



# REGULATORY GUIDE

## OFFICE OF NUCLEAR REGULATORY RESEARCH

### REGULATORY GUIDE 1.26

(Draft was issued as DG-1152, dated November 2006)

## QUALITY GROUP CLASSIFICATIONS AND STANDARDS FOR WATER-, STEAM-, AND RADIOACTIVE-WASTE-CONTAINING COMPONENTS OF NUCLEAR POWER PLANTS

### A. INTRODUCTION

General Design Criterion 1, “Quality Standards and Records,” as set forth in Appendix A, “General Design Criteria for Nuclear Power Plants,” to Title 10, Part 50, of the *Code of Federal Regulations* (10 CFR Part 50), “Licensing of Production and Utilization Facilities” (Ref. 1), requires that structures, systems, and components important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Under 10 CFR 50.55a, “Codes and Standards,” certain systems and components of boiling- and pressurized-water-cooled nuclear power reactors must be designed, fabricated, erected, and tested in accordance with the standards for Class 1, 2, and 3<sup>1</sup> components given in Section III, “Nuclear Power Plant Components,” of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Ref. 2) or equivalent quality standards. This guide describes a quality classification system related to specified national standards that may be used to determine quality standards acceptable to the staff of the U.S. Nuclear Regulatory Commission (NRC) for satisfying General Design Criterion 1 for other safety-related components containing water, steam, or radioactive material in light-water-cooled nuclear power plants.

---

<sup>1</sup> In editions of the ASME Boiler and Pressure Vessel Code published before 1971, Section III uses the terms Class A, Class B, and Class C in lieu of Class 1, Class 2, and Class 3.

---

The U.S. Nuclear Regulatory Commission (NRC) issues regulatory guides to describe and make available to the public methods that the NRC staff considers acceptable for use in implementing specific parts of the agency's regulations, techniques that the staff uses in evaluating specific problems or postulated accidents, and data that the staff need in reviewing applications for permits and licenses. Regulatory guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions that differ from those set forth in regulatory guides will be deemed acceptable if they provide a basis for the findings required for the issuance or continuance of a permit or license by the Commission.

This guide was issued after consideration of comments received from the public. The NRC staff encourages and welcomes comments and suggestions in connection with improvements to published regulatory guides, as well as items for inclusion in regulatory guides that are currently being developed. The NRC staff will revise existing guides, as appropriate, to accommodate comments and to reflect new information or experience. Written comments may be submitted to the Rules and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

Regulatory guides are issued in 10 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 and Financial Review; and 10, General.

Requests for single copies of draft or active regulatory guides (which may be reproduced) should be made to the U.S. Nuclear Regulatory Commission, Washington, DC 20555, Attention: Reproduction and Distribution Services Section, or by fax to (301) 415-2289; or by email to [Distribution@nrc.gov](mailto:Distribution@nrc.gov). Electronic copies of this guide and other recently issued guides are available through the NRC's public Web site under the Regulatory Guides document collection of the NRC's Electronic Reading Room 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>, under Accession No. ML070290283.

---

This regulatory guide contains information collections that are covered by the requirements of 10 CFR Part 50 which the Office of Management and Budget (OMB) approved under OMB control number 3150-0011. The NRC may neither conduct nor sponsor, and a person is not required to respond to, an information collection request or requirement unless the requesting document displays a currently valid OMB control number.

## **B. DISCUSSION**

In the early 1970s, the NRC staff developed a quality classification system to provide licensees with guidance for satisfying General Design Criterion 1. The system consists of four quality groups, A through D; methods for assigning components to those quality groups; and specific quality standards applied to each quality group. When the NRC issued Revision 2 of this guide in June 1975 and Draft Revision 3 for public comment in February 1976, 10 CFR 50.55a required only that components of the reactor coolant pressure boundary be designed, fabricated, erected, and tested to the highest available national standards; this corresponded to the quality standards for Quality Group A of the NRC system. On March 15, 1984, the Commission published a final rule (Ref. 3) amending 10 CFR 50.55a to incorporate by reference the criteria in Section III of the ASME Code, as they relate to the design and fabrication of Class 2 and 3 components (Quality Group B and C components, respectively).

Because the quality group classification system is well-established, this Revision 4 of Regulatory Guide 1.26 retains the method described in previous versions for determining acceptable quality standards for Quality Group B, C, and D components. Other systems not covered by this guide, such as instrument and service air, diesel engines and their generators and auxiliary support systems, diesel fuel, emergency and normal ventilation, fuel handling, and radioactive waste management systems,<sup>2</sup> should be designed, fabricated, erected, and tested to quality standards commensurate with the safety function to be performed. The evaluation to establish the quality group classification of these other systems should consider the guidance provided in Regulatory Positions 1 and 2 of this guide.

---

<sup>2</sup> Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants" (Ref. 4), provides specific guidance on the classification of radioactive waste management systems.

## C. REGULATORY POSITION

### 1. Quality Group B

The Quality Group B standards given in Table 1 of this guide should be applied to water- and steam-containing pressure vessels, heat exchangers (other than turbines and condensers), storage tanks, piping, pumps, and valves that are either (1) part of the reactor coolant pressure boundary defined in 10 CFR 50.2 but excluded from the requirements of 10 CFR 50.55a<sup>3</sup> pursuant to paragraph (c)(2) of that section, or (2) not part of the reactor coolant pressure boundary but part of the following:

- (a) systems or portions of systems<sup>4</sup> important to safety that are designed for (i) emergency core cooling, (ii) postaccident containment heat removal, or (iii) postaccident fission product removal
- (b) systems or portions of systems<sup>5</sup> important to safety that are designed for (i) reactor shutdown or (ii) residual heat removal
- (c) those portions of the steam systems of boiling-water reactors extending from the outermost containment isolation valve up to but not including the turbine stop and bypass valves,<sup>5</sup> and connected piping up to and including the first valve that is either normally closed or capable of automatic closure during all modes of normal reactor operation; alternatively, for boiling-water reactors containing a shutoff valve (in addition to the two containment isolation valves) in the main steamline and the main feedwater line, those portions of the steam and feedwater systems extending from the outermost containment isolation valves up to and including the shutoff valve or the first valve that is either normally closed or capable of automatic closure during all modes of normal reactor operation
- (d) those portions of the steam and feedwater systems of pressurized-water reactors extending from and including the secondary side of steam generators up to and including the outermost containment isolation valves, and connected piping up to and including the first valve (including a safety or relief valve) that is either normally closed or capable of automatic closure during all modes of normal reactor operation
- (e) systems or portions of systems<sup>5</sup> that are connected to the reactor coolant pressure boundary and are not capable of being isolated from the boundary during all modes of normal reactor operation by two valves, each of which is either normally closed or capable of automatic closure

---

<sup>3</sup> The regulations in 10 CFR 50.55a specify the Quality Group A standards for pressure-containing components of the reactor coolant pressure boundary.

<sup>4</sup> The system boundary includes those portions of the system necessary to accomplish the specified safety function and connected piping up to and including the first valve (including a safety or relief valve) that is either normally closed or capable of automatic closure when the safety function is required.

<sup>5</sup> The turbine stop valve and turbine bypass valve, although not included in Quality Group B, should be subjected to a quality assurance program at a level generally equivalent to Quality Group B.

## 2. Quality Group C

The Quality Group C standards given in Table 1 of this guide should be applied to water-, steam-, and radioactive-waste-containing pressure vessels; heat exchangers (other than turbines and condensers); storage tanks; piping; pumps; and valves that are not part of the reactor coolant pressure boundary or included in Quality Group B but part of the following:

- (a) cooling water and auxiliary feedwater systems or portions of those systems<sup>5</sup> important to safety that are designed for (i) emergency core cooling, (ii) postaccident containment heat removal, (iii) postaccident containment atmosphere cleanup, or (iv) residual heat removal from the reactor and from the spent fuel storage pool (including primary and secondary cooling systems), although Quality Group B includes portions of those systems that are required for their safety functions and that (i) do not operate during any mode of normal reactor operation and (ii) cannot be tested adequately
- (b) cooling water and seal water systems or portions of those systems<sup>5</sup> important to safety that are designed for the functioning of components and systems important to safety, such as reactor coolant pumps, diesels, and the control room
- (c) systems or portions of systems<sup>5</sup> that are connected to the reactor coolant pressure boundary and are capable of being isolated from that boundary during all modes of normal reactor operation by two valves, each of which is either normally closed or capable of automatic closure<sup>6</sup>
- (d) systems, other than radioactive waste management systems<sup>3</sup>, not covered by Regulatory Positions 2(a) through 2(c) (above) that contain or may contain radioactive material and whose postulated failure would result in conservatively calculated potential offsite doses [using meteorology as recommended in Regulatory Guide 1.3, “Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss-of-Coolant Accident for Boiling-Water Reactors” (Ref. 5), and Regulatory Guide 1.4, “Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss-of-Coolant Accident for Pressurized-Water Reactors” (Ref. 6)] that exceed 0.5 rem to the whole body or its equivalent to any part of the body; only single component failures need be assumed for those systems located in Seismic Category I structures, and no credit should be taken for automatic isolation from other components in the system or for treatment of released material, unless the isolation or treatment capability is designed to the appropriate seismic and quality group standards and can withstand loss of offsite power and a single failure of an active component

---

<sup>6</sup> Components in influent lines may be classified as Quality Group D if they are capable of being isolated from the reactor coolant pressure boundary by an additional valve that has high leaktight integrity.

### 3. Quality Group D

The Quality Group D standards given in Table 1 of this guide should be applied to water- and steam-containing components that are not part of the reactor coolant pressure boundary or included in Quality Groups B or C, but are part of systems or portions of systems that contain or may contain radioactive material.

**Table 1**

| Components   | QUALITY STANDARDS  |  |   |
|--|--|--|---|
|  | Quality Group B  | Quality Group C  | Quality Group D   |
| Pressure Vessels   | ASME Boiler and Pressure Vessel Code, Section III, “Rules for Construction of Nuclear Facility Components,” <sup>a,b</sup> Class 2 | ASME Boiler and Pressure Vessel Code, Section III, “Rules for Construction of Nuclear Facility Components,” <sup>a,b</sup> Class 3 | ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, “Rules for Construction of Pressure Vessels” (Ref. 7) |
| Piping   | As above   | As above   | ASME B31.1 (Ref. 8)   |
| Pumps  | As above   | As above   | Manufacturers’ standards  |
| Valves   | As above   | As above   | ASME B31.1 (Ref. 8)   |
| Atmospheric Storage Tanks  | As above   | As above   | API-650 (Ref. 9), AWWA D-100 (Ref. 10), or ASME B96.1 (Ref. 11)   |
| 0–15 psig Storage Tanks  | As above   | As above   | API-620 (Ref. 12)   |
| <sup>a</sup> See 10 CFR 50.55a for guidance regarding the ASME Code and addenda to be applied.<br><sup>b</sup> Other regulatory guides or Commission regulations cover the specific applicability of code cases, where appropriate. Applicants proposing the use of code cases not covered by guides or regulations should demonstrate that an acceptable level of quality and safety would be achieved. |  |  |   |

## **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. No backfitting is intended or approved in connection with the issuance of this guide.

Except in those cases in which an applicant or licensee proposes or has previously established an acceptable alternative method for complying with specified portions of the NRC's regulations, the NRC staff will use the methods described in this guide to evaluate (1) submittals in connection with applications for construction permits, standard plant design certifications, operating licenses, early site permits, and combined licenses; and (2) submittals from operating reactor licensees who voluntarily propose to initiate system modifications if there is a clear nexus between the proposed modifications and the subject for which guidance is provided herein.

### **REGULATORY ANALYSIS / BACKFIT ANALYSIS**

The regulatory analysis and backfit analysis for this regulatory guide are available in Draft Regulatory Guide DG-1152, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-containing Components of Nuclear Power Plants" (Ref. 13). The NRC issued DG-1152 in November 2006 to solicit public comment on the draft of this Revision 4 of Regulatory Guide 1.26.

## REFERENCES

1. *U.S. Code of Federal Regulations*, Title 10, Part 50, “Domestic Licensing of Production and Utilization Facilities,” U.S. Nuclear Regulatory Commission, Washington, DC.<sup>7</sup>
2. ASME Boiler & Pressure Vessel Code, Section III, “Nuclear Power Plant Components,” American Society of Mechanical Engineers, New York, New York.<sup>8</sup>
3. “Codes and Standards for Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, *Federal Register*, Vol. 49, March 15, 1984, p. 9711.<sup>9</sup>
4. Regulatory Guide 1.143, “Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, Washington, DC.<sup>10</sup>
5. Regulatory Guide 1.3, “Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss-of-Coolant Accident for Boiling-Water Reactors,” U.S. Nuclear Regulatory Commission, Washington, DC.<sup>10</sup>
6. Regulatory Guide 1.4, “Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss-of-Coolant Accident for Pressurized-Water Reactors,” U.S. Nuclear Regulatory Commission, Washington, DC.<sup>10</sup>

---

<sup>7</sup> All NRC regulations listed herein are available electronically through the Public Electronic Reading Room on the NRC’s public Web site, at <http://www.nrc.gov/reading-rm/doc-collections/cfr/part050>. Copies are also available for inspection or copying for a fee from the NRC’s Public Document Room at 11555 Rockville Pike, Rockville, MD; the PDR’s mailing address is USNRC PDR, Washington, DC 20555; telephone (301) 415-4737 or (800) 397-4209; fax (301) 415-3548; email [PDR@nrc.gov](mailto:PDR@nrc.gov).

<sup>8</sup> Copies of ASME standards discussed herein may be obtained from the American Society of Mechanical Engineers, Three Park Avenue, New York, New York 10016-5990; telephone (800) 843-2763; <http://www.asme.org/Codes/Publications/>.

<sup>9</sup> All *Federal Register* notices listed herein were issued by the U.S. Nuclear Regulatory Commission. Copies are available for inspection or copying for a fee from the NRC’s Public Document Room at 11555 Rockville Pike, Rockville, MD; the PDR’s mailing address is USNRC PDR, Washington, DC 20555; telephone (301) 415-4737 or (800) 397-4209; fax (301) 415-3548; email [PDR@nrc.gov](mailto:PDR@nrc.gov).

<sup>10</sup> All regulatory guides listed herein were published by the U.S. Nuclear Regulatory Commission. Where an ADAMS accession number is identified, the specified regulatory guide is available electronically through the NRC’s Agencywide Documents Access and Management System (ADAMS) at <http://www.nrc.gov/reading-rm/adams.html>. All other regulatory guides are available electronically through the Electronic Reading Room on the NRC’s public Web site, at <http://www.nrc.gov/reading-rm/doc-collections/reg-guides/>. Single copies of regulatory guides may also be obtained free of charge by writing the Reproduction and Distribution Services Section, ADM, USNRC, Washington, DC 20555-0001, or by fax to (301)415-2289, or by email to [DISTRIBUTION@nrc.gov](mailto:DISTRIBUTION@nrc.gov). Active guides may also be purchased from the National Technical Information Service (NTIS) on a standing order basis. Details on this service may be obtained by contacting NTIS at 5285 Port Royal Road, Springfield, Virginia 22161, online at <http://www.ntis.gov>, by telephone at (800) 553-NTIS (6847) or (703)605-6000, or by fax to (703) 605-6900. Copies are also available for inspection or copying for a fee from the NRC’s Public Document Room (PDR), which is located at 11555 Rockville Pike, Rockville, Maryland; the PDR’s mailing address is USNRC PDR, Washington, DC 20555-0001. The PDR can also be reached by telephone at (301) 415-4737 or (800) 397-4209, by fax at (301) 415-3548, and by email to [PDR@nrc.gov](mailto:PDR@nrc.gov).

7. ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, "Rules for Construction of Pressure Vessels," American Society of Mechanical Engineers, New York, New York.<sup>8</sup>
8. ASME B31.1, "Power Piping," American Society of Mechanical Engineers, New York, New York.<sup>8</sup>
9. API-650, "Welded Steel Tanks for Oil Storage," American Petroleum Institute, Washington, DC.<sup>11</sup>
10. AWWA D-100, "Welded Steel Tanks for Water Storage," American Water Works Association, Denver, Colorado.<sup>12</sup>
11. ASME B96.1, "Welded Aluminum-Alloy Storage Tanks," American Society of Mechanical Engineers, New York, New York.<sup>8</sup>
12. API-620, "Design and Construction of Large, Welded, Low-Pressure Storage Tanks," American Petroleum Institute, Washington, DC.<sup>11</sup>
13. Draft Regulatory Guide DG-1152, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-containing Components of Nuclear Power Plants," U.S. Nuclear Regulatory Commission, Washington, DC.<sup>13</sup>

---

<sup>11</sup> Copies of API standards discussed herein may be obtained from the American Petroleum Institute , 1220 L Street, NW, Washington, DC 20005-4070; telephone (800) 926-7337; <http://www.api.org/Publications/>.

<sup>12</sup> Copies of AWWA standards discussed herein may be obtained from the American Water Works Association , 6666 W. Quincy Ave., Denver, CO 80235 ; telephone (202) 682-8000; <http://www.awwa.org/bookstore/Category.cfm?cat=ALLSTD>.

<sup>13</sup> Draft Regulatory Guide DG-1152 is available electronically under Accession No. ML063100379 in the NRC's Agencywide Documents Access and Management System (ADAMS) at <http://www.nrc.gov/reading-rm/adams.html>. Copies are also available for inspection or copying for a fee from the NRC's Public Document Room (PDR), which is located at 11555 Rockville Pike, Rockville Maryland; the PDR's mailing address is USNRC PDR, Washington, DC 20555-0001. The PDR can also be reached by telephone at (301) 415-4737 or (800) 397-4209 by fax at (301) 415-3548, and by email to [PDR@nrc.gov](mailto:PDR@nrc.gov).