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Comparisons of ANSI Standards Cited in the NRC Standard Review Plan, NUREG–0800, and Related Documents

Prepared by
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Prepared for
U.S. Nuclear Regulatory Commission

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Abstract

This report provides the results of comparisons of the cited and latest versions of ANSI standards cited in the NRC Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (NUREG 0800) and related documents. The comparisons were performed by Battelle Pacific Northwest Laboratories in support of the NRC's Standard Review Plan Update and Development Program. Significant changes to the standards, from the cited version to the latest version, are described and discussed in a tabular format for each standard. Recommendations for updating each citation in the Standard Review Plan are presented. Technical considerations and suggested changes are included for related regulatory documents (i.e., Regulatory Guides and the Code of Federal Regulations) citing the standard. The results and recommendations presented in this document have not been subjected to NRC staff review.

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Background and Purpose

This report provides the results of comparisons of the cited and latest versions of ANSI standards cited in the Nuclear Regulatory Commission (NRC) Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (NUREG 0800) and associated Regulatory Guides and Code of Federal Regulations (CFR) sections. The comparisons were performed by Battelle Pacific Northwest Laboratories in support of the NRC's Standard Review Plan Update and Development Program (SRP-UDP) under JCN L-2013, and will be used by the NRC to evaluate whether the SRP citations to ANSI standards should be updated. The report will also afford nuclear plant vendors, utilities, and the public an opportunity to review and provide comments on the rationale and supporting documentation for updating citations to ANSI standards in the SRP and associated Regulatory Guides and CFR sections. The NRC will publish a Federal Register Notice of availability of this document and solicit public comments on whether ANSI standard citations should be updated, and if so, what exceptions should be included with the citation.

Contents

This document presents the comparisons of selected ANSI standards cited in the SRP and associated Regulatory Guides and CFR sections. Straightforward comparisons are presented first, followed by problematic comparisons, e.g., those requiring further analysis or involving a number of significant changes. "Significant," as used herein, is defined as that which the NRC has relied upon to establish a position in the regulatory document, and specifically, in the case of SRP citations, that which is relied upon as the basis for SRP acceptance criteria.

A separate section has been prepared for each ANSI standard comparison. Each section is comprised of three parts. Part I lists the sources and locations of the citations of the standard in the SRP and associated Regulatory Guides and CFR sections and briefly describes the context of the citation.

Part II presents a detailed comparison of the cited version of the standard to the latest version in a tabular format and discusses the ramifications of updating the citation to the latest version.

Part III presents further consideration of the effects of the changes described in Part II on the SRP and associated Regulatory Guides and CFR sections citing the standard. Recommendations for updating each citation in the SRP to the latest version are presented. Technical considerations and suggested changes are also included for related regulatory documents citing the ANSI standard in Part III.

METHODOLOGY

ANSI standards were selected for comparison based on the following criteria:

1. Comparisons are considered for standards cited in SRP Sections, Regulatory Guides and Title 10 of the CFR. Comparisons are not performed on standards cited in other documents unless specifically requested by the NRC.

2. Comparisons are performed for standards cited in the SRP if the citation is determined to have safety significance, i.e., if it provides a basis for SRP acceptance criteria.

3. Comparisons are performed for standards cited in the Regulatory Guides that have potential impact on associated SRP sections, unless the citation is a secondary reference or the standard is cited in a portion of the Regulatory Guide which is not applicable to the associated SRP section.

4. Comparisons are performed for standards cited in the 10 CFR if the citation has potential impact on the associated SRP section(s).

A side-by-side comparison of the cited and latest versions is made to identify any changes that are "significant" as defined above. Significant differences between the cited and latest versions are presented and discussed in tabular form in Part II. To facilitate evaluation of the citations and presentation of the results, significant differences are classified into one of five change types, as listed below:

1. new or changed requirements affecting established NRC positions and requirements,

2. new or changed requirements not addressed by established NRC positions and requirements,

3. new or changed requirements allowing more flexibility,

4. deleted or relaxed requirements, and

5. new or changed requirements implementing or adding detail to established NRC regulatory positions.

Part III presents further consideration of the effects of the changes described in Part II on the SRP and associated regulatory documents citing the standard. Those changes classified as types 1 - 4 are summarized in this section based on their regulatory importance. Evaluations and recommendations regarding action on the specific citations are also presented.

Results

An overall summary of results is given in Section 1.5 of the Introduction. In this summary, recommendations and suggestions are tabulated by ANSI standard for each of the documents citing the standard. Results of the ANSI standard comparisons show that updating of the SRP relative to its citation of and reliance on ANSI standards for acceptance criteria involves coordination with revisions to other regulatory documents, especially the NRC's Regulatory Guides. In many cases, citations can be updated to cite the latest version of the standard, but usually with exceptions necessary to preserve established regulatory positions. These exceptions can be addressed in a corresponding Regulatory Guide that may already exist and which may delineate exceptions to the cited version of the ANSI standard. Alternatively, the exceptions could be addressed in some other reference document or included in the SRP. For several of the ANSI standards, considerable analysis is required for proper evaluation and eventual endorsement of more recent versions of ANSI standards than those currently cited in the SRP.

ANSI	American National Standards Institute
CFR	Code of Federal Regulations
NRC	Nuclear Regulatory Commission
NUREG	NRC Technical Report Designation
PNL	Pacific Northwest Laboratory
SRP	Standard Review Plan
SRP-UDP	Standard Review Plan Update & Development Program

Background information on the Nuclear Regulatory Commission (NRC) Standard Review Plan Update Development Program (SRP-UDP) effort to evaluate citations to ANSI standards is provided in Section 1.1. The purpose and anticipated use of this document are described in Section 1.2. The contents of the document are described in Section 1.3. Section 1.4 describes the methodology for selecting the standards and performing the comparisons. Section 1.5 provides a summary of the results of the comparisons. The current status of the comparisons is discussed in Section 1.6.

1.1 Background

A large number of nuclear industry consensus codes and standards are cited and referenced in regulatory documents such as the NRC Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants - NUREG-0800 (SRP), Regulatory Guides, the Code of Federal Regulations (CFR), NRC Bulletins, Information Notices, Circulars, Generic Letters, and Policy Statements. A list of these citations and references is available as NUREG/CR-5973, "Codes and Standards and other Guidance Cited in Regulatory Documents," prepared by Pacific Northwest Laboratory (PNL) as part of the SRP-UDP.

As noted in NUREG/CR-5973, only a small percentage of the codes and standards cited in the regulatory documents are the latest versions of those codes and standards. To assess the regulatory impact of revising the citations to the latest versions of the codes and standards, comparisons of the cited and latest[1] versions of selected standards have been performed by PNL as part of the SRP-UDP under JCN L-2013.

1.2 Purpose and Anticipated Use of this Document

It is anticipated that the information and recommendations in this ANSI comparison topical report will be used by the NRC to evaluate whether the SRP citations to ANSI standards should be updated. This report will also afford nuclear plant vendors, utilities, and the public an opportunity to review and comment on the rationale and supporting documentation for updating citations to ANSI standards in the SRP and associated Regulatory Guides and CFR sections.

(1) For many of the standards, the regulatory documents cite different versions of the standard. The "cited" version is that which was chosen as representative of the citations for that standard for comparison to the "latest" version. The term "latest" refers to that version of the ANSI standard which was used as the reference version for comparison to the cited version. In most cases the "latest" version is the version in effect at the time the comparison was performed. Any exceptions to this will be addressed in the specific sections on the affected standards.

1.3 Contents of this Document

This document presents the comparisons of selected ANSI standards cited in the SRP and associated Regulatory Guides and CFR sections. The basis for selection of those standards for comparison is discussed in Subsection 1.4, Methodology. Straightforward comparisons are presented first. Problematic comparisons (e.g., those requiring further analysis, and or those involving a number of significant changes) are presented last.

A separate section has been prepared for each ANSI standard comparison. Each section is comprised of three parts. Part I lists the sources and location of the citations of the standard in the SRP and associated Regulatory Guides and CFR sections and briefly describes the context of the citation.

Part II presents a detailed comparison of the cited version of the standard to the latest version in a tabular format and discusses the ramifications of updating the citation to the latest version.

Part III presents further consideration of the effects of the changes described in Part II on the SRP and associated Regulatory Guides and CFR sections citing the standard. Recommendations regarding action on the citation are also presented.

1.4 Methodology

The methodology for selection of standards for comparison as well as guidelines for performing the comparisons are described below.

1.4.1 Selection of Standards

ANSI standards were selected for comparison based on the following criteria:

1. Standard comparisons are considered for citations from SRP Sections, Regulatory Guides, and Title 10 of the CFR. Comparisons are not performed on standards cited in other documents unless they are specifically requested by the NRC.

2. Comparisons are performed for standards cited in the SRP if the citation is determined to have "safety significance," i.e., if it provides a basis for SRP acceptance criteria.

3. Comparisons are performed for standards cited in the Regulatory Guides that have potential impact on associated SRP sections unless:

   a. The citation is a secondary reference and the performance of a comparison is not justified, or

   b. The standard is cited in a portion of the Regulatory Guide which is not applicable to the associated SRP Section.

4. Comparisons are performed for standards cited in the 10 CFR if the citation has potential impact on the associated SRP(s).

1.4.2 Performance of Standard Comparisons

A side-by-side comparison of the cited and latest versions is made to identify changes that are "significant." "Significant," as used herein, is defined as that which the NRC has relied upon to establish a position in the regulatory document, and specifically, in the case of SRP citations, that which is relied upon as the basis for SRP acceptance criteria. For example, a change to a standard is deemed to be "significant" if the revised wording, deletion, or addition is not consistent with regulatory requirements or recommendations. Any change that constitutes a relaxation of standard requirements is considered to be significant. Similarly, added or deleted requirements are considered significant unless the change clearly and explicitly aligns the standards with latest regulatory criteria. Changes that use a modified method, test, or process to achieve the same results are also considered significant until they are reviewed and accepted by the NRC. Significant changes identified in the side-by-side comparison are presented and discussed in Part II of the section for that ANSI standard.

To facilitate evaluation of the citations and presentation of the evaluation, significant differences between the cited and latest versions are classified into one of five change types, listed below:

1. new or changed requirements affecting established NRC positions and requirements,
2. new or changed requirements not addressed by established NRC positions and requirements,
3. new or changed requirements allowing more flexibility,
4. deleted or relaxed requirements, and
5. new or changed requirements implementing or adding detail to established NRC regulatory positions.

Part III presents further consideration of the effects of the changes described in Part II on the SRP and associated Regulatory Guides and CFR sections citing the standard. Those changes classified as types 1 - 4 are summarized in this section based on their regulatory importance. Evaluations and recommendations regarding action on the SRP citations are presented in Part III. Technical considerations and suggested changes are also included for related regulatory documents citing the ANSI standard.

1.5 Summary of Results

The results of the ANSI standard comparisons are summarized in this section. In this summary, recommendations, considerations, and suggestions are tabulated by ANSI standard for those regulatory documents citing the standard. The results of the straightforward comparisons are presented first, followed by the results for the problematic comparisons.

STRAIGHTFORWARD COMPARISONS

ANSI Standard	Cited Version	Latest Version	Report Section	Citing Document(s)
N13.10	**1974**	**ANSI/IEEE N42.18-1980 (R1991)**	**2.1**	**SRP Section 11.5 (3 places), Regulatory Guide 4.15 (2 places)**

ANSI N13.10-1974, cited in SRP Section 11.5, has been redesignated and subsequently reaffirmed. There are no differences between the latest reaffirmation in 1991 and the cited version. Consider revising SRP Section 11.5 to cite ANSI/IEEE N42.18-1980 (R1991).

N16.2	**1969**	**ANSI/ANS 8.3-1986**	**2.2**	**SRP Section 12.3-12.4 (3 places)**

N16.2 was revised and redesignated as ANSI/ANS 8.3. No side-by-side comparison is necessary between the cited version (ANSI N16.2-1969) and the latest version (ANSI/ANS 8.3-1986) of the standard. The latest version of the standard is currently endorsed by Revision 2 of Regulatory Guide 8.12. This existing regulatory endorsement supersedes the need to perform a comparison of the two standards.

N42.3	**1969**	**ANSI/IEEE 309-1970 (R1991)**	**2.3**	**SRP Section 12.5 (2 places), Regulatory Guide 8.6 (2 places)**

ANSI N42.3-1969, cited in SRP Section 12.5 and endorsed by Regulatory Guide 8.6, has been redesignated and subsequently reaffirmed four times. There are no differences between the latest reaffirmation in 1991 and the cited version. Consider revising SRP Section 12.5 to cite ANSI/IEEE 309-1970 (R1991).

N237	**1976**	**ANSI/ANS 18.1-1984**	**2.4**	**SRP Section 12.2 (5 places), Regulatory Guide 8.8 (2 places), Regulatory Guide 1.70 (2 places) Regulatory Guide 1.112 (1 place)****

The changes identified to be significant do not appear to reduce requirements. Consider replacing the citations to N237 with ANSI/ANS 18.1-1984.

KEY TO NOTES

*	Date of cited Standard is inferred from the context of the citation in the regulatory document.
**	Regulatory Guide 1.112 cites a 1975 draft of ANSI N237.
R	Indicates standard is "reaffirmed" without revision.

PROBLEMATIC COMPARISONS

ANSI Standard	Cited Version	Latest Version	Report Section	Citing Document(s)
A58.1	**1972**	**ANSI/ ASCE 7- 1988**	**3.1**	**SRP Section 2.3.1 (3 places), SRP Section 3.3.1 (3 places), SRP Section 3.3.2 (4 places)**

ANSI/ASCE 7-88 involves a fundamental change in the way in which wind loads and snow loads were determined in ANSI A58.1-1972. ANSI/ASCE 7-1988 appears to provide a more through analytical approach to determining design wind and snow loads. Consider updating the citation of ANSI A58.1-1972 with ANSI/ASCE 7-1988.

N2.1	**1969**	**1989**	**3.2**	**Regulatory Guide 8.1 (1 place)**

It appears that the provisions of ANSI N2.1-1989 are less restrictive than those of both the 1969 version and the applicable sections of the CFR. If the latest version is cited, Regulatory Guide 8.1 should specify that the color provisions as stated in the CFR should also be met.

N13.7	**1972**	**1983 R1989**	**3.3**	**SRP Section 12.5 (1 place), Regulatory Guide 8.3 (1 place)**

The deletion in ANSI N13.7-1983 of the attributes of ANSI N13.7-1972 that were endorsed by Regulatory Guide 8.3 appears to be a significant change. Given the reduction in scope, a change to the 1983 version is not recommended. In addition, the use of thermoluminescent dosimeters has largely replaced film badge usage and a revision to Regulatory Guide 8.3 may not be needed at this time. Consideration should also be given to deletion of ANSI N13.7 from the list of references in SRP Section 12.5.

N18.1	**1971**	**ANSI/ANS 3.1-1993**	**3.4**	**SRP Section 13.1.1 (1 place),* SRP Section 13.1.2-13.1.3 (2 places),* SRP Section 13.4 (2 places),* Regulatory Guide 1.8 (2 places)**

Changes generally involve new, expanded or modified requirements that appear to exceed those of the cited version. Differences were also identified that involve reductions in requirements. NRC staff review is necessary to determine the acceptability of updating the citations to the 1993 version.

KEY TO NOTES

* Date of cited Standard is inferred from the context of the citation in the regulatory document.

** Regulatory Guide 1.112 cites a 1975 draft of ANSI N237.

R Indicates standard is "reaffirmed" without revision.

N18.17	**1973**	**ANSI/ANS 3.3-1988**	**3.5**	**SRP Section 13.6 (3 places),* Regulatory Guide 1.70 (3 places)**

Consider replacing the citations to N18.17 in SRP Section 13.6 and Regulatory Guide 1.70 with ANSI/ANS 3.3-1988. Although the 1988 version reflects the requirements of 10 CFR Part 73 to a large degree, additional reviews for conformance with specific elements of Part 73 is recommended to ensure all necessary regulatory exceptions to the 1988 standard are identified.

N195	**1976**	ANS 59.51-1989	**3.6**	**SRP Section 9.5.4 (3 places),* Regulatory Guide 1.137 (7 places)**

A number of significant differences were identified between the 1976 and 1989 versions. Further NRC staff review is needed to determine whether the SRP citation should be updated.

KEY TO NOTES

*	Date of cited Standard is inferred from the context of the citation in the regulatory document.
**	Regulatory Guide 1.112 cites a 1975 draft of ANSI N237.
R	Indicates standard is "reaffirmed" without revision.

1.6 Current Status of the ANSI Standard Comparisons

The ANSI standard comparisons presented herein have been prepared by PNL and have not been reviewed by the NRC staff. Therefore the suggestions and recommendations contained in this report are the work of PNL, and their implementation is contingent upon NRC acceptance of justifications for revisions to the SRP and other regulatory documents citing the ANSI standards. It is anticipated that PNL's recommendations for SRP citations in the straightforward standard comparisons presented in Section 2 will be implemented, subject to NRC staff review and NRC resolution of public comments. Further NRC staff review and evaluation, including resolution of public comments will be needed prior to updating the SRP citations for the problematic standard comparisons presented in Section 3 of this report. Comments and suggestions concerning the comparisons are solicited, specifically on whether an update to the latest version is appropriate and on any necessary exceptions and qualifications required to update citations to the latest version. Please reply by mail to Gene Y. Suh, SRP-UDP Engineer (JCN L-2013), at the following address:

Mr. Gene Y. Suh
U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Mail Stop 0-12 E4
Washington, DC 20555-0001

Section 2

STRAIGHTFORWARD COMPARISONS

2.1 ANSI Standard N13.10 Comparison

This section presents a comparison of the version of ANSI N13.10 cited in the Standard Review Plan (SRP) and associated Regulatory Guides and Code of Federal Regulation (CFR) sections with the latest version of the standard, in support of the Nuclear Regulatory Commission's (NRC's) Standard Review Plan Update and Development Program (SRP-UDP).

CITED STANDARD:

ANSI N13.10-1974, "Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents"

LATEST STANDARD:

ANSI/IEEE N42.18-1980 (Reaffirmed 1991), "Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents"

CONTENTS

I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI N13.10-1974 in the SRP and associated Regulatory Guides and 10 CFR sections. Recommendations on the disposition of these citations based on the results of this standard comparison are presented in Part III, Recommendations.

SRP Citations

ANSI N13.10-1974 was redesignated as ANSI/IEEE N42.18 and reaffirmed on August 15, 1980. Since that time, the ANSI/IEEE N42.18 standard has been reaffirmed by ANSI on April 30, 1985 and March 19, 1991. Therefore, the provisions of the latest and cited versions of the standard are identical.

SRP Section 11.5

Revision/Title: Section 11.5, Rev. 3, July 1981, "Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems"

Location: SRP Section 11.5 cites ANSI N13.10-1974 in Subsection III.1.d, Review Procedures; in Subsection VI, References; and in Table I of Appendix 11.5-A.

Context: ANSI N13.10-1974 is endorsed by the SRP in the Review Procedures for Operating License (OL) review of the applicant's monitoring instrumentation specifications and performance criteria. SRP Section 11.5 also lists ANSI N13.10-1974 as Reference 8 in Subsection VI. ANSI N13.10-1974 is also cited in Table I of SRP Section 11.5 Appendix 11.5-A as design criteria for radiological effluent monitoring instrumentation, providing a signal for the actuation of a system used to reduce releases of radioactive materials in effluents within plant Technical Specification limits (but not required to initiate actuation for an ESF system).

Other Citations

Regulatory Guide 4.15

Revision/Title: Rev. 1, February 1979, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment"

Location: Regulatory Guide 4.15 cites ANSI N13.10-1974 in Regulatory Position C.7 and References, Reference 18.

Context: ANSI N13.10-1974 is endorsed in Regulatory Position C.7 for guidance on specification and performance of onsite instrumentation for continuously monitoring radioactivity in effluents and is listed as Reference 18.

II. CITED VS. LATEST STANDARD DIFFERENCES

This part of the comparison presents those changes from the cited version (1974) to the latest version (1980, R1991) identified for ANSI N13.10. The comparison of differences between the standards was not performed since the provisions of the latest version of the standard, ANSI/IEEE N42.18-1980 (Reaffirmed 1991) are identical to those of the version cited (ANSI N13.10-1974) in SRP Section 11.5, Revision 3 and Regulatory Guide 4.15, Revision 1.

III. RECOMMENDATIONS

This part of the comparison summarizes significant differences (identified in Part II) between the cited and latest versions of the standard and addresses their regulatory effects on the citing documents. Those changes in the standard that only added detail to existing requirements are not included in the summary of significant differences. The regulatory citations to ANSI N13.10 (identified in Part I) are evaluated based on the significant differences between the cited and latest versions of this standard. Citations in the SRP are evaluated first, followed by citations in associated Regulatory Guides and 10 CFR sections. Recommendations concerning the updating of these citations as they relate to the SRP-UDP are also included in this part of the comparison.

Summary of Significant Differences

No significances were identified. The standard cited in SRP Section 11.5 (ANSI N13.10-1974) and endorsed and supplemented by Regulatory Guide 4.15 in Regulatory Position C.7 has been redesignated as ANSI/IEEE N42.18 and subsequently reaffirmed three times. The last reaffirmation occurred in 1991. Thus, there are no differences between the provisions of the latest and cited versions of the standard.

SRP Citations to the Standard

SRP Section 11.5 - Consider revising SRP Section 11.5 to endorse ANSI/IEEE N42.18-1980 (R1991). There are no significant differences between the provisions of the latest and cited versions of the standard. Specific changes recommended are as follows:

SRP Section 11.5 Location	Suggested Changes
III.1.d, Review Procedures	Consider revising the Review Procedures to cite ANSI/IEEE N42.18-1980 (R1991).
Subsection VI, References	Consider revising the References to list ANSI/IEEE N42.18-1980 (R1991).
Table I of Appendix 11.5-A.	Consider Table 1 to cite ANSI/IEEE N42.18-1980 (R1991).

Other Regulatory Citations to the Standard

Regulatory Guide 4.15 (February 1979) - Consider revising Regulatory Guide 1.45 to endorse ANSI/IEEE N42.18-1980 (R1991). There are no significant differences between the provisions of the latest and cited versions of the standard. Specific changes recommended are as follows:

Regulatory Guide 4.15 Location	Suggested Changes
Regulatory Position C.7	Consider revising the Regulatory Position to cite ANSI/IEEE N42.18-1980 (R1991).
References, Reference 18	Consider revising Reference 18 to list ANSI/IEEE 42.18-1980(R1991).

2.2 ANSI Standard N16.2 Comparison

This section presents a comparison of the version of ANSI N16.2 cited in the Standard Review Plan (SRP) and associated Regulatory Guides and Code of Federal Regulation (CFR) sections with the latest version of the standard, in support of the Nuclear Regulatory Commission's (NRC's) Standard Review Plan Update and Development Program (SRP-UDP).

CITED STANDARD:

ANSI N16.2-1969, "Criticality Accident Alarm System"

LATEST STANDARD:

ANSI/ANS 8.3-1986, "Criticality Accident Alarm System"

CONTENTS

I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI N16.2 in the SRP and associated Regulatory Guides and 10 CFR sections. Recommendations on the disposition of these citations based on the results of this standard comparison are presented in Part III, Recommendations.

SRP Citations

SRP Section 12.3-12.4

Revision/Title: Section 12.3-12.4, Rev. 2, July 1981, "Radiation Protection Design Features"

Location: SRP 12.3-12.4 cites ANSI N16.2-1969 in the Subsection II, "Acceptance Criteria," and in Subsection IV, "Evaluation Findings."

Context: ANSI N16.2-1969 is endorsed for guidance and criteria for instrumentation to monitor for accidental criticality.

Other Citations

Regulatory Guide 8.12

Revision/Title: Rev. 2, October 1988, "Criticality Accident Alarm System"

Location: Regulatory Guide 8.12 cites ANSI/ANS 8.3-1986 in Subsection B, "Discussion," and in Subsection C, "Regulatory Position." (ANSI N16.2-1969 was revised and redesignated as ANSI/ANS 8.3 in 1979.)

Context: ANSI/ANS 8.3-1986 is endorsed by Regulatory Guide 8.12, with limitations, for guidance on criticality accident alarm systems.

II. CITED VS. LATEST STANDARD DIFFERENCES

No side-by-side comparison is necessary between the cited version (ANSI N16.2-1969) and the latest version (ANSI/ANS 8.3-1986) of the standard. The latest version of the standard is currently endorsed by Regulatory Guide 8.12. This existing regulatory endorsement supersedes the need to perform a comparison of the two standards.

III. RECOMMENDATIONS

This part of the comparison summarizes significant differences (identified in Part II) between the cited and latest versions of the standard and addresses their regulatory effects on the citing documents. The regulatory citations to ANSI N16.2 (identified in Part I) are evaluated based on the significant differences between the cited and latest versions of this standard. Citations in the SRP are evaluated first, followed by citations in associated Regulatory Guides and 10 CFR sections. Recommendations concerning the updating of these citations as they relate to the SRP-UDP are also included in this part of the comparison.

Summary of Significant Differences

The 1969 version of ANSI N16.2 was revised and redesignated as ANSI/ANS 8.3 in 1979. That revision also incorporated features of ANSI N2.3-1979, "Immediate Evacuation Signal for Use in Industrial Installations." In 1986, ANSI N2.3-1979 and ANSI/ANS 8.3-1979 were consolidated, provisions relating to emergency planing were removed, and the resulting standard was issued as ANSI/ANS 8.3-1986, the latest version of the standard. Consequently, there has been a substantial amount of revision between the cited version (ANSI N16.2-1969) and the latest version of the standard. However, a side-by-side comparison was not necessary. The latest version (ANSI/ANS 8.3-1986) of the standard is endorsed (with some exceptions) by Regulatory Guide 8.12, "Criticality Accident Alarm Systems," Revision 2, dated October 1988, as providing acceptable guidance for criticality alarm systems. SRP Section 12.3-12.4 cites Regulatory Guide 8.12 as Acceptance Criteria. Because the latest version of the standard is endorsed by Regulatory Guide 8.12, and the Regulatory Guide is cited as Acceptance Criteria in the SRP, it is recommended that the SRP citation of ANSI N16.2-1969 be updated to cite ANSI/ANS 8.3-1986.

SRP Citations to the Standard

Section 12.3-12.4, Radiation Protection Design Features (July 1981)

Recommendations for updating specific references in SRP Section 12.3-12.4 are as follows:

SRP Section 12.3-12.4 Section	Recommendation
II. ACCEPTANCE CRITERIA, 19.	Consider replacing the citation of "ANSI N16.2-1969, "Criticality Accident Alarm Systems,"" with "ANSI/ANS 8.3-1986, "Criticality Accident Alarm System.""
II. ACCEPTANCE CRITERIA, 4.	Consider replacing the citation of "ANSI N16.2" with "ANSI/ANS 8.3-1986."
IV. EVALUATION FINDINGS	Consider replacing the citation of "ANSI Standard N16.2" with "ANSI/ANS 8.3-1986."

Other Regulatory Citations to the Standard

Regulatory Guide 8.12, Criticality Accident Alarm System

Because Regulatory Guide 8.12 endorses the latest version of the standard, no changes are necessary.

2.3 ANSI Standard N42.3 Comparison

This section presents a comparison of the version of ANSI N42.3 cited in the Standard Review Plan (SRP) and associated Regulatory Guides and Code of Federal Regulation (CFR) sections with the latest version of the standard, in support of the Nuclear Regulatory Commission's (NRC's) Standard Review Plan Update and Development Program (SRP-UDP).

CITED STANDARD:

ANSI N42.3-1969 (IEEE 309-1970), "Test Procedure for Geiger-Mueller Counters"

LATEST STANDARD:

ANSI/IEEE 309-1970, R1991, "Test Procedure for Geiger-Mueller Counters"

CONTENTS

I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI N42.3 in the SRP and associated Regulatory Guides and 10 CFR sections. Recommendations on the disposition of these citations based on the results of this standard comparison are presented in Part III, Recommendations.

SRP Citations

SRP Section 12.5

Revision/Title: Section 12.5, Rev. 2, July 1981, "Operational Radiation Protection Program"

Location: SRP 12.5 cites ANSI N42.3-1969 in the Subsection 28 of Section II, "Acceptance Criteria," and as Item 33 in Section VI., "References."

Context: ANSI N42.3-1969 is endorsed by SRP 12.5, in Subsection 28 of Section II, "Acceptance Criteria," and Section VI, "References." The standard is cited for guidance on the specification of test conditions for counters, such as associated electronic circuitry, environment, counting rate, to assure that operating characteristics can be appropriately evaluated.

Other Citations

Regulatory Guide 8.6

Revision/Title: Rev. 0 , May 1973, "Standard Test Procedure for Geiger-Mueller Counters"

Location: Regulatory Guide 8.6 cites ANSI N42.3-1969 in Section B "Discussion," and C "Regulatory Position.

Context: ANSI N42.3-1969 (IEEE No. 309) is endorsed by Regulatory Guide 8.6 for test procedures to determine the acceptability of the operating characteristics of Geiger-Muller counters.

II. CITED VS. LATEST STANDARD DIFFERENCES

This part of the comparison presents those changes from the cited version (1969) to the latest version (1970, R1991) identified for ANSI N42.3. ANSI N42.3-1969 (IEEE 309-1970) was approved by ANSI on December 23, 1969. Since that time, the ANSI/IEEE standard has been reaffirmed by IEEE in 1974, 1980, 1984, and 1991. Therefore, the provisions of the cited and latest versions of the standard are identical and no changes were identified.

III. RECOMMENDATIONS

This part of the comparison summarizes significant differences (identified in Part II) between the cited and latest versions of the standard and addresses their regulatory effects on the citing documents. The regulatory citations to ANSI N42.3 (identified in Part I) are evaluated based on the significant differences between the cited and latest versions of this standard. Citations in the SRP are evaluated first, followed by citations in associated Regulatory Guides and 10 CFR sections. Recommendations concerning the updating of these citations as they relate to the SRP-UDP are also included in this part of the comparison.

Summary of Significant Differences

The cited standard, ANSI N42.3-1969 (IEEE 309-1970), was reaffirmed in 1991. Since there are no differences between the latest standard and the cited standard, no changes are addressed here.

SRP Citations to the Standard

Section 12.5, Operational Radiation Protection Program (July 1981)

Although there are no differences in the cited version of ANSI N42.3 and its latest version, it is recommended that SRP 12.5 be revised to cite the latest version.

Recommendations for updating specific references in SRP Section 12.5 are as follows:

SRP Section 12.5 Section	Recommendation
II. ACCEPTANCE CRITERIA	Consider replacing the citation of ANSI N42.3-1969, "Test Procedure for Geiger-Mueller Counters," with ANSI/IEEE 309-1970 (R1991), "Test Procedure for Geiger-Mueller Counters."
	Consider annotating the citation of Regulatory Guide 8.6, in item 7 of the Acceptance Criteria, with a reference to IEEE 309 - 1970 (R1991).
VI. REFERENCES	Consider replacing 33. ANSI-N42.3, "Test Procedure for Geiger-Mueller Counters" with 33. ANSI/IEEE 309-1970 (R1991), "Test Procedure for Geiger-Mueller Counters."

Other Regulatory Citations to the Standard

Regulatory Guide 8.6, Standard Test Procedure for Geiger-Mueller Counters (May 1973) - Although there are no differences between the cited version of ANSI N42.3 and its latest version, it is suggested that Regulatory Guide 8.6, be revised to endorse the latest version of the standard. Specific recommendations for the revision follow:

Regulatory Guide 8.6 Section	Recommendation
B. DISCUSSION	Consider replacing the citation of "ANSI N42.3-1969" with "ANSI/IEEE 309-1970 (R1991)," and indicate that it was reaffirmed in 1991.
C. REGULATORY POSITION	Consider replacing the citation of ANSI N42.3-1969 (IEEE No. 309), "Test Procedure for Geiger-Muller Counters" with ANSI/IEEE 309-1970 (R1991), "Test Procedure for Geiger-Mueller Counters."

2.4 ANSI Standard N237 Comparison

This section presents a comparison of the version of ANSI N237/ANS 18.1 cited in the Standard Review Plan (SRP) and associated Regulatory Guides and Code of Federal Regulation (CFR) sections with the latest version of the standard, in support of the Nuclear Regulatory Commission's (NRC's) Standard Review Plan Update and Development Program (SRP-UDP).

CITED STANDARD:

ANSI N237/ANS 18.1-1976, "Source Term Specifications"

LATEST STANDARD:

ANSI/ANS 18.1-1984, "Radioactive Source Term for Normal Operation of Light Water Reactors"

CONTENTS

I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI N237/ANS 18.1 in the SRP and associated Regulatory Guides and 10 CFR sections. Recommendations on the disposition of these citations based on the results of this standard comparison are presented in Part III, Recommendations.

SRP Citations

SRP Section 12.2

Revision/Title: Section 12.2, Rev. 2, July 1981, "Radiation Sources"

Location: SRP Section 12.2 endorses ANSI N237-1976, "Source Term Specification," in Subsection II, "Acceptance Criteria," in Subsection IV, "Evaluation Findings," and in Subsection VI, "References."

Context: ANSI N237-1976 is endorsed in Subsection II for the establishment of typical long-term concentrations of principal radionuclides in fluid streams of light-water-cooled nuclear power plants, in Subsection IV for evaluation of source terms, and as Reference 7 in Subsection VI.

Other Citations

Regulatory Guide 8.8

Revision/Title: Rev. 3, June 1978, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be As Low As Reasonably Achievable.

Location: Regulatory Guide 8.8 endorses ANSI N237-1976 in Subsection C, "Regulatory Position," Subsection 2, "Facility and Equipment Design Features," and is listed as Reference 7 in the References Subsection.

Context: ANSI N237-1976 is endorsed by Regulatory Guide 8.8 for estimating activation source terms.

Regulatory Guide 1.70

Revision/Title: Rev. 3, November 1978, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants"

Location: Regulatory Guide 1.70 cites ANSI N237, Final Draft 1977, in Section 12, "Radiation Protection", Subsection 12.2, "Radiation Sources," Subsection 12.2.1, "Contained Sources," and as Reference 5 in the Reference Subsection. The 1977 final draft appears to be the 1976 approved version.

Context: ANSI N237-1976 is endorsed by Regulatory Guide 1.70 for guidance on sources of radiation.

Regulatory Guide 1.112

Revision/Title: Rev. 0-R, April 1976, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Light-Water-Cooled Power Reactors."

Location: Regulatory Guide 1.112 cites ANSI N237-1975 (draft) in footnote * (pg. 1.112-6) related to paragraph B.1.

Context: ANSI N237-1975 (draft) is cited with regard to standardized reactor coolant activities used in source term calculations. Given the citation of the 1976 version in SRP Section 12.2 and Regulatory Guide 8.8, a separate comparison of the 1975 draft was not performed.

II. CITED VS. LATEST STANDARD DIFFERENCES

This part of the comparison presents those changes from the cited version (ANSI N237-1976) to the latest version (ANSI/ANS 18.1-1984) identified in this comparison. Many of these changes involve formatting, editorial and grammatical differences.

Examples of differences between the cited version and the latest version of the standard that are editorial in nature and do not appear to be significant with regard to the endorsement of the standard are:

- Changes in capitalization and punctuation; replacement of "which" with "that," "may" with "might," "division" with "element classification," and "modification" with "adjustment;" and changes in the order of the words, phrases and clauses within some sentences that do not change the meaning of the sentence.

- Specific words changed for clarification. For example, the phrase "basic differences between the systems" in the cited version was replaced with the more specific term "differences in design," "radioactivity" was changed to "radioactive materials," "water and steam" was changed to "coolant" or "fluids," "three reference reactors" was changed to "three reactor types," "models" was changed to "block diagrams," "leak" was changed to "leakage," and "specific activity" was changed to "radionuclide concentration."

- Clarifying words were added. Such changes are the addition of the word "immediately" to describe the time when a system that satisfactorily passes its tests is to be returned to service, and a change from "flow" to "flow rate."

- In some places, redundant information was deleted.

- A change in the format to display exponentiation of numbers, changes in units, and changes in symbols for parameters and mathematical operators.

Other differences that do not appear to be significant involved deletion of the specification that the standard is applicable only to normal operating conditions, deletion of a statement of purpose that the standard is expected to aid the public's understanding of the impact of nuclear power, and deletion of comments on variations in the principal parameters.

Those differences between the cited and latest versions of ANSI N237 which are judged to be significant and warranted further investigation relative to the technical and regulatory effects of their citation in regulatory documents are tabulated and discussed on the following pages.

To facilitate review and consideration of their effects on ANSI N237 citations in regulatory documents, significant differences between the cited and latest versions are classified into the following change types:

1. new or changed requirements affecting established NRC positions and requirements,
2. new or changed requirements not addressed by established NRC positions and requirements,
3. new or changed requirements allowing more flexibility,
4. deleted or relaxed requirements, and
5. new or changed requirements adding detail to established NRC regulatory positions.

Further consideration of the effects of the changes presented in this section on the SRP and associated Regulatory Guides and CFR sections that cite ANSI N237 is provided in the Part III, Recommendations, of this section. Those differences classified as change types 1-4 are summarized in Part III

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 1 [Table 1]	The cited version specifies valid ranges for the parameters in terms of maximum and minimum values. The latest version does not contain valid ranges for the parameters.	1	In the cited version, valid ranges were specified for all of the principal plant parameters in Table 1. When the cited version of the standard was applied to BWRs for which the principal plant parameters were within the ranges specified in Table 1, the values in Table 5 could be used without adjustment. In the latest version, no such valid ranges are given. Therefore when applying the latest version of the standard to BWRs in which any of the plant parameters differed even slightly from the nominal values listed in Table 1, the adjustment procedure of section 3.2 must be used on the values within Table 5. Since the extremes of the ranges in Table 1 of the cited version differed from the nominal values by between 11% and 20%, it would seem likely that there are plants which were not required to follow the adjustment procedure by the cited version, but must now use the adjustment procedure to implement the latest version of the standard. The identified difference is more restrictive than in the cited version by reducing the flexibility to use the nominal values provided in the tables without need for adjustments.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
None [Table 1 footnote]	A footnote in the latest version indicates that the reference plant is assumed to be a "non-pumped forward drained plant." The footnote also describes how the parameter NC is to be determined for a "pumped forward drained plant."	5	The latest version includes a footnote that states that the values for the ratio of the condensate demineralizer flow rate to the steam flow rate (NC) are based on the assumption that the plant is a "non-pumped forward drained plant." This footnote also provides an alternate value of NC for a "pumped forward drained plant." Therefore the latest version includes information that is not present in the cited version that directly impacts the data to be used in implementing the standard.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 2 [Table 2] (Cont'd)	The following differences exist between the cited and the latest versions of the standard: - The cited version specifies valid ranges for the parameters in terms of maximum and minimum values. The latest version does not contain valid ranges for the parameters. - The nominal value for the parameter FBD (i.e., steam generator total blowdown flow) is 9000 lbs/hour in the cited version, while it is 75000 lbs/hour in the latest version.	1	In the cited version, valid ranges were specified for all of the principal plant parameters in Table 2. When applying the cited version of the standard to PWRs with U-tube steam generators for which the principal plant parameters were within the ranges specified in Table 1, the values in Table 6 could be used without adjustment. In the latest version, no such valid ranges are given. Therefore when applying the latest version of the standard to plants in which any of the plant parameters differed even slightly from the nominal values listed in Table 2, the adjustment procedure of section 3.2 must be used on the values within Table 6. Since the extremes of the ranges in Table 1 of the cited version differed from the nominal values by between 9% and 100%, it would seem likely that there are plants which were not required to follow the adjustment procedure by the cited version, but must now use the adjustment procedure to implement the latest version of the standard. This difference results in the possibility that a particular plant will have to employ a different calculational procedure when implementing the latest version instead of the cited version. (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 2 [Table 2]			Also, the value of parameter FBD (the steam generator blowdown total flow rate) differs considerably between the two versions. This difference will result in an increase in the removal rates r_n from the secondary coolant.
Table 3 [Table 3] (Cont'd)	The following differences exist between the cited and the latest versions of the standard: - The cited version specifies valid ranges for the parameters in terms of maximum and minimum values. The latest version does not contain valid ranges for the parameters. - The description of the parameter Y has been reworded in the transition from the cited to the latest version.	1	The first of the differences that appear significant involves a change in the definition of parameter Y. In the cited version, this definition is the "Ratio of the total amount of noble gases routed to gaseous radwaste from the purification system to the total amount routed to the primary coolant system from the purification system (not including the boron recovery system)." In the latest version it is the "Fraction of the noble gas activity in the letdown stream which is not returned to the reactor coolant system (not including the boron recovery system)." (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 3 [Table 3] (Cont'd)			In order to clarify that the two definitions may be different, let L = Noble gas activity in the letdown stream, W = Noble gas activity in the let down stream that is routed to the gaseous radwaste system, X = Noble gas activity in the letdown stream that escapes the coolant while the coolant is being processed by the demineralizer and purification systems, (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 3 [Table 3] (Cont'd)			R = Noble gas activity in the let down stream that is returned to the primary reactor coolant. Then, $L = W + X + R$ **(1)** Now, in the cited version, the definition of Y is equivalent to $Y = \frac{W}{R}$ **(2)** while in the latest version, the definition of Y is equivalent to $Y = \frac{L - R}{L} = \frac{W + X}{L}$ **(3)** using the value of L from equation **(1)**.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 3 [Table 3] (Cont'd)			Therefore, the definitions of Y in the two versions of the standard are not equivalent. Finally, the remaining difference that appears to be significant involves the deletion of ranges for the plant parameter values. In the cited version, valid ranges were specified for all of the principal plant parameters in Table 3. When applying the cited version of the standard to PWRs with once-through steam generators for which the principal plant parameters were within the ranges specified in Table 1, the values in Table 7 could be used without adjustment. In the latest version, no such valid ranges are given. Therefore when applying the latest version of the standard to plants in which any of the plant parameters differed even slightly from the nominal values listed in Table 3, the adjustment procedure of section 3.2 must be used on the values within Table 7. Since the extremes in Table 1 differed from the nominal values by between 9% and 100%, it would seem likely that there are plants which were not required to follow the adjustment procedure by the cited version, but which must now use the adjustment procedure to implement the latest version of the standard. (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 3 [Table 3]			This difference results in the possibility that a particular plant will have to employ a different calculational procedure when implementing the latest version instead of the cited version
Table 3 note (a) [None]	A footnote to Table 3 of the cited version refers to the valid range for the weight of water in all steam generators. It states that "the secondary coolant inventory is not of importance in a once-through steam generator plant because decay is not an important removal mechanism." Therefore no range is provided for this parameter since it "cancels from the adjustment factors of Table 12."	1	A footnote that was present in the cited version has been removed from the latest version. This footnote reads as follows: "(a) The secondary coolant inventory is not of importance in a once-through steam generator plant because decay is not an important removal mechanism: WS therefore cancels from the adjustment factors of Table 12." This statement is incorrect. Upon inspection of Table 12 of the cited version it is apparent that WS does not cancel from the secondary coolant adjustment factors for element class 4. For elements classes 2, 3, and 6, the removal rate reduces the activity of the secondary coolant. Therefore, the secondary coolant inventory must be of importance in a once-through steam generator. The deletion of this footnote removes incorrect criteria from the standard.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 5 Class 1 [Table 5 Class 1]	The following differences are present between the cited version and the latest version of the standard: - The following nuclides are included in the table in the cited standard, but not in the latest standard: ^{90}Kr, ^{91}Kr, ^{92}Kr, ^{93}Kr, ^{94}Kr, ^{95}Kr, ^{97}Kr, ^{139}Xe, ^{140}Xe, ^{141}Xe, ^{142}Xe, ^{143}Xe, and ^{144}Xe. - For all nuclides that are listed in both the cited and latest versions of the standard, the numerical values specified for the radionuclide concentrations in reactor coolant and in the reactor steam are different between the two versions.	1,4	Class 1 of Table 5 lists the numerical values for the concentrations of noble gas radionuclides within the principal fluid streams of the reference BWR. However, certain nuclides are listed in the cited version but not in the latest version of Table 5. Those nuclides are as follows: ^{90}Kr, ^{91}Kr, ^{92}Kr, ^{93}Kr, ^{94}Kr, ^{95}Kr, ^{97}Kr, ^{139}Xe, ^{140}Xe, ^{141}Xe, ^{142}Xe, ^{143}Xe, and ^{144}Xe. The deletion of these nuclides, many of which were listed in the cited version with relatively large concentrations, affects the adjustment procedures. Also, for all of the noble gas radionuclides listed in both the cited and latest versions, the numerical values listed for the concentrations are different. This difference also affects the adjustment procedures.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 5 Class 2 [Table 5 Class 2]	The following differences are present between the cited version and the latest version of the standard: - The following nuclides are included in the table in the cited standard, but not in the latest standard: ^{83}Br, ^{84}Br, and ^{85}Br. - For all nuclides that are listed in both the cited and latest versions of the standard, the numerical values specified for the radionuclide concentrations in reactor coolant and in the reactor steam are different between the two versions.	1,4	Class 2 of Table 5 lists the numerical values for the concentrations of halogen radionuclides within the principal fluid streams of the reference BWR. However, certain nuclides are listed in the cited version but not in the latest version of Table 5; those nuclides are as follows: ^{83}Br, ^{84}Br, and ^{85} Br. The deletion of these nuclides affects the adjustment procedures. Also, for all of the halogen radionuclides listed in both the cited and latest versions, the numerical values listed for the concentrations are different. This difference also affects the adjustment procedures.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 5 Class 3 [Table 5 Class 3]	The latest version includes ^{137m}Ba, and since this nuclide would be in secular equilibrium with ^{137}Cs, the values specified for the reactor water and reactor steam radionuclide concentrations apply to each of the two radionuclides; consequently these numerical values are different between the cited and the latest versions.	1	Class 3 of Table 5 lists the numerical values for the concentrations of cesium and rubidium radionuclides within the principal fluid streams of the BWR. However, the cited version lists concentrations for ^{137}Cs alone, while the latest version lists^{137} Cs together with its parent nuclide ^{137m}Ba. Since the parent and daughter are in secular equilibrium, the concentration values listed apply to each of the nuclides. The net effect is the addition of a new nuclide for consideration within the standard. Also, the concentrations listed for ^{137}Cs have changed between the cited and the latest versions of the standard. These changes affect the adjustment calculations.
Table 5 Class 4 [Table 5 Class 4]	The following nuclides are included in the table in the cited standard, but not in the latest standard: ^{13}N, ^{17}N, ^{19}O, and^{18} F.	4	Class 4 of Table 5 lists the numerical values for the concentrations of water activation products within the principal fluid streams of the BWR. However, the following nuclides are listed in the cited version but not in the latest version: ^{13}N, ^{17}N, ^{19}O, and ^{18}F. The elimination of these nuclides from consideration constitutes a change in methodology.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 5 Class 6 [Table 5 Class 6] (Cont'd)	The following differences are present between the cited version and the latest version of the standard: - The following nuclides are included in the table in the cited standard, but not in the latest standard: ^{65}Ni, ^{69m}Zn, ^{98}Nb, ^{101}Tc, ^{104}Tc, ^{105}Ru, ^{139}Ba, ^{141}Ba, ^{142}Ba, ^{142}La, ^{143}Ce, ^{143}Pr, and ^{147}Nd. - In the latest version, parent-daughter radionuclide pairs in secular equilibrium are listed together, with the concentrations applying to each radionuclide. For two of these pairs, the cited standard lists the two nuclides separately, each with its own concentration; these pairs are ^{95}Zr-^{95}Nb and ^{99}Mo-^{99m}Tc. For five other pairs, the daughter is not listed in the cited version; these pairs (with the parent listed first) are as follows: ^{90}Sr-^{90}Y, ^{103}Ru-^{103m}Rh, ^{106}Ru-^{106}Rh, ^{140}Ba-^{140}La, and ^{144}Ce-^{144}Pr. - Between the cited and the latest versions, the numerical values specified for the reactor water and reactor steam radionuclide concentrations are different for the following nuclides: ^{24}Na, ^{51}Cr, ^{54}Mn, and ^{239}Np.	1,4	Class 6 of Table 5 lists the numerical values for concentrations of "other" radionuclides within the principal fluid streams of the BWR. "Other" nuclides are those which could not be classified into any of the other element groups that are used in the standard. However, certain nuclides are listed within the cited version but not in the latest version of Table 5; those nuclides are as follows: ^{65}Ni, ^{69m}Zn, ^{98}Nb, ^{101}Tc, ^{104}Tc, ^{105}Ru, ^{139}Ba, ^{141}Ba, ^{142}Ba, ^{142}La, ^{143}Ce, ^{143}Pr, and ^{147}Nd. The deletion of these nuclides, some of which had relatively large concentrations in the cited standard, affects the adjustment procedures. Table 5 in the latest version also differs from its counterpart in the cited version in that parent-daughter radionuclide pairs in secular equilibrium are listed together in the latest version, the given concentrations apply to each nuclide. In the cited standard, parent-daughter radionuclides are not listed together. For the pairs ^{95}Zr-^{95}Nb and ^{99}Mo-^{99m}Tc, the cited standard lists both the parent and daughter radionuclides separately. With the exception of ^{99}Mo, the values provided for the radionuclide concentrations are different between (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 5 Class 6 [Table 5 Class 6]			the cited and latest versions of the standard. For other pairs that are listed in the latest standard, including ^{90}Sr-^{90}Y, ^{103}Ru-^{103m}Rh, ^{106}Ru-^{106}Rh, ^{140}Ba-^{140}La, and ^{144}Ce-^{144}Pr, the cited version does not list the daughter nuclides. The equilibrium concentrations of ^{90}Sr and ^{95}Zr are different between the two versions of the standard. These changes constitute the addition of new nuclides for consideration within the standard, as well as changes in specific numeric criteria. These changes affect the adjustment procedures. The numerical values for some of the singly listed radionuclide concentrations have changed between the cited and the latest versions. Those radionuclides which fall into this category are as follows: ^{24}Na, ^{51}Cr, ^{54}Mn, and^{239} Np. These differences involve changes to specific numeric criteria.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 6 Class 1 [Table 6 Class 1]	The following differences are present between the cited version and the latest version of the standard: - The following nuclides are included in the table in the cited standard, but not in the latest standard: ^{83m}Kr and ^{89}Kr. - For all nuclides that are listed in both the cited and latest versions of the standard, the numerical values specified for the radionuclide concentrations in reactor coolant and in the secondary coolant (both water and steam) are different between the two versions.	1,4	Class 1 of Table 6 lists the numerical values for the concentrations of noble gas radionuclides within the principal fluid streams of the reference PWR with U-tube steam generators. However, certain nuclides which were listed in the cited version are not included in the latest version. These nuclides are: ^{83m}Kr and ^{89}Kr. The deletion of these nuclides from consideration affects the adjustment procedures. The noble gas radionuclides that are listed in both the cited and latest versions of Table 6, class 1, the numerical values given for the concentrations have been changed. These differences in specific numeric criteria affect the adjustment procedures.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 6 Class 2 [Table 6 Class 2]	The following differences are present between the cited version and the latest version of the standard: - The following nuclides are included in the table in the cited standard, but not in the latest standard: ^{83}Br, ^{85}Br, and ^{130}I. - For all nuclides that are listed in both the cited and latest versions of the standard, the numerical values specified for the radionuclide concentrations in reactor coolant and in the secondary coolant (both water and steam) are different between the two versions.	1,4	Class 2 of Table 6 lists the numerical values for halogen radionuclide concentrations within the principal fluid streams of the reference PWR with U-tube steam generators. However, certain radionuclides which were listed in the cited version are no longer present in the latest version; these radionuclides are as follows: ^{83}Br, ^{85}Br, and ^{130}I. The removal of these radionuclides from consideration affects the adjustment procedures. For all of the halogen radionuclides that are listed in both the cited and latest versions of Table 6, class 2, the numerical values given for the concentrations have been changed. These differences in specific numeric criteria affect the adjustment procedures.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 6 Class 3 [Table 6 Class 3]	The following differences are present between the cited version and the latest version of the standard: - ^{86}Rb is included in the table in the cited standard, but not in the latest standard. - For all nuclides that are listed in both the cited and latest versions of the standard, the numerical values specified for the radionuclide concentrations in reactor coolant and in the secondary coolant (both water and steam) are different between the two versions.	1,4	Class 3 of Table 6 lists the numerical values for cesium and rubidium radionuclide concentrations within the principal fluid streams of the reference PWR with U-tube steam generators. However, the cited version lists concentrations for ^{86}Rb, while the latest version does not. The removal of this radionuclide from consideration affects the adjustment procedures. For all of the cesium and rubidium radionuclides that are listed in both the cited and latest versions of Table 6, class 3, the numerical values given for the concentrations have been changed. These differences in specific numeric criteria affect the adjustment procedures.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 6 Class 6 [Table 6 Class 6]	The following differences are present between the cited version and the latest version of the standard: - The following nuclides are included in the table in the cited standard, but not in the latest standard: ^{90}Y, ^{103m}Rh, ^{106}Rh, ^{125m}Te, ^{127m}Te, ^{127}Te, ^{137m}Ba, ^{143}Pr, and ^{144}Pr. - The following nuclides are included in the table in the latest standard, but not in the cited standard: ^{24}Na, ^{65}Zn, ^{110m}Ag, and ^{187}W. - For all nuclides that are listed in both the cited and latest versions of the standard, the numerical values specified for the radionuclide concentrations in reactor coolant and in the secondary coolant (both water and steam) are different between the two versions.	1,4	Class 6 of Table 6 lists the numerical values for concentrations of "other" radionuclides (that is, those nuclides which do not chemically belong within any of the five previous classes) within the principal fluid streams of the reference PWR with U-tube steam generators. However, certain radionuclides which were listed in the cited version were not listed in the latest version; these nuclides are as follows: ^{90}Y, ^{103m}Rh, ^{106}Rh, ^{125m}Te, ^{127m}Te, ^{127}Te, ^{137m}Ba, ^{143}Pr and ^{144}Pr. The removal of these radionuclides from consideration affects the adjustment procedures. There are a few radionuclides that are new to the latest version; that is, concentrations of these radionuclides are not listed in the cited version of the standard. These radionuclides are as follows: ^{24}Na, ^{65}Zn, ^{110m}Ag, and ^{187}W. The addition of these radionuclides to the standard affects the adjustment procedures. For all of the "other" radionuclides that are listed in both the cited and latest versions of Table 6, class 6, the numerical values given for the concentrations have been changed. These differences in specific numeric criteria affect the adjustment procedures.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 6 footnote [Table 6 footnote]	The following difference exists between the cited and the latest versions of the standard: - The assumed leakage rate in the cited version is 100 pounds per day, while it is 75 pounds per day in the latest version.	1	The remaining difference is in the magnitude of the primary-to-secondary leakage rate. In the cited version, this rate is 100 pounds per day, while it is 75 pounds per day in the latest version. This change in specific numeric value, affects the basis by which the radionuclide concentrations in the secondary coolant are determined.
Table 7 Class 1 [Table 7 Class 1]	The following differences are present between the cited version and the latest version of the standard: - The following nuclides are included in the table in the cited standard, but not in the latest standard: ^{83m}Kr and ^{89}Kr. - For all nuclides that are listed in both the cited and latest versions of the standard, the numerical values specified for the radionuclide concentrations in reactor coolant and in the secondary coolant (both water and steam) are different between the two versions.	1,4	Class 1 of Table 7 lists the numerical values for the concentrations of the noble gas radionuclides within the principal fluid streams of the reference PWR with once-through steam generators. However, two of the radionuclides that are listed in the cited version, ^{83m}Kr and ^{89}Kr, are not included in the latest version. The removal of these radionuclides from consideration affects the adjustment procedures. For all of the noble gas radionuclides that are listed in both the cited and latest versions of Table 7, class 1, the numerical values given for the concentrations have been changed. These differences in specific numeric criteria affect the adjustment procedures.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 7 Class 2 [Table 7 Class 2]	The following differences are present between the cited version and the latest version of the standard: - The following nuclides are included in the table in the cited standard, but not in the latest standard: ^{83}Br, ^{85}Br, and ^{130}I. - For all nuclides that are listed in both the cited and latest versions of the standard, the numerical values specified for the radionuclide concentrations in reactor coolant and in the secondary coolant (both water and steam) are different between the two versions.	1,4	Class 2 of Table 7 lists the numerical values for the concentrations of the halogen radionuclides within the principal fluid streams of the reference PWR with once-through steam generators. However, three of the radionuclides that are listed in the cited version, ^{83}Br, ^{85}Br and ^{130}I, are not included in the latest version of the standard. The removal of these radionuclides from consideration affects the adjustment procedures. For all of the halogen radionuclides that are listed in both the cited and latest versions of Table 7, class 2, the numerical values given for the concentrations have been changed. These differences in specific numeric criteria affect the adjustment procedures.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 7 Class 3 [Table 7 Class 3]	The following differences are present between the cited version and the latest version of the standard: - ^{86}Rb is included in the table in the cited standard, but not in the latest standard. - For all nuclides that are listed in both the cited and latest versions of the standard, the numerical values specified for the radionuclide concentrations in reactor coolant and in the secondary coolant (both water and steam) are different between the two versions.	1,4	Class 3 of Table 7 lists the numerical values for the concentrations of the cesium and rubidium radionuclides within the principal fluid streams of the reference PWR with once-through steam generators. However, the cited version lists a concentration for ^{86}Rb, while the latest version of the standard does not. The removal of this radionuclide from consideration affects the adjustment procedures. For all of the cesium and rubidium radionuclides that are listed in both the cited and latest versions of Table 7, class 3, the numerical values given for the concentrations have been changed. These differences in specific numeric criteria affect the adjustment procedures.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 7 Class 6 [Table 7 Class 6] (Cont'd)	The following differences are present between the cited version and the latest version of the standard: - The following nuclides are included in the table in the cited standard, but not in the latest standard: ^{90}Y, ^{103m}Rh, ^{106}Rh, ^{125m}Te, ^{127m}Te, ^{127}Te, ^{137m}Ba, ^{143}Pr, and ^{144}Pr. - The following nuclides are included in the table in the latest standard, but not in the cited standard: ^{24}Na, ^{65}Zn, ^{110m}Ag, and ^{187}W. - For all nuclides that are listed in both the cited and latest versions of the standard, the numerical values specified for the radionuclide concentrations in reactor coolant and in the secondary coolant (both water and steam) are different between the two versions.	1,4	Class 6 of Table 7 lists the radionuclide concentrations of the "other" nuclides (that is, those nuclides that could not be classified into any of the previous five classes) within the principal fluid streams of the reference PWR with once-through steam generators. However, a number of the radionuclides listed in the cited version are not listed in the latest version. These radionuclides are as follows: ^{90}Y, ^{103m}Rh, ^{106}Rh, ^{125m}Te, ^{127m}Te, ^{127}Te, ^{137m}Ba, ^{143}Pr and ^{144}Pr. Though the concentrations for most of these radionuclides are small compared to the concentrations listed for other radionuclides in Table 7, class 6, the concentrations listed for ^{137m}Ba are relatively large. The removal of these radionuclides from consideration affects the adjustment procedures. There are a few radionuclides that are new to the latest version; that is, concentrations for these nuclides are not listed in Table 7, class 6 of the cited version. These nuclides are as follows: ^{24}Na, ^{65}Zn, ^{110m}Ag and ^{187}W. The addition of these radionuclides for consideration within the standard affects the adjustment procedures. (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 7 Class 6 [Table 7 Class 6]			For all of the "other" radionuclides for which concentrations have been listed in both the cited and the latest versions of Table 7, class 6, the numerical values given for the concentrations have been changed. These differences in specific numeric criteria affect the adjustment procedures.
Table 7 footnote * and b [Table 7 footnote b	The following difference exists between the cited and the latest versions: - The assumed leakage rate in the cited version is 100 pounds per day, while it is 75 pounds per day in the latest version.	1	The difference between the standards is in the magnitude of the primary-to-secondary leakage rate. In the cited version, this rate is 100 pounds per day, while it is 75 pounds per day in the latest version. Changes to a specific numeric value affect the basis by which the radionuclide concentrations in the secondary coolant have been determined.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 8 [Table 8]	The following differences exist between the cited and the latest versions of the standard: - The value for parameter NS for element class 2 is "0.02" in the cited standard, while it is "1.5-2" (meaning $1.5x10^{-2}$) in the latest version. - The value for parameter R for element class 2 in the cited version is 1.0 hr^{-1}, while the value for parameter R_n for element class 2 is $8.6x10^{-1}$ hr^{-1} in the latest version. - The value for parameter R for element class 3 in the cited version is 0.19 hr^{-1}, while the value for parameter R_n for element class 3 is $1.7x10^{-1}$ hr^{-1} in the latest version.	1,4	The value of parameter NS for element class 2 has been changed from 0.02 in the cited version to 0.015 in the latest version. Also, the values of parameter R for element classes 2 and 3 have been changed from values of 1.0 and 0.19, respectively, in the cited standard to 0.86 and 0.17, respectively, in the latest version. These differences represent decreases of from 11% to 25% in specific numerical parameters. Changes of this magnitude are likely to lead to differences in results obtained from the standard.
Table 8 footnote (c) [None]	The cited standard contains a sentence which discusses the basis for the tritium concentration in the reactor coolant, including a numerical value for the "appearance rate in the coolant." No such sentence exists in the latest version.	4	The second sentence in the footnote of the cited version has been removed from the latest version. This sentence states that the tritium concentration in the reactor coolant system is given by the ratio of the appearance rate of tritium in the coolant to the total loss rate of tritium from the system. A numerical value for the appearance rate of tritium in the coolant ($1.2x10^{8}$ μCi/year) was also provided. The removal of this information from the latest version of the standard affects the adjustment procedures.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
None [Table 8 footnote **]	In the latest version of the standard, a footnote has been added to the value for parameter NS for element class 2. This footnote states that the value presented is for "BWRs which have Deep Bed Condensate Treatment;" it also lists alternative values which are to be used for BWRs with different types of condensate treatment systems. No corresponding information is present in the cited version.	1	A footnote added to the latest version refers to the value of parameter NS for element class 2. The footnote indicates that the value listed in the table is to be used for "BWRs which have Deep Bed Condensate Treatment." The footnote also provides guidance for BWRs which use different types of condensate treatment systems. The inclusion of this new information into the latest version affects the adjustment factors for boiling water reactors.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 9 [Table 9] (Cont'd)	The following differences exist between the cited and the latest versions of the standard: - The value for parameter NB for element class 2 is 0.9 in the cited standard, while it is $9.9x10^{-1}$ in the latest version. - The value for parameter NB for element class 6 is 0.9 in the cited standard, while it is $9.8x10^{-1}$ in the latest version. - The value for parameter R for element class 2 in the cited version is 0.06 hr^{-1}, while the value for parameter R_n for element class 2 is $6.7x10^{-2}$ in the latest version. - The value for parameter R for element class 6 in the cited version is 0.06 hr^{-1}, while the value for parameter R_n for element class 2 is $6.6x10^{-2}$ in the latest version. - Footnote * applies to the value for parameter R in Element Class 6 in the cited version, but not to the parameter R_n for element class 6 in the latest version.	1,4	The following differences appear to be of regulatory significance. These involve changes in parameter values between the cited and the latest versions of the standard. The parameters that have changed are as listed below: • Parameter NB, element class 2: changed from 0.9 to 0.99, • Parameter NB, element class 6: changed from 0.9 to 0.98, • Parameter R, element class 2: changed from 0.06 to 0.067, • Parameter R, element class 6: changed from 0.06 to 0.066, • Parameter NS, element class 3: changed from 0.001 to 0.0005, • Parameter NS, element class 6: changed from 0.001 to 0.0005, • Parameter r for U-tube steam generators, element class 2: changed from 0.02 to 0.17, • Parameter r for U-tube steam generators, element class 3: changed from 0.02 to 0.15, (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 9 [Table 9] (Cont'd)	- The value for parameter NS, element class 3 for U-tube steam generators in the cited version is 0.001 hr^{-1}, while the corresponding parameter value is $5.0x10^{-3}$ hr^{-1} in the latest version. - The value for parameter NS, element class 6 for U-tube steam generators in the cited version is 0.001 hr^{-1}, while the corresponding parameter value is $5.0x10^{-3}$ hr^{-1} in the latest version. - Footnote * applies to the value for arameter NX in Element Class 6 in the cited version, but not to the corresponding parameter value in the latest version. - The value for parameter r, element class 2 for U-tube steam generators in the cited version is 0.02 hr^{-1}, while the corresponding parameter value is $1.7x10^{-1}$ hr^{-1} in the latest version. (Cont'd)		• Parameter r for U-tube steam generators, element class 6: changed from 0.02 to 0.17, • Parameter r for once-through steam generators, element class 2: changed from 88 to 27, • Parameter r for once-through steam generators, element class 3: changed from 48 to 75, • Parameter r for once-through steam generators, element class 6: changed from 88 to 14. These differences represent changes to numerical values that range from as low as 9% to as high as 750% depending on the specific parameter; changes of this magnitude are likely to lead to differences in results obtained from the standard.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 9 [Table 9]	- The value for parameter r, element class 3 for U-tube steam generators in the cited version is 0.02 hr^{-1}, while the corresponding parameter value is $1.5x10^{-1}$ hr^{-1} in the latest version. - The value for parameter r, element class 6 for U-tube steam generators in the cited version is 0.02 hr^{-1}, while the corresponding parameter value is $1.7x10^{-1}$ hr^{-1} in the latest version. - The value for parameter r, element class 2 for once-through steam generators in the cited version is 88 hr^{-1}, while the corresponding parameter value is 27 hr^{-1} in the latest version. - The value for parameter r, element class 3 for once-through steam generators in the cited version is 48 hr^{-1}, while the corresponding parameter value is 75 hr^{-1} in the latest version. - The value for parameter r, element class 6 for once-through steam generators in the cited 88 hr^{-1}, while the corresponding parameter value is 14 hr^{-1} in the latest version.		

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Table 9 footnote (d) [Table 9 footnote (b)]	The following difference exists between the cited and the latest versions of the standard: - The equations for R_1 are different.	1	This footnote presents the equation by which the parameter R, the removal rate from the reactor water, is obtained. The change that appears significant involves the right hand side of the first equation, which is the equation for R_1 using the notation of the latest version. The right-hand side of the cited version is as follows: $\frac{FB + FD\ Y}{WP}$ while the right-hand side of the latest version is $\frac{FB + (FD - FB)\ Y}{WP}$ Note that the definitions of FD and FB are the same between the two versions. Therefore the equations have changed substantially between the cited and the latest versions of the standard. This change affects the calculational methodology of the application.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
None [Table 10 footnote **]	The following footnote has been added to the adjustment factor values for element class 4 in the latest version: "Assumes the ratio of coolant mass to power level is approximately constant."	5	The latest version includes a footnote which describes an assumption which forms part of the basis for the adjustment factors for water activation products within Boiling Water Reactors. Thus the latest version includes information about the basis for the radionuclide concentration model; analogous information is not present in the cited version. This new information provides indications about the limitations of the model that is used within the standard.
None [Table 11 footnote *]	A footnote to the Secondary Coolant Adjustment Factor for element class 1 in the latest version refers to footnote (c) of Table 9. That footnote gives the justification for the lack of a Secondary Coolant Adjustment Factor for element class 1. (Note: It would appear that footnote * of the latest version is identical to footnote ** of the cited version, since both read as follows: "See footnote (c) Table 9." However, footnote (c) of Table 9 in the cited version discusses a topic that is different from the one discussed in footnote (c) of Table 9 in the latest version.)	5	The latest version includes a footnote to Table 11 which references another footnote to Table 9. The footnote from Table 9 describes the basis for the adjustment factors for noble gas radionuclides within Pressurized Water Reactors with U-tube steam generators. Within the cited version analogous information is present in the context of Table 9, but not within Table 11. Thus, although the information can be found in both versions, it is not presented in as many applicable places within the cited version as within the latest version. Effectively the latest version provides better indications about the limitations of the model that is used within the standard.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Figure 1 [Figure 1] (Cont'd)	The following differences exist between the cited version and the latest version of the standard: - The figure in the cited version shows the parameter FS above the flow path from the reactor vessel to the turbines, while NS is shown below this flow path. Above the same flow path in the latest version, the equation "FS•NS" is shown. - The figure in the cited version shows the equation "FS(1-NC)" to the right of the flow path from the turbines to the feedwater flow path. The figure in the latest version shows the equation "FS•NS•(1-NC)" to the right of the same flow path. - The figure in the latest version shows the equation "FS•NS•NC" above the flow path from the turbines to the main condenser. - The figure in the cited version shows the equation "NC•FS" to the right of the flow path from the main condenser to the condensate demineralizers. The figure in the cited version shows the equation "NC•FS•NS" to the right of the same flow path.	1	Figure 1 in both versions of the standard provides a schematic diagram for the radionuclide removal paths for the reference Boiling Water Reactor. In the cited version, there are notations beside the various flow paths which indicate the coolant mass flow rate for that flow path. For example, the notation "NC•FS" is beside the flow path which runs through the main condenser and the condensate demineralizers; thus the flow rate through this path is the product of the total steam flow rate from the reactor vessel times the fraction of the total steam flow that passes through the condensate demineralizer. The resulting quantity is the mass flow rate of the reactor coolant through the demineralizer loop. In the latest version, the notations beside some, but not all, of the flow paths have been changed to indicate the mass flow rate of radionuclides, rather than the mass flow rates of secondary coolant, through that path. For example, the notation "NC•FS•NS" is beside the flow path which runs from the main condenser to the condensate demineralizers; thus the flow rate through this path (Cont'd)

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Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Figure 1 [Figure 1]			is the product of three quantities: the total steam flow rate from the reactor, the fraction of the total steam flow that passes through the main condenser/condensate demineralizer path, and the ratio of the radionuclide concentration in the reactor steam to the concentration in reactor water. The resulting quantity is the ratio of the radionuclide mass flow rate to the radionuclide concentration in the reactor water. However, the notation beside the flow path from the reactor vessel to the Reactor Water Cleanup System is "FA;" this quantity is a coolant mass flow rate. To summarize, the notation in Figure 1 of the cited version is self-consistent, while the notation within the latest version is not. The result is that changes from the cited version to the latest versions have resulted in a potential source of confusion for the implementors of the standard. Therefore, these differences appear to be significant.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Figure 2 [Figure 2] (Cont'd)	The following differences exist between the cited version and the latest version of the standard: - The figure in the cited version shows the parameters FS and NS above the flow path from the steam generators secondary side to the turbines; there is no indication that these parameters are to be multiplied together. Above the same flow path in the latest version, the equation "FS•NS" is shown. - The figure in the cited version shows the equation "FS(1-NC)" to the right of the flow path from the turbines to the feedwater flow path. The figure in the latest version shows the equation "FS•NS•(1-NC)" to the right of the same flow path. - The figure in the latest version shows the equation "FS•NC" above the flow path from the turbines to the main condenser. - The figure in the latest version shows the equation "FS•NS•NC" above the same flow path. (Cont'd)	1	Figure 2 in both versions of the standard provides a schematic diagram of the radionuclide removal paths for the reference Pressurized Water Reactor with U-tube steam generators. In the cited version, there are notations beside some of the various flow paths which indicate the coolant mass flow rate for that flow path. For example, the notation "NC FS" is beside the flow path which runs through the main condenser and the condensate demineralizers; this represents the product of the total steam flow rate from the steam generators times the fraction of the total steam flow that passes through the condensate demineralizer. The resulting quantity is the mass flow rate of the secondary coolant through the demineralizer loop. However, the notation "FS NS" is beside the flow path from the steam generator secondary side to the turbines. The term "FS NS" represents the product of the total steam flow rate from the steam generators times the ratio of the radionuclide concentration in the secondary steam to the radionuclide concentration in the secondary water; this quantity is not a mass flow rate of coolant, but is instead a mass flow rate of radionuclides. In all other cases but this one, the notation beside the flow path indicates the mass flow rate through the flow path. (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Figure 2 [Figure 2] (Cont'd)	- The figure in the cited version shows the equation "NC•FS" to the right of the flow path from the main condenser to the cited condensate demineralizers. The figure in the version shows the equation "NC•FS•NS" to the right of the same flow path.		In the latest version, the notations beside some, but not all, of the flow paths have been changed. Where these changes were made, the notation now indicates the mass flow rate of radionuclides, rather than the mass flow rates of secondary coolant, through that flow path. For example, the notation beside the flow path which runs from the main condenser to the condensate demineralizers has been changed to "NC•FS•NS" (this quantity was "FS•NC" in the cited version); this represents the product of three quantities: the total steam flow rate from the reactor vessel, the fraction of the total steam flow that passes through the main condenser/condensate demineralizer path, and the ratio of the radionuclide concentration in the reactor steam to the concentration in reactor water. The resulting quantity is a radionuclide mass flow rate. However, the notation beside the flow path from the reactor vessel to the Reactor Water Cleanup System is "FA" in both versions of the standard; this quantity is a coolant mass flow rate. In total, four of the flow path notations in Figure 2 of the latest standard indicate radionuclide mass flow rates, while the remaining four depict coolant mass flow rates. (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Figure 2 [Figure 2]			To summarize, the notations beside the flow path in Figure 2 of both the cited and latest versions of the standard are not self-consistent. A particular flow path notation may refer either to a coolant mass flow rate or to a radionuclide mass flow rate. Furthermore, there is no indication in either version which identifies the type of flow rate that is being depicted. The result is that changes from the cited version to the latest version have contributed to a potential source of confusion for the implementors of the standard.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Figure 3 [Figure 3] (Cont'd)	The following differences exist between the cited version and the latest version of the standard: - The figure in the cited version shows the parameters FS and NS above the flow path from the steam generators secondary side to the turbines; there is no indication that these parameters are to be multiplied together. Above the same flow path in the latest version, the equation "FS•NS" is shown. - The figure in the cited version shows the equation "FS(1-NC)" to the right of the flow path from the turbines to the feedwater flow path. The figure in the latest version shows the equation "FS•NS•(1-NC)" to the right of the same flow path. - The figure in the latest version shows the equation "FS•NC" above the flow path from the turbines to the main condenser. - The figure in the latest version shows the equation "FS•NS•NC" above the same flow path. (Cont'd)	1	Figure 3 in both versions of the standard provides a schematic diagram of the radionuclide removal paths for the reference Pressurized Water Reactor with once-through steam generators. In the cited version, there are notations beside some of the various flow paths which indicate the coolant mass flow rate for that flow path. For example, the notation "NC FS" is beside the flow path which runs through the main condenser and the condensate demineralizers; this represents the product of the total steam flow rate from the steam generators times the fraction of the total steam flow that passes through the condensate demineralizer. The resulting quantity is the mass flow rate of the secondary coolant through the demineralizer loop. However, the notation "FS NS" is beside the flow path from the steam generator secondary side to the turbines. The term "FS NS" represents the product of the total steam flow rate from the steam generators times the ratio of the radionuclide concentration in the secondary steam to the radionuclide concentration in the secondary water; this quantity is not a mass flow rate of coolant, but is instead a mass flow rate of radionuclides. In all other cases but this one, the notation beside the flow path indicates the mass flow rate through the flow path. (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Figure 3 [Figure 3] (Cont'd)	- The figure in the cited version shows the equation "NC•FS" to the right of the flow path from the main condenser to the condensate demineralizers. The figure in the cited version shows the equation "NC•FS•NS" to the right of the same flow path.		In the latest version, the notations beside some, but not all, of the flow paths have been changed. Where these changes where made, the notation now indicates the mass flow rate of radionuclides, rather than the mass flow rates of secondary coolant, through that flow path. For example, the notation beside the flow path which runs from the main condenser to the condensate demineralizers has been changed to "NC•FS•NS" (this quantity was "FS•NC" in the cited version). This represents the product of three quantities. The total steam flow rate from the reactor vessel, the fraction of the total steam flow that passes through the main condenser/condensate demineralizer path, and the ratio of the radionuclide concentration in the reactor steam to the concentration in reactor water. The resulting quantity is a radionuclide mass flow rate. However, the notation beside the flow path from the reactor vessel to the Reactor Water Cleanup System is "FA" in both versions of the standard; this quantity is a coolant mass flow rate. In total, four of the flow path notations in Figure 3 of the latest standard indicate radionuclide mass flow rates, while the remaining four depict coolant mass flow rates. (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N237			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
Figure 3 [Figure 3]			To summarize, the notations beside the flow path in Figure 3 of both the cited and latest versions of the standard are not self-consistent. A particular flow path notation may refer either to a coolant mass flow rate or a radionuclide mass flow rate. Furthermore, there is no indication in either version which identifies the type of flow rate that is being depicted. The result is that changes from the cited version to the latest version have contributed to a potential source of confusion for the implementors of the standard.
4 [None]	References to the cited version of the standard are listed at the end of that version. References are not listed in the latest version of the standard.	4	The cited version of the standard contains a section that lists the references that are cited within the standard. The latest version of the standard does not cite any references within the body of the standard. The deletion of the references removes support to the contents of the standard and the basis for the significant changes in the adjustment factors and the procedures, especially Table 5. Regulatory review to determine the consequences of removing these references is beyond the scope of this review.

III. RECOMMENDATIONS

This part of the comparison summarizes significant differences (identified in Part II) between the cited and latest versions of the standard and addresses their regulatory effects on the citing documents. Those changes in the standard that only added detail to existing requirements are not included in the summary of significant differences. The regulatory citations to ANSI N237 (identified in Part I) are evaluated based on the significant differences between the cited and latest versions of this standard. Citations in the SRP are evaluated first, followed by citations in associated Regulatory Guides and 10 CFR sections. Recommendations concerning the updating of these citations as they relate to the SRP-UDP are also included in this part of the comparison.

Summary of Significant Differences

The 1976 version of ANSI N237 was revised and redesignated as ANSI/ANS 18.1-1984. There has been a substantial amount of revision between the cited version and the latest version, particularly in the tables which provide the numerical values of the radionuclide concentrations within the coolant.

Differences between the cited and the latest standard that appear to be significant include: new requirements for a different calculational procedure to adjust for changes in plant parameters, new values for the ratio of the condensate demineralizer flow rate to the steam flow rate, a change in the definition from the ratio of the noble gases routed to gaseous radwaste from the purification system to the fraction of the noble gas activity in the letdown stream no returned to the reactor coolant system, deletion of ranges for the plant parameter values, deletion of an incorrect footnote regarding the importance of the radionuclide inventory in the secondary coolant, changes in parameters, changes in radionuclides and radionuclide concentrations, new information regarding limitations and bases of the adjustment factors and radionuclide concentration modes, revised notations for flow paths that may not be self-consistent, and deletion of references.

Most of these changes remove redundancy, improve clarity, and delete or correct erroneous information from the cited version. Subject to NRC analysis of those differences that appear to be significant, consider updating SRP Section 12.2 and Regulatory Guides 8.8, 1.70, and 1.112 to endorse ANSI/ANS 18.1-1984 in place of ANSI N237/ANS 18.1-1976.

SRP Citations to the Standard

Section 12.2, Radiation Sources (July 1981)

Recommendations for updating specific references in SRP Section 12.2 are as follows:

SRP Section 12.2 Section	Recommendation
II. ACCEPTANCE CRITERIA	Consider replacing the references to "ANSI N237-1976, "Source Term Specification,"" and "ANSI N237" with "ANSI/ANS 18.1-1984, "Radioactive Source Term for Normal Operation of Light Water Reactors"" and "ANSI/ANS 18.1," respectively.
IV. EVALUATION FINDINGS	Consider replacing the references to "ANSI Standard N237-1976" and "ANSI N237" with "ANSI/ANS 18.1-1984" and "ANSI/ANS 18.1," respectively.
VI. REFERENCES	Consider replacing "7. ANSI-N237, Final Draft by Working Groups 18.1, "Source Term Specification," American National Standards Institute" with "7. ANSI/ANS 18.1-1984, "Radioactive Source Term for Normal Operation of Light Water Reactors," American Nuclear Society."

Other Regulatory Citations to the Standard

Regulatory Guide 8.8 (June 1978)

Recommendations for updating specific references in Regulatory Guide 8.8 are as follows:

Regulatory Guide 8.8 Section	Recommendation
C. REGULATORY POSITION, 2. Facility and Equipment Design Features	Consider replacing the reference to "ANSI N237-1976 (Ref. 7)" with "ANSI/ANS 18.1-1984 (Ref. 7)."
REFERENCES	Consider replacing "7. ANSI N237, "Source Term Specification." Copies may be obtained from the American Nuclear Society, 555 North Kensington Avenue, La Grange Park, Illinois 60525." with "7. ANSI/ANS 18.1-1984, "Radioactive Source Term for Normal Operation of Light Water Reactors." Copies may be obtained from the American Nuclear Society, La Grange Park, Illinois 60525."

Regulatory Guide 1.70 (November 1978)

Recommendations for updating specific references in Regulatory Guide 1.70 are as follows:

Regulatory Guide 1.70 Section	Recommendation
12. RADIATION PROTECTION, 12.2 Radiation Sources 12.2.1 Contained Sources	Consider replacing the reference to "ANSI N237 (Ref. 5)" with "ANSI/ANS 18.1-1984 (Ref. 5)."
REFERENCES	Consider replacing "5. ANSI N237, "Source Term Specification," Final Draft, 1977." with "5. ANSI/ANS 18.1-1984 "Radioactive Source Term for Normal Operation of Light Water Reactors."

Regulatory Guide 1.112 (April 1976)

Recommendations for updating specific references in Regulatory Guide 1.112 are as follows:

Regulatory Guide 1.112 Section	Recommendation
footnote * (pg. 1.112-6)	Replace the reference to "American National Standards Source Term Specification N237, ANS 18.1 Working Group, "Radioactive Materials in Principal Fluid Streams of Light-Water-Cooled Nuclear Power Plants," Draft, July 7, 1975," with "ANSI/ANS 18.1-1984."

Section 3

PROBLEMATIC COMPARISONS

3.1 ANSI Standard A58.1 Comparison

This section presents a comparison of the version of ANSI A58.1 cited in the Standard Review Plan (SRP) and associated Regulatory Guides and Code of Federal Regulation (CFR) sections with the latest version of the standard, in support of the Nuclear Regulatory Commission's (NRC's) Standard Review Plan Update and Development Program (SRP-UDP).

CITED STANDARD:

ANSI A58.1-1972, "Building Code Requirements for Minimum Design Loads in Buildings and Other Structures"

LATEST STANDARD:

ANSI/ASCE 7-1988, "Minimum Design Loads for Buildings and Other Structures"

CONTENTS

I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI A58.1 in the SRP and associated Regulatory Guides and 10 CFR sections. Recommendations on the disposition of these citations based on the results of this standard comparison are presented in Part III, Recommendations.

SRP Citations

ANSI/ASCE 7-1988 is a revision and redesignation of ANSI A58.1-1982, which was a revision and reissue of ANSI A58.1 1972.

SRP Section 2.3.1

Revision/Title: Section 2.3.1, Rev. 2, July 1981, "Regional Climatology"

Location: SRP Section 2.3.1 cites ANSI A58.1-1972 in Subsection II, Acceptance Criteria; in Subsection III, Review Procedures; and in Subsection VI, References.

Context: ANSI A58.1-1972 is endorsed by the SRP in the Acceptance Criteria for guidance on the operating basis wind velocity (fastest mile of wind); in the Review Procedures for snow and ice loads, extreme winds, the specific vertical velocity distribution, and gust factors; and is listed in the References.

SRP Section 3.3.1

Revision/Title: Section 3.3.1, Rev. 2, July 1981, "Wind Loadings"

Location: SRP Section 3.3.1 cites ANSI A58.1 in Subsection II, Acceptance Criteria; in Subsection IV, Evaluation Findings; and in Subsection VI, References.

Context: ANSI A58.1 is cited by the SRP in the Acceptance Criteria for guidance in transforming the wind velocity into an effective pressure applied to structures and parts and portions of structures, in the Evaluation Findings to transform the wind velocity into an effective pressure on structures and for selecting pressure coefficients corresponding to the structures geometry and physical configuration, and is listed in the References.

SRP Section 3.3.2

Revision/Title: Section 3.3.2, Rev. 2, July 1981, "Tornado Loadings"

Location: SRP Section 3.3.2 cites ANSI A58.1 in Subsection II, Acceptance Criteria; Subsection III, Review Procedures; Subsection IV, Evaluation Findings; and Subsection VI, References.

Context: ANSI A58.1 is cited by the SRP in the Acceptance Criteria for guidance in transforming the tornado wind velocity into an effective pressure applied to structures, in the Review Procedures for transforming tornado wind velocities into effective pressures, in the Evaluation Findings to transform the wind velocity generated by the tornado into an effective pressure on structures and for selecting pressure coefficients corresponding to the structures geometry and physical configuration, and is listed in the References.

Other Citations

None

II. CITED VS. LATEST STANDARD DIFFERENCES

ANSI/ASCE 7-88 involves a fundamental change in the way in which wind loads and snow loads are determined in ANSI A58.1-1972. Given the large number of significant changes between the cited and latest versions, a detailed listing of these differences are not presented in this report. The changes are briefly summarized in Part III.

III. RECOMMENDATIONS

This part of the comparison summarizes significant differences between the cited and latest versions of the standard and addresses their regulatory effects on the citing documents. The regulatory citations to ANSI A58.1 (identified in Part I) are evaluated based on the significant differences between the cited and latest versions of this standard. Citations in the SRP are evaluated first, followed by citations in associated Regulatory Guides and 10 CFR sections. Recommendations concerning the updating of these citations as they relate to the SRP-UDP are also included in this part of the comparison.

Summary of Significant Differences

ANSI/ASCE 7-1988 is a revision and redesignation of ANSI A58.1-1982, which was a revision and reissue of ANSI A58.1-1972. ANSI A58.1-1972 requires stringent loading criteria for situations in which the consequence of failure may be more severe, as specified by mean recurrence interval maps for wind speed and ground snow loads. In contrast, ANSI/ASCE 7-1988 utilizes building categories and importance factors to relate the criteria for maximum wind loads, snow loads, and earthquake loads or distortions specified in the standard to the consequence of those loads being exceeded for a structure and its occupants. In addition to the application of building categories and importance factors, ANSI/ASCE 7-1988 stipulates a more

discrete, analytical scheme versus the tabulation-based methodology of ANSI A58.1-1972. The overall result is a complete restructuring of the applicable section of the document, a significant increase in the amount of material contained in the standard, and a more detailed and rigorous approach to the determination of wind loads. In addition to the application of building categories and importance factors, ANSI/ASCE 7-1988 addresses roof snow load considerations in nine separate sections versus the single section of ANSI A58.1-1972.

ANSI/ASCE 7-1988 appears to provide a more thorough analytical approach to determining design wind and snow loads. Detailed analysis is beyond the scope of the Standard Review Plan Update and Development Project, and NRC review is needed to determine the acceptability of the latest version of the standard.

3.2 ANSI Standard N2.1 Comparison

This section presents a comparison of the version of ANSI N2.1 cited in the Standard Review Plan (SRP) and associated Regulatory Guides and Code of Federal Regulation (CFR) sections with the latest version of the standard, in support of the Nuclear Regulatory Commission's (NRC's) Standard Review Plan Update and Development Program (SRP-UDP).

CITED STANDARD:

ANSI N2.1-1969, "Radiation Symbol"

LATEST STANDARD:

ANSI N2.1-1989, "American National Standard for Warning Symbols - Radiation Symbol"

CONTENTS

I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI N2.1 in the SRP and associated Regulatory Guides and 10 CFR sections. Recommendations on the disposition of these citations based on the results of this standard comparison are presented in Part III, Recommendations.

SRP Citations

None.

Other Citations

Regulatory Guide 8.1

Revision/Title: Rev. 0, February 2, 1973, "Radiation Symbol"

Location: Regulatory Guide 8.1 cites ANSI N2.1-1969 in Subsection C, "REGULATORY POSITION."

Context: ANSI N2.1 is endorsed by Regulatory Guide 8.1 for characteristics of the radiation symbol. Regulatory Guide 8.1 deals with compliance with 10 CFR 20.203, which is an Acceptance Criteria for SRP Sections 12.3 - 12.4, "Radiation Protection Design Features," and SRP Section 12.5, "Operational Radiation Protection Program."

II. CITED VS. LATEST STANDARD DIFFERENCES

This part of the comparison presents those changes from the cited version (ANSI N2.1-1969) to the latest version (ANSI N2.1-1989) identified in this comparison. Many of these changes involve formatting, editorial and grammatical differences. Others involve clarification and have no effect on requirements. Those differences between the cited and latest version of ANSI N2.1 which are judged to be significant and warranted further investigation relative to the technical and regulatory effects of their citation in regulatory documents are tabulated and discussed on the following pages.

To facilitate review and consideration of their effects on ANSI N2.1 citations in regulatory documents, significant differences between the cited and latest versions are classified into the following change types:

1. new or changed requirements affecting established NRC positions and requirements,
2. new or changed requirements not addressed by established NRC positions and requirements,
3. new or changed requirements allowing more flexibility,
4. deleted or relaxed requirements, and
5. new or changed requirements adding detail to established NRC regulatory positions.

Further consideration of the effects of the changes presented in this section on the SRP and associated Regulatory Guides and CFR sections that cite ANSI N2.1 is provided in the Part III, Recommendations, of this section. Those differences classified as change types 1-4 are summarized in Part III.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N2.1			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
None [Forward]	The 1989 version points out that the standard does not specify a color requirement for the radiation symbol and describes the philosophy behind this change to the standard.	1	The Foreword to the 1989 revision of the standard discusses the fact that this revision does not specify a color for the radiation symbol, because at the time of the revision there did "not appear to be a consensus on the color issue within the radiation protection community in the United States." The last sentences of the 1989 Foreword directs users of the standard to "address the color issue either in terms of other American National Standards or in terms of applicable regulations." It is noted that 10 CFR 20.1901 provides applicable color requirements.
Figure 1 [Figure 1]	Figure 1 from the 1969 version of the standard includes notations which indicate that the color of the four parts of the symbol (the three blades and the central disc) is to be purple and that the background is to be yellow. Figure 1 from the 1989 version of the standard contains no such notations.	3	This difference is a reflection of the fact that the 1989 version of the standard does not specify a color requirement for the radiation standard. This difference is discussed further in the evaluation of changes to Sections 4.1 and 4.2 of the 1969 version that appears later in this comparison.

CITED VS. LATEST STANDARD DIFFERENCES: ANSI N2.1			
Section cited & [latest]	**Significant Changes cited & [latest]**	**Type of Change**	**Discussion**
4 [None]	Section 4.1 of the 1969 version states that "the four parts of the symbol (the three blades and the central disc) shall be a purple color" similar to that established in ANSI Z53.1-1967, Safety Color Code for Marking Physical Hazards. Section 4.2 of the 1969 version states that "the symbol shall be located in a yellow background," the yellow color being similar to that established in ANSI Z53.1-1967, Safety Color Code for Marking Physical Hazards. Neither of these sections are present in the 1989 revision.	3	The 1969 version of the standard specifies that the color of the radiation symbol shall be purple on a yellow background. This is consistent with 10 CFR Part 20 section 20.1901 which requires, with a few specifically defined exceptions, that the color of the radiation symbol shall be "magenta, or purple, or black on a yellow background." On the other hand, ANSI standard N2.1-1989 has omitted the color requirements that were part of ANSI N2.1-1969. Therefore, those symbols that are in compliance with the 1969 version of the standard are also in compliance with 10 CFR §20.1901. However, it is possible that those symbols that are in compliance with the 1989 version of the standard may not conform to the color requirements of 10 CFR §20.1901. This change to the standard affects the conformance of the standard with regulatory requirements.
Footnote 3 [None]	This footnote states the recommendation that the colors of the radiation symbol should be stable for the life of the symbol. The factors which may affect colorfastness are listed. Test methods to confirm the colorfastness of the pigments used are referenced. The information contained within this footnote is not present in the 1989 revision.	3	This was a footnote to Section 4 of ANSI N2.1-1969. That section specified the color requirements for the radiation symbol and background. Apparently when the color requirement was removed for the 1989 revision, this footnote was likewise deleted. This footnote recommends that the colors should be stable for the useful life of the symbol (or for extended periods in some cases).

III. RECOMMENDATIONS

This part of the comparison summarizes significant differences (identified in Part II) between the cited and latest versions of the standard and addresses their regulatory effects on the citing documents. Those changes in the standard that only added detail to existing requirements are not included in the summary of significant differences. The regulatory citations to ANSI N2.1 (identified in Part I) are evaluated based on the significant differences between the cited and latest versions of this standard. Citations in the SRP are evaluated first, followed by citations in associated Regulatory Guides and 10 CFR sections. Recommendations concerning the updating of these citations as they relate to the SRP-UDP are also included in this part of the comparison.

Summary of Significant Differences

ANSI standard N2.1-1969 is cited in the latest version of Regulatory Guide 8.1 (dated 2/2/73) as follows:

The characteristics of the radiation symbol described in ANSI N2.1-1969, "Radiation Symbol," are consistent with the provisions of 20.203. "Caution signs, labels, signals, and controls," of 10 CFR Part 20 and are generally acceptable for use wherever such a symbol may be needed.

Note that revised provisions for the radiation symbol are contained within 10 CFR §20.1901, which became effective June 20, 1991 (56 f 3360). Licensees were allowed to continue to follow the provisions of §20.203 and defer implementation of §20.1901 until January 1, 1994. Effective January 1, 1994, §20.203 was removed from 10 CFR Part 20 (59 FR 1900). Therefore, 10 CFR §20.203 no longer exists, and the provisions for the characteristic of the radiation symbol are contained within 10 CFR §20.1901.

Much of the information contained in the 1969 version of ANSI N2.1-1969, including the shape and proportions of the symbol and appropriate uses for the symbol, may also be found in 10 CFR 20.1901. Both 10 CFR 20.1901 and ANSI N2.1-1969 specify a color requirement for the radiation symbol and background; §20.1901(a) states that "except as otherwise authorized by the Commission, symbols prescribed by this part shall use the colors magenta, or purple, or black on a yellow background." However, ANSI N2.1-1969 does not allow the range of symbol colors provided by 10 CFR §20.1901. The standard requires that the radiation symbol "shall be a purple color similar to that established in" ANSI Z53.1-1967, American National Standard Safety Color Code for Marking Physical Hazards. If the differences in color requirements are neglected, however, the 1969 version of the standard is consistent with the provisions of 10 CFR §20.1901.

The 1989 revision to ANSI Standard N2.1 differs from the 1969 version in that it refrains from specifying requirements for the color of the radiation symbol. The reason that color requirements have been relaxed can be found in the Foreword to the 1989 version:

"This revision specifies only the shape and use of the radiation symbol but not its color, because at present there does not appear to be a consensus on the color issue within the radiation protection community in the United States. Users must address the color issue in terms of other American National Standards or in terms of applicable regulations."

The failure to specify a color requirement in itself makes the 1989 version of the standard inconsistent with the provisions of 10 CFR §20.1901. However, if the differences in the color requirements are neglected, the 1989 version, like the 1969 version, is consistent with the provisions of 10 CFR §20.1901. It is noted that the forward to the 1989 version states that color requirements must be addressed in terms of applicable regulations.

It would therefore appear that if Regulatory Guide 8.1 is to endorse the 1989 version of ANSI N2.1, that an exception to that standard may be necessary. That exception might state that the characteristics of the radiation symbol described in ANSI N2.1-1989 are consistent with the provisions of 10 CFR §20.1901 except that the color of the symbol and the background shall be as described in 10 CFR §20.1901(a).

There are other exceptions to the standard which may be considered in the event that Regulatory Guide 8.1 endorses the 1989 version of ANSI N2.1. First of all, Regulatory Guide 8.1 (2/73) takes the following exception to the citation of the 1969 version of the standard:

> "In some cases, such as applications involving high temperatures which destroy paints of the prescribed colors, exceptions to the standards may be necessary. Determination of such exceptions will be made by the Regulatory Staff on an individual case basis."

It would appear that this exception would apply equally well if the Regulatory Guide is revised to cited the 1989 version of ANSI N2.1-1989; retention of this exception should therefore be considered. Secondly, there are provisions in 10 CFR Part 20 and Part 39 which allow exceptions to the color requirements of §20.1901 in very specific cases. These provisions are as follows

1) §20.1901(b) provides for an exception to the color requirements of §20.1901(a) in the case of labels for "sources, source holders, or device components containing sources of licensed materials that are subjected to high temperatures."

2) 10 CFR 39.15(a)(5)(iii)(B) provides an exception to the color requirements in §§20.1901(a) in the case of plaques which mark the location of wells in which a radiation source has become irretrievably lodged.

SRP Citations to the Standard

There are no direct citations of the standard in the SRP. However with respect to SRP Sections 12.3 - 12.4 and 12.5, it is recommended that the Acceptance Criteria associated with 10 CFR 20.203 be augmented with a reference to ANSI N2.1-1989, as providing information and describing a basis acceptable to the staff to implement the requirements of Part 20. This recommendation is contingent upon NRC staff analysis of the significant differences identified in this comparison.

Other Regulatory Citations to the Standard

Regulatory Guide 8.1

Consideration should be given to the inclusion of the provisions discussed above in an exception to the endorsement of ANSI N2.1 by Regulatory Guide 8.1.

In summary, it appears that neither the 1969 nor the 1989 versions of ANSI standard N2.1 contain color requirements that are consistent with the applicable sections of the Code of Federal Regulations. Therefore it would appear that if Regulatory Guide 8.1 is to cite the latest version of ANSI N2.1 that consideration should be given to including exceptions to that standard; these exceptions would state that the color provisions as given in 10 CFR Parts 20 and 39 also be met. This course of action would appear to require a further evaluation of the potential regulatory impacts; such an analysis is beyond the scope of the SRP-UDP. NRC review is needed to determine the appropriate course of action.

Also, 10 CFR Part 20 has been extensively revised since the last update of Regulatory Guide 8.1. As a result, Regulatory Guide 8.1 as it is currently written (2/73 version) references a section of the Code of Federal Regulations which no longer exists (§20.203). That section of Part 20 contained requirements for a radiation symbol that have been updated and placed within 10 CFR §20.1901. Consideration should be given to updating Regulatory Guide 8.1 so that all references to 10 CFR §20.203 are changed to refer to 10 CFR §20.1901. This action would also appear to require further evaluation of the potential regulatory impacts; such an analysis is beyond the scope of the SRP-UDP. NRC review is needed to determine the appropriate course of action.

3.3 ANSI Standard N13.7 Comparison

This section presents a comparison of the version of ANSI N13.7 cited in the Standard Review Plan (SRP) and associated Regulatory Guides and Code of Federal Regulation (CFR) sections with the latest version of the standard, in support of the Nuclear Regulatory Commission's (NRC's) Standard Review Plan Update and Development Program (SRP-UDP).

CITED STANDARD:

ANSI N13.7-1972, "American National Standard for Film Badge Performance"

LATEST STANDARD:

ANSI N13.7-1983 (R1989), "American National Standard for Radiation Protection - Photographic Film Dosimeters - Criteria for Performance"

CONTENTS

I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI N13.7 in the SRP and associated Regulatory Guides and 10 CFR sections. Recommendations on the disposition of these citations based on the results of this standard comparison are presented in Part III, Recommendations.

SRP Citations

SRP Section 12.5

Revision/Title: Rev. 2, July 1981, "Operational Radiation Protection Program"

Location: SRP Section 12.5 lists ANSI N13.7-1972 as Reference 32 in the REFERENCES

Context: ANSI N13.7-1972 is endorsed by Regulatory Guide 8.3, Rev. 0, for film badge performance, practices, and criteria and is listed in the SRP Section 12.5 References.

Other Citations

Regulatory Guide 8.3

Revision/Title: Rev. 0, February 1973, "Film Badge Performance Criteria"

Location: Regulatory Guide 8.3 endorses ANSI N13.7 in B, "Discussion" and C, "Regulatory Position."

Context: ANSI N13.7-1972 is discussed in Subsection B of Regulatory Guide 8.3 and is endorsed in Subsection C of Regulatory Guide 8.3 for film badge performance and practices with specified exceptions.

II. CITED VS. LATEST STANDARD DIFFERENCES

As discussed in the forward to the latest version (ANSI N13.7 1983 R89) of the standard, the cited version (ANSI N13.7 1972) was significantly revised. The cited version of the standard appears to have been replaced by a combination of ANSI N13.11 1983 and ANSI N13.7 1983. Evaluation of the provisions of ANSI N13.11 1983 with regard to the cited standard (ANSI N13.7 1972) is not within the scope of the SRP-UDP. Therefore, it was not determined whether the requirements and recommendations of ANSI N13.7 1972 are completely captured by the combination of later standards.

Both the cited and latest versions of the ANSI N13.7 are limited to film badge dosimetry performance, however, based on the issuance of ANSI N13.11 1983, the scope of the latest version of the standard was reduced. The scope of the latest version is now limited to providing film badge tests and performance criteria to determine the impact of environmental variables such as heat, humidity, aging, chemical vapors and ambient light on film badge performance. In addition, the latest version also addresses the effects on film badge performance of varying the photon angle of incidence. Unlike the cited version, the latest version of the standard does not cover evaluation of film badge dosimeter response to different types and energies of incident radiation.

The changes to ANSI N13.7 reduce the scope and purpose of the standard with regard to performance criteria and testing of film badge dosimetry and therefore appear to be significant.

Further consideration of the effects of the changes presented in this section on the SRP and associated Regulatory Guides and CFR sections that cite ANSI N13.7 is provided in the Part III, Recommendations, of this section.

III. RECOMMENDATIONS

This part of the comparison summarizes significant differences (identified in Part II) between the cited and the latest versions of the standard and addresses their regulatory effects on the citing documents. Those changes in the standard that only added detail to existing requirements are not included in the summary of significant differences. The regulatory citations to ANSI N13.7 (identified in Part I) are evaluated based on the significant differences between the cited and latest versions of this standard. Citations in the SRP are evaluated first, followed by citations in associated Regulatory Guides and 10 CFR sections. Recommendations concerning the updating of these citations as they relate to the SRP-UDP are also included in this part of the comparison.

Summary of Significant Differences

There are numerous significant changes in the standard that indicate the 1983 version of ANSI N13.7 is substantially different from the 1972 version. The requirements and recommended practices provided in ANSI N13.7-1972, "Film Badge Performance Criteria," have generally been endorsed by Regulatory Guide 8.3 as acceptable, but were deleted in ANSI 13.7-1983. ANSI N13.7-1972 is cited in Regulatory guide 8.3 for the following attributes: 1) it provides film badge performance criteria for several categories of radiations following exposure under specified conditions, 2) because performance criteria are intimately connected with the methods of testing, a testing procedures is described, 3) the stated intention of the standard is to consider the performance of film badge dosimetry under the most reproducible conditions, 4) insofar as possible, uncertainties introduced by scattering, unspecified radiation sources, and nonuniform irradiations are eliminated from the prescribed procedures, and 5) the standard enumerates some advisory "Principles of Good Practice" in film badge dosimetry. These attributes have been deleted in ANSI N13.7-1983. Furthermore Standard ANSI N13.7-1983 does not prescribe procedures to eliminate uncertainties introduced by scattering, unspecified radiation sources, and nonuniform irradiations; but instead sets forth performance criteria for photographic film dosimeters that are exposed to heat, humidity, aging, chemical vapors, and ambient light. It also specifies the performance of film dosimeters when they are irradiated with isotropic rather than normally incident photons.

SRP Citations to the Standard

In addition to the considerations discussed above, consider deleting the citation of ANSI N13.7-1972 and Regulatory Guide 8.3 from SRP Section 12.5. The use of thermoluminescent dosimeters has largely replaced film badge use.

SRP Section 12.5

Contingent on NRC staff review of the significant differences identified in this comparison, consider deleting the citation of ANSI N13.7-1972 in SRP Section 12.5. The recommendations regarding future endorsement of ANSI N13.7 by SRP Section 12.5 are as follows:

SRP Section 12.5 Paragraph	Recommendation
REFERENCES	Standard ANSI N13.7-1972 is included in the REFERENCES to SRP 12.5, but is not cited in the text. The deletion in ANSI N13.7-1983 of the attributes of ANSI N13.7-1972 that were endorsed by Regulatory Guide 8.3 appears to be a significant change that may cause ANSI N13.7-1983 to be inadequate for establishing criteria for testing personnel dosimetry performance. Consideration should be given to deletion of ANSI N13.7-1972 from the list of references in SRP Section 12.5. Citations of associated Regulatory Guide 8.3 should also be considered for deletion. The use of thermoluminescent dosimeters has largely replaced film badge usage. The use or reference of ANSI N13.7 is not anticipated in future licensing applications for nuclear power plants.

Other Regulatory Citations to the Standard

Consider retaining the citation of ANSI N13.7-1972 in Regulatory Guide 8.3. The recommendation with regard to future endorsement of ANSI N13.7 by Regulatory Guide 8.3 follow:

Regulatory Guide 8.3

Regulatory Guide 8.3 Paragraph	Recommendation
B. DISCUSSION	The requirements and recommended practices contained in ANSI N13.7-1972, "Film Badge Performance Criteria," have generally been endorsed by Regulatory Guide 8.3 as acceptable. ANSI N13.7-1972 is cited in Regulatory guide 8.3 for the following attributes: 1) it provides film badge performance criteria for several categories of radiations following exposure under specified conditions, 2) because performance criteria are intimately connected with the methods of testing; a testing procedures is described, 3) the stated intention of the standard is to consider the performance of film badge dosimetry under the most reproducible conditions, 4) insofar as possible, uncertainties introduced by scattering, unspecified radiation sources, and nonuniform irradiations are eliminated from the prescribed procedures, and 5) the standard enumerates some advisory "Principles of Good Practice" in film badge dosimetry. This standard comparison shows that these attributes have been deleted in ANSI N13.7-1983. Given the reduction in scope in ANSI N13.7-1983, a change to the 1983 version is not recommended. In addition, the use of thermoluminescent dosimeters has largely replaced film badge usage and a revision to Regulatory Guide 8.3 may not be needed at this time.

3.4 ANSI Standard N18.1 Comparison

This section presents a comparison of the version of ANSI N18.1 cited in the Standard Review Plan (SRP) and associated Regulatory Guides and Code of Federal Regulation (CFR) sections with the latest version of the standard, in support of the Nuclear Regulatory Commission's (NRC's) Standard Review Plan Update and Development Program (SRP-UDP).

CITED STANDARD:

ANSI N18.1-1971, "Selection and Training of Nuclear Power Plant Personnel"

LATEST STANDARD:

ANSI/ANS-3.1-1993, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants"

CONTENTS

I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI N18.1-1971 in the SRP and associated Regulatory Guides and 10 CFR sections. Recommendations on the disposition of these citations based on the results of this standard comparison are presented in Part III, Recommendations.

SRP Citations

SRP Section 13.1.1

Revision/Title: Section 13.1.1, Rev. 2, July 1981, "Selection and Training of Nuclear Power Plant Personnel"

Location: SRP Section 13.1.1 cites ANSI N18.1 in Subsection II, "Acceptance Criteria," (Subsection II.B.6).

Context: ANSI 18.1 is cited by SRP Section 13.1.1 for qualifications of the "Engineer in Charge" as endorsed by Regulatory Guide 1.8.

SRP Section 13.1.2-13.1.3

Revision/Title: Section 13.1.2-13.1.3, Rev. 3, July 1989, "Operating Organization"

Location: SRP Section 13.1.2-13.1.3 endorses ANSI N18.1 in Subsection II, "Acceptance Criteria" and in Subsection III, "Review Procedures."

Context: ANSI N18.1 is endorsed with exceptions (as supplemented by Regulatory Guide 1.8) in SRP Section 13.1.2-13.1.3 for qualifications, selection, responsibilities and authorities of operating organization personnel.

SRP Section 13.4

Revision/Title: Section 13.4, Rev. 2, July 1981, "Operational Review"

Location: SRP Section 13.4 endorses Section 4.4 of ANSI N18.1 in Subsection II, "Acceptance Criteria" and in Subsection IV, "Evaluation Findings."

Context: Section 4.4 of ANSI N18.1 is endorsed in SRP Section 13.4 for qualification of plant staff personnel performing operational review as endorsed by Regulatory Guide 1.8.

Other Citations

Regulatory Guide 1.8

Revision/Title: Rev. 2, April 1987, "Qualification and Training of Personnel for Nuclear Power Plants"

Location: Regulatory Guide 1.8 endorses ANSI N18.1-1971 in Sections B, "Discussion," and C, "Regulatory Position" (Regulatory position C.2).

Context: ANSI N18.1-1971 is addressed in a historical context by Regulatory Guide 1.8 in Section B, "Discussion," and is endorsed as criteria for the qualification and training of selected nuclear power plant personnel by Regulatory Guide 1.8 in Section C, "Regulatory Position."

II. CITED VS. LATEST STANDARD DIFFERENCES

The cited standard, ANSI N18.1-1971 was first revised and reissued as ANS/ANS-3.1-1978. Subsequent revisions and reissuances of the standard were ANSI/ANS-3.1-1981, ANSI/ANS-3.1-1987, and most recently, ANSI/ANS-3.1-1993. Given the large number of significant changes between the cited and latest versions, a detailed listing of these differences are not presented in this report. The changes are summarized in Part III.

III. RECOMMENDATIONS

This part of the comparison summarizes significant differences between the cited and latest versions of the standard and addresses their regulatory effects on the citing documents. The regulatory citations to ANSI N18.1 (identified in Part I) are evaluated based on the significant differences between the cited and latest versions of this standard. Citations in the SRP are evaluated first, followed by citations in associated Regulatory Guides and 10 CFR sections. Recommendations concerning the updating of these citations as they relate to the SRP-UDP are also included in this part of the comparison.

Summary of Significant Differences

ANSI N18.1-1971 was first revised and reissued as ANSI/ANS-3.1-1978. Subsequent revisions and reissuances of the standard were ANSI/ANS-3.1-1981, ANSI/ANS-3.1.1987 and, most recently, ANSI/ANS-3.1-1993.

The major elements of each of the steps in the evolution of the document from ANSI N18.1-1971 to ANSI/ANS-3.1-1993, as expressed in the Foreword accompanying each revision/reissue, are summarized below:

(1) ANSI/ANS-3.1-1978 --- The standard was updated to factor in industry experience and changing regulatory requirements. Definitions were added to elaborate on Nuclear Power Plant Experience and for Off-Site Personnel, Licensed Operator, Licensed Senior Operator and Owner Organization. Nuclear power plant experience requirements were increased, and the criteria for credit given for

college level experience were revised to include credit for advanced degrees and special job oriented training, for the following positions: Maintenance Manager; Supervisors Requiring NRC Licenses; Professional-Technical personnel responsible for Reactor Engineering, Instrumentation and Control, and Radiation Protection; and Technicians. Provisions were added for new owner organization positions associated with quality assurance programs, commitments to Regulatory Guides, and requirements for review and audit pursuant to ANSI N18.7-1976 (ANS-3.2). The entire training section was revised to provide better guidance for "hot" and "cold" license training, requalification training and general employee training. Guidance was provided as to the application of military service experience to nuclear power plant experience. An appendix was added to provide an example of a typical NRC approved reactor training program.

(2) ANSI/ANS-3.1-1981 --- The standard was revised to factor in lessons learned from the Three Mile Island accident and changing regulatory requirements, with major changes being made to several sections throughout the standard. A new definition was added for startup testing, and new plant positions and their associated experience requirements were added for Training Manager, Shift Supervisor, Senior Operator, Pre-Operational Testing Personnel, Training Instructor, Shift Technical Advisor, Training Coordinator, Non-Licensed Operators and Licensed Operators. A new paragraph was added requiring job overlap for personnel being replaced in the station organization. A major addition was made to provide guidance for the selection of those rare, exceptional individuals who have demonstrated outstanding management ability yet who do not possess the formal education required by the standard. The entire training section was revised to provide more detailed guidance, with the major change consisting of requiring task analysis as the basis for training programs. A revised appendix was provided as an example of a typical NRC approved licensed candidate training program.

(3) ANSI/ANS-3.1-1987 --- Major changes in content and format were made to the standard to incorporate improvements in industry practices as the result of actions taken by INPO, NRC and NUMARC. Criteria in the standard were organized by general functional levels of responsibility. For management positions, minimum qualifications were specified both by functional level and by individual. Training requirements were updated to reflect the growing industry practice of training based on a systematic analysis of the training need and on performance-based training.

(4) ANSI/ANS-3.1-1993 --- The standard was revised to not allow simulator and classroom training to substitute for operator nuclear power plant experience. A compensating change was made to the associated experience requirements.

The resulting differences between ANSI/ANS-3.1-1993 and ANSI N18.1-1971 can be broadly described as follows:

(1) With the exception of "shall, should and may", all defined terms are new, there are more of them (19 versus 8) and, in general, they are more focused.

(2) The qualification criteria in the standard are explicitly structured by the general functional levels of responsibility which generally occur in a nuclear power plant organization.

(3) There are more identified positions (approximately 40 versus less than 20) and most of the new positions are applicable to the plant staff.

(4) The standard is more focused on the plant staff, with minimal provisions for off-site or support positions.

(5) There are more qualification requirements applicable to each position and/or the requirements are more specific.

(6) The training section is written in the context of the training development process and the systematic approach to training, versus specific training program content.

In general, the identified changes involve new, expanded or modified requirements that appear to exceed those of the cited standard. However, differences were identified that involve reductions in requirements or that require further NRC staff review. These differences are as follows:

- The 1993 version addresses alternative to educational requirements and provides for substitution of experience for education. (Section 4.1.1 of 1993 version.)

- The 1993 version provides for detailed discussion of acceptable alternatives to experience requirements. (Section 4.1 of 1971 version, Section 4.1.2 of 1993 version.)

- The 1993 version requires the use of the systematic approach to training process for specified positions. (Sections 4.1.4 and 6.2.1 of 1993 version.)

- The 1993 version allows one incumbent in a managerial position to fail to meet experience requirements provided a collective experience requirement is met. (Section 4.2 of 1993 version.)

- The basic qualification requirements for quality assurance or quality control supervisors as contained in the 1993 version of the standard are less stringent than those in the 1971 version for supervisors not requiring a license (the most comparable category/position) --- see Section 4.4.13 in the 1993 version and Section 4.3.2 in the 1971 version, respectively.

  Regulatory Guide 1.8, in the third paragraph of Section B, endorses the 1971 version for the qualification requirements for the quality assurance or quality control supervisors.

SRP Citations to the Standard

Section 13.1.1 - Selection and Training of Nuclear Power Plant Personnel (July 1981)

With regard to the regulatory citation in SRP Section 13.1., paragraph II.B.6 states that "Qualifications of the "Engineer in Charge" should meet or exceed those given in Section 4.6.1 of ANSI N18.1, as endorsed by Regulatory Guide 1.8." The 1993 standard does not address the position of "Engineer in Charge." The 1993 version includes the positions of Technical Manager (Section 4.2.4), Engineering Support Middle Manager (Section 4.3.9), and Engineering Support first line supervisor (Section 4.4.10), which are not directly comparable to the Engineer in Charge position discussed in the 1971 version.

Further regulatory review is necessary to determine the appropriate changes, if any, to the SRP with regard to cited and latest versions of the standard.

Section 13.1.2-13.1.3 - Operating Organization (July 1989)

SRP Section 13.1.2-13.1.3 cites Sections 3.2 and 4 of ANSI N18.1. Section 3.2 of the 1971 version discusses and establishes the functional levels of the operating organization, including managers, supervisors, professional-technical personnel, and operators-technicians-repairmen. There is no comparable section in the 1993 version. Section 4 of the 1971 version establishes the experience and educational requirements for the established positions. The omission of a section in the 1993 version related to the functional levels of the operating organization is replaced with sections that identify functional levels and qualifications for a more comprehensive organizational structure. The functional levels, requirements and qualifications described in the 1993 version are more extensive that in than in the 1971 version.

Further NRC review is necessary to determine the acceptability of updating the SRP citation of ANSI N18.1.

Section 13.4 - Operational Review (July 1981)

With regard to the regulatory citation, SRP 13.4 cites Section 4.4 of the 1971 standard. There is not a one-to-one correspondence between the positions described in Section 4 of the 1971 and 1993 versions. Positions equivalent to those in Section 4.4 of the 1971 version are not presented in the 1993 version. The 1993 version contains middle management and supervisory positions related to the same or similar disciplines described in Section 4.4 of the 1971 version, but in general, the qualification requirements in the 1993 version are more stringent. Furthermore, NRC review is needed for these changes.

Other Regulatory Citations to the Standard

Regulatory Guide 1.8

Regulatory Guide 1.8, Position C.2, cites ANSI N18.1-1971 for positions other than shift supervisor, senior operator, licensed operator, shift technical advisor and radiation protection supervisor. The 1993 version significantly expands the number and types of management, supervisory, and technical positions from those described in the 1971 version. In addition, the qualification requirements in the 1993 version have been expanded, modified, and in some cases reduced from these in the 1971 version. Based on the number of important differences between the two versions of the standard, further NRC review is necessary to determine the acceptability of updating the citations to reflect the requirements of the latest version (ANSI/ANS 3.1-1993).

3.5 ANSI Standard N18.17 Comparison

This section presents a comparison of the version of ANSI N18.17 cited in the Standard Review Plan (SRP) and associated Regulatory Guides and Code of Federal Regulation (CFR) sections with the latest version of the standard, in support of the Nuclear Regulatory Commission's (NRC's) Standard Review Plan Update and Development Program (SRP-UDP).

CITED STANDARD:

ANSI N18.17 (Version not Specified), "Industrial Security for Nuclear Power Plants." The 1973 version was in effect at the time the SRP was issued in July 1981 and was used for this comparison.

LATEST STANDARD:

ANSI/ANS-3.3-1988, "Security for Nuclear Power Plants"

CONTENTS

I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI N18.17-1973 in the SRP and associated Regulatory Guides and 10 CFR sections. Recommendations on the disposition of these citations based on the results of this standard comparison are presented in Part III, Recommendations.

SRP Citations

The SRP citations addressed here do not reference a specific version (year) for ANSI N18.17. However, SRP Section 13.6 is dated July 1981. The Foreword to ANSI/ANS 3.3-1982 states "This standard is a revision of ... ANSI N18.17-1973." Therefore, the 1973 version of ANSI N18.17 was in effect in July 1981. Regulatory Guide 1.70 dated November 1978 endorses ANSI N18.17-1973. Therefore, this analysis assumes that the cited standard was ANSI N18.17-1973.

SRP Section 13.6

Revision/Title: Rev. 2, July 1981, "Physical Security"

Location: ANSI N18.17 is cited in three locations: in Subsection II, "Acceptance Criteria," Subsection III, "Review Procedures," and in Subsection VI, "References."

Context: SRP Section 13.6 cites ANSI N18.17 for requirements and recommendations to be used as a checklist for the applicant's security plan for the protection of nuclear power plants against radiological sabotage.

Other Citations

Regulatory Guide 1.70

Revision/Title: Rev. 3, November 1978, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants"

Location: Regulatory Guide 1.70 cites ANSI N18.17-1973 in Section 13.6, "Industrial Security."

Context: Regulatory Guide 1.70 states that Regulatory Guide 1.17 endorses ANSI N18.17-1973 and cites ANSI N18.17-1973 as guidance for the FSAR security plan, Section 3.2 for the owner-controlled area, Sections 3.3 and 3.4 for the construction of the physical barrier for the protected and vital areas, and Section 4.4 for response capabilities of local law enforcement agencies. Regulatory Guide 1.17 was withdrawn in May 1991 with the issuance of 10 CFR 73.56.

II. CITED VS. LATEST STANDARD DIFFERENCES

ANSI/ANS 3.3-1988 reflects extensive changes made to 10 CFR Part 73 since the issuance of ANSI N18.17-1973. Given the large number of significant changes between the cited and latest versions, a detailed listing of these differences are not presented in this report. The changes are summarized in Part III.

III. RECOMMENDATIONS

This part of the comparison summarizes significant differences between the cited and latest versions of the standard and addresses their regulatory effects on the citing documents. The regulatory citations to ANSI N18.17 (identified in Part I) are evaluated based on the significant differences between the cited and latest versions of this standard. Citations in the SRP are evaluated first, followed by citations in associated Regulatory Guides and 10 CFR sections. Recommendations concerning the updating of these citations as they relate to the SRP-UDP are also included in this part of the comparison.

Summary of Significant Differences

The recommendations that follow are contingent upon NRC staff analysis of the apparently significant differences identified in this standard comparison.

ANSI N18.17-1973 was first revised and reissued as ANSI/ANS-3.3-1982. As discussed in the Foreword to ANSI/ANS-3.3-1982, the purpose of the revision/reissue was to reflect changes made by the Nuclear Regulatory Commission to 10 CFR 73, "Physical Protection of Plants and Materials," after 1973. In particular, ANSI/ANS-3.3-1982 addressed extensive revisions made to 10 CFR Part 73 in 1977 relative to security requirements for nuclear power plants and, as such, represented a major updating and restructuring of the standard.

ANSI/ANS-3.3-1982 was subsequently revised and reissued as ANSI/ANS-3.3-1988. The Foreword to ANSI/ANS-3.3-1988 indicates that the standard reflects changes to 10 CFR Part 73 after 1982. And, while a detailed comparison was not a part of the current effort, it appears that the 1988 version of the standard did not involve extensive changes versus the 1982 version. Changes that were noted include the addition of a definition of "safeguards information"; referencing 10 CFR 73.21 relative to the protection of safeguards information; referencing 10 CFR 73.71 relative to reporting requirements; and the addition of a requirement that the audit and review program include a periodic review of security plans and contingency plans and procedures, to evaluate their potential impact on plant and personnel safety.

The resulting differences between ANSI/ANS-3.3-1988 and ANSI N18.17-1973 that appear to be significant can be broadly described as follows:

(1) There is less background material. (The Foreword to ANSI N18.17-1973 states that, in the preparation of the standard, the writers became aware of the paucity of guidance available on the subject of industrial security programs for nuclear power plants, and concluded that it was appropriate to provide background material in somewhat greater detail than was the normal practice in standards preparation. For that reason, the Scope section of the standard was relatively long.)

(2) There are more defined terms (27 versus 8), the majority of which are aligned with the provisions of 10 CFR 73, particularly Section 73.2, "Definitions."

(3) There are fewer provisions relative to administrative matters such as responsibilities and authorities, security procedure preparation and processing, and interfaces with local law enforcement authorities or military units.

(4) There are significantly more "facility requirements" relative to implementing a physical security plan. These requirements are grouped into four sets: Plant Security Force, Plant Layout and Physical Structures, Security Equipment, and Procedures. And the facility requirements section now represents the bulk of the standard.

While detailed analysis is beyond the scope of the Standard Review Plan Update Project, ANSI/ANS 3.3-1988 appears to conform with latest regulatory criteria of 10 CFR 73, with the possible exception of the following:

- Section 73.1(a)(1) describes the design basis threat for radiological sabotage. Section 1.2 of ANSI/ANS-3.3-1988 is consistent with the description with the exceptions of not including use of a four-wheel drive land vehicle and including the ability to operate as two or more teams.

- In Section 2 of ANSI/ANS-3.3-1988, the definition of authorized individual allows designation of such individuals in writing or an equivalent method. The definition provided in Section 73.2 does not address the use of an equivalent method.

- Section 73.55(c)(3) of 10 CFR 73 requires that protected area isolation zones be of sufficient size to permit observation of the activities of people on either side in the event of penetration. Whereas, Section 5.2.2.2 of ANSI/ANS-3.3-1988 recommends that the protected area isolation zone be of sufficient size to permit observation of activities on either side. (Emphasis added.)

- Section 73.55(c)(5) of 10 CFR 73 requires that isolation zones and all exterior areas within the protected area be provided with illumination sufficient for the monitoring and observation requirements of Section 73.55, but not less than 0.2 foot-candles measured horizontally at ground level. Whereas, Section 5.3.1.2 of ANSI/ANS-3.3-1988 requires that illumination be provided in the

isolation zone to permit observation of activities and to accurately assess intrusion detections made at the protected area perimeter; and the standard requires that illumination at the protected area perimeter, including the isolation and the entire exterior protected area, exclusive of buildings over 18 feet in height, be, as a minimum, 0.2 foot-candles measured by placing a light meter horizontal to the ground at ground level. (Emphasis added.)

- Section 73.55(d)(5) of 10 CFR 73 requires that badges be displayed by all individuals while inside the protected area. Whereas, Section 5.4.1.1 of ANSI/ANS-3.3-1988 requires that each individual display a badge while within a protected area except when inconsistent with safety or radiation considerations. (Emphasis added.)

- Section 73.55(g)(2) of 10 CFR 73.55 requires that each intrusion alarm be tested for performance at the beginning and end of any period that it is used for security. And Section 73.55(g)(2) requires that, if the period of consecutive use is longer than seven days, the intrusion alarm is also to be tested at least once every seven days. Whereas, Section 5.4.4.1 of ANSI/ANS-3.3-1988 requires that testing of the intrusion detection alarm system for the protected and vital areas be conducted at the beginning of the period of use and at least once every seven days while in use. (Emphasis added.)

- Section 73.55(g)(3) of 10 CFR 73.55 requires that communications equipment required for communications onsite be performance tested not less frequently than once at the beginning of each security personnel work shift and that communication equipment required for communications offsite be performance tested not less frequently that once a day. Section 5.4.4.3 of ANSI/ANS-3.3-1988 recommends that equipment required for communications onsite be performance tested not less frequently than once at the beginning of each security force work shift and that equipment required for communications offsite be performance tested not less than once a day. (Emphasis added.)

- Several requirements of 10 CFR 73 related to record retention appear to be more restrictive than the applicable provisions of ANSI/ANS-3.3-1988. Section 5.5.2 of the standard requires that initial records of acceptance of security equipment be retained for the life of the equipment; requires that personnel screening records be retained for three years following the termination of need for unescorted access; requires that records of maintenance and testing of security equipment and security force training be retained for a period of five years; and requires that all other security records be retained for a period of one year. Whereas, for example, Section 73.55(b)(3) requires that security procedure records be retained for three years; Section 73.55(d)(6) requires that the register of individuals allowed escorted access into the protected area be retained for three years; Section 73.55(g)(4) and Section 73.56(h)(2) require that security program review and audit records be retained for three years; Section 73.56(h)(1) requires that access authorization records be retained for five years following termination of the authorization and that records associated with the denial of unescorted access be retained for five years thereafter; and Section 73.70 requires that a variety of security related records be retained for three years.

Also, it should be noted that ANSI/ANS-3.3-1988 does not address or incorporate all of the applicable provisions of 10 CFR 73, particularly Section 73.55.

In addition, specific surveillance requirements of protected areas and vital areas by security personnel and operating personnel presented in Sections 3.3.3 and 3.4.3 of the 1973 version have not been retained in ANSI/ANS-3.3-1988. Also, employee screening provisions discussed in Section 4.3 of the 1973 version and Section 5.4.5.1 of the 1988 version differ significantly between the two versions, and the impact of 10 CFR 73.56, issued in 1991, needs to be evaluated.

As described in the earlier paragraphs of this section, the changes to the standard subsequent to 1973 have been to address NRC requirements and to develop consistency with 10 CFR 73. NRC regulatory review is needed to determine the acceptability of significant changes identified.

SRP Citations to the Standard

Recommendations for updating specific references in SRP Section 13.6 are as follows:

SRP Section 13.6, Rev. 2, "Physical Security" (July 1981)

Although ANSI/ANS-3.3-1988 reflects the requirements of 10 CFR Part 73 to a large degree, additional reviews for conformance with specific elements of Part 73 are recommended to ensure all necessary regulatory exceptions to the 1988 standard are identified.

Other Regulatory Citations to the Standard

Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants" (November 1978)

Recommendations for updating specific references in Regulatory Guide 1.70, Section 13.6, are as follows:

Although ANSI/ANS-3.3-1988 reflects the requirements of 10 CFR Part 73 to a large degree, additional reviews for conformance with specific elements of Part 73 are recommended to ensure all necessary regulatory exceptions to the 1988 standard are identified.

3.6 ANSI Standard N195 Comparison

This section presents a comparison of the version of ANSI N195 cited in the Standard Review Plan (SRP) and associated Regulatory Guides and Code of Federal Regulation (CFR) sections with the latest version of the standard, in support of the Nuclear Regulatory Commission's (NRC's) Standard Review Plan Update and Development Program (SRP-UDP).

CITED STANDARD:

ANSI N195 (version/date not specified), "Fuel Oil Systems for Standby Diesel-Generators." ANSI N195-1976 was in place prior to 1981 when SRP Section 9.5.4 was issued and is the version cited in Regulatory Guide 1.137, Rev. 1, 1979.

LATEST STANDARD:

ANS 59.51-1989, "Fuel Oil Systems for Standby Diesel-Generators"

CONTENTS

I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI N195 in the SRP and associated Regulatory Guides and 10 CFR sections. Recommendations on the disposition of these citations based on the results of this standard comparison are presented in Part III, Recommendations.

SRP Citations

SRP Section 9.5.4

Revision/Title: Rev. 2, July, 1981,"Emergency Diesel Engine Fuel Oil Storage and Transfer System"

Location: SRP Section 9.5.4 cites ANSI N195 in Subsection II, "ACCEPTANCE CRITERIA," Subsection IV, "EVALUATION FINDINGS," and in Subsection VI, "REFERENCES."

Context: ANSI N195 is endorsed by SRP Section 9.5.4 for requirements for the design of fuel-oil systems for diesel generators that provide standby electrical power for a nuclear power plant.

Other Citations

Regulatory Guide 1.137

Revision/Title: Rev. 1, October, 1979, "Diesel Generator Fuel Oil Systems"

Location: Regulatory Guide 1.137 cites ANSI N195 in Subsection C, "REGULATORY POSITION."

Context: ANSI N195-1976 is endorsed by Regulatory Guide 1.137 for requirements for the design of fuel-oil systems for diesel generators that provide standby electrical power for a nuclear power plant.

II. CITED VS. LATEST STANDARD DIFFERENCES

ANS 59.51-1989 incorporates extensive changes to the provisions of ANSI N195. Given the large number of significant changes between the cited and latest versions, a detailed listing of these differences are not presented in this report. The changes are summarized in Part III.

III. RECOMMENDATIONS

This part of the comparison summarizes significant differences between the cited and latest versions of the standard and addresses their regulatory effects on the citing documents. The regulatory citations to ANSI N195 (identified in Part I) are evaluated based on the significant differences between the cited and latest versions of this standard. Citations in the SRP are evaluated first, followed by citations in associated Regulatory Guides and 10 CFR sections. Recommendations concerning the updating of these citations as they relate to the SRP-UDP are also included in this part of the comparison.

Summary of Significant Differences

It appears that Regulatory Guide 1.137, Revision 1 could be revised to endorse ANSI/ANS-59.51-1989 with exceptions as suggested below and those determined necessary based upon further NRC staff analyses of identified significant differences. The following paragraphs identify significant differences between ANSI N195-1976/ANS-59.51 (endorsed by Regulatory Guide 1.137, Revision 1) and the current 1989 version for which further analyses (beyond the scope of the SRP-UDP) are recommended.

A new requirement in the 1989 version to use definitions from ANSI/ANS-51.1 and ANSI/ANS-52.1 appears to be a significant difference. This requirement does not appear to directly impose any specific new requirements for the design, function, or performance of emergency diesel generator fuel oil systems upon prospective users of ANSI/ANS-59.51-1989. Citation of other standards in the 1989 version introduces the need for a disclaimer in regulatory documents which endorse ANSI/ANS-59.51-1989 similar to those used in recent Division 1 Regulatory Guides which endorse standards containing references to other standards. (Section 2 of the 1989 version, first paragraph)

A change in specified conditions for fuel oil system operation appears to be a significant difference. Both versions require that the fuel oil system be designed so that specified functions can be performed in the event of a single failure (1989 version cites ANSI/ANS-58.9-1981 (R1987) for definition of the single failure criterion). Both versions specify the same basic function for diesel generator fuel oil systems (i.e., supplying fuel oil to the diesel generators under "specified conditions"). The 1989 version clarifies the function as "supplying an adequate supply of suitable fuel." Both versions provide requirements (in other sections of the standard) addressing the adequacy of fuel supply capability and the suitability of the fuel oil. The identified difference for this comparison item thus primarily relates to potential differences between the two versions in the "specified conditions." The 1976 version "specified conditions" were "all plant operating conditions and during all plant design basis events" whereas the 1989 version "specified conditions" are "all Plant Conditions that are defined in ANSI/ANS-51.1-1983 (R1988) and ANSI/ANS-52.1-1983 (R1988)." The differences in specified conditions may need to be addressed through the use of a regulatory exception to specify that system function is required for plant operating conditions including transients and accidents addressed in the plant safety analysis report. NRC staff review is needed to determine the acceptability of significant changes identified in this comparison. (Sections 4, 5.2 and 5.3 of the 1976 version; Section 3 of the 1989 version)

Replacement of previous requirements for design to permit maintenance within Technical Specification limits and degraded fuel removal/replacement with similar recommendations in the 1989 version appears to be a significant difference. Current STS appear to include a combination of LCOs, Action statements, and surveillance requirements for the fuel oil system which may rely in part on the design requirements of the 1976 version. The level of detail provided in the 1976 version requirements does not appear to be available elsewhere in regulatory guidance. Endorsement of the 1989 version would thus appear to necessitate a regulatory exception to treat these 1989 version recommendations as requirements to provide guidance equivalent to current guidance and assurance of fuel oil system design compatibility with current STS. (Section 4, Item (1) of the 1976 version; Section 6.4.1 of the 1989 version)

A new requirement in the 1989 version for fill line protection against siphoning appears to be a significant difference. This requirement is at a level of detail which does not appear to be available in current regulatory guidance. The regulatory implications of this added requirement, assuming endorsement of the 1989 version, should be determined based upon further NRC regulatory evaluation. (Section 4, Item (2) of the 1976 version; Section 6.2.5 of the 1989 version)

More stringent 1989 version requirements for fuel oil storage (fuel storage sufficient for each diesel as opposed to sufficient storage for the minimum number of diesels) appear to be significant differences. Since both versions require that system functions be accomplished in the event of a single failure (e.g., a lack of sufficient fuel), the 1989 version requirements appear to represent an improvement in clarity which does not entail significant regulatory implications. (Section 5.2 of the 1976 version; Section 5.2 of the 1989 version)

More stringent requirements in the 1989 version for fuel oil storage capacity at multiple unit stations with fuel oil system components shared between units appear to be significant differences. The requirements of the 1989 version appear to be consistent with current regulatory requirements (e.g., GDC 5) and regulatory practices related to diesel generators (e.g., Regulatory Guide 1.9, Revision 3), safe shutdown, and sharing of safety-related systems/components between multiple units. (Section 5.3 of the 1976 version; Section 5.3 of the 1989 version)

Potentially more stringent design requirements and citation of other standards (ANSI/ANS-51.1 and ANSI/ANS-52.1) in the 1989 version for multiple unit stations with fuel oil system components shared between units appear to be significant differences. (Section 5.3 of the 1976 version; Section 5.3 of the 1989 version)

Changed requirements related to fuel oil storage calculation methodology appear to be significant differences. Both versions recommend essentially the same conservative calculation based upon diesel generator capacity rating. Both versions detail essentially the same calculation methodology based upon operation of the diesel generator under minimum required load. The 1989 version allows this methodology (as opposed to requiring it as minimally acceptable as in the 1976 version) as an acceptable alternative to the recommended conservative calculation based on operation of the diesel engines at

rated capacity. The 1989 version does not discuss or explicitly allow any different calculation methodologies than detailed in the 1976 version. It is thus unlikely that users of the standard would use a calculation methodology which would be non-conservative with respect to the minimum required calculation prescribed in the 1976 version. (Section 5.4 of the 1976 version; Section 5.4 of the 1989 version)

Differences involving added and more stringent requirements in the 1989 version including added day/integral tank design/size requirements, added tank sizing considerations (capacity must consider unusable fuel at tank bottom), added transfer pump design requirements to provide sufficient head and capacity to allow for partial strainer blockage, added pump control design requirements to prevent excessive pump cycling, added requirements for the design and arrangement of strainers, and added requirements to consider sources that could cause system overpressurization during selection of design pressures and temperatures appear to be significant. These requirements are at a level of detail which does not appear to be available in current regulatory guidance. The regulatory implications of these requirements, assuming endorsement of the 1989 version, should be determined based upon further NRC regulatory evaluation. (Section 6 of the 1976 version; Sections 5.5 and 6.2.1 of the 1989 version)

Differences involving revised, added, and/or more stringent requirements in the 1989 version for safety classification of fuel oil systems, associated structures, and components and design facilitating compliance with applicable provisions of the ASME B & PVC, Sections III and XI (1989 edition) appear to be significant. SRP Section 3.2.2 identifies the diesel fuel oil storage and transfer system as an example of a system that the staff considers to be Quality Group C (which cross references to ANS SC-3 classification). 10 CFR 50.55a paragraphs (e), (f), and (g) impose the requirements of the edition and addenda, determined to be applicable in accordance with the regulation, of the ASME B & PVC Sections III and XI upon Quality Group C components. The ASME B & PVC is incorporated by reference into 10 CFR 50.55a and the 1989 edition appears currently acceptable for use per 10 CFR 50.55a. (Sections 6.2 and 7.4 of the 1976 version; Sections 5.5.2, 6, and 6.4 of the 1989 version)

Differences involving apparent new requirements for day tank location in the 1989 version and differences in requirements for interconnections between the diesel generator fuel oil system and other systems using fuel oil appear to be significant. The apparent new requirements for day tank location reduce to no firm requirements to do anything further upon examination of Section 5.5.1 of the 1989 version of the standard. The differences in requirements for interconnections between the diesel generator fuel oil system and other systems using fuel oil appear to involve more conservative practices (analysis demonstrating the safety of permanent interconnections) in the 1989 version which appear, to an extent, consistent with current applicable regulatory requirements. (Section 7.3 of the 1976 version; Section 6.2.4 of the 1989 version)

A difference involving added requirements for arrangement and location of fuel oil system components to satisfy oil temperature specification extremes in the 1989 version appears to be significant. The 1989 version requires that minimum and maximum fuel oil temperature conditions required by the fuel specifications be satisfied by the arrangement and location of fuel oil system components. This requirement appears consistent with the intent of Regulatory Guide 1.137 position C.1.f. (Section 6.2.4 of the 1989 version)

Differences involving revised, updated, and new design requirements for fuel oil system interfaces with supporting systems in the 1989 version appear to be significant. The 1989 version requirements for support services from systems designed as nuclear safety-related (the 1976 version required support from systems designed as engineered safety features) and that support be provided from the same safety division as the fuel oil subsystem supported appear consistent with current regulatory requirements, guidance, and practices. The 1989 version requirements for electric power involve citation of an updated version of IEEE Std 308 (IEEE-308-1980) with respect to the 1976 version. Citation of other standards in the 1989 version introduces the need for a disclaimer in regulatory documents which endorse ANSI/ANS-59.51-1989 similar to those used in recent Division 1 Regulatory Guides which endorse standards containing references to other standards. (Section 7.5 of the 1976 version; Sections 5.5.4 and 6.2.5 of the 1989 version)

Differences involving added requirements for providing corrosion protection, non-conservative alternatives thereto, and potentially significant tank coating recommendations in the 1989 version appear to be significant. The corrosion protection requirements and alternatives (using corrosion allowance) of the 1989 version do not appear to be fully consistent with the intent of current Regulatory Guide 1.137 position C.1.g and include citation of an updated version of NACE-Std-RP-01-69, (1983 Revision) with respect to the Regulatory Guide. The 1989 version recommendation not to use zinc coatings on the interior of tanks is not addressed in current position C.1.g. The 1989 version also provides an added requirement to apply coatings using qualified procedures, coatings, and applications such as required by ASTM D3843-80. Citation of other standards in the 1989 version introduces the need for a disclaimer in regulatory documents which endorse ANSI/ANS-59.51-1989 similar to those used in recent Division 1 Regulatory Guides which endorse standards containing references to other standards. Endorsement of the 1989 version also appears to necessitate a regulatory exception retaining at least a portion of the intent of position C.1.g. (Section 7.5 of the 1976 version; Section 6.2.5 of the 1989 version)

A difference involving new requirements in the 1989 version for fuel oil system overpressure design and protection appears to be significant. Unless also required by the ASME B & PVC, these requirements are at a level of detail which does not appear to be available in current regulatory requirements or guidance. The regulatory implications of these added requirements, assuming endorsement of the 1989 version, should be determined based upon further NRC regulatory evaluation. (Section 6.2.2 of the 1989 version)

A difference involving a new, more comprehensive overall requirement in the 1989 version that the fuel oil system meet requirements (e.g., flow, capacity, pressure, temperature, and fuel oil chemistry) specified for the diesel generators served appears to be significant. This new, more comprehensive

requirement appears consistent with (and appears to envelop) the intent of Regulatory Guide 1.137 position C.1.d, although it is stated in a fashion substantially different than explicitly stated in the position. (Section 6.3.1 of the 1989 version)

A difference involving a new interface requirement in the 1989 version that ventilation systems serving components of the fuel oil system be designed to meet design criteria set forth in ANSI/ANS-59.2-1985 appears to be significant. Citation of other standards in the 1989 version introduces the need for a disclaimer in regulatory documents which endorse ANSI/ANS-59.51-1989 similar to those used in recent Division 1 Regulatory Guides which endorse standards containing references to other standards. (Section 6.3.4 of the 1989 version)

A difference involving a new interface requirement in the 1989 version that structures that house fuel oil system components be designed to meet Seismic Category I requirements and codes and standards for SC-3 structures set forth in ANSI/ANS-51.1-1983(R1988) and ANSI/ANS-52.1-1983(R1988) appears to be significant. This requirement appears consistent with current practice to house safety-related components in Seismic Category I structures designed in accordance with appropriate codes and standards. Citation of other standards in the 1989 version introduces the need for a disclaimer in regulatory documents which endorse ANSI/ANS-59.51-1989 similar to those used in recent Division 1 Regulatory Guides which endorse standards containing references to other standards. (Section 6.3.5 of the 1989 version)

Changes in pressure indicator requirements appear to be significant. The 1976 version required a pump discharge pressure indicator, strainer differential pressure indicator, and control room alarm. The 1989 version required a local pump discharge pressure indicator, local or control room strainer differential pressure indicator, and an alarm at an unspecified location. These changes may involve a reduction in requirements. (Section 8, Item 1 of the 1976 version; Section 6.3.3, Item 1 of the 1989 version)

A difference involving new, revised requirements in the 1989 version for design, classification, and qualification of instrumentation associated with fuel oil system safety functions appears to be significant. The 1989 version classification/design requirements for instrumentation appear consistent with current regulatory requirements (e.g., 10 CFR 50.55a, GDC 1, 10 CFR 50 Appendix B), guidance (SRP Section 3.2.2), and practices related to classification of components and specification of applicable criteria (e.g., standards commensurate with the importance of safety functions) based upon classification. (Section 8 of the 1976 version; Section 6.3.3 of the 1989 version)

A difference involving changed requirements in the 1989 version relating to fuel oil system testing and design for inspectability/testability appears to be significant. The elimination of the fuel oil system functional testing prerequisite for the fire protection system to be operable prior to performing tests in the 1989 version appears to necessitate a regulatory exception retaining the intent of the currently endorsed 1976 version requirement. Added design requirements for vents, drains, and connections to support testing and design to support testing and inspection requirements of the standard, the ASME B & PVC, Technical Specifications, etc. in the 1989 version appear consistent with current regulatory requirements (e.g., 10 CFR 50.55a) and guidance (including Regulatory Guide 1.137 position C.1.e) to

design safety-related systems such that they are inspectable and testable. It is noted that both versions require that the arrangement of the fuel oil system provide for ISI and IST in accordance with Section XI requirements in Section 7.3 of the 1976 version and 6.2.4 of the 1989 version. (Section 9 of the 1976 version; Sections 6.4.1 and 6.4.2 of the 1989 version)

A difference involving elimination of design requirements to consider fuel oil system maintenance, its effects on the ability of the system to meet design requirements, and resulting limitations on plant operation in the 1989 version appears to be significant. Endorsement of the 1989 version would thus appear to necessitate a regulatory exception retaining the intent of the currently endorsed 1976 version requirement. (Section 10 of the 1976 version)

A difference involving added requirements in the 1989 version for features needed to ensure that the fuel oil system satisfies its design function (e.g., vents, drains, and accessibility to allow maintenance of all components) appears to be significant. Similar 1976 version requirements were limited to tanks. These requirements are at a level of detail which does not appear to be available in current regulatory guidance. The regulatory implications of these requirements, assuming endorsement of the 1989 version, should be determined based upon further NRC regulatory evaluation. (Section 10 of the 1976 version; Section 6.4.3 of the 1989 version)

A difference involving added requirements in the 1989 version that applicable portions of ANSI/ASME NQA-1-1989 be applied to the design of the fuel oil system and its components appears to be significant. Regulatory Guide 1.137 position C.1.b provides guidance that ANSI N195-1976 should be used in conjunction with Regulatory Guide 1.28, "Quality Assurance Program Requirements (Design and Construction)," which endorses ANSI N45.2-1977, "Quality Assurance Program Requirements for Nuclear Power Plants," for the design, construction, and maintenance of the fuel-oil system. Regulatory Guide 1.28, Revision 3, endorses ANSI/ASME NQA-1-1983. Regulatory exception C.1.b for Regulatory Guide 1.137 may need to be retained with an update to NQA-1-1983. (Section 6.5 of the 1989 version)

A difference involving differing requirements for use of other cited standards appears to be significant. The 1976 version required use of the latest ANSI approved versions of cited standards whereas the 1989 version prohibits use of subsequent revisions. Citation of other standards in the 1989 version introduces the need for a disclaimer in regulatory documents which endorse ANSI/ANS-59.51-1989 similar to those used in recent Division 1 Regulatory Guides which endorse standards containing references to other standards. Such disclaimers normally take precedence over guidance for use of other standards contained in the endorsed standard. (Section 11 of the 1976 version; Section 7 of the 1989 version)

A difference involving added requirements in the 1989 version that if used, alternate fill line and auxiliary booster pump design requirements must be the same as those of the fuel oil subsystem appears to be significant. Such features, if used, would be considered to be part of the subsystem. Application of system/subsystem design criteria to all portions of a system/subsystem appears consistent with current regulatory requirements and guidance. (Section 4 of the 1989 version)

Differences involving reduced requirements in the 1989 version relating to fuel oil quality sampling and testing practices appear to be significant. Both versions disclaim the recommended fuel oil practices appendix as not being a part of the standard. The 1976 version presented information in the appendix stated in the form of requirements whereas the 1989 version presents corresponding information without use of the word "shall." Regulatory Guide 1.137 positions C.2.a through C.2.e endorse and supplement the 1976 version appendix. The surveillance requirements and associated bases of current STSs incorporate the intent of Regulatory Guide 1.137 positions C.2.a through C.2.f while differing considerably from Regulatory Guide 1.137 positions with respect to level of detail, standards cited, test acceptance criteria, time limits for actions, etc. Information presented in the 1989 version appears consistent with the surveillance requirements and associated bases of current STSs, with the exception that the 1989 version cites ASTM D4057-88 for sampling of new fuel oil whereas the bases of STSs cite ASTM D4054 for this purpose (apparently in error). Information presented in the 1989 version thus also appears consistent with the intent of Regulatory Guide 1.137 regulatory positions C.2.a through C.2.e (although the 1989 version cites different standards/versions and may in some cases provide different criteria for acceptable fuel oil than the Regulatory Guide). (Appendix B of the 1976 version; Appendix C of the 1989 version)

SRP Citations to the Standard

In summary, the standard comparison between ANSI N195-1976 and ANSI/ANS 59.51-1989 identified a number of significant differences. As discussed above, most of these differences involved added or more stringent requirements, and in some cases incorporated Regulatory Guide 1.137 positions (e.g., positions C.1.f and C.2.g were addressed in Sections 6.2.4 and 5.5.1 of the 1989 version). The remaining significant differences may involve reduced requirements, and thus may require the use of regulatory exceptions by the NRC staff. These include the items on plant conditions in Section 3 of the 1989 version; fuel oil system maintenance in Sections 6.4.1 and 6.4.3; use of corrosion allowance in Section 6.2.5; pressure indicators in Section 6.3.3; quality assurance provisions in Section 6.5; and fuel oil quality provisions in Appendix C. Recommendations on revisions to SRP Section 9.5.4 and Regulatory Guide 1.137 require further NRC staff review of the significant differences between the cited and latest version of the standard.

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11. ABSTRACT *(200 words or less)*

This report provides the results of comparisons of the cited and latest versions of ANSI standards cited in the NRC Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (NUREG 0800) and related documents. The comparisons were performed by Battelle Pacific Northwest Laboratories in support of the NRC's Standard Review Plan Update and Development Program. Significant changes to the standards, from the cited version to the latest version, are described and discussed in a tabular format for each standard. Recommendations for updating each citation in the Standard Review Plan are presented. Technical considerations and suggested changes are included for related regulatory documents (i.e., Regulatory Guides and the Code of Federal Regulations) citing the standard. The results and recommendations presented in this document have not been subjected to NRC staff review.

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