No	
NE-3216.1	Constant Principal Stress Direction	Same	Same	No	
NE-3216.2	Varying Principal Stress Direction	Same	Same	No	
NE-3217	Classification of Stresses	Same	Same	No	
NE-3220	Stress Intensity and Buckling Stress Values for Other Than Bolts				
NE-3221	Stress Intensity Values	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3221.1	General Primary Membrane Stress Intensity	Same	Same	No	
NE-3221.2	Local Membrane Stress Intensity	Same	Same	No	
NE-3221.3	Primary General or Local Membrane Plus Primary Bending Stress Intensity	Same	Same	No	
NE-3221.4	Primary Plus Secondary Stress Intensity	Same	Same	No	
NE-3221.5	Analysis for Cyclic Operation	Same	Same	No	
NE-3221.6	Thermal Stress Ratchet	Same	Same	No	
NE-3221.7	Deformation Limits	Same	Same	No	
Table NE-3217-1	Classification of Stress Intensity in Vessels for Some Typical Cases	Same	Same	No	
Table NE-3221-1	Summary of Stress Intensity Limits	Same	Same	No	
Fig. NE-3221-1	Stress Categories and Limits of Stress Intensity for Design Conditions	Same	Same	No	
Fig. NE-3221-2	Stress Categories and Limits of Stress Intensity for Level A and B Service Limits; and for Level C Service Limits where the Structure is not integral and Continuous	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
Fig. NE-3221-3	Stress Categories and Limits of Stress Intensity for Level C Service Limits where the Structure is Integral and Continuous; and for Level D Service Limits where the Structure is not Integral and Continuous, and at Partial Penetration Welds	Same	Same	No	
Fig. NE-3221-4	Stress Categories and Limits of Stress Intensity for Level D Service Limits where the Structure is Integral and Continuous	Same	Same	No	
NE-3222	Buckling Stress Values				
NE-3222.1	Basic Compressive Allowable Stress	Same	Same	No	
NE-3222.2	Stability Stress Limits	Same	Same	No	
NE-3226	Testing Limits	Same	Same	No	
NE-3227	Special Stress Limits	Same	Same	No	
NE-3227.1	Bearing Loads	~ (1) for materials to which **Note (2)** of Section II, Part D, Subpart 1, Tables 1A and 1B applies, the lower of 0.5Sy at 100°F (38°C) and 0.675Sy at temperature; ~	~ (1) for materials to which **Note (G5)** of Section II, Part D, Subpart 1, Tables 1A and 1B applies, the lower of 0.5Sy at 100°F (38°C) and 0.675Sy at temperature; ~	No	Corrected by errta
NE-3227.2	Pure Shear	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3227.3	Progressive Distortion of Nonintergal Connection	~ Therefore, primary plus secondary stress intensities (NE-3221.4) which result in slippage between the parts of a nonintegral connection in which is engagement could occur as a result of progressive distortion shall be limited to the value Sy (Section II, Part D, **Subpart 2**, Table Y-1).	~ Therefore, primary plus secondary stress intensities (NE-3221.4) which result in slippage between the parts of a nonintegral connection in which is engagement could occur as a result of progressive distortion shall be limited to the value Sy (Section II, Part D, **Subpart 1,** Table Y-1).	No	Corrected by errta
NE-3227.4	Triaxial Stresses	Same	Same	No	
NE-3227.5	Nozzle Piping Transition	Same	Same	No	
NE-3227.6	Application of Elastic Analysis for Stresses Beyond the Yield Strength	Same	Same	No	
NE-3228	Application of Plastic Analysis	Same	Same	No	
NE-3228.1	Plastic Analysis	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3228.2	Limit Analysis	The limits on local membrane stress intensity (NE-3221.2) and primary membrane plus primary bending stress intensity (NE-3221.3) need not be satisfied at a specific location if it can be shown by means of limit analysis or by tests that the specified loadings do not exceed two-thirds of the lower bound collapse load except for those materials of Section II, Part D, Subpart 1, Tables 2A and 2B to which Note (2) of those tables is applicable. ~.	The limits on local membrane stress intensity (NE-3221.2) and primary membrane plus primary bending stress intensity (NE-3221.3) need not be satisfied at a specific location if it can be shown by means of limit analysis or by tests that the specified loadings do not exceed two-thirds of the lower bound collapse load except for those materials of Section II, Part D, Subpart 1, Table 2A **to which Note G7 is applicable** and Table 2B to which Note G1 is applicable. ~.	No	Corrected by errta
NE-3228.3	Simplified Elastic-Plastic Analysis	Same	Same	No	
NE-3228.4	Impluse Loads	Same	Same	No	
Table NE-3228.3(b)-1	Values of *m*,*n* and T_{max} for Various Classes of Permitted Marerials	Same	Same	No	
NE-3230	Stress Limits for Bolts				
NE-3231	Design Conditions	Same	Same	No	
NE-3232	Combined Loads	Same	Same	No	
NE-3232.1	Average Stress	Same	Same	No	
NE-3232.2	Maximum Stress	Same	Same	No	
NE-3232.3	Fatigue Analysis of Bolts	Same	Same	No	
NE-3236	Design Stress Values	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3300	Design Formula				
NE-3310	Design Criteria				
NE-3311	Requirements for Acceptability	Same	Same	No	
NE-3320	Design Considerations				
NE-3324	Vessels under Internal Pressures				
NE-3324.1	General Requirements	Same	Same	No	
NE-3324.2	Nomenclature	Same	Same	No	
NE-3324.3	Cylindrical Shells	Same	Same	No	
NE-3324.4	Spherical Shells	Same	Same	No	
NE-3324.5	Formed Heads, General Requirements	Same	Same	No	
NE-3324.6	Ellipsoidal Heads	Same	Same	No	
NE-3324.7	Hemispherical Heads	Same	Same	No	
NE-3324.8	Torispherical Heads	Same	Same	No	
NE-3324.9	Conical Heads without Transition Knuckle	Same	Same	No	
NE-3324.10	Torispherical Heads	Same	Same	No	
NE-3324.11	Reducer Sections	Same	Same	No	
NE-3324.12	Nozzles	Same	Same	No	
Fig. NE-3324.2-1	Principal Dimensions of Typical Heads	Same	Same	No	
Table NE-3324.2-1	Values of Factor K	Same	Same	No	
Table NE-3324.8(b)-1	Values of Factor M	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
Fig. NE-3324.11(a)(6)-1	Large Head Opening:Reverse Curve and Concial Shell Reducer Sections	Same	Same	No	
Table NE-3324.11(b)(2)-1	Values Δ for Junctions at the Large Cylinder for α≤30 deg	Same	Same	No	
Table NE-3324.11(b)(3)-1	Values Δ for Junctions at the Small Cylinder for α≤30 deg	Same	Same	No	
NE-3325	Flat Heads and Covers	Same	Same	No	
NE-3325.1	Nomenclature	Same	Same	No	
NE-3325.2	Thickness	Same	Same	No	
NE-3325.3	Values of C	Same	Same	No	
Fig. NE-3325-1	Some Acceptable Types of Unstayed Flat Heads and Covers	Same	Same	No	
NE-3326	Spherically Dished Covers with Bolting Flanges				
NE-3326.1	Nomenclature	Same	Same	No	
NE-3326.2	Spherically Dished Heads with Bolting Flanges	Same	Same	No	
Fig. NE-3326.1-1	Spherically Dished Covers with Bolting Flanges	Same	Same	No	
NE-3327	Quick Actuating Closures	Same	Same	No	
NE-3327.1	Positive Locking Devices	Same	Same	No	
NE-3327.2	Other Quick Access and Safety Devices	Same	Same	No	
NE-3327.3	Manual Operation	Same	Same	No	
NE-3327.4	Pressure Indicating Device	Same	Same	No	
NE-3328	Combination Units	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3330	Openings and Reinforcement				
NE-3331	General Requirement for Openings	Same	Same	No	
NE-3332	Reinforcement Requirement for Openings in Shells and Formed Heads				
NE-3332.1	Openings not Requiring Reinforcement	Same	Same	No	
NE-3332.2	Required Area of Reinforcement	Same	Same	No	
NE-3332.4	Reinforcement for External Pressure	Same	Same	No	
NE-3332.5	Reinforcement for Both Internal and External Pressure	Same	Same	No	
Table NE-3332.2-1	Values of Spherical Radius Factor K_1	Same	Same	No	
Fig. NE-3332.2-1	Chart for Determining Values of F	Same	Same	No	
NE-3333	Reinforcement Required for Openings in Flat Heads	Same	Same	No	
NE-3334	Limits of Reinforcement	Same	Same	No	
NE-3334.1	Limit of Reinforcement Along the Vessel Wall	Same	Same	No	
NE-3334.2	Limit of Reinforcement Normal to the Vessel Wall	Same	Same	No	
Fig. NE-3334.2-1	Nozzle Dimensions	Same	Same	No	
NE-3335	Metal Available for Reinforcement	Same	Same	No	
NE-3335.1	Reinforcement of Multiple Openings	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
Fig. NE-3335.1-1	Arrangement of Multiple Openings	Same	Same	No	
NE-3336	Strength of Reinforcing Material	Same	Same	No	
NE-3336.1	Strength of Weld	Same	Same	No	
NE-3336.2	Strength of Attachment	Same	Same	No	
NE-3338	Pressure Stresses in Openings for Fatigue Evaluation under Operating Conditions				
NE-3338.1	General	Same	Same	No	
NE-3338.2	Stress Index Method	Same	Same	No	
Table NE-3338.2 (c) -1	Stress Indices for Nozzles	Same	Same	No	
Fig. NE-3338.2-1	Direction of Stress Components	Same	Same	No	
NE-3350	Design of Welded Connections				
NE-3351	Welded Joint Categories	Same	Same	No	
NE-3351.1	Category A	Same	Same	No	
NE-3351.2	Category B	Same	Same	No	
NE-3351.3	Category C	Same	Same	No	
NE-3351.4	Category D	Same	Same	No	
Fig. NE-3351-1	Welded Joint Locations Typical of Categories A,B,C and D	Same	Same	No	
NE-3352	Permissible Types of Welded Joints	Same	Same	No	
NE-3352.1	Joint of Category A	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3352.2	Joint of Category B	(a) Same (b) None	(a) Same **(b) Surface examination in accordance with NE-5280(b) may be substituted for radiographic examination required in NE-5221 for Category B butt welds in electrical penetration assemblies subject to the following limitations:** **(1) The allowable stress for the weld joint shall be multiplied by a factor of 0.8.** **(2) P-No. 1 base materials shall be used for construction.**	No	There is no impact in APR1400 design because the revised contents have relaxed the requirement of nondestructive examination for Category B butt weld in the electrical penetration assemblies.
NE-3352.3	Joint of Category C	Same	Same	No	
NE-3352.4	Joint of Category D	Same	Same	No	
Fig. NE-3352-1	Typical Butt Joints	Same	Same	No	
NE-3355	Welding Grooves	Same	Same	No	
NE-3356	Fillet Welds	Same	Same	No	
NE-3358	Design Requirements for Head Attachments				
NE-3358.1	Skirt Length of Formed Heads	Same	Same	No	
NE-3358.2	Unstayed Flat Heads Welded to Shells	Same	Same	No	
NE-3358.3	Head Attachments using Corner Joints	Same	Same	No	
NE-3358.4	Flat Heads with Hubs	Same	Same	No	
Fig. NE-3358.1(a)-1	Heads Attached to Shells	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3359	Design Requirements for Nozzle Attachment Welds	Same	Same	No	
NE-3360	Special Vessel Requirements				
NE-3361	Tapered Transitions	Same	Same	No	
Fig. NE-3361-1	Category A and B Joints between Sections of Unequal Thickness	Same	Same	No	
NE-3362	Bolted Flange and Studded Connection	Same	Same	No	
NE-3363	Access Openings	Same	Same	No	
NE-3364	Attachments	Same	Same	No	
NE-3365	Supports	Same	Same	No	
NE-3366	Bellows Expansion Joints				
NE-3366.1	General Requirements	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3366.2	Design Requirements	~. (e)(1) ~. The cyclic life plot (versus the combined stress) used in evaluating **NE-3365.1(d)** shall be obtained from the results of at least 25 fatigue tests on bellows of varying diameters, thicknesses, and convolution profiles. ~. (e)(2)(b) ~. Cumulative fatigue requirements can be satisfied in accordance with **NE-3365.1(g)** without additional testing by assuming that the slope of the fatigue curve is 4.3 (on a log–log plot) and that the curve passes through the test point. ~ (e)(3)(b) ~. the pressure test of NE-6230, provided that the test is conducted at 2.25 times the equivalent cold design pressure, and single rotation and universal joints are held at their design rotation angle or offset movement during the test and the requirements of **NE-3365.1(b)** are not exceeded by such a test. ~	~. (e)(1) ~. The cyclic life plot (versus the combined stress) used in evaluating **NE-3366.2(d)** shall be obtained from the results of at least 25 fatigue tests on bellows of varying diameters, thicknesses, and convolution profiles. ~. (e)(2)(b) ~. Cumulative fatigue requirements can be satisfied in accordance with **NE-3366.2(g)** without additional testing by assuming that the slope of the fatigue curve is 4.3 (on a log–log plot) and that the curve passes through the test point. ~ (e)(3)(b) ~. the pressure test of NE-6230, provided that the test is conducted at 2.25 times the equivalent cold design pressure, and single rotation and universal joints are held at their design rotation angle or offset movement during the test and the requirements of **NE-3366.2(b)** are not exceeded by such a test. ~	No	Corrected by errta

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3367	Closures on Small Penetrations	Closures on penetrations of 2 in. pipe size (DN 50) or less may be made by the use of closure fittings such as blind flanges, welded plugs, or caps manufactured in accordance with standards listed in **Table NE-3132-1.**	Closures on penetrations of NPS 2 (DN 50) or less may be made by the use of closure fittings such as blind flanges, welded plugs, or caps manufactured in accordance with standards listed in **Table NCA-7100-1.**	No	Table reference revised
NE-3700	Electrical and Mechanical Penetration Assembles				
NE-3720	Design Rules	Same	Same	No	

The comparison of two editions in ASME Section III, Division 1, Article NE-3000

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3100	General Design				
NE-3110	Loading Criteria				
NE-3111	Loading Conditions	Same	Same	No	
NE-3112	Design Loadings	Same	Same	No	
NE-3112.1	Design Pressure	Same	Same	No	
NE-3112.2	Design Temperature	Same	Same	No	
NE-3112.3	Desgn Mechanical Loads	Same	Same	No	
NE-3112.4	Allowable Stress Intensity and Stress Values	~. The material shall not be used at metal and design temperatures **above those for** which stress intensity values are listed. The values in the Tables may be interpolated for intermediate temperatures.	~. The material shall not be used at metal and design temperatures **that exceed the temperature limit in the applicability column for** which stress intensity values are listed. The values in the Tables may be interpolated for intermediate temperatures.	No	The meanings of changed sentence has not impact to the design of MC components.
NE-3113	Service Limits	Same	Same	No	
NE-3113.1	Level A Service Limits	Same	Same	No	
NE-3113.2	Level B Service Limits	Same	Same	No	
NE-3113.3	Level C Service Limits	Same	Same	No	
NE-3113.4	Level D Service Limits	Same	Same	No	
NE-3113.5	Level E Service Limits	Same	Same	No	
NE-3114	Testing Conditions	Same	Same	No	
NE-3120	Special Considerations				

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3121	Corrosion	Same	Same	No	
NE-3122	Cladding	Same	Same	No	
NE-3122.1	Primary Stress	Same	Same	No	
NE-3122.2	Design Dimensions	Same	Same	No	
NE-3122.3	Bearing Stresses	Same	Same	No	
NE-3122.4	Maximum Allowable Stress Values	Same	Same	No	
NE-3122.5	Maximum Allowable Temperature	Same	Same	No	
NE-3123	Welds Between Dissimilar Metals	Same	Same	No	
NE-3125	Comfigurations	Same	Same	No	
NE-3130	General Design Rules				
NE-3131	Genral Requirements	Same	Same	No	
NE-3132	Dimensional Standards doe Standard Products	Dimensions of standard products shall comply with the standards and specifications listed in **Table NE-3132-1** when the standard or specification is eferenced in the specific design Subarticle. ~.	Dimensions of standard products shall comply with the standards and specifications listed in **Table NCA-7100-1** when the standard or specification is referenced in the specific design Subarticle. ~.	No	Table reference revised
NE-3133	Component Under External Loading				
NE-3133.1	General	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3133.2	Nomenclature	S = pthe lesser of 2 times the allowable stress at design metal temperature from Section II, Part D, Subpart 1, Tables 1A and 1B or 0.9 times the tabulated yield strength at design metal temperature from Section II, Part D, **Subpart 2**, Table Y-1, psi (kPa)	S = the lesser of 2 times the allowable stress at design metal temperature from Section II, Part D, Subpart 1, Tables 1A and 1B or 0.9 times the tabulated yield strength at design metal temperature from Section II, Part D, **Subpart 1**, Table Y-1, psi (MPa)	No	Corrected by errta
NE-3133.3	Cylindrical Shells	Same	Same	No	
NE-3133.4	Spherical Shells and Formed Heads	Same	Same	No	
NE-3133.5	Stiffening Rings for Cylindrical Shells	Same	Same	No	
NE-3133.6	Cylindrical Under Axial Compression	Same	Same	No	
NE-3133.7	Conical Heads	Same	Same	No	
Table NE-3132-1	Dimensional Standards	**It maintains a table.**	**Deleted**	No	Table deleted
NE-3134	Material Properties	Same	Same	No	
NE-3134.1	Yield Strength Values	The values of yield strength Sy shall be those given in Section II, Part D, **Subpart 2**, Table Y-1.	The values of yield strength Sy shall be those given in Section II, Part D, **Subpart 1**, Table Y-1.	No	Corrected by errta
NE-3134.2	Ultimate Tensile Strength Values	The values of ultimate tensile strength shall be those given in Section II, Part D, **Subpart 2**, Table TCD.	The values of ultimate tensile strength shall be those given in Section II, Part D, **Subpart 1**, Table U.	No	Corrected by errta
NE-3134.3	Coefficients of Thermal Conductivity and Thermal Diffusivity	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3134.4	Coefficients of Thermal Expansion	Same	Same	No	
NE-3134.5	Modulus of Elasticity Values	Same	Same	No	
NE-3134.6	Allowable Stress Intensity and Stress Values	Same	Same	No	
NE-3135	Attachments	Same	Same	No	
NE-3200	Design by Analysis				
NE-3210	Design Criteria				
NE-3211	Genral Requirements for Applicability	Same	Same	No	
NE-3212	Basis for Determining Stresses	Same	Same	No	
NE-3213	Terms Relating to Stress Analysis	Same	Same	No	
NE-3213.1	Stress Intensity	~~Stress intensity is the equivalent intensity of combined stress, or, in short,~~ the stress intensity is defined as twice the maximum shear stress. ~~In other words, the stress intensity~~ is the difference between the algebraically largest principal stress and the algebraically smallest principal stress at a given point. Tensile stresses are considered positive and compressive stresses are considered negative.	Stress intensity is defined as twice the maximum shear stress, which is the difference between the algebraically largest principal stress and the algebraically smallest principal stress at a given point. Tensile stresses are considered positive and compressive stresses are considered negative.	No	The meanings of changed sentence has not impact to the design of MC components.
NE-3213.2	Gross Structural Discontinuity	Same	Same	No	
NE-3213.3	Local Structural Discontinuity	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3213.4	Normal Stress	Normal stress is the component of stress normal to the plane of reference. This is also referred to as direct stress. Usually the distribution of normal stress is not uniform through the thickness of a part, so this stress is considered to ~~be made up in turn of~~ two components, one ~~of which is~~ uniformly distributed and equal to the average value of stress across the thickness under consideration, and the other of which varies from this average value with the location across the thickness.	Normal stress is the component of stress normal to the plane of reference. This is also referred to as direct stress. Usually the distribution of normal stress is not uniform through the thickness of apart, so this stress is considered to have two components, one uniformly distributed and equal to the average stress across the thickness under consideration, and the other varying from this average value across the thickness.	No	The meanings of changed sentence has not impact to the design of MC components.
NE-3213.5	Shear Stress	Same	Same	No	
NE-3213.6	Membrane Stress	Membrane stress is the component of normal stress **which** is uniformly distributed and equal to the average of stress across the thickness of the section under consideration.	Membrane stress is the component of normal stress that is uniformly distributed and equal to the average of stress across the thickness of the section under consideration.	No	The meanings of changed sentence has not impact to the design of MC components.
NE-3213.7	Bending Stress	**Bending stress is the variable component of normal stress described in NE-3213.4.** The variation may or may not be linear across the thickness.	Bending stress is the component of normal stress that varies across the thickness. The variation may or may not be linear across the thickness.	No	The meanings of changed sentence has not impact to the design of MC components.
NE-3213.8	Primary Stress	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3213.9	Secondary Stress	Same	Same	No	
NE-3213.10	Local Primary Membrane stress	Same	Same	No	
NE-3213.11	Peak Stress	Same	Same	No	
NE-3213.12	Load Stress	Same	Same	No	
NE-3213.13	Thermal Stress	Same	Same	No	
NE-3213.14	Total Stress	Same	Same	No	
NE-3213.15	Service Cycle	Same	Same	No	
NE-3213.16	Stress Cycle	Same	Same	No	
NE-3213.17	Fatigue Strength Reduction Factor	Same	Same	No	
NE-3213.18	Shakedown	Same	Same	No	
NE-3213.19	Free End Dispalcement	Same	Same	No	
NE-3213.20	Expansion Stresses	Same	Same	No	
NE-3213.21	Limit Analysis - Collapse Load	Same	Same	No	
NE-3213.22	Collapse Load - Lower Bound	Same	Same	No	
NE-3214	Stress Analysis	Same	Same	No	
NE-3215	Derivation of Stress Intensities	Same	Same	No	
NE-3216	Derivation of Stress Differences	Same	Same	No	
NE-3216.1	Constant Principal Stress Direction	Same	Same	No	
NE-3216.2	Varying Principal Stress Direction	Same	Same	No	
NE-3217	Classification of Stresses	Same	Same	No	
NE-3220	Stress Intensity and Buckling Stress Values for Other Than Bolts				
NE-3221	Stress Intensity Values	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3221.1	General Primary Membrane Stress Intensity	Same	Same	No	
NE-3221.2	Local Membrane Stress Intensity	Same	Same	No	
NE-3221.3	Primary General or Local Membrane Plus Primary Bending Stress Intensity	Same	Same	No	
NE-3221.4	Primary Plus Secondary Stress Intensity	Same	Same	No	
NE-3221.5	Analysis for Cyclic Operation	Same	Same	No	
NE-3221.6	Thermal Stress Ratchet	Same	Same	No	
NE-3221.7	Deformation Limits	Same	Same	No	
Table NE-3217-1	Classification of Stress Intensity in Vessels for Some Typical Cases	Same	Same	No	
Table NE-3221-1	Summary of Stress Intensity Limits	Same	Same	No	
Fig. NE-3221-1	Stress Categories and Limits of Stress Intensity for Design Conditions	Same	Same	No	
Fig. NE-3221-2	Stress Categories and Limits of Stress Intensity for Level A and B Service Limits; and for Level C Service Limits where the Structure is not integral and Continuous	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
Fig. NE-3221-3	Stress Categories and Limits of Stress Intensity for Level C Service Limits where the Structure is Integral and Continuous; and for Level D Service Limits where the Structure is not Integral and Continuous, and at Partial Penetration Welds	Same	Same	No	
Fig. NE-3221-4	Stress Categories and Limits of Stress Intensity for Level D Service Limits where the Structure is Integral and Continuous	Same	Same	No	
NE-3222	Buckling Stress Values				
NE-3222.1	Basic Compressive Allowable Stress	Same	Same	No	
NE-3222.2	Stability Stress Limits	Same	Same	No	
NE-3226	Testing Limits	Same	Same	No	
NE-3227	Special Stress Limits	Same	Same	No	
NE-3227.1	Bearing Loads	~ (1) for materials to which **Note (2)** of Section II, Part D, Subpart 1, Tables 1A and 1B applies, the lower of 0.5Sy at 100°F (38°C) and 0.675Sy at temperature; ~	~ (1) for materials to which **Note (G5)** of Section II, Part D, Subpart 1, Tables 1A and 1B applies, the lower of 0.5Sy at 100°F (38°C) and 0.675Sy at temperature; ~	No	Corrected by errta
NE-3227.2	Pure Shear	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3227.3	Progressive Distortion of Nonintergal Connection	~ Therefore, primary plus secondary stress intensities (NE-3221.4) which result in slippage between the parts of a nonintegral connection in which is engagement could occur as a result of progressive distortion shall be limited to the value Sy (Section II, Part D, **Subpart 2**, Table Y-1).	~ Therefore, primary plus secondary stress intensities (NE-3221.4) which result in slippage between the parts of a nonintegral connection in which is engagement could occur as a result of progressive distortion shall be limited to the value Sy (Section II, Part D, **Subpart 1,** Table Y-1).	No	Corrected by errta
NE-3227.4	Triaxial Stresses	Same	Same	No	
NE-3227.5	Nozzle Piping Transition	Same	Same	No	
NE-3227.6	Application of Elastic Analysis for Stresses Beyond the Yield Strength	Same	Same	No	
NE-3228	Application of Plastic Analysis	Same	Same	No	
NE-3228.1	Plastic Analysis	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3228.2	Limit Analysis	The limits on local membrane stress intensity (NE-3221.2) and primary membrane plus primary bending stress intensity (NE-3221.3) need not be satisfied at a specific location if it can be shown by means of limit analysis or by tests that the specified loadings do not exceed two-thirds of the lower bound collapse load except for those materials of Section II, Part D, Subpart 1, Tables 2A and 2B to which Note (2) of those tables is applicable. ~.	The limits on local membrane stress intensity (NE-3221.2) and primary membrane plus primary bending stress intensity (NE-3221.3) need not be satisfied at a specific location if it can be shown by means of limit analysis or by tests that the specified loadings do not exceed two-thirds of the lower bound collapse load except for those materials of Section II, Part D, Subpart 1, Table 2A **to which Note G7 is applicable** and Table 2B to which Note G1 is applicable. ~.	No	Corrected by errta
NE-3228.3	Simplified Elastic-Plastic Analysis	Same	Same	No	
NE-3228.4	Impluse Loads	Same	Same	No	
Table NE-3228.3(b)-1	Values of *m*,*n* and T_{max} for Various Classes of Permitted Marerials	Same	Same	No	
NE-3230	Stress Limits for Bolts				
NE-3231	Design Conditions	Same	Same	No	
NE-3232	Combined Loads	Same	Same	No	
NE-3232.1	Average Stress	Same	Same	No	
NE-3232.2	Maximum Stress	Same	Same	No	
NE-3232.3	Fatigue Analysis of Bolts	Same	Same	No	
NE-3236	Design Stress Values	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3300	Design Formula				
NE-3310	Design Criteria				
NE-3311	Requirements for Acceptability	Same	Same	No	
NE-3320	Design Considerations				
NE-3324	Vessels under Internal Pressures				
NE-3324.1	General Requirements	Same	Same	No	
NE-3324.2	Nomenclature	Same	Same	No	
NE-3324.3	Cylindrical Shells	Same	Same	No	
NE-3324.4	Spherical Shells	Same	Same	No	
NE-3324.5	Formed Heads, General Requirements	Same	Same	No	
NE-3324.6	Ellipsoidal Heads	Same	Same	No	
NE-3324.7	Hemispherical Heads	Same	Same	No	
NE-3324.8	Torispherical Heads	Same	Same	No	
NE-3324.9	Conical Heads without Transition Knuckle	Same	Same	No	
NE-3324.10	Torispherical Heads	Same	Same	No	
NE-3324.11	Reducer Sections	Same	Same	No	
NE-3324.12	Nozzles	Same	Same	No	
Fig. NE-3324.2-1	Principal Dimensions of Typical Heads	Same	Same	No	
Table NE-3324.2-1	Values of Factor K	Same	Same	No	
Table NE-3324.8(b)-1	Values of Factor M	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
Fig. NE-3324.11(a)(6)-1	Large Head Opening:Reverse Curve and Concial Shell Reducer Sections	Same	Same	No	
Table NE-3324.11(b)(2)-1	Values Δ for Junctions at the Large Cylinder for α≤30 deg	Same	Same	No	
Table NE-3324.11(b)(3)-1	Values Δ for Junctions at the Small Cylinder for α≤30 deg	Same	Same	No	
NE-3325	Flat Heads and Covers	Same	Same	No	
NE-3325.1	Nomenclature	Same	Same	No	
NE-3325.2	Thickness	Same	Same	No	
NE-3325.3	Values of C	Same	Same	No	
Fig. NE-3325-1	Some Acceptable Types of Unstayed Flat Heads and Covers	Same	Same	No	
NE-3326	Spherically Dished Covers with Bolting Flanges				
NE-3326.1	Nomenclature	Same	Same	No	
NE-3326.2	Spherically Dished Heads with Bolting Flanges	Same	Same	No	
Fig. NE-3326.1-1	Spherically Dished Covers with Bolting Flanges	Same	Same	No	
NE-3327	Quick Actuating Closures	Same	Same	No	
NE-3327.1	Positive Locking Devices	Same	Same	No	
NE-3327.2	Other Quick Access and Safety Devices	Same	Same	No	
NE-3327.3	Manual Operation	Same	Same	No	
NE-3327.4	Pressure Indicating Device	Same	Same	No	
NE-3328	Combination Units	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3330	Openings and Reinforcement				
NE-3331	General Requirement for Openings	Same	Same	No	
NE-3332	Reinforcement Requirement for Openings in Shells and Formed Heads				
NE-3332.1	Openings not Requiring Reinforcement	Same	Same	No	
NE-3332.2	Required Area of Reinforcement	Same	Same	No	
NE-3332.4	Reinforcement for External Pressure	Same	Same	No	
NE-3332.5	Reinforcement for Both Internal and External Pressure	Same	Same	No	
Table NE-3332.2-1	Values of Spherical Radius Factor K_1	Same	Same	No	
Fig. NE-3332.2-1	Chart for Determining Values of F	Same	Same	No	
NE-3333	Reinforcement Required for Openings in Flat Heads	Same	Same	No	
NE-3334	Limits of Reinforcement	Same	Same	No	
NE-3334.1	Limit of Reinforcement Along the Vessel Wall	Same	Same	No	
NE-3334.2	Limit of Reinforcement Normal to the Vessel Wall	Same	Same	No	
Fig. NE-3334.2-1	Nozzle Dimensions	Same	Same	No	
NE-3335	Metal Available for Reinforcement	Same	Same	No	
NE-3335.1	Reinforcement of Multiple Openings	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
Fig. NE-3335.1-1	Arrangement of Multiple Openings	Same	Same	No	
NE-3336	Strength of Reinforcing Material	Same	Same	No	
NE-3336.1	Strength of Weld	Same	Same	No	
NE-3336.2	Strength of Attachment	Same	Same	No	
NE-3338	Pressure Stresses in Openings for Fatigue Evaluation under Operating Conditions				
NE-3338.1	General	Same	Same	No	
NE-3338.2	Stress Index Method	Same	Same	No	
Table NE-3338.2 (c) -1	Stress Indices for Nozzles	Same	Same	No	
Fig. NE-3338.2-1	Direction of Stress Components	Same	Same	No	
NE-3350	Design of Welded Connections				
NE-3351	Welded Joint Categories	Same	Same	No	
NE-3351.1	Category A	Same	Same	No	
NE-3351.2	Category B	Same	Same	No	
NE-3351.3	Category C	Same	Same	No	
NE-3351.4	Category D	Same	Same	No	
Fig. NE-3351-1	Welded Joint Locations Typical of Categories A,B,C and D	Same	Same	No	
NE-3352	Permissible Types of Welded Joints	Same	Same	No	
NE-3352.1	Joint of Category A	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3352.2	Joint of Category B	(a) Same (b) None	(a) Same **(b) Surface examination in accordance with NE-5280(b) may be substituted for radiographic examination required in NE-5221 for Category B butt welds in electrical penetration assemblies subject to the following limitations:** **(1) The allowable stress for the weld joint shall be multiplied by a factor of 0.8.** **(2) P-No. 1 base materials shall be used for construction.**	No	There is no impact in APR1400 design because the revised contents have relaxed the requirement of nondestructive examination for Category B butt weld in the electrical penetration assemblies.
NE-3352.3	Joint of Category C	Same	Same	No	
NE-3352.4	Joint of Category D	Same	Same	No	
Fig. NE-3352-1	Typical Butt Joints	Same	Same	No	
NE-3355	Welding Grooves	Same	Same	No	
NE-3356	Fillet Welds	Same	Same	No	
NE-3358	Design Requirements for Head Attachments				
NE-3358.1	Skirt Length of Formed Heads	Same	Same	No	
NE-3358.2	Unstayed Flat Heads Welded to Shells	Same	Same	No	
NE-3358.3	Head Attachments using Corner Joints	Same	Same	No	
NE-3358.4	Flat Heads with Hubs	Same	Same	No	
Fig. NE-3358.1(a)-1	Heads Attached to Shells	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3359	Design Requirements for Nozzle Attachment Welds	Same	Same	No	
NE-3360	Special Vessel Requirements				
NE-3361	Tapered Transitions	Same	Same	No	
Fig. NE-3361-1	Category A and B Joints between Sections of Unequal Thickness	Same	Same	No	
NE-3362	Bolted Flange and Studded Connection	Same	Same	No	
NE-3363	Access Openings	Same	Same	No	
NE-3364	Attachments	Same	Same	No	
NE-3365	Supports	Same	Same	No	
NE-3366	Bellows Expansion Joints				
NE-3366.1	General Requirements	Same	Same	No	

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3366.2	Design Requirements	~. (e)(1) ~. The cyclic life plot (versus the combined stress) used in evaluating **NE-3365.1(d)** shall be obtained from the results of at least 25 fatigue tests on bellows of varying diameters, thicknesses, and convolution profiles. ~. (e)(2)(b) ~. Cumulative fatigue requirements can be satisfied in accordance with **NE-3365.1(g)** without additional testing by assuming that the slope of the fatigue curve is 4.3 (on a log–log plot) and that the curve passes through the test point. ~ (e)(3)(b) ~. the pressure test of NE-6230, provided that the test is conducted at 2.25 times the equivalent cold design pressure, and single rotation and universal joints are held at their design rotation angle or offset movement during the test and the requirements of **NE-3365.1(b)** are not exceeded by such a test. ~	~. (e)(1) ~. The cyclic life plot (versus the combined stress) used in evaluating **NE-3366.2(d)** shall be obtained from the results of at least 25 fatigue tests on bellows of varying diameters, thicknesses, and convolution profiles. ~. (e)(2)(b) ~. Cumulative fatigue requirements can be satisfied in accordance with **NE-3366.2(g)** without additional testing by assuming that the slope of the fatigue curve is 4.3 (on a log–log plot) and that the curve passes through the test point. ~ (e)(3)(b) ~. the pressure test of NE-6230, provided that the test is conducted at 2.25 times the equivalent cold design pressure, and single rotation and universal joints are held at their design rotation angle or offset movement during the test and the requirements of **NE-3366.2(b)** are not exceeded by such a test. ~	No	Corrected by errta

Subarticle	Title	2001 Edition including 2003 Addenda	2007 Edition including 2008 Addenda	Design Affected (Yes/No)	Remarks
NE-3367	Closures on Small Penetrations	Closures on penetrations of 2 in. pipe size (DN 50) or less may be made by the use of closure fittings such as blind flanges, welded plugs, or caps manufactured in accordance with standards listed in **Table NE-3132-1.**	Closures on penetrations of NPS 2 (DN 50) or less may be made by the use of closure fittings such as blind flanges, welded plugs, or caps manufactured in accordance with standards listed in **Table NCA-7100-1.**	No	Table reference revised
NE-3700	Electrical and Mechanical Penetration Assembles				
NE-3720	Design Rules	Same	Same	No	