



# REGULATORY GUIDE

## OFFICE OF NUCLEAR REGULATORY RESEARCH

### REGULATORY GUIDE 1.37

(Draft was issued as DG-1165, dated October 2006)

## QUALITY ASSURANCE REQUIREMENTS FOR CLEANING OF FLUID SYSTEMS AND ASSOCIATED COMPONENTS OF WATER-COOLED NUCLEAR POWER PLANTS

### A. INTRODUCTION

Nuclear power plants and fuel reprocessing plants include structures, systems, and components (SSCs) that prevent or mitigate the consequences of postulated accidents. In Title 10, Part 50, of the *Code of Federal Regulations* (10 CFR Part 50), “Domestic Licensing of Production and Utilization Facilities,” Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” establishes quality assurance (QA) requirements for the design, construction, and operation of such SSCs. The pertinent requirements of Appendix B to 10 CFR Part 50 apply to all activities affecting the safety-related functions of the SSCs. These activities include designing, purchasing, fabricating, handling, shipping, storing, cleaning, erecting, installing, inspecting, testing, operating, maintaining, repairing, refueling, and modifying. Appendix B requires, in part, that measures must be established to control the cleaning of material and equipment in accordance with work and inspection instructions to prevent damage or deterioration.

This regulatory guide describes methods that the staff of the U.S. Nuclear Regulatory Commission (NRC) considers acceptable for use in complying with the Commission’s QA-related regulations regarding the cleaning and cleanliness control of fluid systems and associated components for nuclear power plants during manufacturing, construction, repairs, and modifications. This regulatory guide will support the review of applications that the agency expects to receive for new nuclear reactor construction permits, standard plant design certifications, early site permits, and combined licenses through the construction phase.

---

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. ML070250571.

---

This regulatory guide contains information collections, covered by the requirements of 10 CFR Part 50 and 10 CFR Part 52, “Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants,” that the Office of Management and Budget (OMB) approved under OMB control numbers 3150-0011 and 3150-0151, respectively. 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 March 1973, the Atomic Energy Commission (AEC) issued Regulatory Guide (RG) 1.37, which generally endorsed the provisions and recommendations in American National Standards Institute (ANSI) N45.2.1-1973, “Cleaning of Fluid Systems and Associated Components During Construction Phase of Nuclear Power Plants.”<sup>1</sup> This ANSI standard contained QA criteria for onsite cleaning of materials and components, cleanness control, and preoperational cleaning and layup of nuclear plant fluid systems. The AEC found that ANSI N45.2.1-1973 provided an adequate basis for complying with the pertinent QA requirements of Appendix B to 10 CFR Part 50, subject to six additional regulatory positions.

In 1975, the American Society of Mechanical Engineers (ASME), Committee on Nuclear Quality Assurance (NQA), accepted the overall responsibility to develop and maintain nuclear power QA standards. Four years later, ASME issued NQA-1, “Quality Assurance Program Requirements for Nuclear Power Plants.”<sup>2</sup> That standard was based on ANSI N45.2-1977, “Quality Assurance Program Requirements for Nuclear Facilities”; ANSI N46.2, Revision 1, “Quality Assurance Program Requirements for Post-Reactor Nuclear Fuel Cycle Facilities”; and seven other standards in ANSI N45.2. Then, in 1983, ASME issued NQA-2, “Quality Assurance Requirements for Nuclear Power Plants,” based on seven standards in ANSI N45, including ANSI N45.2.1-1980, “Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants.” Six years later, ASME issued NQA-3, “Quality Assurance Program Requirements for the Collection of Scientific and Technical Information on Site Characterization of High-Level Nuclear Waste,” to expand the QA standards to address site characterization of high-level nuclear waste repositories. Then, in the 1990s, ASME restructured the NQA standards into a single, multipart document. Initially issued as NQA-1-1994, that standard included criteria and nonmandatory guidance to establish and implement a QA program for any nuclear facility application, and was divided into four parts:

- Part I contained QA program criteria for the siting, design, construction, operation, and decommissioning of nuclear facilities.
- Part II contained the QA criteria for planning and conducting fabrication, construction, modification, repair, maintenance, and testing of systems, components, or activities for nuclear facilities.
- Part III contained nonmandatory guidance and application appendices.
- Part IV contained NQA position papers, application matrices for users, cross-reference comparisons to NQA, and other program information.

---

<sup>1</sup> Copies of ANSI N45.2.1-1973 may be obtained from the American National Standards Institute, 1819 L Street, NW, 6<sup>th</sup> Floor, Washington, DC 20036; telephone (202) 293-8020; fax (202) 298-9287; <http://www.ansi.org/>.

<sup>2</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://catalog.asme.org/home.cfm?CATEGORY=CS&TaxonomyItemID=3021>.

ASME NQA-1-1994, Part II, Subpart 2.1, “Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants,” contains updated QA criteria for ANSI N45.2.1-1973.

This revision of RG 1.37 endorses ASME NQA-1-1994, Part II, Subpart 2.1 as a generally acceptable standard. In preparing this revision, the staff compared ANSI N45.2.1-1973 to ASME NQA-1-1994, Part II, Subpart 2.1, and evaluated the differences between the two standards, as well as the need for additional regulatory positions associated with endorsing ASME NQA-1-1994, Part II, Subpart 2.1. This comparison revealed that although the text may have changed, the content and intent of these standards have not.

On the basis of the staff’s evaluation, Regulatory Positions 1 and 2 of this revision of RG 1.37 update Regulatory Positions 1 and 3 from the original version of RG 1.37, with respect to endorsing the applicable sections of ASME NQA-1-1994, Part II, Subpart 2.1. The other regulatory positions from the original version of RG 1.37 are no longer needed because they have been subsumed into ASME NQA-1-1994, Part II, Subpart 2.1. However, Regulatory Position 3 is new and states that licensees should follow the precautions in ASME NQA-1-1994, Part III, Subpart 3.2, Nonmandatory Appendix 2.1, “Guidance on Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants.” In addition, the new Regulatory Position 3 includes a recommendation to use a suitable chloride stress-corrosion cracking inhibitor when using fresh water to flush systems containing austenitic stainless steel components.

## **C. REGULATORY POSITION**

The NRC staff finds that the provisions and recommendations included in ASME NQA-1-1994, Part II, Subpart 2.1 are generally acceptable for onsite cleaning of materials and components, cleanliness control, and preoperational cleaning and layup of water-cooled nuclear power plant fluid systems. These provisions and recommendations provide an adequate basis for complying with the pertinent QA requirements of Appendix B to 10 CFR Part 50, subject to the following regulatory positions:

### **1. Referenced Documents**

Section 7 of the Introduction to ASME NQA-1-1994, Part II, which is applicable to Subpart 2.1, states that the codes, standards, and specifications referenced in this Part may be identified with the applicable date or citation at the point of reference or in Table entitled “Codes, Standards, and Specifications Referenced in Text.” The specific applicability or acceptability of these listed documents has been (or will be) covered separately in other regulatory guides or in Commission regulations, as appropriate.

### **2. Water Quality**

Section 3.4.1 of ASME NQA-1-1994, Part II, Subpart 2.1 states that “the water quality for mixing cleaning solutions, rinsing, and flushing shall be specified by the organization responsible for cleaning unless otherwise stipulated in procurement documents or approved procedures.” The water quality for final flushes of fluid systems and associated components should be at least equivalent to the quality of the operating system water.

### **3. Precautions**

Sections 8.2.2 and 8.2.3 of ASME NQA-1-1994, Part II, Subpart 2.1 provide precautions related to the use of alkaline cleaning solutions and chelating agents, respectively, by referencing nonmandatory Appendix 2.1 to ASME NQA-1-1994, Part III, Subpart 3.2. These precautions should be followed. In addition, a suitable chloride stress-cracking inhibitor should be added to the fresh water used to flush systems containing austenitic stainless steels.

## 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 through the construction phase only; 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-1165, "Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants."<sup>3</sup> The NRC issued DG-1165 in October 2006 to solicit public comment on the draft of this Revision 1 of Regulatory Guide 1.37.

---

<sup>3</sup> Draft Regulatory Guide DG-1165 is available electronically under Accession #ML063040652 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) 397-4205, by fax at (301) 415-3548, and by email to [PDR@nrc.gov](mailto:PDR@nrc.gov).