U.S. NUCLEAR REGULATORY COMMISSION

Revision 7
August 1976

REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

REGULATORY GUIDE 1.84

CODE CASE ACCEPTABILITY ASME SECTION III DESIGN AND FABRICATION

A. INTRODUCTION

Section 50.55a, "Codes and Standards," of 10 CFR Part 50, "Licensing of Production and Utilization Facilities," 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, "Nuclear Power Plant Components,"* of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code or equivalent quality standards. Footnote 6 to §50.55a states that the use of specific Code Cases may be authorized by the Commission upon request pursuant to §50.55a(a)(2)(ii), which requires that proposed alternatives to the described requirements or portions thereof provide an acceptable level of quality and safety.

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

Criterion 20, "Quality of Reactor Coolant Pressure Boundary," of the same appendix requires, in part, that components which are part of the reactor coolant pressure boundary be designed, fabricated, erected, and tested to the highest quality standards practical.

Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 requires, in part, that measures be established for the control of special processing of materials and that proper testing be performed.

This regulatory guide lists those Section III ASME Code Cases oriented to design and fabrication that are generally acceptable to the NRC staff for implementation in the licensing of light-water-cooled nuclear power plants.

B. DISCUSSION

The ASME Boiler and Pressure Vessel Committee publishes a document entitled "Code Cases."* Generally, the individual Code Cases that make up this document explain the intent of Code rules or provide for alternative requirements under special circumstances.

Most Code Cases are eventually superseded by revision to the Code and then are annulled by action of the ASME Council. In such cases, the intent of the annulled Code Case becomes part of the revised Code, and therefore continued use of the Code Case intent is sanctioned under the rules of the Code. In other cases, the Code Case is annulled because it is no longer acceptable or there is no further requirement for it. A Code Case that was approved for a particular situation and not for a generic application should be used only for construction of the approved situation because annulment of such a Code Case could result in construction that would not meet Code requirements.

The Code Cases listed in this guide are limited to those cases applicable to Section III that are oriented toward design and fabrication.

All published Code Cases in the area of design and fabrication that are applicable to Section III of the Code

*Copies may be obtained from the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, New York 10017.

USNRC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the NRC staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience. This guide was revised as a result of substantive comments received from the public and additional staff review.

Comments should be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Section.

The guides are issued in the following ten broad divisions:

1. Power Reactors
2. Research and Test Reactors
3. Fuels and Materials Facilities
4. Environmental and Siting
5. Materials and Plant Protection
6. Products
7. Transportation
8. Occupational Health
9. Antitrust Review
10. General

Copies of published guides may be obtained by written request indicating the divisions desired to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Office of Standards Development.

*| and were in effect on March 2, 1976, were reviewed for inclusion in this guide. In addition to the listing of acceptable Code Cases, this revision of the guide includes listings of (1) Code Cases that were identified as acceptable in a prior version of this regulatory guide and that were annulled after the original issuance of this guide (June 1974) and (2) Code Cases that were identified as acceptable in a prior version of this regulatory guide and that were superseded by revised Code Cases after the original issuance of this guide (June 1974). Code Cases that are not listed herein are either not endorsed or will require supplementary provisions on an individual basis to attain endorsement status.

The endorsement of a Code Case by this guide constitutes acceptance of its technical position for applications not precluded by regulatory or other requirements or by the recommendations in this or other regulatory guides. Contingent endorsement is indicated in regulatory position C.1.c for specific cases. However, it is the responsibility of the user to make certain that no regulatory requirements are violated and that there are no conflicts with other recommended limitations resulting from Code Case usage.

Acceptance or endorsement by the NRC staff applies only to those Code Cases or Code Case revisions with the date of "Council Approval" as shown in the regulatory position of this guide. Earlier or later revisions of a Code Case are not endorsed by this guide. New Code Cases will require evaluation by the NRC staff to determine if they qualify for inclusion in the approved list. Because of the continuing change in the status of Code Cases, it is planned that this guide will require periodic updating to accommodate new Code Cases and any revisions of existing Code Cases.

C. REGULATORY POSITION

1. The Section III ASME Code Cases** listed below (by number, date of Council approval, and title) are acceptable to the NRC staff for application in the construction of components for water-cooled nuclear power plants. Their use is acceptable within the limitations stated in the "Inquiry" and "Reply" sections of each individual Code Case, within the limitations of such NRC or other requirements as may exist, and within the additional limitations recommended by the NRC staff given with the individual Code Case in the list. The categorization of Code Cases used in this guide is intended to facilitate the Code Case listing and is not intended to indicate a limitation on its usage.

a. Design-oriented Code Cases (Code Case number, date of Council approval, and title):

(1) Code Cases applicable to piping design:

1477-1	3-9-72	Use of 1970 Addenda of ANSI B31.7, Section III
1506	12-13-71	Stress Intensification Factors, Section III, Class 2 and 3 Piping
1614	11-5-73	Hydrostatic Testing of Piping Prior To or Following the Installation of Spray Nozzles for Section III, Classes 1, 2, and 3 Piping Systems
1623	3-2-74	Design by Analysis for Section III, Class 1 Sleeve-Coupled and Other Patented Piping Joints
1659	11-4-74	Interconnection of Two Piping Systems for Section III, Class 1, 2 and 3 Construction
1676	12-16-74	Clarification of Stress Intensities in Curved Pipe or Welded Elbows, Section III
1677	12-16-74	Clarification of Flange Design Loads, Section III, Class 1, 2 and 3
1744	3-1-76	Carbon Steel Pipe Flanges Larger than 24 in. Section III, Division 1, Class 2 and 3 Construction
1745	3-1-76	Stress Indices for Structural Attachments, Class 1, Section III, Division 1

(2) Code Cases applicable to valve design:

1533	6-14-72	Pressure Temperature Ratings of SA-351 Grades CF8A, CF3, and CF3M, Section III
1539	11-6-72	Metal Bellows and Metal Diaphragm Stem Sealed Valves, Section III, Classes 1, 2, and 3
1540-1	3-3-73	Elastomer Diaphragm Valves, Section III, Classes 2 and 3
1552	12-18-72	Design by Analysis of Section III, Class 1 Valves
1555	12-18-72	Certification of Safety Relief Valves on Liquids
1573	4-30-73	Vacuum Relief Valves, Section III
1581	6-25-73	Power-Operated Pressure Relief Valves, Section III
1665	11-4-74	Pressure-Temperature Ratings for Class 1 Valves Made from 5 Cr-1/2 Mo, Section III
1672	11-4-74	Nuclear Valves for Section III, Division 1, Class 1, 2 and 3 Construction
1678	12-16-74	Butterfly Valves of Circular Cross Section Larger than 24 in. NPS for Section III, Class 2 and 3 Construction

*Lines indicate substantive changes from previous issue.
**A numerical listing of the Code Cases appears in the appendix.

1700	11-3-75	Determination of Capacities of Liquid Relief Valves, Section III, Division 1, Class 1, 2, and 3
1701	6-30-75	Determination of Capacities of Vacuum Relief Valves Section III, Class MC
1702	6-30-75	Flanged Valves Larger than 24 inches for Section III, Class 1, 2 and 3 Construction
1732	11-3-75	Hardsurfaced Valves with Inlet Connections less than 2-in. Nominal Pipe Size for Section III, Division 1, Class 1 and 2 Construction

(3) Other Code Cases related to design:

1536	8-14-72	Closing Seam for Electrical Penetration for Section III, Classes 2, 3, and MC
1620	3-2-74	Stress Category for Partial Penetration Welded Penetrations, Section III, Class 1 Construction
1630	11-4-74	External Pressure Charts for High Yield Strength Carbon Steels and Low Alloy Steels. (Yield Strength above 38 Ksi to 60 Ksi Inclusive.) For Section III, Class 1, 2, 3, and MC; and Section VIII, Division 1 and 2
1633	4-29-74	Brazing of Seats to Class 1, 2, and 3 Valve Body or Bonnets, Section III
1657	11-4-74	Stress Criteria for Class 2 and 3 Atmospheric and Low Pressure (0-15 psig) Steel Storage Tanks
1660	11-4-74	Overpressure Protection Under Emergency Operating Conditions for Section III, Class 1
1692	4-28-75	Rules for Design of Welded Class 1 Pumps
1718	8-11-75	Design of Structural Connections for Linear Type Component Supports Section III, Division 1, Class 1, 2, 3 and MC
1729	11-3-75	Minimum Edge Distance-Bolting for Section III, Division 1, Class 1, 2 and 3 and MC Construction of Component Supports
1733	11-3-75	Evaluation of Safe Shut Down Earthquake Loadings for Section III, Division 1, Class MC Containment Vessels

b. Fabrication-oriented Code Cases (Code Case number, date of Council approval, and title):

(1) Code Cases related to welding and brazing:

1461-1	3-9-72	Electron Beam Welding, Sections I, III, and VIII, Division 1 and 2
1471-1	3-9-72	Vacuum Electron Beam Welding of Tube Sheet Joints, Section III
1494-1	3-3-73	Weld Procedure Qualification Tests, Section III
1516-2	8-11-75	Welding of Seats or Minor Internal Permanent Attachments in Valves for Section III Applications
1580-1	11-5-73	Buttwelded Alignment Tolerance and Acceptable Slopes for Concentric Centerlines for Section III, Class 1, 2 and 3 Construction
1609-1	3-1-76	Inertia and Continuous Drive Friction Welding, Section I, III, IV, VIII, Division 1 and 2, and IX
1661	11-4-74	Postweld Heat Treatment for P-No. 1 Materials for Section III, Class 1 Vessels
1675	12-16-74	Tubesheet to Shell or Formed Head Weld Joints Section III, Class 1 Vessels
1685	4-28-75	Furnace Brazing Section III, Class 1, 2, 3 and MC Construction
1686	3-3-75	Furnace Brazing, Section III, Subsection NF, Component Supports
1695-1	11-3-75	Brazing, Section III, Division 1, Class 3
1703	6-30-75	Brazing of Copper Alloys Section III, Class 2
1719	8-11-75	Single-Welded, Full-Penetration, Sidewall Butt Joints in Atmospheric Storage Tanks Section III, Division 1, Class 2
1726	11-3-75	Refinement of Low Alloy Steel Heat Affected Zone Under Overlay Cladding Section III, Division 1, Class 1 Components

(2) Other Code Cases related to fabrication:

1535-2	4-30-73	Hydrostatic Testing of Section III, Class 1 Valves
1541-1	8-13-73	Hydrostatic Testing of Embedded Class 2 and Class 3 Piping for Section III Construction
1553-1	3-3-75	Upset Heading and Roll Threading of SA-453 for Bolting in Section III
1588	8-13-73	Electro-Etching of Section III Code Symbols

1651	8-12-74	Interim Requirements for Certification of Component Supports, Section III, Subsection NF
1662	11-4-74	Shop Assembly of Components, Appurtenances and Piping Subassemblies for Section III Class 1, 2, 3 and MC Construction
1681-1*	3-3-75	Organizations Accepting Overall Responsibility for Section III Construction
1683-1	3-1-76	Bolt Holes for Section III, Class 1, 2, 3 and MC Component Supports
1706	6-30-75	Data Report Forms for Component Supports, Section III, Class 1, 2 and 3
1712	8-11-75	Nameplates and Stamping for Section III, Division 1, Class 1, 2, 3 and MC Construction as Referenced in NA-8300

c. Code Cases with contingent approval:

1361-2	3-9-72	Socket Welds, Section III

Code Case 1361-2 is approved when used in connection with Section III, paragraph NB-3356, Fillet Welds.

1569	3-3-72	Design of Piping for Pressure Relief Valve Station, Section III

Code Case 1569 is approved subject to compliance with the recommendations contained in Regulatory Guide 1.67, "Installation of Overpressure Protection Devices."

1606-1	12-16-74	Stress Criteria Section III, Classes 2 and 3 Piping Subject to Upset, Emergency, and Faulted Operating Conditions

Code Case 1606-1 is approved subject to the interpretation that the stress limit designations of "Upset," "Emergency," and "Faulted" do not necessarily imply agreement with specified plant conditions applicable to ASME Code Class 2 and 3 components for fluid systems. These designations should be established and justified in the design specifications.

1607-1	11-4-74	Stress Criteria for Section III, Classes 2 and 3 Vessels Designed to NC/ND-3300 Excluding the NC-3200 Alternate

Code Case 1607-1 is approved subject to the interpretation that the stress limit designations of "Upset," "Emergency," and "Faulted" do not necessarily imply agreement with specified plant conditions applicable to ASME Code Class 2 and 3 components for fluid systems. These designations should be established and justified in the design specifications.

1635-1**	8-12-74	Stress Criteria for Section III, Class 2 and 3 Valves Subjected to Upset, Emergency, and Faulted Operating Conditions

Code Case 1635-1 is approved subject to the interpretation that the stress limit designations of "Upset," "Emergency," and "Faulted" do not necessarily imply agreement with specified plant conditions applicable to ASME Code Class 2 and 3 components for fluid systems. These designations should be established and justified in the design specifications.

1636-1**	8-12-74	Stress Criteria for Section III, Class 2 and 3 Pumps Subjected to Upset, Emergency, and Faulted Operating Conditions

Code Case 1636-1 is acceptable subject to the interpretation that the stress limit designations of "Upset," "Emergency," and "Faulted" do not necessarily imply agreement with specified plant conditions applicable to ASME Code Class 2 and 3 components for fluid systems. These designations should be established and justified in the design specifications.

1689	6-30-75	Alternate PWHT Time and Temperature for SA-182 Grade F22 Section III, Class 1, 2, 3 and CS

Code Case 1689 is acceptable subject to the following condition in addition to that specified in the Code Case: The alternate postweld heat treatment should be prequalified along with the applicable welding procedure in accordance with ASME Section IX.

1711	11-3-75	Pressure Relief Valve Design Rules, Section III, Division 1, Class 1, 2 and 3

Code Case 1711 is acceptable subject to the following conditions in addition to those conditions

*Code Case 1681 was approved by Council on 12-16-74 and revised on 3-3-75. Because Code Case 1681 was not in effect on March 31, 1975, the Code Case was not included in this guide.

**Code Cases 1635 and 1636 were approved by Council on July 1, 1974, and revised on August 12, 1974. Because Code Cases 1635 and 1636 were not in effect on September 1, 1974, they are not included in this guide.

specified in the Code Case. The following information should be provided in the Safety Analysis Report:

(1) If stress limits are utilized in excess of those specified for the upset operating condition, it should be demonstrated how the pressure relief function is assured. Refer to paragraph 3.1, Section I, of the Case for Class 1, and paragraph 3.2, Section II, of the Case for Class 2 and 3 pressure relief valves.

(2) If Case 1660 is to be used in conjunction with this Case, it should be stated that the stress limits of Case 1660 supersede those of paragraph 3.2(b), Section I, of Case 1711. Functional assurance of (1) above is required in all situations.

1720-1 3-1-76 Weld End Preparation for Section III, Division 1 Construction

Code Case 1720-1 is acceptable subject to the following condition in addition to those conditions specified in the Code Case: Weld end preparations other than those shown in Figures 1, 2, and 3 of the Code Case are not acceptable on a generic basis. Such alternate end preparations should be treated on a case-by-case basis.

1727 12-22-75 Alternate Test Fluids, Section III, Division 1

Code Case 1727 is acceptable subject to the following condition in addition to those conditions specified in the Code Case: The applicant should provide justification in the referencing Safety Analysis Report for the fluid selected for use in the pressure test. The information provided should demonstrate that the fluid selected will not have deleterious effects on the material of the pressure boundary and that the fluid may be safely utilized at the specified temperature and pressure of the test. When the fluid selected for use is the operating fluid, additional information is not required.

1734 11-3-75 Weld Design for Use for Section III, Division 1, Class 1, 2, 3 and MC Construction of Component Supports

Code Case 1734 is acceptable subject to the following conditions in addition to those conditions specified in the Code Case: If the configuration of Figure 1 of the Code Case is used for Class 1 and MC component supports, full penetration welds should be used. The application of the configuration shown in Figures 2 and 3 should be restricted to the welding of cans for spring encapsulation in spring hangers. In Figure 3, the length of the leg of the fillet weld adjacent to the plate should be equal to the thickness of the exposed end of the plate; also, the leg of the fillet weld adjacent to the shell should be equal to the thickness of the exposed end of the shell.

2. Code Cases that were endorsed by the NRC in a prior version of this guide and were later annulled by action of the ASME Council should be considered as deleted from the list of acceptable Code Cases as of the date of the ASME Council action that approved the annulment. Such Code Cases which were annulled on or after July 1, 1974, are listed below by number, date of Council action, and title.*

1470-2**	11-4-74	External Pressure Charts for High-Strength Carbon Steels and for Low-Alloy Steels, Section VIII, Division 1 and 2, and Section III
1574	12-31-74	Hydrostatic Test Pressure for Safety Relief Valves, Section III
1601	7-1-74	Limits of Reinforcement for Two-thirds Area, Section III, Class 1

3. Code Cases that were endorsed by the NRC in a prior version of this guide and were superseded by revised Code Cases on or after July 1, 1974, should be considered as not endorsed as of the date of the Council action that approved the revised version of the Code Cases. These Code Cases that are no longer endorsed are listed in the following by number, date of Council action that approved the new revision of the particular Code Case and thus specifies the date when the Code Case no longer has NRC endorsement, and title.

1508***	6-30-75	Allowable stresses, Design Intensity and/or yield strength values, Section I, III, and VIII, Divisions 1 and 2
1516-1	8-11-75	Welding of Seats in Valves for Section III Applications
1553	3-3-75	Upset Heading and Roll Threading of SA-453 for Bolting, Section III
1606	12-16-74	Stress Criteria for Section III, Class 2 and 3 Piping Subjected

*Code Cases 1355-3, 1534, and 1554, which were listed in the original issue of this guide, were annulled by Council action prior to July 1, 1974.

**The annulment of Code Case 1470-2 was effective upon Council approval of Code Case 1630. However, due to an oversight, the annulment was not noted until publication of Supplement No. 13 to the 1974 Code Cases.

***Code Case 1508 is no longer listed by ASME as a Section III Code Case and is therefore deleted from the acceptable listing.

		to Upset, Emergency, and Faulted Operating Conditions

Code Case 1606 was approved subject to the interpretation that the stress limit designations of "Upset," "Emergency," and "Faulted" do not necessarily imply agreement with specified plant conditions applicable to ASME Code Class 2 and 3 components for fluid systems. These designations should be established and justified in the design specifications.

1607	11-4-74	Stress Criteria for Section III, Classes 2 and 3 Vessels Subjected to Upset, Emergency, and Faulted Operating Conditions

Code Case 1607 was approved subject to the interpretation that the stress limit designations of "Upset," "Emergency," and "Faulted" do not necessarily imply agreement with specified plant conditions applicable to ASME Code Class 2 and 3 components for fluid systems. These designations should be established and justified in the design specifications.

1683	3-1-76	Bolt Holes for Section III, Division 1, Class 1, 2, 3 and MC Component Supports
1695	11-3-75	Brazing, Section III, Class 3
1720	3-1-76	Weld End Preparation for Section III, Division 1 Construction

Code Case 1720 was acceptable subject to the following condition in addition to those conditions specified in the Code Case: Weld end preparations other than those shown in Figures 1, 2, and 3 of the Code Case are not acceptable on a generic basis. Such alternate end preparations should be treated on a case-by-case basis.

4. Code Cases for Class 1 components that are not on the approved list of this guide (paragraph C.1) or other regulatory guides, or for which authorization by the Commission has not been granted, are not acceptable for Class 1 components.

5. Code Cases for other classes of components that are not on the approved list of this guide (paragraph C.1) or other regulatory guides should be considered not acceptable on a generic basis.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants regarding the utilization of this regulatory guide.

1. Except for those Code Cases that have been annulled by action of the ASME Council, the NRC staff will authorize appropriate use of the Code Cases listed in this guide under regulatory position C.1 upon specific request by the applicant in accordance with footnote 6 to §50.55a of the Codes and Standards rule.

2. Components ordered to a specific version of a Code Case need not be changed because a subsequent revision to the Code Case is listed as the approved version in this guide.

3. Components ordered to a Code Case that was previously approved for use need not be changed because the Code Case has been subsequently annulled.

4. Code Cases on the approved list may be applied to components that were in process of construction prior to the effective date of the Code Case within the limits specified in the Code Case and applicable regulations or recommended in other regulatory guides.

APPENDIX

NUMERICAL LISTING OF CODE CASES*

1361-2	1609-1	1686
1461-1	1614	1689
1471-1	1620	1692
1477-1	1623	1695-1
1494-1	1630	1700
1506	1633	1701
1516-2	1635-1	1702
1533	1636-1	1703
1535-2	1651	1706
1536	1657	1711
1539	1659	1712
1540-1	1660	1718
1541-1	1661	1719
1552	1662	1720-1
1553-1	1665	1726
1555	1672	1727
1569	1675	1729
1573	1676	1732
1580-1	1677	1733
1581	1678	1734
1588	1681-1	1744
1606-1	1683-1	1745
1607-1	1685	

*Code Case 1625 was inadvertently listed in the appendix of Regulatory Guide 1.84, Revision 1. This Code Case is covered in Regulatory Guide 1.85, Revision 1.

Code Case 1575 is a Section VIII Case and therefore has been eliminated from this regulatory guide, which covers Section III Cases.