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Comparisons of ANS, ASME, AWS, and NFPA Standards Cited in the NRC Standard Review Plan, NUREG-0800, and Related Documents

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This report provides the results of comparisons of the cited and latest versions of ANS, ASME, AWS, and NFPA 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 ANS, ASME, AWS, and NFPA 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 ANS, ASME, AWS, and NFPA 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 ANS, ASME, AWS, and NFPA 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 these ANS, ASME, AWS, and NFPA standard citations should be updated, and if so, what exceptions should be included with the citation.

Contents

This document presents the comparisons of selected ANS, ASME, AWS, and NFPA 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 ANS, ASME, AWS, and NFPA 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 ANS, ASME, AWS, and NFPA standard in Part III.

METHODOLOGY

ANS, ASME, AWS, and NFPA 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.

EXECUTIVE SUMMARY

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. 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 ANS, ASME, AWS, or NFPA standard for each of the documents citing the standard. Results of the ANS, ASME, AWS, and NFPA standard comparisons show that updating of the SRP relative to its citation of and reliance on ANS, ASME, AWS, and NFPA 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 ANS, ASME, AWS, or NFPA standard. Alternatively, the exceptions could be addressed in some other reference document or included in the SRP. For several of the standards, considerable analysis is required for proper evaluation and eventual endorsement of more recent versions of standards than those currently cited in the SRP.

ACRONYM LIST

ANS	American Nuclear Society
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
AWS	American Welding Society
CFR	Code of Federal Regulations
GDC	General Design Criteria
INPO	Institute of Nuclear Power Operations
ISA	Instrument Society of America
NCRP	National Council on Radiation Protection and Measurements
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
NUMARC	Nuclear Management and Resources Council
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 and Development Program (SRP-UDP) effort to evaluate citations to ANS, ASME, AWS, and NFPA 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 ANS, ASME, AWS, and NFPA comparison topical report will be used by the NRC to evaluate whether the SRP citations to these 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 these 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 ANS, ASME, AWS, or NFPA 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 ANS, ASME, AWS, and NFPA 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 ANS, ASME, AWS, and NFPA 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

ANS, ASME, AWS, and NFPA 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 ANS, ASME, AWS, or NFPA 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. 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 ANS, ASME, AWS, or NFPA standard.

1.5 Summary of Results

The results of the ANS, ASME, AWS, and NFPA standard comparisons are summarized in this section. In this summary, recommendations, considerations, and suggestions are tabulated by ANS, ASME, AWS, or NFPA 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

<u>Standard</u>	<u>Cited Version</u>	<u>Latest Version</u>	<u>Report Section</u>	<u>Citing Document(s)</u>
AWS D1.1	1981*	1994	2.1	SRP 6.1.1 (2 places), Regulatory Guide 1.85 (7 places)

No significant changes were identified that would relax the requirements of AWS D1.1. Consider revising SRP Section 6.1.1 and Code Case N-71-15 in Regulatory Guide 1.85 to reference the latest version.

PROBLEMATIC COMPARISONS

<u>Standard</u>	<u>Cited Version</u>	<u>Latest Version</u>	<u>Report Section</u>	<u>Citing Document(s)</u>
ASME B30.2	1976	ASME B30.2b -1992	3.1	SRP 13.5.1 (2 places),

The changes impose new requirements and in some cases relax previous requirements. Pending regulatory review of the apparently significant differences, consider revising SRP Section 13.5.1 to endorse the latest version of ASME B30.2b-1992 (Chapter 2-3) as the standard for crane operator qualification.

NFPA 232	1980*	1991	3.2	SRP 17.1 (1 place)
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Many of the significant changes increased requirements. Exceptions include the addition of an exception to permit subterranean file rooms and the updating, addition, and deletion of referenced standards considered part of the requirements. The changes identified as being apparently significant require further analysis to assess the impact on the regulatory citation.

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

PROBLEMATIC COMPARISONS

<u>Standard</u>	<u>Cited Version</u>	<u>Latest Version</u>	<u>Report Section</u>	<u>Citing Document(s)</u>
ANS 3.1	1981	1993	3.3	SRP 12.5 (2 places) SRP 13.2.1 (1 place) SRP 13.2.2 (4 places) SRP 13.4 (2 places) SRP 13.5.1 (2 places) SRP 17.1 (2 places) Regulatory Guide 1.8 (2 places) Regulatory Guide 1.149 (1 place)

Although the majority of the SRP sections listed cite the 1978 version of the standard, the 1981 version was used for comparison by virtue of its endorsement in Regulatory Guide 1.8.

Several significant differences are identified between the 1981 and the 1993 version. These differences require further NRC staff review to determine the acceptability of updating the citations of ANSI/ANS 3-1 to the latest version (1993).

ANS 57.2	1976	1983	3.4	SRP 3.8.4 (1 place), SRP 9.1.2 (7 places), SRP 9.1.5 (3 places)
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Almost all of the contents of the 1976 version were carried forward into the 1983 version. Recommendations and requirements that were not carried over in the 1983 version have generally been replaced with performance criteria that will require implementation of provisions that will be adequate to meet the performance criteria. Pending regulatory review of changes that appear to be significant, consideration should be given for SRP Sections 3.8.4, 9.1.2 and 9.1.5 to endorse ANS 57.2-1983. It appears that many of the regulatory exceptions in Regulatory Guide 1.13 need to be retained.

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

1.6 Current Status of the ANS, ASME, AWS, and NFPA Standard Comparisons

The ANS, ASME, AWS, and NFPA 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 ANS, ASME, AWS, and NFPA 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 evaluation of public comments. Further NRC staff review and evaluation, including evaluation 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 AWS Standard D1.1 Comparison

This section presents a comparison of the version of AWS D1.1 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:

AWS D1.1-1981, "Structural Welding Code"

LATEST STANDARD:

AWS D1.1-1994, "Structural Welding Code"

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I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to AWS D1.1 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 6.1.1

Revision/Title: Section 6.1.1, Rev. 2, July 1981, "Engineered Safety Features Materials"

Location: SRP Section 6.1.1 endorses AWS D1.1 "Structural Welding Code" in "Acceptance Criteria," Subsection II.A.1.b.2, for moisture control on low hydrogen welding materials and in "References," Subsection VI.

Context: AWS D1.1 is endorsed in Subsection II.A.1.b.2 and listed as Reference 4 in Subsection VI of SRP Section 6.1.1 for moisture control on low hydrogen welding material. Because moisture control on low hydrogen welding material is addressed in Section 4.5 and Appendix J (AWS D1.1-1981) or Appendix VIII (AWS D1.1-1994), this comparison was performed for only those sections of the standard. The version of AWS D1.1 is not specified in SRP Section 6.1.1. The 1981 version of AWS D1.1 is assumed to be relevant to SRP Section 6.1.1 issued in July 1981.

Other Citations

Regulatory Guide 1.85

Revision/Title: Rev. 30, October 1994, "Materials Code Case Acceptability ASME Section III Division 1"

Location: Regulatory Guide 1.85, cites AWS D1.1 once in "REGULATORY POSITION," in Subsection C.1.a(4) and endorses AWS D1.1 in seven locations through Code Cases N-71-15, 1644-9, N-71-10, N-71-11, N-71-12, N-71-13, and N-71-14.

Context: AWS D1.1 is cited by Regulatory Guide 1.85 for moisture control on low hydrogen welding materials.

II. CITED VS. LATEST STANDARD DIFFERENCES

This part of the comparison presents those changes from the cited version (1981) to the latest version (1994) of AWS D1.1. Many of these changes involve formatting, editorial and grammatical differences. Others involve clarification (e.g., the addition of a figure or illustration) and have no effect on requirements. Those differences between the cited and latest versions of AWS D1.1 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 AWS D1.1 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 AWS D1.1 is provided in the Part III, Recommendations, of this section. Those differences classified as change types 1-4 are summarized in Part III.

STRAIGHTFORWARD
COMPARISONS

CITED VS. LATEST STANDARD DIFFERENCES: AWS D1.1			
<u>Section</u> cited & [latest]	<u>Significant Changes</u> cited & [latest]	Type of Change	Discussion
4.5.2 [4.5.2]	The ANSI designation was added to the AWS designation and the range of drying temperatures for ANSI/AWS A5.1 electrodes was increased from between 450°F (230°C) and 500°F (260°C) to between 500°F (260°C) and 800°F (430°C).	1	The increase in the range of drying temperatures is a significant technical requirement to produce low hydrogen electrodes. However, the higher temperatures are within the range for most laboratory ovens and should not be difficult to achieve.
4.5.2.1 [4.5.2.1]	The phrase "with optional supplemental designators, where applicable" was added.	3	Section 4.5.2.1 introduces Table 4.6. The addition of several electrodes with optional supplemental designators to Table 4.6 in the 1994 version increases the number of low hydrogen electrodes that can be used. This change does not reduce the requirements for drying, however, and therefore does not appear to reduce the applicability of this standard.

CITED VS. LATEST STANDARD DIFFERENCES: AWS D1.1			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
Table 4.5.2 [Table 4.6]	A parenthetical note to see 4.5.2.1 was added to the title; Electrodes E70XXR, E70XXHZR, and E7018M were added for AWS A5.1; "-X" was added as a suffix to the A5.5 electrode designations; and Notes 3 and 4 were added.	3	The addition of electrodes E70XXR, E70XXHZR, and E7018M to Table 4.6 in the 1994 version increases the number of low hydrogen electrodes that can be used. This change does not reduce the requirements for drying and therefore, does not appear to reduce the applicability of this standard. The added "-X" to electrode designations to A5.5 appears to bring the electrode designations into consistency with A.5.5. The added Notes 3 and 4 provide clarification and explanation and do not change requirements.
None [4.5.2.3]	Section 4.5.2.3 was added, allowing electrodes exposed to the atmosphere for periods less than those permitted by Table 4.6 to be dried and reissued after a minimum holding period of 4 hours in a storage oven.	1	The addition of Section 4.5.2.3 provides more explicit detail on procedures to assure that electrodes are adequately dried prior to use and may represent advances in electrode technology.
4.5.3 [4.5.3]	Electrode class E100XX was updated to E100XX-X and exceptions to the drying requirements were made for electrodes E7018M and E70XXH4R.	1	Updating the electrode class designation for consistency with the latest version of A5.5 does not appear to be significant. The exceptions to the drying requirements for electrodes E7018M and E70XXH4R are apparently based on new information and experience and should enhance the usefulness of the standard.

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 added detail to existing requirements are not included in the summary of significant differences. The regulatory citations to AWS D1.1 (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

The increased range of drying temperature appears to be a significant change; however, the higher temperatures are within the operating range of most ovens and should not be difficult to achieve for drying electrodes. Identification of additional electrodes and their corresponding drying procedures appears to be a significant enhancement of the standard, but does not change requirements for drying and storing low hydrogen electrodes. The addition of the new Section 4.5.2.3 allowing electrodes to be returned to a holding oven after limited periods of atmosphere exposure may be significant. Exceptions to the drying requirements for electrodes E7018M and E70XXH4R appear to be significant and are apparently based on new information and experience and should enhance the usefulness of the standard.

Subject to NRC analysis of the significant differences, consideration should be given to revising SRP Section 6.1.1 to cite ANS D1.1-1994.

SRP Citations to the Standard

Section 6.1.1, Rev. 2, "Engineered Safety Features Materials" (July 1981)

SRP Section 6.1.1

Location

Suggested Changes

II. ACCEPTANCE
CRITERIA,
A.1.b.2.

Standard AWS D1.1 (version not specified) is cited in Section II.A.1.b.2 for ferritic steel in SRP Section 6.1.1. The latest version, AWS D1.1-1994 includes requirements for higher drying temperatures and applicability for storing additional low hydrogen electrodes. This 1994 version provides enhancements that appear to reflect latest industry practice. It appears that SRP 6.1.1 would be enhanced by revising Section II.A.1.b.2 to replace AWS D1.1 (version not specified) with AWS D1.1-1994.

VI. REFERENCES

Standard AWS D1.1 is also included in the Section VI REFERENCES to SRP 6.1.1. The version listed in Section VI should be maintained to agree with the version cited in Section II.

Other Regulatory Citations to the Standard

Regulatory Guide 1.85, Rev. 30, "Materials Code Case Acceptability ASME Section III Division 1." (October 1994)

With the exception of code case N-71-15, consider retaining the citation of AWS D1.1 (version not specified) in Regulatory Guide 1.85, since the remaining code cases endorsed by Regulatory Guide 1.85, which cite AWS D1.1, have been superseded.

Revisions to Section 4.5.2.2 of the latest version of AWS D1.1-1994 (as compared with AWS D1.1-1981) do not appear to be significant. The changes include updating the table and section numbers, deletion of "by the user" with regard to who performs testing to establish maximum allowable exposure time, the addition of the ANSI designation to ANSI/AWS standard references, and renumbering of the footnote and associated Appendix.

Consideration should be given for Regulatory Guide 1.85 to continue to cite AWS D1.1 (version not specified) in Code Cases 1644-9, N-71-10, N-71-11, N-71-12, N-71-13, and N-71-14. Regulatory Guide 1.85 indicates that these code cases were endorsed by the NRC in a prior version of this guide and were superseded by revised code cases on or after July 1, 1974. They should be considered as not endorsed as of the date of the ASME action that approved the revised version of the code cases. The retention of the record of these code cases in Regulatory Guide 1.85 appears to be for historical purposes. Updating the citation of AWS D1.1 to AWS D1.1-1994 in Regulatory Guide 1.85 to support code cases that have been superseded and considered as no longer endorsed by the NRC would not seem appropriate.

Regulatory Guide 1.85
Paragraph

Suggested Changes

C. REGULATORY
POSITION,
1.a.(4)

Consideration should be given for Regulatory Guide 1.85 to cite AWS D1.1-1994 in Code Case N-71-15. The comparison of AWS D1.1-1994 to AWS D1.1-1981 indicates that there are no significant changes that relax or change the requirements of the standard. The higher drying temperatures, specification of additional low hydrogen electrodes, and ANSI acceptance should enhance the applicability of the 1994 version of this standard.

Section 3

PROBLEMATIC COMPARISONS

3.1 ASME Standard B30.2

This section presents a comparison of the version of B30.2 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 B30.2-1976, "Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)"

LATEST STANDARD:

ASME B30.2b-1992 (1992 addenda to ASME B30.2-1990) "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)." Subsequent to the completion of this comparison, ASME B30.2d-1994 (1994 addenda to ASME B30.2-1990) was issued. The 1994 revision will be considered for evaluation as potential future work.

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I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI B30.2 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 13.5.1

Revision/Title: Section 13.5.1, Rev. 0, July 1981, "Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)"

Location: SRP Section 13.5.1 endorses the requirements and recommendations of ANSI B30.2-1976 in subsection II, "Acceptance Criteria," (subsection IIA Administrative Procedures - General) paragraph 9. ANSI B30.2 is also cited in subsection IV, "Evaluation Findings."

Context: SRP Section 13.5.1 cites ANSI B30.2-1976 for requirements for qualification and conduct of crane operators who operate cranes over the fuel pools.

Other Citations

None

II. CITED VS. LATEST STANDARD DIFFERENCES

This part of the comparison presents those changes from the cited version (ANSI B30.2-1976) to the latest version (ASME B30.2b-1992) identified for ANSI B30.2. Given the limited citation in SRP Section 13.5.1, this comparison is limited to Chapter 2-3 of ANSI B30.2. Many of these changes involve formatting, editorial and grammatical differences. Others involve clarification (e.g., the addition of a figure or illustration) and have no effect on requirements. Those differences between the cited and latest versions of ANSI B30.2 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 B30.2 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 B30.2 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: ASME B30.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
2-3.1.1 [2-3.1.1]	The cited version restricts operation to a list of various personnel including inspectors. The latest version omits inspectors from the list.	1	<p>The 1976 version of the standard allows inspectors to operate cab-operated and pulpit-operated cranes. The 1992 version deleted "inspectors" from the list of personnel qualified to operate cranes.</p> <p>Both versions of the standard allow "designated" personnel to operate the cranes. "Designated" personnel are defined in the standards as selected or assigned by the employer as being competent to perform specific duties. In accordance with Section 2-2.1 of the 1992 version of the standard, "designated" personnel are to perform the crane inspections. Therefore, if an inspector is designated as capable of crane operation, the inspector may enter the cab or pulpit and operate the crane under the 1992 version of the standard. However, this change appears to be an additional restriction over the 1976 version in that not all inspectors may be allowed to enter or operate the crane.</p>

CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
c [(c)]	<p>The 1992 version has a specific requirement for the operator to be familiar with hand signals. Hand signals are addressed in Section 2-3.3.2 and Figure 5 of the 1976 version.</p> <p>The requirement for hand signals for deenergizing the magnet switch was moved from paragraph 3. of section 2-3.3.2 "Hand Signals" of the cited version to paragraph 2-3.1.7(c)(4) of the latest version.</p>	1	<p>The specific requirement for the operator to be familiar with and understand hand signals was added to Section 2-3.1.7, "Conduct of Operations," in the 1992 version. The 1976 version does not explicitly require the operator to be familiar with and understand hand signals. However, it should be noted that the 1976 version addresses hand signals in Section 2-3.3.2, requiring the hand signals to be posted conspicuously and as illustrated in Figure 5 of the standard. Therefore, although not explicitly stated, the text of the 1976 version implies the operator should be familiar with hand signals.</p>
f [(f)]	<p>The latest version has an additional requirement for deenergizing the runway disconnect if all the cranes on a runway are unattended for a period longer than one shift.</p>	1	<p>In addition to the requirement (in both versions of the standard) that the specific crane disconnect switch be deenergized before leaving a cab operated crane, the 1992 version requires that the runway disconnect switch also be deenergized if all cranes on the runway will be unattended for a period longer than one shift. There is no similar provision in the 1976 version of the standard. This change to the latest version is an additional restriction on crane operation.</p>

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CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
g [(g)]	The cited version states that if there is a warning sign or lock on the main line disconnect, it can only be removed by the person who placed it thereon. The latest version allows the removal of the sign or lock by the person who placed it there or by an authorized person.	4,1	The change in the 1992 version allowing any authorized person to remove a warning sign or lock is a relaxation of the requirements in the cited standard. However, although this individual change to removal of signs or locks appears to be a relaxation in requirements, it should be noted that the 1992 version of the standard requires crane owners or operators to implement lockout/tagout policy and procedures. There is no similar lockout/tagout requirement in the 1976 version.
m [(m)]	The 1976 version requires the bridge or gantry on outside cranes to be anchored upon receipt of a wind alarm. The latest version requires that crane operation be discontinued and the crane to be prepared and stored for excessive winds conditions.	1	The two versions of the standard differ in their respective terminology for securing a crane in the event of wind warnings. Since the term "anchored" is not defined in the 1976 version of the standard, the association or correlation (if any) with the requirements and terminology of the 1992 version is not clear or obvious, and therefore the changes regarding crane operation during following receipt of wind alarms should be considered as apparently significant.

CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
n [(n)]	The 1992 version contains an additional requirement for cranes with a lifting magnet to lock and tag the magnet disconnect switch if the magnet is not deenergized by the main switch or crane disconnect.	1	<p>The 1992 version of the standard requires that, prior to performing maintenance on cranes with lifting magnets, the magnet disconnect switch must be locked and tagged in the deenergized position if the magnet is not deenergized by the main disconnect. There is no similar provision in the 1976 version of the standard. This change is an additional requirement.</p> <p>It should be noted that the 1992 version of the standard requires crane owners or operators to implement lockout/tagout policy and procedures. There is no similar lockout/tagout requirement in the 1976 version. The specific change described here regarding lockout/tagout of disconnects could be considered as part of the broader changes in the 1992 version regarding lockout/tagout policy and procedures.</p>

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COMPARISONS**

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CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
None [2- 3.2.1.1(a)]	The 1992 version limits planned engineered lifts to cranes rated at 5 tons or more.	1	The 1992 version limits planned engineered lifts to cranes rated at 5 tons or more. The 1976 version does not contain a similar limit on crane size for performing special heavy lifts. (Note: "Planned" engineered lifts and special heavy lifts are synonymous between the two versions of the standard.) The 5 ton limitation in the 1992 version is more restrictive than the 1976 version.
None [(b)]	The 1992 version limits planned engineered lifts to 125% of the crane load rating without consulting the crane manufacturer.	1	The 1992 version limits planned engineered lifts to 125% of rated load. For lifts exceeding 125% of rated load, the 1992 version requires that the crane manufacturer be consulted. The 1976 version does not contain specific limits on special heavy lifts (note: "planned engineered lifts and special heavy lifts are synonymous between the two versions of the standard), nor does it require consultation with the crane manufacturer regarding such lifts. This addition of limits in the 1992 version appears to be an additional restriction.

CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
None [(c)]	The 1992 version allows planned engineered lifts up to two occurrences per 12 month period without consulting the crane manufacturer.	1	The 1992 version limits the frequency of planned engineered lifts to 2 in a consecutive 12 month period. For greater frequencies, the 1992 version requires consultation with the crane manufacturer. There are no similar limits or provisions in the 1976 version of the standard. Therefore, the 1992 changes are more restrictive than the 1976 version.
None [(d)]	The 1992 version requires the crane manufacturer to be consulted if the lift exceeds 125% of rated load or the frequency of two planned engineered lifts per year.	1	The 1992 version requires consultation with the crane manufacturer for planned engineered lifts exceeding 125% of rated load or a lift frequency exceeding 2 in a consecutive 12 month period. There are no similar requirements in the 1976 version regarding load limitations, frequency of lifts, or consultation with the manufacturer. The requirements of the 1992 version appear to be more restrictive than the 1976 version.
a [(e)(1)]	The 1992 version requires documentation of the review of the crane's service history including reference to previous planned engineered lifts, structural repairs and modifications of the original design.	1	The 1976 version only requires that a review of the crane's maintenance history and previous special heavy lifts be performed. There is no provision in the 1976 version for documenting the review. This change increases scope of review and documentation requirements in the 1992 version.

CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
b [(e)(2)]	The 1992 version requires the design of crane components to be reviewed and approved by means of calculations in accordance with crane design standards for lifts exceeding 125% of design load or a lift frequency exceeding 2 in a consecutive 12 month period. The 1976 version citation of crane design standards CMAA #70 and AISE #6 is not included in the 1992 version.	1,4	<p>The 1976 version states that structural, electrical, and mechanical components of the crane design shall be checked by the manufacturer or other qualified person according to accepted crane design standards such as CMAA #70 or AISE #6. The 1992 version does not cite these standards in this section, but they are cited in section 2-1.4.2 under "crane construction."</p> <p>The imposition of limits for design review of crane components in the 1992 version may be a relaxation of the 1976 version requirements that required design reviews regardless of load limits or frequencies. The 1992 version requirement to perform calculations appears to be an increase in requirements over the 1976 version. In addition, the deletion in the 1992 version of references to specific crane design standards may constitute a relaxation in requirements. These changes involve either increases or relaxations in requirements.</p>
e [(e)(5)]	The 1992 version adds a requirement to make the lift in accordance with a previously prepared lift plan.	1	There is no similar provision in the 1976 version for the preparation of a lift plan as required by the 1992 standard. This is an increase in requirements.

CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
f [(e)(6)]	The 1992 version specifically states the lift can only continue if the brakes hold when tested under load, and any failure to hold the load must be corrected before proceeding with the lift.	1	Both versions of the standard require that the operator test the brakes by lifting the load a short distance and setting the brakes. The 1992 version expands the requirements for testing the brakes by allowing the lift to continue only if the brakes hold, and in the event of failure to hold the load, requiring correction of any failures prior to continuing the lift.
g [(e)(8)]	The 1992 version specifically requires calculations and inspection records from the lift to be maintained on file.	1	Both versions of the standard require that a record of the lift including all distances moved be placed on file. The 1992 version of the standard expands the requirement to specifically include calculations and inspection records. The 1976 version only refers to "complete" records of the lift. It cannot be determined if the complete records required by the 1976 version necessarily include calculations and inspection reports as required by the 1992 version. Therefore these changes are considered additional requirements.

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CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
h [(e)(7)]	The 1992 version states the crane shall be inspected in accordance with paragraph 2-2.1.3 after the lift is completed and prior to being used for lifting of any other load. The 1976 version only states that, after the special heavy lift is concluded, a thorough inspection shall be made of all critical parts of the crane.	1	<p>The 1992 version requires that inspections be performed after the planned engineered lift is complete and before being used to lift any other load. This inspection is to be performed in accordance with paragraph 2-2.1.3 of the standard which lists 12 specific areas of inspection. The 1976 version states that after the special heavy lift is concluded, a thorough inspection shall be make of all critical parts of the crane.</p> <p>Although not referenced in paragraph 2-3.2.1.1.h of the 1976 standard, specific inspection requirements are also provided in paragraph 2-2.1.3 of the 1976 version. The 1976 version contains 9 areas of inspection compared to the 12 in the 1992 standard. The areas of inspection are similar but not identical to those in the 1992 version. In addition, the frequency of inspection following the lifts of special loads is left to the determination of a qualified individual in the 1976 version (Section 2-2.1.1b.2.d).</p> <p>The changes in the 1992 version constitute an increase in requirements in terms of inspection areas and frequencies.</p>

CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
a [(a)(1), (a)(2)]	The 1992 version adds a requirement to check that the lifting device is seated in the bowl of the hook.	1	The 1992 version requires the person directing the lift to ascertain that the load, sling, or lifting device is seated in the bowl of the hook. There is no similar provision in the 1976 version. However, it should be noted that although this is an additional requirement in the standard, it appears to be a natural progression in the lifting procedure.
d [(c)]	The 1992 version expands the precautions required for performing side pulls to include determinations that hoist ropes will not rub or bear against the crane, hoist ropes will not pull out of sheaves or across drum grooves, and side pulls will not result in excessive swinging of the load or load block.	1,4	Both versions require that cranes not be used for side pulls unless specifically authorized by a qualified person that has determined that various parts of the crane will not be overstressed. The 1976 version also requires a determination that the stability of the crane is not endangered. There is no similar provision in the 1992 version. The 1992 version is expanded from the 1976 version to include determinations that hoist ropes will not rub or bear against the crane; hoist ropes will not pull out of sheaves or across drum grooves; and the side pull will not result in excessive swing of the load block or load. These changes appear to involve both relaxations and expansions in the standard requirements.

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CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
None [(f)]	The 1992 version adds a caution for the operator of a floor-operated crane having a lifting magnet to exercise caution due to the hazard of possible falling metal.	1	<p>The 1992 version adds a precaution for operators of floor-operated cranes having magnetic lifting devices to exercise caution due to the hazard of possible falling metal. There is no similar provision in the 1976 version.</p> <p>It should be noted that the precaution in the 1992 version is a "should" statement which the standard defines as a recommendation as opposed to "shall" statements which are considered to be mandatory requirements. Therefore, the addition in the 1992 version of the recommended precaution regarding falling metal does not constitute an additional requirement under strict interpretation of the standard.</p>

CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
2-3.3.2 [2-3.3.1, 2-3.1.7(c) (4)]	<p>The 1976 version includes instructions for numbering multiple trolley cranes and establishing signals. There are no similar provisions in the 1992 version.</p> <p>The signals for cranes using magnetic lifting devices described in 2-3.3.2 (1976) were moved to 2-3.1.7(c)(4) of the 1992 version.</p>	4	<p>The 1976 version includes recommendations on numbering and signaling associated with multiple trolley cranes. The 1992 version no longer contains these provisions. However, it should be noted that the provisions in the 1976 standard are "should" statements, as opposed to "shall" statements. Should statements are considered to be recommendations and not requirements by the standard. Therefore the exclusion from the 1992 version does not constitute a reduction in requirements under strict interpretation of the standard.</p> <p>The moving of the special signals for magnetic lift cranes from 2-3.3.2.3 to 2-3.1.7.(c)(4) is editorial only.</p>

3.1-15

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CITED VS. LATEST STANDARD DIFFERENCES: ASME B30.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
None [2-3.5]	The 1992 version includes a new section providing requirements for lockout/tagout policy, procedures and practices including specific areas for application.	1	ANSI Z244.1 is cited in the 1992 version as providing the basis for the lockout/tagout requirements. There is no similar provision in the 1976 version with the exception of a limited number of individual paragraphs (2-2.3.2.a.3; 2-3.1.7.g; 2-3.1.7.n) that require some form of warning, tag, or locking device. The addition of specific lockout/tagout requirements in accordance with the ANSI standard is an expansion in requirements from those in the 1976 version.

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 B30.2 (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

Increases in requirements include deletion of inspectors from the list of personnel authorized to enter and operate cab- or pulpit-operated cranes; an added specific requirement for the operator to be familiar with and understand the hand signals; an added requirement to de-energize the runway disconnect if all the cranes on a runway will be unattended for longer than one shift; a new requirement for only an authorized person to remove warning signs or locks on the main switch or crane disconnect; a new requirement for operation to be discontinued and the crane be prepared and stored for high wind conditions; a new requirement for the magnet disconnect switch to be locked and tagged prior to maintenance; added requirements for lifts in excess of the rated load or planned engineered lifts for cranes rated at 5 tons or more; an added requirement to consult with the crane manufacturer, if the lift exceeds 125% of the rated load or if the frequency of planned engineered lifts exceeds two in one continuous 12 month period; an added requirement for a written review of the cranes maintenance history prior to any planned engineered lift; the addition of pneumatic and hydraulic components to the system checks required prior to a planned engineered lift exceeding 125% of the rated load or if the frequency of planned engineered lifts exceeds two during a continuous 12 month period; an added requirement for a lift plan; a new requirement that if the brakes fail to pass the check, the lift shall be stopped and the failure corrected before continuing; new requirement for calculations and inspections to be included in the records; a new requirement to check that the sling or lifting device is seated in the bowl of the hook; and added specific precautions against the hoist rope rubbing against the crane members, the hoist rope being pulled out of the sheaves or across the drum grooves, and excessive swinging of the load block or load. The removal of instructions in the latest version for numbering the trolleys of multiple trolley cranes does not appear to be significant, because the instructions did not impose requirements.

While most of the changes involve increased requirements, one notable exception deals with planned engineered lifts in Section 2-3.2.1.1. The 1992 version requires a design review of crane components if the load to be lifted exceeds 125% of rated load or if the frequency of planned engineered lifts exceeds two during a 12 month period. The 1976 version required design reviews regardless of load limits or frequencies.

NRC review is necessary to determine the acceptability of the significant differences identified in Part II of this comparison. Pending NRC analysis of the significant differences, consideration should be given to revising SRP Section 13.5.1 to reference ASME B30.2b-1992.

SRP Citations to the Standard

Section 13.5.1, Rev. 0, "Administration Procedures" (July 1981)

Consider revising SRP Section 13.5.1 to endorse ASME 30.2b-1992. Proposed revisions to SRP Section 13.5.1 implementing this recommendation are provided below.

SRP Section 13.5.1

Paragraph

Recommendation

II.A.9

Consider revising SRP Section 13.5.1 paragraph II.A.9 to endorse/cite the latest version of ASME B30.2b-1992 (Chapter 2-3) as the standard for crane operator qualification.

IV. 3rd
paragraph

Consider citing ASME B30.2b-1992 in the last sentence of the third paragraph of "Evaluation Findings."

Other Regulatory Citations to the Standard

None.

3.2 NFPA Standard 232 Comparison

This section presents the comparison for NFPA 232 for the Nuclear Regulatory Commission's (NRC's) Standard Review Plan Update and Development Program (SRP-UDP).

CITED STANDARD:

NFPA 232 (version not specified), "Protection of Records." NFPA 232 is cited in SRP Section 17.1 Revision 2, dated July 1981. NFPA 232-1991 indicates that it revises the 1980 version (which was reconfirmed in 1986) of NFPA 232. Therefore, the 1980 version was in effect at the time of the last SRP revision and is assumed to be the version cited version.

LATEST STANDARD:

NFPA 232-1991, "Protection of Records"

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I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to NFPA 232 in the Standard Review Plan (SRP) and in other regulatory documents. 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 17.1

Revision/Title: Rev. 2, July 1981, "Quality Assurance During the Design and Construction Phases."

Location: SRP Section 17.1 cites NFPA 232 (version not specified) in paragraph II.17.4.

Context: SRP Section 17.1 in paragraph II.17.4 cites NFPA 232 for conformance to fire protection rated provisions for record storage facilities and specifies additional requirements. The 1980 version of NFPA 232 is assumed to be the cited version, because it was the latest version when SRP Section 17.1 was issued.

Other Citations

None

II. CITED VS. LATEST STANDARD DIFFERENCES

This part of the comparison presents those changes from the cited version (1980) to the latest version (1991) identified for NFPA 232. Those differences between the cited and latest versions of NFPA 232 which are judged to be significant and warrant 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 NFPA 232 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 NFPA 232 is provided in Part III, Recommendations, of this section.

CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
1.6 [1.6]	The 1991 version added "usually" to the definition.	4	In the definition of mobile shelving, the 1980 version of the standard states "that mobile shelving is a type of open-shelf file equipment." The 1991 version states that mobile shelving is <u>usually</u> a type of open-shelf file equipment. The standard requirements for open-shelf files are different than for enclosed files. Strict compliance with the 1980 definition would require that all mobile shelving be treated under the requirements for open-shelf files. Therefore, this change appears to be a relaxation in requirements.
1.6 [1.6]	The 1991 version adds to the definition of Vital Records, "or that contain information for which the temporary unavailability could constitute a serious legal or business impairment. Examples are records of which a reproduction cannot be substituted for the original;...". The 1991 version adds to the definition of Important Records, "while acceptable as a substitute for the original...".	1	The scope of the definition of vital records was expanded to include records for which the temporary unavailability could constitute serious legal or business impairment. This change appears to expand the scope of the definition and thus the record protection requirements to additional records.

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CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
2-7.5.4 [2-7.5.4]	The 1991 version added "for sprinkler" to description of wall penetrations, and "...shall be sealed with approved or listed fire-rated material..." replaced "...shall be grouted, potted, or otherwise sealed for the thickness of the wall..."	1	Sprinkler piping was added to the list of wall penetrations required to be sealed. The 1991 version was also revised to specifically require that the penetration seal be of "approved or listed fire-rated material." The 1980 version required penetrations to be "grouted, potted, or otherwise sealed for the thickness of the wall." The objective of the requirement (i.e., to prevent heat, smoke, flame, or water penetration) is the same. However, the requirement to use approved or listed fire-rated material appears to be an expansion in the requirements for penetration seals.
2-11.3 [2-11.3]	The 1991 version replaced "power limited circuits" with "low energy devices."	4	The 1991 version of the standard revised the term "power limited circuits" to "low energy devices." It is unclear if power limited and low energy are the same. Additionally, devices are not necessarily attached to circuits. This appears to allow a broader scope of devices and thus may constitute a relaxation in the standard requirements.

CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
2-13.1 [2-13.1]	The 1991 version replaced "file rooms" with "vaults" in the NOTE.	4	The 1991 version of the standard changed the NOTE to read vaults instead of file rooms. This change could be construed as a correction to a typographical error since Chapter 2 contains those requirements applicable to records vaults and not file rooms. This conclusion is further substantiated by the appearance of the same note in Chapter 3, Section 3-12.1.1 (1991) and Section 3-13.1 (1980), regarding the requirements for file rooms. If the change is not a typographical error, then the standard is expanded to allow floor penetration for sprinkler systems in vaults on grade.

**PROBLEMATIC
COMPARISONS**

Section 3

CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
3-1 [3-1]	The requirements in these sections were rearranged and revised in the 1991 edition. The 1991 addition no longer allows "Vital Records" to be stored in file rooms. Section 3-1.5 of the 1980 version which allowed vital record storage, was deleted. The 1991 addition also requires all file rooms to have automatic sprinkler protection with the exception of those rooms where all storage is in six sided noncombustible containers.	4.1	<p>The 1991 version of the standard requires all file rooms to be sprinklered with the exception of those file rooms where all storage is in six-sided noncombustible containers. The 1980 version requires all records in file rooms to be kept in noncombustible containers. It is unclear if the 1991 Standard considers all file rooms with storage <u>not</u> in noncombustible containers as open-shelf file rooms. If this is the case, then the 1991 requirements do not differ from those of 1980 which require sprinkler protection for all open-shelf file rooms.</p> <p>In the case of file rooms, the regulatory citation in Standard Review Plan (SRP) 17.1 states that file rooms in accordance with NFPA 232 are acceptable with additional provisions which include but are not limited to early warning detection, suppression, and storage in fully enclosed metal containers. The changes to the standard do not preclude nor require all of these provisions. Therefore, compliance with the regulatory citation in the SRP does not effect the ability to conform to the standard.</p> <p style="text-align: right;">(Cont'd)</p>

CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
3-1 [3-1] (Cont'd)			The 1991 version prohibits the storage of vital records in file rooms. Section 3.1.5 of the 1980 version, which allowed vital record storage in file rooms, was deleted. This appears to be an expansion of the standard requirements from the 1980 version.
3-2.1 [3-2.1]	The 1991 version changes "...a licensed structural engineer or architect." to "a licensed or registered structural engineer or architect in consultation with a licensed or registered fire protection engineer."	1	<p>Section 3-2.1 states the formal certification requirements for individuals involved in the design and construction of file rooms. The addition of "or registered" does not change the intent of this requirement which is to ensure that the design, and construction supervision, are performed by individuals certified by formal procedures and testing to perform these types of activities. Most states refer to professional engineering registration as opposed to professional engineers license. Therefore, this change appears to be editorial.</p> <p>The 1991 version also added the requirement for the licensed or registered engineer or architect to be in consultation with a licensed or registered fire protection engineer. This is an expansion of the requirements from the 1980 version.</p>

**PROBLEMATIC
COMPARISONS**

Section 3

CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
3-2.3 [3-2.3]	The 1991 version adds an Exception clause to the requirement stating that file rooms shall not be located below ground level. File rooms located below ground level are acceptable if specifically designed by a licensed or registered fire protection engineer to mitigate the inherent hazards.	4	The 1991 version provides an exception that allows file rooms to be located below ground level if specifically designed by licensed or registered fire protection engineers to mitigate the inherent problems of subterranean storage. The 1980 version strictly prohibited underground storage. This appears to be a relaxation of the standard requirements.
3-2.4 [3-2.4]	The 1991 version deleted this paragraph.	4	The 1991 version of the standard deleted paragraph 3-2.4 from the 1980 version which prohibited location of file rooms below anticipated flood levels. This appears to be a relaxation of the standard requirements.
3-3 [3-3]	The 1991 version deleted the 12 ft maximum room height requirement contained in 1980 version.	4	The 1980 version specifically limited the file room height to 12 ft. The 1991 version deleted the height restriction. This appears to be a relaxation of the standard requirements.
3-6.3.1 [3-6.3.1]	The 1991 version adds "Sealing requirements of 2-7.5.4 shall be followed."	1	The 1980 version of the Standard had no provisions for sealing openings in walls of file rooms. The 1991 version revised the text of paragraph 3-6.3.1 to require sealing in accordance with paragraph 2-7.5.4. This appears to be an expansion of the standard requirements.

CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
3-10.2 [3-10.2]	The 1991 version replaced "matches or other hazardous lighting" with "temporary lighting."	1	The 1991 version of the standard revised the text to state "temporary lighting" instead of "matches or other hazardous lighting," as stated in the 1980 version of the standard. The basic requirement of this section is that the fixed lighting shall be adequate for all areas of the file room to preclude the use of some other means of lighting. This basic requirement remains unchanged by the text revision, however, the change expands the standard requirements from hazardous to all temporary types of lighting.
3-10.3 [3-10.3]	The 1991 version adds an Exception to the electrical service requirements of 3-10.3 allowing file maintenance equipment approved for installation and use.	4	Paragraph 3-10.3 of the 1991 version, exempts file maintenance equipment specifically designed and approved for use from the limitations on electrical service to the file room. SRP Section 17.1, paragraph II.17.4.3 appears to prohibit this type of activity for file rooms. The 1980 version had no such provision and thus this appears to be a relaxation of Standard requirements.

PROBLEMATIC
COMPARISONS

Section 3

CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
3-12.1 [3-12.1]	Requirement deleted in 1991 version.	4	<p>The requirement in the 1980 version that all records shall be stored in fully enclosed noncombustible containers was deleted in the 1991 version. The 1991 version exempts the requirement for sprinkler protection if all records are stored in six-sided noncombustible containers (3-12.1) but does not prohibit other storage arrangements providing that sprinkler protection is installed. It is unclear if the 1991 standard considers all file rooms with storage <u>not</u> in noncombustible containers as open-shelf file rooms. If this is the case, then the 1991 requirements do not differ from those of 1980 which require sprinkler protection for all open-shelf file rooms.</p> <p>In the case of file rooms, the regulatory citation in Standard Review Plan (SRP) 17.1 states that file rooms in accordance with NFPA 232 are acceptable with additional provisions which include but are not limited to early warning detection, suppression, and storage in fully enclosed metal containers. The changes to the standard do not preclude nor require all of these provisions. Therefore, compliance with the regulatory citation in the SRP does not affect the ability to conform to the standard.</p>

CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
3-12.4 [3-12.4]	The 1991 version added exceptions to the condition that file rooms shall not be used as working spaces. The exceptions are if the room is fully sprinklered or smoke detectors and 6-sided noncombustible containers are provided.	4	The 1991 version added an exception that allows file rooms to be used as work spaces providing either the file room is fully sprinklered or smoke detectors are installed and all storage is in six-sided noncombustible containers. The 1980 version prohibited any use of the file rooms as work spaces. The regulatory citation in SRP Section 17.1 does not appear to allow work spaces within the file rooms. This appears to be a relaxation of standard requirements.
3-12.7 [3-12.7]	The 1991 version added an exception to the spacing requirements for records containers.	1	The 1991 version allows exception from the separation and clearance requirements if sprinklers are provided in each aisle. This change trades spacing requirements for additional sprinkler coverage.

CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
3-13.1, 3-13.2 [3-12.1]	The 1991 version rearranges, revises, and amends the requirements for suppression and detection from those in the 1980 version. The 1991 version requires all file rooms to be sprinklered except those where all storage is in six-sided noncombustible containers.	1	<p>The 1991 version made several changes to these sections of the standard. Section 3-12.1 specifically requires that all file rooms will be sprinklered except where all records are stored in six-sided noncombustible containers. There is no similar provision in the 1980 version. This change appears to expand the requirements of the standard. It is unclear if the 1991 standard considers all file rooms with storage <u>not</u> in noncombustible containers as open-shelf file rooms. If this is the case, then the 1991 requirements do not differ from those of 1980 which require sprinkler protection for all open-shelf file rooms.</p> <p>In the case of file rooms, the regulatory citation in Standard Review Plan (SRP) 17.1 states that file rooms in accordance with NFPA 232 are acceptable with additional provisions which include but are not limited to early warning detection, suppression, and storage in fully enclosed metal containers. The changes to the standard do not preclude nor require all of these provisions. Therefore, compliance with the regulatory citation in the SRP does not effect the ability to conform to the standard.</p>

CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
3-13.4 [3-12.3]	The 1991 version made editorial changes to the text and added paragraph (b) requirements for smoke detectors in file rooms with six-sided noncombustible containers.	1	The 1991 version adds sub paragraph (b) to the requirement for the installation of smoke detection systems. The 1980 version of the standard has no similar provision. This appears to be an expansion of the standard requirements.
B-1.1 [6-1.1]	The 1991 version updated the reference titles and editions, deleted NFPA 40, "Cellulose Nitrate Motion Picture Film," and NFPA 232AM, Archives and Record Centers" from this list and added them to the list of informational references in Appendix B of the 1991 standard. The 1991 version added NFPA 231, "Standard for General Storage," 1990 Edition, and NFPA 231C, "Standard for Rack Storage of Materials," 1991 Edition. The 1991 version also replaced NFPA 72A,B,C, and D with NFPA 72, "Standard for the Installation, Maintenance, and Use of Protective Signaling Systems, 1990 Edition.	1	The 1991 version updated the reference titles and editions, deleted NFPA 40 and NFPA 232AM from consideration as requirements and added NFPA 231 and 231C.
B-1.2 [6-1.2]	The 1991 version updated ANSI/UL 72-July 1977 to ANSI/UL 72-83.	1	The 1991 version updated reference ANSI/UL 72-July 1977 to ANSI/UL 72-83.

CITED VS. LATEST STANDARD DIFFERENCES: NFPA 232			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
None [B-1]	The 1991 version lists documents that are referenced in the standard for informational purposes and are not considered part of the requirements.	1	<p>The 1991 version, Appendix B lists documents that are referenced in the standard but are not considered requirements. There is no similar provision in the 1980 version of the standard which considered all references part of the standard requirements. NFPA 40, NFPA 220 and NFPA 232AM, along with ANSI/ACMI NQA-1, are referenced in Appendix B.</p> <p>NFPA 40, NFPA 220, and NFPA 232AM were considered part of the requirements in the 1980 version of the standard. Also note that NFPA 220 appears in both Chapter 6 and Appendix B of the 1991 version.</p>

III. RECOMMENDATIONS**Summary of Significant Differences**

Significant differences that were identified as potentially significant include: the definition of vital records in Section 1-6 was expanded to include records for which the temporary unavailability could constitute a serious legal or business impairment. This change could potentially increase the number of records for which the standard requirements apply. Wall penetration sealing requirements were revised to specifically require approved or listed fire rated materials. Several changes were made to the requirement in chapter 3 of the standard which contains requirements for design, operation, and protection of file rooms.

Section 3-1 provides general requirements and was revised to require automatic sprinkler protection in all file rooms with the exception of those in which all storage is in six-sided noncombustible containers. The 1980 version of the standard did not contain this provision and instead required that all records in a file room be stored in noncombustible containers. The 1991 version also was revised to specifically prohibit the storage of vital records in file rooms. Sections 3-12 and 3-13 were similarly modified to update the requirements for protection and operation of file rooms. Sections 3-10.3 and 3-13.2 of the 1991 standard were revised to provide exceptions that allow file maintenance equipment and work spaces within the file room. Work spaces and electrical devices or appliances (e.g., file maintenance equipment) were prohibited in the 1980 version of the standard as well as by the regulatory citation in Standard Review Plan Section 17.1.

Other changes identified as potentially significant include the addition of an exception which allows subterranean file rooms, which were specifically prohibited in all cases in the 1980 version; and updating, addition or deletion of all referenced standards considered part of the requirements. Chapter 6 of the 1991 edition of NFPA 232 contains those standards which are considered part of the requirements by reference. These references were all updated to current versions. NFPA 40 and NFPA 232AM were removed from the requirements and placed in Appendix B of the standard as informational references only. NFPA 220 appears in both Chapter 6 and Appendix B, and therefore, it is not clear if it is a requirement.

SRP Citations to the Standard**Section 17.1, Quality Assurance During the Design and Construction Phases (July 1981)**

Several of the identified changes appear to be more conservative than those in the cited version. However, some provisions have been relaxed, such as the previous prohibition on maintenance equipment and work spaces in file rooms. Note that this specific issue is addressed by the additional provisions provided in SRP Section 17.1, however, other relaxed requirements are not currently addressed by the SRP. If the SRP is updated to cite the latest version of NFPA 232, it may be necessary to include additional provisions to those already contained in SRP Section 17.1 to address the relaxed requirements. Further review and analysis of the significant differences by the NRC is necessary to assess the impact of the changes on the SRP citation prior to making a final recommendation to update the SRP.

Other Regulatory Citations to the Standard

None

3.3 ANS Standard 3.1 Comparison

This section presents a comparison of the version of ANS 3.1 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/ANS-3.1-1981, "Selection, Qualification and Training of Personnel for Nuclear Power Plants"

LATEST STANDARD:

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

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I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANSI/ANS-3.1 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

The current regulatory position concerning ANSI/ANS-3.1 is presented in Revision 2 of Regulatory Guide 1.8 (April 1987). It endorses specific sections in the 1981 version. Endorsement for all other positions remains with ANSI N18.1-1971. While the 1978 version of ANSI/ANS-3.1 is cited in several SRP sections, it was not endorsed by regulatory guidance. The 1981 version provides more information concerning training and qualification requirements, and is partially endorsed (along with ANSI N18.1-1971) by Regulatory Guide 1.8. Therefore, the comparison was performed on the basis of the 1981 version of ANSI/ANS-3.1 and the regulatory guidance provided by Regulatory Guide 1.8. A comparison of ANSI N18.1-1971 vs ANSI/ANS 3.1-1993 is included in a separate NUREG/CR report for ANSI standards.

SRP Section 12.5

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

Location: ANSI/ANS 3.1-1978 is cited in subsections II and VI.

Context: ANSI/ANS 3.1-1978 is listed with other Regulatory Guides, NUREGs and standards that provide information, recommendations, or guidance, and in general describe a basis acceptable to the staff for implementation of requirements from 10 CFR Part 19, Part 20, and Part 50.

SRP Section 13.2.1

Revision/Title: Rev. 0, July 1981, "Reactor Operator Training."

Location: ANSI/ANS 3.1-1978 is cited in subsection VI, "References."

Context: ANSI/ANS 3.1-1978 is cited as a reference, but does not appear in the text of the SRP section.

SRP Section 13.2.2

Revision/Title: Rev. 0, July 1981, "Training for Non-Licensed Plant Staff."

Location: ANSI/ANS 3.1 (version not specified) is cited in subsections I, II, IV, and VI.

Context: ANSI/ANS 3.1 is cited with regard to training program requirements as described in Sections 5.1, 5.3, 5.4, and 5.5 of the standard. The citation of ANSI/ANS 3.1 in the Acceptance Criteria, and Evaluation Findings subsections of the SRP includes the statement "as endorsed by Regulatory Guide 1.8." Regulatory Guide 1.8 endorses the 1981 version of the standard and this was the version used as the cited version in the comparison.

SRP Section 13.4

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

Location: ANSI/ANS 3.1-1978 is cited in subsections II and IV.

Context: ANSI/ANS 3.1-1978, Sections 4.4 and 4.7 are cited with regard to requirements for the qualifications of individuals assigned to the independent safety engineering group, or performing independent reviews, respectively.

SRP Section 13.5.1

Revision/Title: Rev. 0, July 1981, "Administration Procedures."

Location: ANS 3.1-1979 (draft) is cited in subsections II and IV.

Context: ANS 3.1-1979 (draft), Section 4.4.6 is cited with regard to qualifications for individuals that develop, review, and approve test procedures.

SRP Section 17.1

Revision/Title: Rev. 2, July 1981, "Quality Assurance During the Design and Construction Phases."

Location: ANSI/ANS 3.1-1978 is cited in subsections II and VI.

Context: ANSI/ANS 3.1-1978, Section 4.4.5 is cited with regard to the qualifications of the Quality Assurance Manager.

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 cites ANSI/ANS-3.1-1981 in Section B, "Discussion," and in Section C, "Regulatory Position."

Context: Sections 4.3.1.1, 4.3.1.2, 4.5.1.2, 4.4.8, 4.4.4 of ANSI/ANS-3.1-1981 are endorsed by Regulatory Guide 1.8 with exceptions. Endorsement for all other positions remain with ANSI N18.1-1971.

Regulatory Guide 1.149

Revision/Title: Rev. 1, April 1987, "Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations."

Location: ANSI/ANS 3.1 (version not specified) is cited in Section C, "Regulatory Position."

Context: ANSI/ANS 3.1 is cited in conjunction with Regulatory Guide 1.8 with regard to requirements for qualification/examination of reactor and senior reactor operators. The citation of ANSI/ANS 3.1 in Regulatory Guide 1.149 refers to Regulatory Guide 1.8 for applicability of the standard. Regulatory Guide 1.8 endorses the 1981 version of the standard and this was the version used as the cited version in the comparison.

II. CITED VS. LATEST STANDARD DIFFERENCES

ANSI/ANS-3.1-1993 incorporates extensive changes to the provisions of the 1981 version. Given the large number of significant changes between the cited and latest versions, a detailed listing of these differences is 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/ANS-3.1 (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

The cited standard, ANSI/ANS-3.1-1981 was revised and reissued first as ANSI/ANS-3.1-1987 and, most recently, as ANSI/ANS-3.1-1993. The major elements of each of the steps in the evolution of the document as expressed in the Foreword accompanying each revision/reissue, are summarized below:

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

The resulting differences between ANSI/ANS-3.1-1981 and ANSI/ANS-3.1-1993 can be broadly described as follows:

- (1) Approximately two-thirds of the defined terms are new and/or revised 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 about 25 in the 1981 version) 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) The presentation of the qualification requirements applicable to each position has been improved; the material is clearer and more concise.
- (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.

Significant differences between the 1981 and 1993 versions were identified in the comparison. These differences require further NRC staff review. Examples of notable differences follow.

- The 1981 version indicated that use of personnel to temporarily fill a position for which they do not meet the minimum requirements should be limited to 3 months, and recommended a periodic review of staff

- The 1993 version provides more detailed discussion of acceptable alternatives to educational requirements. (Section 4.1.1 of 1993 version, Section 4.1 of 1981 version.)
- The 1993 version provides for alternatives to experience requirements. (Section 4.1.2 of 1993 version.)
- The 1993 version allows the incumbent in any one of the managerial positions to not meet the experience requirement provided the collective experience requirement is met. (This difference does not apply to the positions in ANS-3.1-1981 that are endorsed by Regulatory Guide 1.8.) (Section 4.2 of 1993 version.)
- The 1981 version required the equivalence of 30 semester hours of college level education in specified subject areas for senior operators. The 1993 version requires only a high school diploma. (Section 4.3.1.2 of 1981 version, Section 4.4.2 of 1993 version.)
- 1993 version reduced the requirement for power plant experience for reactor operators from 3 years to 2 years. (Section 4.5.1.2 of 1981 version, Section 4.5.1 of 1993 version.)
- The 1981 version provided detailed discussion on the scope, content, and implementation of the training program. Regulatory Guide 1.8 provided regulatory exceptions to several of the 1981 provisions. The 1993 version adopts a performance based training approach. The effect on NRC regulatory positions is unclear. (Section 5.1 of 1981 version, Section 6.1 of 1993 version.)
- The 1981 version specified a training program for shift technical advisors without an NRC senior operator license, which was not retained in the 1993 version. (Section 5.3.3 of 1981 version.)
- The 1981 version specified requirements for a retraining program with detailed discussion for licensed individuals, covering lectures, on the job training, control manipulations, and evaluations. The 1993 version states that job performance shall be maintained and enhanced by continuing training. (Section 5.5 of 1981 version, Section 6.1 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 1981 version for supervisors not requiring a license (the most comparable position). Specifically the 1993 version requires considerably less experience. (Section 4.3.2 of 1981 version, Section 4.4.13 of 1993 version.)

Regulatory Guide 1.8, in the third paragraph of Section B, endorses ANSI N18.1-1971 for the qualification requirements for the quality assurance or quality control supervisors.

- The basic qualification requirements for maintenance personnel as contained in the 1993 version of the standard are less stringent than those in the 1981 version. The 1981 version requires journeyman certification and additional years of experience. (Section 4.5.3 of 1981 version, Section 4.5.7 of 1993 version.)

Regulatory Guide 1.8, in the third paragraph of section B, endorses ANSI N18.1-1971 for qualification requirements for the repairmen.

- The qualification requirements for shift technical advisor in the 1993 version of the standard do not address the activities of STAs (The standard provides a description of the general responsibilities of STAs which is editorially consistent with similar material in other position-related sections of the standard. In particular, the standard states that an STA is an individual who provides advice and counsel to the operations shift to assist in determining the cause(s) and in mitigating the consequences of plant accidents). (Section 4.6.2 of 1993 version.)

Paragraph C.1.j of Revision 2 of Regulatory Guide 1.8 states that a Shift Technical Advisor should assume an active role in shift activities, provides examples thereof, and states that "Actively performing STA functions" means performing at least three shifts per quarter as an STA.

SRP Citations to the Standard

SRP Section 12.5, "Operational Radiation Protection Program," (July 1981)

Further NRC staff review is necessary to determine the acceptability of citing the latest version (ANSI/ANS 3.1-1993) of the standard.

SRP Section 13.2.1, "Reactor Operator Training," (July 1981)

Significant differences between the 1981 and 1993 versions are identified in the comparison. These differences are even greater between the 1978 and 1993 versions. Further NRC staff review is necessary to determine the acceptability of citing the latest version (ANSI/ANS 3.1-1993) of the standard.

SRP Section 13.2.2, "Training for Non-Licensed Plant Staff," (July 1981)

Significant differences between the 1981 and 1993 versions are identified in the comparison. Further NRC staff review is necessary to determine the acceptability of citing the latest version (ANSI/ANS 3.1-1993) of the standard.

SRP Section 13.4, "Operational Review," (July 1981)

Significant differences between the 1981 and 1993 versions are identified in the comparison. These differences are even greater between the 1978 and 1993 versions. Further NRC staff review is necessary to determine the acceptability of citing the latest version (ANSI/ANS 3.1-1993) of the standard.

SRP Section 13.5.1, "Administration Procedures," (July 1981)

Significant differences between the 1981 and 1993 versions are identified in the comparison. The 1979 draft version cited by the SRP was never finalized (i.e., the 1978 version was superseded by the 1981 version). Further NRC staff review is necessary to determine the acceptability of citing the latest version (ANSI/ANS 3.1-1993) of the standard.

SRP Section 17.1, "Quality Assurance During the Design and Construction Phases," (July 1981)

Significant differences between the 1981 and 1993 versions are identified in the comparison. These differences are even greater between the 1978 and 1993 versions. Further NRC staff review is necessary to determine the acceptability of citing the latest version (ANSI/ANS 3.1-1993) of the standard.

Other Regulatory Citations to the Standard

Regulatory Guide 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," (April 1987)

Further NRC staff review is necessary to determine the acceptability of citing the latest version (ANSI/ANS 3.1-1993) of the standard.

Regulatory Guide 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations," (April 1987)

Significant differences between the 1981 and 1993 versions are identified in the comparison. Further NRC staff review is necessary to determine the acceptability of citing the latest version (ANSI/ANS 3.1-1993) of the standard.

3.4 ANS Standard 57.2 Comparison

This section presents a comparison of the version of ANS-57.2 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:

ANS-57.2/ANSI N210-1976, "Design Objectives for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Stations"

LATEST STANDARD:

ANSI/ANS-57.2-1983, "Design Requirements for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Plants"

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I. REGULATORY CITATIONS

This part of the comparison identifies specific citations to ANS 57.2 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

The SRP citations for SRP Section 9.1.5 do not reference a specific version (year) for ANS 57.2. The 1976 version was the latest version available when the SRP citations were prepared. Therefore, this analysis assumes that the cited standard was ANS 57.2-1976.

SRP Section 3.8.4

Revision/Title: Rev. 1, July 1981, "Other Seismic Category 1 Structures."

Location: ANSI N210-1976 (also designated as ANS-57.2) is cited in Appendix D, "Technical Position on Spent Fuel Pool Racks," Reference 3.2.

Context: ANSI N210 is cited as a reference in Appendix D to SRP Section 3.8.4. Appendix D describes the minimum requirements and criteria for review of spent fuel pool racks and associated structures which would meet the design standards specified in Subsection II, Acceptance Criteria, of the SRP section.

SRP Section 9.1.2

Revision/Title: Rev. 3, July 1981, "Spent Fuel Storage"

Locations: ANS 57.2 is cited in five subsections: I, II, III, IV, and VI.

Context: In subsection I. Areas of Review, ANS 57.2 is cited for criticality limits. In subsection II. Acceptance Criteria, ANS 57.2 is cited as acceptance criteria for meeting GDC 2 for withstanding the effects of natural phenomena; for meeting GDC 4 for withstanding the effects of environmental conditions and missiles; for meeting GDC 61 for fuel storage and handling of radioactive materials; for meeting GDC 62 for prevention of criticality; and for meeting GDC 63 for monitoring systems to detect excessive radiation and conditions that could lead to loss of decay heat removal capabilities. In subsection III. Areas of Review, ANS 57.2 is cited for minimum design storage capacity in the spent fuel storage pool. In IV. Evaluation Findings, ANS 57.2 is cited as related to requirements for GDC 2, 4, 61, and 63. In VI. References, ANS 57.2-1976 is listed as Reference 11.

SRP Section 9.1.5

Revision/Title: Rev. 0, July 1981, "Overhead Heavy Load Handling Systems"

Locations: ANS 57.2 is cited in three subsections: II, IV, and VI.

Context: In subsection II. Acceptance Criteria, ANS 57.2/ANSI N210 is cited as other specific criteria necessary to meet the relevant requirements of GDC 2, 4, and 61. In subsection IV. Evaluation Findings, ANS 57.2/ANSI N210 is cited as guidelines to meet GDC 4 and 61. In subsection VI. References, ANS 57.2 is listed as Reference 9.

Other Citations

None

II. CITED VS. LATEST STANDARD DIFFERENCES

This part of the comparison presents those changes from the cited version (1976) to the latest version (1983) identified for ANS 57.2. Many of these changes involve formatting, editorial and grammatical differences. Others involve clarification (e.g., the addition of a figure or illustration) and have no effect on requirements. Those differences between the cited and latest versions of ANS 57.2 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 ANS 57.2 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 ANS 57.2 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: ANS-57.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
3 [1.3]	The standard now states that it is based on the systems engineering criteria of ANSI/ANS-51.1-1983 and ANSI/ANS-52.1-1983, versus being based on the criteria developed by subcommittees ANS-51 and ANS-52 of the ANS Standards Committee.	1	The added references to ANSI/ANS-51.1-1983 and ANSI/ANS-52.1.1983 to replace the reference to criteria developed by ANS subcommittees for pressurized water reactors, ANS-51, and for boiling water reactors ANS-52 may introduce additional or modified requirements to those provided in the 1976 version.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
4.2 [plant conditions]	The 1976 version of the standard divides "design conditions" into four categories: Condition I, Normal Operation; Condition II, Incidents of Moderate Frequency; Condition III, Infrequent Incidents; and Condition IV, Limiting Faults. For each design condition, a definition, applicable design requirements and several examples are provided. The 1983 version uses the term "Plant Conditions," which are divided into five categories, PC's I through V. For each Plant Condition, a definition and several examples are provided. Also, while there is a correlation between the provisions of each version of the standard applicable to Condition I/PC I, Condition II/PC II, Condition III/PC III, and Condition IV/PC's IV and V, there are numerous differences in the detailed content thereof.	1,4	The expansion of four categories of design conditions related to frequency of occurrence in the 1976 version to five categories of plant conditions related to postulated frequency of occurrence and potential impact on the immediate environs in the 1983 version, led to numerous changes in the specification of the performance requirements of the facility systems and subsystems. The changes in the examples of design conditions do not impose requirements. The 1983 version does not carry forward requirements for the release of radioactive materials to an unrestricted area to be in conformance with 10 CFR Part 20 and the design objectives of 10 CFR Part 50 Appendix A for Condition I occurrences; for the release of radioactive materials in effluents to be in conformance with 10 CFR Part 20 and the design objectives of 10 CFR Part 50 Appendix A for Condition II occurrences; for the release of radioactive material due to Condition III incidents to not exceed the limits imposed by 10 CFR Part 100; for Condition II or III occurrences to not generate, by themselves, a Condition IV fault.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
4.3 4.3.1 4.3.2 [safety classification]	The 1976 version of the standard requires that components be classified as Safety Class 3 or as Non-Nuclear Safety in accordance with their importance to safety. It then identifies how this importance is to be considered and provides details on which equipment/components are to be classified in which class. The 1983 version requires that components be classified as Safety Class 3 or as Non-Nuclear Safety in accordance with definitions set forth in ANSI/ANS-51.1-1983 and ANSI/ANS-52.1-1983.	1	The citation of ANSI/ANS-51.1-1983 and ANSI/ANS-52.1-1983 may introduce additional requirements to those contained in the 1976 version.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
4.4.1 [safe shutdown earthquake]	The last three sentences of the 1976 "definition" were not carried forward to the 1983 version. The first of these defines the structures, systems and components to which an SSE would be applicable. The second requires that the ground acceleration for an SSE be at least 0.1 g. And the last item requires that a suitable response spectrum be used to determine seismic effects.	1,4	The deletion of the information regarding the structures, systems, and components that are necessary to prevent consequences of accidents which could result in potential offsite exposure comparable to the Guideline exposure of 10 CFR 100 appears to relax the specificity of the definition and thus may affect requirements that utilize the defined term. However, exposure guidelines addressed in Section 5 of the 1983 version are more conservative than those in the 1973 definition. The deletion of the seismic design requirement for a ground acceleration of at least 0.1 gravity defaults to the requirement in both versions for evaluation of the maximum regional earthquake potential. The requirement in the 1976 version for a suitable response spectrum was replaced with more specific response spectrum requirements in subsection 6.4.2.14 in the 1983 version.

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CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
5 [5]	The 1976 version of the standard has no narrative directly under this heading. The 1983 version presents the basic performance requirements for Plant Condition PC I, PC II, PC III and PC IV occurrences. {However, the applicable paragraphs [(1) and (2), respectively] for PC I and PC II events in the 1983 version are updates to the "Design Requirements" for Condition I and Condition II occurrences [Sections 4.2.1.1 and 4.2.2.2, respectively] of the 1976 version. In each instance, the relevant 10 CFR references were revised, while the descriptive material has been carried forward with various wording changes, only.}	1	The added facility performance requirements for corrective actions to prevent the release of radioactive materials during Plant Conditions I, II, III, IV and V provide new requirements. However, the changes appear to be consistent with the regulatory requirements of 10 CFR 20, 50, and 100.
5.1 [5.1]	In the 1976 version of the standard, this is a section number/title, only. In the 1983 version, an introductory statement that "The following criteria shall be met" was included. (See 1983 Sections 5.1.1 - 5.1.4 for applicable criteria.)	1	The change in subsection title from "Spent Fuel Storage Pool" to "Spent Fuel Storage and Cask Handling Pools" extends the requirements on pool water depth and shielding to apply also to cask handling pools in the 1983 version.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.1.1 5.1.1.1 [6.1.2.1]	The statement "These systems need not otherwise meet Seismic Category I requirements" was deleted with respect to drains, permanently connected systems, and other features. The word "shielding" was deleted with respect to minimum pool depth.	1,5	Deletion of the statement "These systems need not otherwise meet Seismic Category I requirements" eliminates exceptions to seismic Category I design and thus appears to be an increase in requirements. The change in the description of requirements that the pool structures in the 1983 version, versus the spent fuel storage pool/facility (including its safety-related structures and equipment) in the 1976 version, be designed to Seismic Category I is not a relaxation in requirements, because Subsection 6.5.2.2 in the 1983 version requires the building to be designed to Seismic Category I requirements. Deletion in the 1983 version of a water depth requirement for shielding in the 1976 version does not reduce requirements, because shielding requirements are defined elsewhere in subsection 6.1.2.5 of the 1983 version.

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CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
5.1.1.2 [6.3.2.6, 6.3.2.7]	A recommendation that the capacity of each makeup system be such that water can be supplied at a rate adequate for Condition I, II, III and IV occurrences was deleted. It is now required that the capacity of the makeup system (and emergency backup system, if provided) be sized to maintain pool water level above the minimum depth for cooling assuming the maximum decay heat load in the pool is rejected to the environment by boiling of the pool water. Also, additional requirements related to the emergency pool water makeup system were included.	1,5	The new requirements in the 1983 version for the capacity of the makeup system to maintain pool water above a minimum depth for cooling and for the implementation time of the makeup system, increase the requirements for the makeup pool. Citation of the 1983 version would require a regulatory exception to Section 6.3.2.7 on the capacity of the makeup system. The capacity of the system should be as stated in C.8 of Regulatory Guide 1.13.
5.1.2 [6.1.2.2]	Removable gates (or bulkheads) are now required to support the full height of water remaining on the fuel pool side, versus "on one side," after the other side is completely drained. A recommendation that seals be provided on both vertical pressure faces of the gates was changed to a requirement that radiation resistant seals be provided on the pressure faces of the gates. Also, removable gates or bulkheads are now required to be designed to remain in position following an SSE.	1	The differences relative to identifying the position of the spent fuel pool with respect to the ability of removable gates (or bulkheads) to support the full height of water on the fuel pool side, the new requirement for removable gates or bulkheads to remain in position following an SSE, and the new requirement for seals to be radiation resistant are increased requirements for pool structures and components.

CITED V/S. LATEST STANDARD DIFFERENCES: ANS-57.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
5.1.3 [6.1.2.3]	The design of the spent fuel pool structure is now required to be based on the loading combinations contained in the facility FSAR or, alternately, those in ACI 349-1980, versus being required to consider the most severe loading resulting from appropriate combinations of mechanical, hydraulic and thermal conditions and natural phenomena. Also, specifications related to thermal loads from boiling were included.	1	The limitation of the requirements in the 1983 version to the spent fuel pool structure, the specification of the facility FSAR or ACI 349-1980 for loadings, and the specification of PC IV and V for thermal loads are new requirements.

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CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.1.5 5.1.5.1 5.1.5.2 5.1.5.3 5.1.5.4 [6.1.2.5, 6.3.2.15]	<p>The recommendation that shielding design be based on the highest radiation intensity expected was changed to a requirement that the design be based on the maximum expected complement of fuel assemblies. The requirement related to the shielding of auxiliary equipment was deleted. Also, two provisions related to shielding design, if water is used for shielding, were carried forward.</p> <p>The requirement that the materials handling systems include a positive means to prevent violation of minimum water shielding requirements during normal operations was deleted.</p> <p>The basic requirement related to shielding design for the spent fuel water purification system was carried forward. A reference to where the "required limits" are specified in the standard was added. A statement was deleted concerning the addition of the expected dose rate from the spent fuel pool water purification system to the attenuated dose rate from stored material when projecting exposures to personnel.</p>	1,4	<p>The change from a recommendation for shield design to be based on the highest expected radiation intensity to a requirement for shield design to be based on the maximum complement of fuel assemblies changes the design approach. The deletion of the shielding requirements for auxiliary equipment, the deletion of a requirement for materials handling systems to include a positive means to prevent violation of minimum water shielding requirements, and the deletion of a requirement to add the dose rate from stored material to other dose rates appear to be reductions in specific requirements; however, the strong emphasis on ALARA in the 1983 version (e.g., subsection 5.3.7) imposes design requirements to protect personnel from radiation exposure.</p>

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.1.6.3 [6.1.2.10]	The recommendation for a stainless steel or other suitable liner was changed to a requirement. The provision related to liner surface finish was carried forward verbatim. Also, requirements were inserted related to what must be shown (will not happen) in the event of the failure of the pool liner, if the liner is not designed to Seismic Category I.	5	The changing of a recommendation for a stainless steel liner to a requirement and the addition of requirements for pool liner performance during an SSE are increased requirements. The SSE performance criteria are exactly as stated in SRP Section 9.1.2, Review Procedure 3.b.
5.1.7 [6.1.2.12]	The 1976 version of the standard states: "The design of the storage facility and associated system shall include consideration of the following"; whereas, the 1983 version states: "The design of the storage facility and associated systems shall include the following."	1	The use of "shall include the following" in the 1983 version versus "shall include consideration of the following" in the 1976 version appears to represent the provision as a strict requirement for design of the storage facility by eliminating the term "consideration," and therefore, the change represents an increase in requirements.
5.1.7.1.2 [6.1.2.5 (a)]	The requirement that, if pool water is used for shielding, the minimum depth must assure at least minimum shielding under Condition I, II and III occurrences, was changed to state that, if shielding is dependent on water depth, a system is to be provided to maintain the required minimum depth to prevent accessible areas from becoming High Radiation Areas for recovery operations following PC III events.	1	Deletion of the restrictive condition that "If pool water is used also for shielding" and a change in requirements from maintaining "a minimum depth" to requirements for providing a system "to maintain the required minimum depth per 5.1.3" are increased requirements.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
5.1.7.1.4 [6.1.2.12 (a)(2)]	The subject requirement was changed to state that pool water depth must be assured as required by the applicable facility performance criteria (for all storage conditions and all Plant Conditions), versus a specification that minimum pool water depth be assured under Condition IV events.	1	The change in requirement in design of the makeup for minimum water depth during Condition IV incidents to all storage conditions and all Plant Conditions is an increase in requirements.
5.1.7.3 [6.1.2.12 (b)]	The requirement that monitoring and control of the pool water level be provided was changed to a specification that redundant means be provided to monitor the spent fuel pool level. Also, the subject requirement was integrated with a provision from the control, instrumentation, monitoring and communication systems function portion of the 1976 version of the standard --- see 1976 Section 5.4.2.	5	The addition of a requirement to provide redundant means to monitor the spent fuel pool level, and a new requirement for a low-low level alarm in the fuel storage building and in the control room are increased requirements. The new text appears to be consistent with Regulatory Position C.7 of Revision 1 to Regulatory Guide 1.13.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.1.8 [6.1.2.14]	Exceptions for certain pool penetrations (the fuel transfer tube(s), isolation gates and reactor cavity) below the minimum level required for cooling were deleted. An exception for isolation gates below the minimum water level required for shielding was added. A reference to the applicable criteria related to pool water depth was replaced in one sentence by "water level for shielding," and a reference to the applicable functional performance criteria was added in another location. A provision that passive antisiphoning devices meet the single failure criterion was deleted. Also, a permissive related to drains in the cask handling pool and transfer canal was added.	5	The deletion of the fuel transfer tube(s), isolation gates, and reactor cavity as accepted penetrations below the minimum level required for cooling, the added provision for isolation gates above the minimum water level required for shielding, the deletion of the requirement for passive antisiphon devices meeting the single failure criterion, and the added provision for double valved drains in the cask handling pool and transfer canal are revised pool penetration requirements. The latter two items are relaxations from the 1976 version; however, Position C.6 of Regulatory guide 1.13 prohibits installation of drains and permanently connected systems.
5.1.9.1 [6.3.2.2, 6.3.2.4, 6.3.4.1, 6.3.4.2, 6.3.4.3]	Additional requirements were included, if the incremental option for cooling capacity is chosen.	3	Requirements for a cooling system and for the design of the cooling system to be based on operating power history and irradiation time were deleted. The change in the provision for cooling capacity to be operable in increments to match requirements was changed to equipment for cooling may be added in increments, with additional requirements added for the incremental option. These changes result in expansions or reductions to the requirements for the cooling system.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
5.1.9.2 [6.3.2.11]	The requirement related to the control, retention and disposal of radioactive material was changed to apply to the pool water cleanup system, versus the cooling and/or cleanup system. Also, the specification that the design assure that potential releases of radioactive material via cooling system effluents are within appropriate limits was deleted. (References/criteria related to radioactive effluents are now included as facility performance requirements in Section 5 of the 1983 version of the standard.)	3	The change in applicability of the requirement for control, retention, and disposal of radioactive material collected from the cooling and/or cleanup system in the 1976 version was limited to the pool water cleanup system in the 1983 version. The requirement for the design to assure potential releases of radioactive material via cooling system effluents are within the limits for Condition I, II, III, and IV occurrences was deleted from this section, but is addressed as facility performance requirements in Section 5 of the 1983 version. These changes appear to be relaxations in requirements.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.1.9.3 5.1.9.3.1 5.1.9.3.2 [5.3.2]	The requirement related to the ability to recover from Condition IV incidents with cooling and/or makeup systems meeting specified redundancy, seismic and safety class criteria was changed. The standard now requires that capability must be provided to recover from Plant Condition IV and V occurrences with either a redundant Seismic Category I and Safety Class 3 cooling system or a Seismic Category I and Safety Class 3 makeup system that has the capability to feed and bleed.	5	The 1976 version specifies system specific Seismic Category I and Safety Class 3 design requirements for either 1) a redundant cooling system or 2) a redundant makeup system to recover from Condition IV incidents. The 1983 version also requires the capability to recover from PC IV and V occurrences with a redundant Category I and Safety Class 3 cooling system or makeup system. The 1983 standard deleted requirements for the Seismic Category I makeup system for case 1) above or for a single primary cooling system and redundant cooling system for case 2) above, neither of which need to Seismic Category nor Safety Class 3. The 1983 version adds new requirements for the Seismic Category I and Safety Class 3 makeup system to have the capability to feed and bleed. These changes both decrease and increase the design requirements for the cooling and makeup systems.

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CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.1.9.4 [6.3.2.9, 6.3.2.14]	Requirements related to maintaining water clarity were changed. The 1983 version requires that water chemistry be controlled to maintain the properties of the fuel assembly cladding, structural members and cooling system, versus being controlled within Technical Specifications limits.	1	Requirements in the 1976 version for water quality were changed to requirements for the pool water cleanup system, requirements to maintain clarity such that pool features can be seen with available viewing devices was changed to such that fuel assembly identification can be established with underwater viewing devices, requirements for suitable equipment to remove dirt from the pool surface were deleted, requirements for the activity level to be maintained ALARA below 2.5 mR/hr was revised to ALARA, requirements to provide adequate systems to maintain the pool water chemistry within the Technical Specifications was changed to control water chemistry to maintain material properties of the fuel cladding, structural members and cooling system. In addition requirements were added in the 1983 version to provide for the design and installation of pool water auxiliary systems, to shield equipment such as ion exchanger and filters, and to provide for isolation and flushing systems with decontamination solutions.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.1.10.1 [6.1.4.1]	The testing, maintenance and inspection requirements are applicable to only the spent fuel storage pool in the 1976 version, but expanded to include the spent fuel storage and cask handling pools in the 1983 version.	1	The 1976 version requires permanent access ladders in the cask handling pool and fuel transfer canal to allow maintenance of transfer mechanisms and upenders. The 1983 version requires permanent anchor points for removable access ladders. The 1983 version expands the applicability of the testing, maintenance and inspection requirements to the spent fuel storage pool in the 1976 version to the spent fuel storage and cask handling pools.
5.1.11 [5.6.2, 5.6.6]	Detailed requirements related to pool lighting were replaced by criteria that (1) lighting be provided within the storage pool to allow stored assemblies to be identified under normal operating conditions and (2) interior and exterior lighting for normal operations and for physical security be provided as specified in ANSI/ANS-3.3-1982.	1	The change from the requirement for adequate lighting for operation, to lighting allowing stored assemblies to be identified, and the replacement of detailed lighting requirements with a reference to ANSI/ANS 3.3-1982, appear to impact design and operational requirements for pool lighting. The citation of ANSI/ANS 3.3-1982 has the potential to introduce additional or modified requirements.
5.1.12.1, 5.1.12.2 [6.4.2.1, 6.4.2.2]	Two sections/paragraphs in the 1976 version related to the k_{eff} 's for the fuel storage racks, have been replaced by 16 sections/subsections of detailed provisions.	1	The 1976 version requirements that the design of spent fuel storage racks shall assure $K_{eff} < 0.95$, and a maximum $K_{eff} < 0.98$ for new fuel stored dry in spent fuel racks were significantly expanded in the 1983 version to enhance nuclear criticality safety.

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CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
5.1.12.3 [6.4.2.17, 6.4.4.2]	<p>The basic requirement related to the compatibility of storage rack materials with their environment was rewritten. A requirement addressing the evaluation of any poison material associated with the racks was added.</p> <p>The requirement related to fixed neutron absorbers is now addressed in a separate section and focuses on the periodic verification of the required physical properties of the absorbers and of their continued presence.</p>	5	The requirement in the 1976 version that the rack materials shall not contaminate the fuel assemblies such that the integrity or function of a fuel assembly is not compromised is deleted. Requirements that all materials of construction shall be capable of withstanding expected cumulative radiation exposures and that poison material shall be evaluated for swelling, venting, and poison dissolution were added in the 1983 version.
5.1.12.5 [6.4.2.10]	The 1976 version of the standard contains a requirement that the racks be designed to support and guide the fuel assemblies in a manner that would minimize the possibility of the application of excessive lateral, axial and bending loads. The 1983 version requires that a fuel storage rack cell apply loads to a fuel assembly only where the assembly is designed to withstand such loads.	5	The 1976 version places design requirements on each storage position in the racks to support and guide the fuel assembly. The 1983 version places design requirements on fuel assembly support surfaces of a cell to control fuel assembly loading. These requirements may affect the design of storage racks differently.
5.1.12.6 [6.4.2.11]	A maximum roughness specification was added.	2	An added specification of a finish for all rack surfaces (250 μ m rms) that contact the fuel assembly is an increase in requirements for storage rack fabrication.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.1.12.7 [6.4.2.12]	The phrase "protect from mechanical damage" was changed to read "preclude interference between". Also, fuel handling equipment was included within the scope of this interference/interface requirement for the fuel storage racks.	2	The change in emphasis from protecting fuel assemblies from mechanical damage to precluding interference between the assemblies and the fuel handling equipment may affect design and fabrication requirements for storage racks.
5.1.12.8 [5.4.2]	The recommendation that fuel assemblies not extend above storage rack support or guiding surfaces was deleted. The 1983 version requires racks to prevent physical damage to stored fuel for PC I, II, and III events.	4	The deletion of the recommendation that fuel assemblies not extend above storage rack support or guiding surfaces is a relaxation in specific requirements for the design of storage racks. The 1983 version specifies that racks shall prevent physical damage to stored fuel for PC I, II, and III events. Although the requirement in the 1976 version that fuel assemblies not extend above storage rack support or guiding surfaces is one approach for protecting the fuel assemblies, the new functional requirement for racks in the 1983 version presents the designer with other options for protecting the fuel assemblies.

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CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.1.12.10 [6.4.2.4]	The 1976 version of the standard requires that the structural design of the fuel storage racks limit deformation to preclude criticality and damage to fuel assemblies under "all anticipated loadings including ...". The 1983 version requires prevention of criticality for all Plant Conditions. A separate requirement was added to the 1983 version related to the structural design of the racks limiting physical damage to the fuel.	1	The revised and expanded requirements that structural design shall preclude criticality for all Plant Conditions and limit physical damage to the extent that would still permit normal insertion and removal of fuel during handling operations for PC I and subsequent to PC II and III occurrences affect the structural design.
5.1.13 [6.4.2.16]	The statement that all requirements of the spent fuel storage facility are to be met when storing leaking fuel for Condition I, II and III occurrences was not carried forward, per se. This requirement is now effectively embodied in various Facility Performance Requirements and Design Requirements, Sections 4 and 5, respectively, in the 1983 version. The statement: "The use of failed fuel storage containers may be considered in the design" has been changed to: "Provision may be made for storage of defective fuel assemblies in canisters and consolidated fuel in canisters."	1,5	The re-angment of requirements for meeting all provisions for Condition I, II and III occurrences for the spent fuel storage facility when storing leaking fuel may be a relaxation in requirements. The provision for storing consolidated fuel in canisters is a new provision.

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CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.1.14 [None]	Recommendations related to facility design to accommodate the contemplated examination of irradiated fuel were deleted.	4	The deletion of recommendations related to the examination of irradiated fuel may affect the spent fuel pool design with regard to specific provisions added to the design to accommodate the examinations.
5.1.15 [6.4.2.15]	Recommendations related to the storage capacity for a "two reactor system" and that the designer "should assess his particular situation" were deleted.	4	The deletion of recommendations related to the minimum spent fuel pool storage capacity for a two reactor system is a potential reduction in requirements. However, if the position in the 1983 version is applied to individual plants sharing a common pool, then it appears the 1983 version is more restrictive. The application of the 1983 requirement to multi-unit facilities is not clear.
5.2.2.1 [6.2.2.2]	The 1983 version requires the cask handling facility to contain the structures, systems and equipment to vent the cask and to cooldown the cask internally as necessary.	1	The changes in the 1983 version regarding the cask handling facility structures, systems and equipment adds new requirements to the cask handling facility.
5.2.3.2 [6.2.2.4]	A requirement was added that laydown space be provided for impact limiters and lifting rigs.	1	The addition of a requirement that laydown space be provided is a new design requirement.
5.2.3.3 [6.2.2.5]	The modifier "under all design conditions" was deleted.	4	The deletion of "under all design conditions" is a relaxation in requirements related to maintaining acceptable cask internal temperature.

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Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
<p>5.2.3.5 [6.2.2.7, 6.5.2.14, 6.2.2.8, 6.2.2.10]</p>	<p>The recommendation related to the design of the floor of the cask loading and handling facility to withstand, without failure, a cask drop was changed to a requirement, with the condition "if such a failure would adversely affect the integrity of the storage area or result in the loss of any safety function."</p> <p>The permissive related to the placement of limits on the height of the cask drop accident was rewritten as a requirement.</p>	<p>1</p>	<p>The recommendation to design the floor to withstand the forces from a cask drop on edge and the permissive to use electrical or mechanical controls to limit a cask drop were changed to requirements. These represent increased civil and structural requirements.</p>

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Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.3.1 [5.5.1, 5.5.4]	The general functional requirement in the 1976 version related to the spent fuel storage building was deleted. Related requirements are presented as facility performance requirements for the fuel storage building in the 1983 version.	4,5	The 1976 version requires the spent fuel building including the ventilation and filtration system to provide protection for the fuel and equipment to control exposure of personnel to ALARA and to limit the release of radioactive materials for all conditions. The 1983 version requires a controlled environment for the spent fuel storage area that will not prevent maintaining the fuel in a coolable and subcritical geometry and isolation and filtration to limit the potential release of iodine and other radioisotopes to 10 percent of 10 CFR Part 100 limits for PC III and 25 percent of those limits for PC IV and V events. The requirements in the 1983 version are more specific and quantified when compared in the 1976 version. The change in applicability from "all conditions" to "PC III, IV, and V" appears to be a relaxation in requirements.

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Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.3.3 [6.5.2.3, 6.5.2.4, 6.5.2.5, 5.5.6]	The requirements related to the spent fuel storage building safety-related ventilation system were rewritten.	1	Revisions in the 1983 versions include: a requirement for a redundant safety grade filtration systems replaced an engineered safety feature filtration system; a new specification of ANSI/ASME N509-1980 for design and construction of safety grade filtration systems; a reduction in iodine and other radioisotope releases from 10 CFR 100 limits in the 1976 version to below 25 percent of 10 CFR 100 limits; allowing the system to be "separate from" in the 1983 version instead of "in addition to;" isolation of the normal ventilation system on indication of high radiation; and assurance that air leakage is into the fuel handling area for Plant Conditions I, II, and III.
5.3.5 [6.5.2.11]	The recommendation related to ingress and egress control was changed to a requirement. The entrances to the spent fuel storage building are now required to be equipped with locks which are under administrative control, versus which can be under administrative control. Also, a reference to ANSI/ANS-3.3-1982 was added.	1	The 1983 version upgrades recommendations for control of fuel building ingress and egress and spent fuel building locks to requirements and adds a reference to ANSI/ANS-3.3-1982 for additional access control/security requirements related to security of the fuel storage building.

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Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
5.4.1 [6.6.2.2, 6.6.2.3]	<p>The provisions related to spent fuel building radiation monitors now state that a criticality monitor may be used to meet the requirement for an installed radiation monitor that both indicates and alarms in the pool area and in the control room.</p> <p>The provisions related to the spent fuel building safety-related filtration and ventilation system now include a requirement that alarms are to be provided to alert operators if the system is not in operation when it is supposed to be.</p>	1	The added allowance for a criticality monitor to be used to meet the requirement for an installed radiation monitor, and the added requirement that the spent fuel building safety-related filtration and ventilation system include alarms to alert operators if the system is not in operation, increase requirements.
5.4.2 [6.1.2.12]	The subject requirement was integrated with a provision from the spent fuel storage pool portion of the 1976 version of the standard --- see 1976 Section 5.1.7.3 --- and the provision related to periodic testing was deleted.	5	The deletion of a requirement for periodic testing of the spent fuel pool level monitor and the added requirement for redundant means to monitor the spent fuel pool level revise the requirements for pool level monitoring.
5.4.3 [6.6.2.5]	The recommendation that equipment be provided to monitor pool temperature was deleted as a separate item/section. Fuel pool temperature is now included in the list of parameters for which indication and alarms must be provided.	1	The deletion of a recommendation in the 1976 version that equipment be provided to monitor pool temperature is replaced in another section by a requirement for a fuel pool temperature indication and alarm.

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5.4.4 [6.6.2.4]	The 1983 version requires, versus recommends, that uninterruptible communications for fueling operations, operate on a different channel from the remainder of the plant. The loudspeaker (public address) system is required in the 1983 version to communicate to both the spent fuel storage building and the primary reactor containment, versus only the fuel building in the 1976 version.	1	The recommendation for uninterruptible communications between fuel handling machines, refueling machines and the control room was changed to a requirement between fuel handling machines, refueling machines, the control room and transfer mechanisms/upender control station(s). The recommendation for a "public address system" for rapid communication from the control room to the spent fuel building was changed to a requirement for a "loudspeaker system" for rapid communication from the control room to both the fuel storage building and the primary reactor containment. The recommendation for communications to operate on a channel different from the remainder of the plant was changed to a requirement.
6.1 [5.3.2]	The Seismic Category I/Safety Class 3 design requirement for fluid systems was modified such that the capability must be provided to recover from Plant Condition IV and V occurrences with either a redundant Seismic Category I and Safety Class 3 system or a Seismic Category I and Safety Class 3 makeup system that has the capability to feed and bleed.	1	The modified requirement to provide the capability to recover from PC IV and V occurrences with either a redundant, seismic Category I and Safety Class 3 cooling system or a seismic Category I and Safety Class 3 makeup system with feed and bleed capability is an increase in requirements.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
6.2 [6.1.1.2, 6.2.1.2, 6.2.2.1, 6.3.1.2, 6.3.2.1, 6.4.2.17, 6.5.1.2, 6.5.2.1, 6.6.1.2, 6.6.2.1]	The general requirement that all materials used in components and structures be compatible with the environment in which they are used and with other materials in the system was not carried forward. With the exception of the spent fuel storage racks, the individual system design requirement sections of the 1983 version of the standard either specify codes and standards which are to be applied for the selection of materials, and/or state that system components are to be operable within the environmental limits established for their location within the facility.	1	The general requirement in the 1976 version that all materials used in components and structures be compatible with the environment in which they are used and with other materials in the system was replaced with specific design requirements based on codes and standards, and operability requirements under specific environmental parameters including, but not limited to, temperature, humidity and radiation levels. Requirements for materials exposed to radiation, pool water, and performance of poison materials were added.

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Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
6.3.1 [6.5.2.9, 5.2.6]	Requirements related to the auxiliary fuel handling crane being physically limited from lifting a load heavier than a fuel assembly were replaced by a new requirement that physical means be provided to ensure that loads heavier than accounted for in the rack analysis cannot be transported over the spent fuel storage racks. The 1983 version prohibits the cask crane from passing over the spent fuel storage pool which was previously allowed in the 1976 version.	1,5	The requirement in the 1976 version prohibiting the auxiliary fuel handling crane from lifting loads heavier than a fuel assembly with control components over stored fuel in storage racks was changed to require physical means to ensure that loads heavier than accounted for in the rack analysis cannot be transported over the spent fuel storage racks. A requirement to employ positive mechanical means to the cask crane to prevent raising an irradiated fuel assembly above a minimum level for shielding in the pool was replaced with a requirement to provide interlocks to prevent the cask crane from passing over the spent fuel storage pool. A requirement was added to restrict shipping cask movement such that casks cannot pass over or impact stored fuel for all Plant Conditions. These are increased requirements for preventing impact to spent fuel. The new text appears to be consistent with the restructuring of the standard and with Regulatory Position C.5 of Revision 1 to Regulatory Guide 1.13.

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Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
6.3.2 [6.2.2.12]	The design of the cask handling system is now required to protect the stored spent fuel, versus the stored spent fuel and the spent fuel pool. Reference to Condition III and IV incidents was deleted. The statement that seismic requirements be considered in the design of the cask handling area was deleted.	4	Requiring protection of the "stored spent fuel" instead of the "stored spent fuel and the spent fuel pool," and deletion of Condition III and IV incidents, except dropping or tipping over of the spent fuel shipping cask, are reductions in requirements.
6.4.1 [6.1.2.1, 6.3.2.6, 6.4.2.13, 6.5.2.2]	The requirement for, and list of, those systems, structures and components which are to be designed to Seismic Category I was deleted. Design requirements are now presented separately, by system, and Seismic Category I is specified for the pool structures and the building containing the pool structure and associated equipment (which includes HVAC), for the spent fuel storage racks (and their associated support structures), and for the makeup system and either its redundant or backup system.	5	Requirements for the spent fuel building to "remain in place" was changed to "be capable of protecting the pool, its Safety class 3 mechanical and fluid systems, and stored fuel during all Plant Conditions." New requirements are added for a redundant makeup system or a backup (emergency) system for filling the pool, for reliability of the water source, and for the storage racks to allow coolant flow. Requirements for the Safety Class 3 portions of the cask loading and handling facility were changed to requirements for the storage space in the fuel storage building for tools and slings and for the spent fuel shipping cask head and other accessories and space for equipment maintenance.

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6.4.2 [6.5.1, 6.1.1]	Revised/updated lists of codes and standards applicable to the design of the fuel storage building and the spent fuel storage and cask handling pools are provided.	1	The 1976 standard recommends codes and standards for consideration in the facility design. The 1983 presents codes and standards that are required for building design, purchase of materials, spent fuel storage and cask handling pools design, interface design, and materials selection. These standards may introduce additional requirements by reference. The changes to recommended codes and standards may increase requirements for materials and design for the fuel storage building and spent fuel storage and cask handling pools.
6.4.3 [6.6.1]	A revised/updated list of codes and standards applicable to electrical, I&C and communication components and systems is provided.	1,4	The 1976 standard recommends electrical codes and standards for consideration in the facility design. The 1983 presents electrical codes and standards that are required for design of the electrical, I&C, and communication components and systems, and purchase of materials. These standards may introduce additional or modified requirements by reference. The 1976 version cited safety related standards such as IEEE 308 and IEEE 384. The 1983 version cites commercial codes and standards such as IEEE C2.

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<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
6.4.4 [None]	Applicable quality assurance codes, standards and regulations are revised and relocated in the individual system design requirement sections in the 1983 version.	1	The deletion of a general section related to quality assurance and the specification of applicable quality assurance codes, standards and regulations in individual system design requirement sections (in the 1983 version) involve changes in requirements. The 1976 version references 10 CFR Part 50, Appendix B for quality assurance criteria, Appendix I for guides for ALARA, and ANSI N45.2 for quality assurance program requirements. The 1983 version references ANSI/ASME NQA-1-1983 for quality assurance program requirements and IEEE 467-1980 for quality assurance program requirements for the design and manufacture of Class 1E instrumentation and electric equipment. These documents may present different quality assurance requirements.

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6.4.5 [6.5.2.3, 6.5.4.1]	The 1976 version indicates that the latest issue of Chapter 22 of the ASHRAE Handbook and Product Directory; AMCA 210-1974 "Laboratory Methods of Testing Fans for Rating;" ARI, Air Filter Units;" UL-900-1975, "Air Filter Units;" and UL-586-1975, "High Efficiency Particulate Air Filter Units" should be considered in the design of the facility. The 1933 version requires redundant safety grade filtration systems, designed and constructed to the requirements of ANSI/ASME N509-1980.	5	The ventilation/HVAC codes and standards recommended by the 1976 version were replaced in the 1983 version with the requirements of ANSI/ASME N509-1980. Other new requirements include limiting the release of iodine and other radioisotopes during a PC IV and V fuel rupture incident to keep releases below 25 percent of 10 CFR 100 limits. The filtration system may be separate from the normal ventilation system and must have redundant means for automatic actuation. New requirements are also provided for accessibility of the filters and fans for maintenance and replacement of bearings and motors.
6.4.6 [6.5.1]	The 1983 version provides a revised list of codes and standards applicable to the spent fuel storage building.	1	Changing the referenced codes and standards in the 1976 version from NFPA 802-1975 and NFPA 801-1974 to NFPA 78-1977 and ANSI/ANS-59.4-1979, along with referencing other codes and standards for building design and fire protection may add or modify requirements.
6.6.1(1) [6.4.2.2]	The statement that the maximum k_{eff} for the spent fuel not exceed 0.95 has been replaced by detailed requirements for criticality calculations.	1	The addition of detailed requirements for criticality calculations increases the requirements for nuclear criticality design.

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Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
6.6.1.(2) [5.3.3, 5.3.10, 5.3.11]	The maximum temperature requirement for the spent fuel pool was reduced and the criteria revised. The requirement that, under Condition IV incidents, boiling is permitted within the capability of the makeup system to resupply and within 10 CFR 100 limits was changed to require that the capability be provided to recover from loss of forced cooling before bulk boiling occurs for Plant Condition II events and before the exceeding pool structure design limits for PC III, IV and V events.	5	Requirements for the maximum pool temperature to not exceed 150°F with all storage spaces full under normal operating conditions, at a level consistent with personnel comfort and safety under less than full storage conditions, and for boiling limits under Condition IV incidents, were revised to require the capability to recover from loss of forced cooling before bulk boiling occurs for PC II events and before the design limits of the pool structures are exceeded for PC III, IV, and V events and to provide capability to maintain bulk average Fuel Storage Pool temperature no higher than 60°C (140°F) under conditions of maximum heat generation and no concurrent failure for PC I.
6.6.1(3) [5.1]	The dose rate specification for personnel in normally occupied areas was incorporated into a performance requirement and expanded.	1	The specification that the dose rate to personnel in normally occupied areas be maintained as low as reasonably achievable below 2.5 mrem/hr in the 1976 version was extended to include Plant Condition I and II, and expanded into a performance requirement related to shielding in accessible areas. This is an expansion of requirements.

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6.6.1(4) [5.1.2]	The specification that the spent fuel storage pool be designed for the lowest practicable leakage was revised and incorporated into a performance requirement related to pool water retention,	5	The requirement in the 1976 for the pool to be designed for the lowest practicable leakage was revised in the 1983 version to require zero leakage and prohibit inadvertent release of radioactive material.
6.6.1(5) [5.3.2]	The recommended redundancy for the spent fuel pool water cleanup system was replaced in the 1983 version with a performance requirement related to the ability to recover from Plant Condition IV and V occurrences.	1	The replacement of a recommendation related to the required degree of redundancy for the spent fuel pool water cleanup system with a performance requirement related to the ability of the cooling, cleanup and makeup systems to recover from Plant Condition IV and V occurrences is an increase in requirements.
6.6.1(6) [None]	The general specification that the design basis of the spent fuel storage pool include a spectrum of Condition II, III and IV occurrences was deleted, and is now effectively embodied in the Facility Performance Requirements and Design Requirements of the 1983 version.	5	The general specification in the 1976 version that the design basis of the spent fuel storage pool include a spectrum of Condition II, III and IV occurrences was deleted and is addressed in the Facility Performance Requirements and Design Requirements subsections for the spent fuel storage and cask handling pools in the 1983 version. These subsections in the 1983 version appear to provide more detailed requirements.

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6.6.1(7) [5.3.2]	The specification related to providing at least two sources to fulfill the functional requirements of makeup water was replaced with a performance requirement related to the ability of the cooling, cleanup and makeup systems to recover from Plant Condition IV and V occurrences.	1	The change from a functional requirement to a performance requirement related to the capability to maintain spent fuel pool cooling and makeup involves an increase in requirements.
6.6.1(8) [None]	The recommendation to provide a support barrier around the periphery of the pools was deleted.	4	The deletion of a recommendation to provide a support barrier around the periphery of the pools is a reduction in requirements.
6.6.1(9) [5.3.12]	The recommendation that fluid systems piping design consider the possibility of freezing was incorporated in a performance requirement.	1	The 1976 version recommended that fluid systems piping design consider the possibility of freezing was expanded into a performance requirement that piping design shall preclude syphoning and freezing for all plant conditions.
6.6.1(10) [None]	The recommendation related to design provisions for to pool floor cleaning was deleted.	4	The deletion of a recommendation that consideration be given to pool equipment design to allow cleaning of the pool floor is a reduction in provisions for pool maintenance.

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6.6.2(1) [6.2.2.11]	The list of the applicable types of radiation and contamination to be monitored was deleted.	3	The replacement of the list of radiation and contamination types for which radiation monitoring capability is to be available, with a more general requirement for radiation and contamination monitoring capability is a reduction in the clarity of the requirement.
6.6.2(2) [6.2.2.6]	The minimum recommended lighting intensity for inspection purposes was changed to a requirement.	5	The recommendation in the 1976 version for a minimum lighting intensity of 100 foot-candles measured at the surface to be inspected was changed to a requirement in the 1983 version.
6.6.3(1) [None]	The recommendation related to air change rates was deleted.	4	The deletion of the recommendation in the 1976 version that ventilation air flow rates in the enclosed spent fuel pool area be at least 2 changes per hour is a reduction in requirements.
6.6.3(2) [6.5.2.4]	The requirement that air flow be from areas of lower radioactive contamination to areas of higher radioactive contamination was incorporated into a broader specification in the 1983 version related to the layout and operation of the fuel storage building normal ventilation system.	1	The ventilation requirements for contamination control from the 1976 version were incorporated with the 1983 requirements for the layout and operation of the fuel storage building normal ventilation system, that include added provisions for cleaning incoming air.
6.6.3(3) [None]	The recommended minimum illumination at the working surface of at least 50 foot candles was deleted.	4	The deletion of a recommendation for minimum illumination at the working surface represents a relaxation in the illumination requirements.

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6.6.3(4) [6.5.2.3]	The requirement for redundant air filtration components to filter iodines for a Condition IV fuel assembly rupture incident was incorporated into a broader specification related to redundant safety-grade filtration systems. The provision concerning maintaining a negative pressure in the spent fuel storage building for such an incident was deleted. A performance requirement that air leakage be into rather than out of the fuel handling area for Plant Conditions I, II and III was added.	1,5	The requirement for the redundant air filtration system to be separate (independent in the 1976 version) was relaxed to a permissive. New requirements were added for the safety grade filtration system to be designed and constructed to the requirements of ANSI/ASME N509-1980, to provide filtration of other isotopes in addition to iodine, to maintain the releases below 25 percent of 10 CFR 100 limits, and to provide automatic actuation of the safety grade filtration system and isolation of the normal ventilation system on indication of high radiation. These are increased requirements for the safety grade filtration systems.
6.6.3(5) [None]	The recommendation that consideration be given for breathing apparatus, clothing change and rapid decontamination for personnel safety was deleted.	4	The deletion of a recommendation for breathing apparatus, clothing change and rapid decontamination for personnel safety is a reduction in requirements.

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6.6.4.1 [6.6.2.5]	The list of required parameters and systems status indications was retained with several changes and additions.	5	New requirements for a local demineralizer ΔP indication, remote and local indication of fuel pool temperature and remote indication of pool level to be upgraded from recommended to required, local indication and high alarm for the filter ΔP , local indication of the building ΔP , local indication of the cooler inlet and outlet temperatures, and local indication of cooler ΔP were added. The requirement for a remote indication of pump controls was downgraded from required to recommended. These changes increase and decrease requirements for indicators and alarms. Position C.7 of Regulatory Guide 1.13 should be retained.

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Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
7.1.1 [6.6.4.5, 6.3.4.3, 6.3.4.4, 6.6.4.6, 6.4.4.2]	<p>An allowance for monitoring <u>or</u> periodic functional testing, versus only periodic functional testing, was added to the design requirements for instrumentation for decay heat removal capability, spent fuel cooling flows, pool leakage, pool purification system performance and radiation monitoring.</p> <p>Recommendations were added related to equipment/instrumentation for periodic functional testing to the design requirements for the pool water cleanup system and heat exchangers.</p> <p>A requirement was added in the electrical power, I&C and communications portion of the 1983 version that the storage design allow for testing of neutron poisons and the spent fuel storage racks design requirements section requires that provisions be made for the periodic verification of the continued presence of fixed neutron absorbers.</p>	1	The option of monitoring was added to the requirement for periodic functional testing; a requirement for testing the effectiveness of neutron poison in the spent fuel storage racks was changed to a design requirement to allow testing; requirements were added for provision of equipment for periodic functional testing of the pool water cleanup system and heat exchanger performance; and a requirement was added for provisions to periodically verify the required physical properties and continued presence of fixed neutron absorbers. These changes increase requirements for monitoring and testing.
7.1.2 [None]	The testing requirements of ASME Section XI are deleted with regard to Safety Class 3 components.	4	The deletion of a requirement that Safety Class 3 components also meet the testing requirements of ASME Section XI is a reduction in requirements.

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7.2 [6.6.4.5]	The design requirements for instrumentation for radiation monitoring were revised or expanded. The requirement for instrumentation for functionally testing decontamination system operation was deleted.	1	Sampling or indications were added to the requirement for sufficient instrumentation and "monitoring or periodic" was added to functional testing. The "decontamination system operation" was expanded to "Pool purification system performance decontamination factor." Monitoring or periodic functional testing of the decay heat removal capability of heat exchanger, spent fuel cooling flows, and pool leakage were added. The expanded and new requirements affect monitoring and functional testing requirements.
7.3 [6.5.4.2]	A reference to ANSI/ASME N510-1980, "American National Standard for Testing of Nuclear Air Cleaning Systems," was incorporated into the requirement related to instrumentation for testing of spent fuel building system performance.	5	The requirements of ANSI/ASME N510-1980 were added in the 1983 version for instrumentation to test and evaluate spent fuel building ventilation system performance, filter integrity and performance, and building negative pressure alarms. Addition of the reference to ANSI/ASME N510-1980 for testing and evaluation instrumentation may increase or modify requirements.

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8 [6.3.2.14]	The requirement in the 1976 version of the standard that system design take into consideration maintenance requirements and equipment and piping layout so as to minimize radiation exposure to personnel as low as reasonably achievable, was deleted. It is now required that provisions be made in the design and installation of pool water auxiliary systems to maintain worker exposure during operation and maintenance ALARA. Requirements were added for equipment shielding and isolation and flushing of systems with decontamination solutions.	1	The ALARA requirements in the 1976 version were restructured in the 1983 version which requires provisions in design and installation to maintain worker exposure during operation and maintenance to ALARA. Additional requirements were added for ion exchangers and filters to be shielded, and additional provisions for isolation and flushing the systems with decontamination solutions. These are increased requirements for maintaining radiation exposure to personnel to ALARA.
8.1 [6.3.4.1, 6.3.4.2]	The recommendation that filters be capable of being either remotely back-flushed or designed so that cartridges can be removed directly into a shielded cask was made a requirement. The recommendation that filters and resin traps (if used) be parallel flow construction was deleted.	1	Changing the recommendation in the 1976 version regarding filter flushing and removal to a requirement in the 1983 version and deleting a recommendation in the 1976 version for parallel filter flow affect requirements for maintenance of pumps, valves, and filters
8.2 [6.5.4.1]	A reference to ANSI/ASME N509-1980 was added.	1	A reference to ANSI/ASME N509-1980 was added to the 1983 version for filter maintainability criteria. This change may introduce new or modified requirements by reference.

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8.3 [6.1.4.2]	The recommendation that underwater components be remotely removable while maintaining the minimum safe shielding depth was rewritten as a requirement and changed to include only items requiring periodic maintenance.	1,4	A recommendation in the 1976 version that components located underwater in the spent fuel storage pool be remotely removable without lowering the pool level below the minimum safe shielding depth was changed to a requirement in the 1983 version. The requirement was relaxed for components by limiting its provision to components requiring periodic maintenance, unless the equipment is located in an area that can be isolated by valves or gates. These changes in requirements affect maintenance and replacement of fuel storage pool components.
9 [7]	The list of references was updated and expanded.	1	The updating of the list of references supports changes in requirements generally associated with changes in references to the codes and standards. The updating of references may introduce additional or modified requirements.

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CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
None [5.1.3, 5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.5]	These subsections introduce new requirements to retain pool water depth for shielding and for spent fuel cask handling.	1	New subsections in the 1983 version introduce new requirements to retain pool water shielding depth to protect accessible areas from becoming high radiation areas following a PC III event; provide for the inspection, monitoring, decontamination, venting, and flushing of shipping casks; provide for moving casks for PC I; provide auxiliary cooling if required for PC I and II; and prevent mechanical damage that could result in a cask drop or affect cask integrity or handling operations for all plant conditions. These new requirements affect radiation protection and cask handling, operations and management.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2

Section cited & [latest]	<u>Significant Changes</u> cited & [latest]	Type of Change	Discussion
None [5.3.1, 5.3.4, 5.3.5, 5.3.6, 5.3.7, 5.3.8, 5.3.9]	These subsections introduce new requirements for the spent fuel pool cooling, cleanup and makeup systems for various plant conditions.	1	New subsections in the 1983 version introduce new requirements to provide forced cooling to maintain pool water temperature, capability to replace evaporated pool water with demineralized water, capability to maintain minimum pool depth for shielding for PC I, II, and III, capability to add water to the storage pool to maintain water level for PC IV and V events, capability to maintain pool water activity to control worker exposure, maintain visual clarity in pool water, and the capability to maintain the design decontamination factors for Plant Conditions I and II. These new requirements affect radiation protection and fuel storage pool system design and operations.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
None [5.4, 5.4.1, 5.4.2, 5.4.3, 5.4.4, 5.5.2, 5.5.3, 5.5.4, 5.5.5]	The 1983 version provides new performance requirements for spent fuel storage racks and the fuel storage building.	1	The 1983 version introduces new requirements for spent fuel storage racks to maintain the capability to remove and insert fuel assemblies for PC I and subsequent to PC II and III events, prevent physical damage to stored fuel for PC I, II, and III events, and maintain a coolable geometry for all Plant Conditions. New requirements are also provided for the fuel storage building to maintain fuel coolability and subcritical geometry, prevent contamination spread during PC I and II events, prevent spread of fire during PC I and II events, provide isolation and filtration to limit the release of iodine and other radioisotopes to 10 percent of 10 CFR Part 100 limits for PC III and 25 percent of these limits for PC IV and V events, and control interior ambient temperatures within design limits for PC I events. These changes affect the performance and design requirements for spent fuel storage racks and the fuel storage building.

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CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
None [5.6, 5.6.1, 5.6.3, 5.6.4, 5.6.5]	The 1983 version provides new requirements for electrical power, process system and area radiation monitoring, instrumentation and alarm functions for each process system and spent fuel building on-site communications for various Plant Conditions.	1	New subsections in the 1983 version introduce new requirements to provide power for all electrically operated components for PC I events, monitor process system and area radiation levels for direct radiation, gaseous and airborne particulate activity for all Plant Conditions, provide instrumentation and alarm functions for each process system, and provide on-site communications for the spent fuel building for all Plant Conditions. These new requirements affect radiation control and protection.
None [6.1, 6.1.2, 6.1.2.6, 6.1.2.7, 6.1.2.11]	New subsections in the 1983 version introduce new requirements for the design of the cask handling pool.	1	New requirements in the 1983 version include design of the cask handling pool to assure that a dropped cask cannot impact on stored fuel or result in a loss of fuel storage pool functional integrity, the cask handling pool should be designed to accept anticipated shipping casks, and design of the spent fuel storage pool shall address the effects of internal gamma heating of the concrete. These new requirements affect the design of the cask handling pool.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
None [6.1.3]	This section permits certain interfacing systems to be supported by the pool structures and cites ANSI/ANS-57.1-1980, "American National Standard Design Requirements for Light Water Reactor Fuel Handling Systems" for additional requirements.	i	The 1983 version indicates that the cask handling, fuel handling, fuel storage rack, and pool water makeup systems that interface with the spent fuel storage and cask handling pools may be totally or partially supported by the pool structures. Mounting and services provisions shall be included in the design to accommodate the fuel handling equipment specified in ANSI/ANS-57.1-1980. These provisions and requirements for pool interfaces, mounting and service provisions are not provided by the 1976 version.
None [6.1.5]	New requirements are provided for documentation to substantiate and verify conformance to standards and government requirements.	1	The 1983 version requires documentation to substantiate conformance with the standard and government requirements. Certification of Conformance with applicable standards is required for all structural materials. Verification of design documentation as required by ANSI/ASME NQA-1-1983 is specified. These provisions and requirements for documentation are not provided by the 1976 version.

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CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
<u>Section cited & [latest]</u>	<u>Significant Changes cited & [latest]</u>	<u>Type of Change</u>	<u>Discussion</u>
None [6.2, 6.2.1, 6.2.1.1, 6.2.2, 6.2.2.9, 6.2.4, 6.2.4.1, 6.2.4.2, 6.2.4.3, 6.2.5]	New requirements include compliance of the spent fuel cask handling system design with certain applicable codes and standards. In addition, new requirements are provided for electrical panel access; testing, maintenance, and inspection of cranes and other components; decontamination of radioactive material transfer systems for maintenance; and documentation to substantiate and verify conformance with this standard and government requirements.	1	New subsections in the 1983 version introduce new requirements for compliance of the spent fuel cask handling system design with ANSI B30.2-1976, ANSI N14.6-1978, CMAA 70-1975, 49 CFR Parts 173.392 and 173.393; a new provision to allow decontamination of radioactive material transfer system for maintenance by flushing; and new requirements for maintenance of documentation and verification of design documentation per ANSI/ASME NQA-1-1983. These new requirements that affect the design of the spent fuel cask handling system were not provided in the 1976 version.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2

Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
None [6.3, 6.3.1, 6.3.1.1, 6.3.2, 6.3.2.3, 6.3.2.5, 6.3.2.8, 6.3.2.10, 6.3.2.12, 6.3.2.13, 6.3.5, 6.3.3.1, 6.3.3.2, 6.3.4, 6.3.5, 6.3.5.1, 6.3.5.2, 6.3.5.3] (Cont'd)	The 1983 version cites several codes and standards for design of the spent fuel pool water makeup, cooling, and cleanup systems and provides additional specific design requirements for these systems.	1	New subsections in the 1983 version introduce new requirements for the design of the spent fuel pool water makeup, cooling, and cleanup system to be in accordance with applicable codes and standards ANSI C2-1981, ASME B&P Vessel Code Section III Par. NF, IEEE 323-1980, ANSI/ASME B31.3-1980, ANSI/ASME B&P Code, Section VII, Division 1, ANSI/API-650-1978, and NFPA 70-1981. Other new requirements include limiting operating temperatures for the storage pool, pool design to inhibit escape of contaminated water, makeup of water lost to evaporation, requirements for connections to the pool water cleanup system, pool water turnover time, recoverability from a loss of cooling condition, piping design to eliminate sites for trapping radioactive materials, elevation requirements for pool penetrations, piping configuration for the cooling and cleanup system, documentation of the pool water cooling and cleanup systems sizing, Certificates of (Cont'd)

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CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2

Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
None [6.3, 6.3.1, 6.3.1.1, 6.3.2, 6.3.2.3, 6.3.2.5, 6.3.2.8, 6.3.2.10, 6.3.2.12, 6.3.2.13, 6.3.5, 6.3.3.1, 6.3.3.2, 6.3.4, 6.3.5, 6.3.5.1, 6.3.5.2, 6.3.5.3]			Compliance with applicable standards for component materials that come in contact with the pool water, and verification of design documentation in accordance with ANSI/ASME NQA-1-1983. These new requirements affect the performance of the pool water makeup, cooling and cleanup system.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
None [6.4, 6.4.1, 6.4.2, 6.4.2.3, 6.4.2.5, 6.4.2.7, 6.4.2.8, 6.4.2.9, 6.4.2.14, 6.4.2.18, 6.4.3, 6.4.3.1, 6.4.3.2, 6.4.4, 6.4.4.1, 6.4.4.3, 6.4.5, 6.4.5.1, 6.4.5.2, 6.4.5.3] (Cont'd)	The 1983 version cites numerous codes and standards, and provides additional requirements specific to the design of the spent fuel storage racks.	1	New subsections in the 1983 version introduce new requirements that include applicable codes and standards ANSI/ANS-8.1-1983, ANSI/ASTM A240-81a, ANSI/ASNT B209-1982, ASTM A588-1981, ASME B&PVC Section III, Part NF, AISI S326-1978, ASME B&PVC Section III, Division I Part NF, and ASME B&PVC Section III, Part NF, Appendix I. These codes and standards may introduce additional requirements by reference. The 1983 version also includes new requirements for thermal loads during boiling, the support of the racks, minimum fuel element separation, accounting for tipping, tilting, and sliding in the design; prohibits fuel damage or reduction in required margin to criticality due to impact; simultaneously acting horizontal and vertical seismic loadings; methods to combine modal responses; plant specific earthquake response curves for seismic calculations; permanent identification of each storage rack cell; the interface between the spent fuel storage racks and the spent fuel storage pool and fuel handling systems; design requirements for the pool structure and liner; natural circulation cooling requirements in the spent fuel (Cont'd)

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
None [6.4, 6.4.1, 6.4.2, 6.4.2.3, 6.4.2.5, 6.4.2.7, 6.4.2.8, 6.4.2.9, 6.4.2.14, 6.4.2.18, 6.4.3, 6.4.3.1, 6.4.3.2, 6.4.4, 6.4.4.1, 6.4.4.3, 6.4.5, 6.4.5.1, 6.4.5.2, 6.4.5.3]			storage racks in the spent fuel storage pool; verification of the presence of mixed neutron poisons; removability of the spent fuel storage racks; application of ANSI/ASME NQA-1-1983 to documentation of the design calculations and analyses for spent fuel storage racks; a Certificate of Conformance with applicable standards for all component materials that come in contact with pool water; and a Certificate of Conformance of loading and homogeneity for all fixed neutron absorber materials in spent fuel storage racks where credit is taken for their use in design, and for the design of spent fuel storage racks. These new requirements affect the design and performance of spent fuel storage racks.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
None [6.5, 6.5.2, 6.5.2.6, 6.5.2.8, 6.5.2.12, 6.5.2.13, 6.5.3, 6.5.4, 6.5.4.3, 6.5.4.4, 6.5.4.5, 6.5.5]	The 1983 version provides new design requirements with regard to the fuel storage building, including specific requirements for ventilation systems, crane systems, effluent monitoring and contamination control.	1	New subsections in the 1983 version introduce new requirements for the fuel storage building that include applicable codes and standards 10 CFR Part 50, Appendix I, ANS-59.2, and also require alarms to signal high activity levels in gaseous effluents; structure design to facilitate crane maintenance, building design to minimize crane travel during cask loading operations; controlled sumps and drains that interface with the radwaste system, design to eliminate traps, loops, and minimized flanges that might accumulate radioactive particles in interconnecting piping; design of HEPA filters for in-place testing of pressure drop and filtration efficiency per ANSI/ASME N510-1980; design of filter mounts to permit ready access and visual inspection of gaskets and seals; monitoring provisions for airborne radioactive materials in exhaust air from HEPA filters; maintenance of documentation to substantiate conformance with applicable standards and government requirements, and verification of design documentation per ANSI/ASME NQA-1-1983 requirements. These new requirements affect the design and performance of the fuel storage building.

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
None [6.6, 6.6.2, 6.6.3, 6.6.3.1, 6.6.3.2, 6.6.3.3, 6.6.3.4, 6.6.4, 6.6.4.1, 6.6.4.2, 6.6.4.3, 6.6.4.4, 6.6.5] (Cont'd)	The 1983 version includes new requirements for electrical equipment, instrumentation, and communications; and cites standard IEEE 308-1980, "American National Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations," IEEE 384-1977, "American National Standard Criteria for Independence of Class 2E Equipment and Circuits" and ANSI/ANS-3.3-1982, "American National Standard Security for Nuclear Power Plants."	1	New subsections in the 1983 version introduce new requirements for the electrical power, I&C and communications that include suitable transformers and isolation equipment to regulate voltage and prevent damage to electrical equipment, instrumentation, and communications; applicable codes and standards for non-safety related systems connected to the class 1E power system shall meet the requirements of IEEE 308-1980 and the independence requirements of IEEE 384-1977; lighting and security system interface with normal and emergency power systems; security system requirements accommodated by the emergency power system design; specification of ANSI/ANS-3.3-1982 for additional requirements; design of electrical power system components and normal and emergency lighting systems for periodic inspection, testing, and maintenance; design of communications systems for periodic testing and maintenance; maintenance of documentation to substantiate conformance with applicable standards and (Cont'd)

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Section 3

CITED VS. LATEST STANDARD DIFFERENCES: ANS-57.2			
Section cited & [latest]	Significant Changes cited & [latest]	Type of Change	Discussion
None [6.6, 6.6.2, 6.6.3, 6.6.3.1, 6.6.3.2, 6.6.3.3, 6.6.3.4, 6.6.4, 6.6.4.1, 6.6.4.2, 6.6.4.3, 6.6.4.4, 6.6.5]			government requirements, and verification of design documentation per ANSI/ASME NQA-1-1983 requirements. These new requirements affect the design and testing of the electrical power, I&C and communications systems.
None [App. B]	This new Appendix provides equations for calculating the seismic responses of a spent fuel storage pool facility.	1	The 1983 version includes a new Appendix B. This appendix is stated as being for information only and is not considered to be part of the standard. The appendix illustrates equations for calculating the seismic responses of a spent fuel storage pool facility as described in the standard. However, use of these equations and calculational methods may ultimately effect the facility design in a manner different from the 1976 version requirements.

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 ANS 57.2 (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

Almost all of the contents of the 1976 version were carried forward into the 1983 version. The significant differences primarily increase design and operation requirements; implement new requirements for documentation and verification of documentation of design, structures, and systems as required by ANSI/ASME NQA-1-1983; add new requirements for security requirements by reference to ANSI/ANS-3.3-1982; reduce radioactive material release limits; increase the requirements for communications, indications and alarms for surveillance and control of systems; increase requirements for seismic, structural, and operational design; and increase requirements for maintenance of subcritical fuel configuration. Recommendations and requirements in the 1976 version that were deleted, have generally been replaced with performance criteria that will require implementation of the deleted provisions or alternate provisions that appear to be adequate to meet the performance criteria.

Examples of changes affecting facility/structural design requirements include the addition of new requirements for protection of the makeup system from missiles and design of the system to withstand a SSE; a transformation of four categories of design conditions into five categories of plant conditions; iodine and radioactive material release limits for PC IV and V events were reduced from 100 to 10 percent of 10 CFR Part 100 limits; upgrading a recommendation for control of ingress and egress to the fuel building to a requirement; and upgrading a permissive for the spent fuel building locks to be under administrative control to a requirement. An example of deleted requirements includes the deletion of a requirement that the ground acceleration for an SSE be at least 0.1 g.

Examples of changes affecting system design requirements include the addition of new requirements for implementation time for the makeup system; the ability of removable gates or bulkheads to support the full height of water on the fuel pool side and to remain in position following an SSE; seals to be designed to be radiation resistant; a stainless steel liner and required liner performance during a SSE; double valved drains in the cask handling pool and transfer canal; for fuel storage racks; communications not susceptible to loss of either onsite or offsite power between fuel handling machines, refueling machines, the control room, and transfer mechanisms/upender control stations(s); a loudspeaker system for rapid communication from the control room to both the fuel storage building and the primary reactor containment; materials exposed to radiation, pool water, and performance of poison materials; the reliability of the makeup water source; zero pool leakage; prohibition of inadvertent release of radioactive material; local demineralizer ΔP indication;

remote and local fuel pool temperature indication; high alarm for the filter ΔP ; local indication of the building ΔP ; local indication of the cooler inlet and outlet temperatures; local indication of cooler ΔP ; a recommendation for makeup system sizing was expanded into a requirement; permanent access ladders in the cask handling pool and fuel transfer canal was changed to permanent anchor points for removable access ladders; that fuel assemblies not extend above storage rack support or guiding surfaces was revised in the 1983 version to prevent physical damage to stored fuel for PC I, II, and III events; the recommendation to design the floor to withstand the forces from a cask drop on edge and the permissive to use electrical or mechanical controls to limit a cask drop were changed to requirements; and a recommendation that components located in the pool be remotely removable without lowering the pool level below the minimum was changed to a requirement.

Specific new permissives for systems in the 1983 version include the cask handling, fuel handling, fuel storage rack and pool water makeup systems may be totally or partially supported by the spent fuel storage pool and cask handling structures; the pool water makeup system may be permanently connected to the cooling system or completely separate and need not be designed to operate continuously; the spent fuel storage racks may be designed to be free standing, individually supported on embedments in the pool floor, or supported by combination compression tension embedments in the pool walls; sliding of spent fuel storage racks may occur during a seismic event, but fuel damage or reduction in required margin to criticality due to impact shall not be allowed; and the permanent identification of each spent fuel storage rack cell may be on the racks themselves or an indexing system may be used.

Examples of deleted or reduced requirements include the deletion of the requirement for antisiphon devices to meet the single failure criterion; deletion of recommendations related to the contemplated examination of irradiated fuel; the requirement for a remote indication of pump controls was downgraded from required to recommended; a recommendation to provide a support barrier around the periphery of spent fuel storage pools; a requirement for shielding the spent fuel storage pool auxiliary equipment; a requirement that materials handling systems include a positive means to prevent violation of minimum water shielding requirements during normal operations; a requirement that personnel comfort, radiation exposure, personnel safety and operational limits of essential instruments be considered when determining spent fuel storage pool operating temperatures; recommendation related to the storage capacity for a two reactor system, and that the designer assess his particular situation with respect to maximum storage capacity of fuel assemblies and control components; a requirement that seismic requirements be considered in the design of the cask handling area; a recommendation that ventilation air flow rates in the spent fuel building in the enclosed spent fuel storage pool area be at least two changes per hour; a recommendation that consideration be given for breathing apparatus, clothing change, and rapid decontamination for personnel safety in the spent fuel building; a requirement that Safety Class 3 components also meet the testing requirements of ASME Section XI, Subsection IWP and IWV; a requirement for instrumentation for functionally testing cask loading and handling facility decontamination system operation; a recommendation that spent fuel storage pool filters and

resin traps (if used) be parallel flow construction; and consideration of equipment design to allow cleaning of the pool floor. Although the deletion of these recommendations and requirements reduce specific requirements that were provided in the 1976 version; the 1983 version specifies added performance requirements that generally require the implementation of these specific items that were deleted or the implementation of comparable provisions in order to comply with the performance requirements. One notable item deals with the capacity of the pool water makeup systems as specified in Section 6.3.2.7 of the 1983 version. The capacity of the system needs to be based on considerations beyond pool water boiling. The capacity of the system should be as stated in C.8 of Regulatory Guide 1.13.

Examples of changes affecting operations requirements include the addition of new requirements for a redundant means to monitor the spent fuel pool level; maintaining and verifying the presence and integrity of absorber materials; an alarm on the safety-related filtration and ventilation system to alert operators if the system is not in operation; and casks shall not pass over or impact stored fuel for all Plant Conditions.

Examples of changes affecting analysis include the addition of new requirements for designing to thermal loads and loading combinations contained in the facility FSAR or in ACI 349-1980.

Examples of changes affecting documentation include the addition of new requirements for documentation and verification of documentation of design and structures; requirements for systems and equipment to vent the cask and to cooldown the cask internally; certification of conformance with applicable standards; and verification of design documentation as required by ANSI/ASME NQA-1-1983.

Examples of changes affecting the application of industry codes and standards include the addition of new requirements by reference to ANSI/ANS-3.3-1982 for security requirements for the fuel storage building; new standards and requirements for the quality assurance program; and references to additional codes and standards as guidance for applicable recommendations and requirements. One notable change is the use in the 1983 version (§ 6.6.1) of commercial codes and standards in the electrical area. The 1976 version cites safety related standards such as IEEE 308 and IEEE 384. This relaxation may increase the importance of Regulatory Guide 1.13, Position C.7.

NRC review is needed to determine the acceptability of these changes that appear to be significant as identified in subsection II of this comparison. Pending this review, consideration should be given for SRP Section 9.1.2 to endorse ANSI/ANS 57.2-1983, "Design Requirements for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Plants," as a replacement for ANS 57.2/ANSI N210-1976, "Design Objectives for Light Water Spent Fuel Storage Facilities at Nuclear Power Stations." SRP 9.1.2 cites Regulatory Guide 1.13 and the 1983 version of ANS 57.2 appears to be generally consistent with regulatory criteria in the SRP and the Regulatory Guide although it appears that many of the regulatory exceptions in Regulatory Guide 1.13 need to be retained. The latest version appears to provide additional clarity and more complete requirements with regard to facility and system design as well as criticality analysis.

Recommendations for updating endorsements/citations in SRP 3.8.4, SRP 9.1.2 and SRP 9.1.5 to specific sections of ANS-57.2 are as follows:

SRP Citations to the Standard

SRP Section 3.8.4, Rev. 1, "Other Seismic Category I Structures" (July 1981)

ANS 57.2-1976 is also designated as ANSI N210 which is cited in SRP Section 3.8.4, Appendix D, "Technical Position on Spent Fuel Pool Racks."

SRP Section 3.8.4

Paragraph

Recommendation

Appendix D Consider revising SRP Section 3.8.4, Appendix D to reference ANSI/ANS 57.2 - 1983.
VI. References

SRP Section 9.1.2, Rev. 3, "Spent Fuel Storage" (July 1981)

SRP Section 9.1.2

Paragraph

Recommendation

- | | |
|---------------|--|
| I | Consider revising the endorsement to cite subsections 6.4.2.1 and 6.4.2.2 in ANS 57.2-1983 instead of paragraphs 5.1.1.2.1 and 5.1.1.2.2 [5.1.12.1 and 5.1.12.2]. |
| II.1 | Consider revising the endorsement to cite subsections 6.1.2.1, 6.1.2.3, 6.4.2.13, 6.5.2.2 and 6.5.2.10 in ANS 57.2-1983 instead of paragraphs 5.1.1, 5.1.3, 5.1.12, 5.3.2, and 5.3.4. (The SRP should also state that the capacity of the pool water makeup system as specified in Section 6.3.2.7, should be augmented with the provisions of Regulatory Guide 1.13, Position C.8.) |
| II.6 and IV.5 | Consider revising the endorsement to cite subsections 6.1.2.12(b), 6.6.2.2, 6.6.2.3, 6.6.2.4 and 6.6.2.5 in ANS 57.2-1983 instead of paragraph 5.4. |
| III.1 | Consider revising the endorsement to cite subsection 6.4.2.15 in ANS 57.2-1983 instead of paragraph 5.1.15. Revise the complementary wording the SRP 9.1.2 to be consistent with the new reference, or retain the requirement related to a two reactor system as a separate/stand-alone statement. |

SRP Section 9.1.2

Paragraph

Recommendation

- IV.1 Consider revising the endorsement to cite subsections 6.1.2.1, 6.1.2.3, 6.4.2.13, 6.5.2.2 and 6.5.2.10 in ANS 57.2-1983 instead of paragraphs 5.1.1, 5.1.3, 5.1.12, 5.3.2, and 5.3.4.
- VI. Consider revising Reference 11 to cite ANS 57.2-1983.

SRP Section 9.1.5, Rev. 0, "Overhead Heavy Load Handling Systems" (July 1981)

SRP Section 9.1.5

Paragraph

Recommendation

- II. ACCEPTANCE CRITERIA Consider revising SRP Section 9.1.5 to endorse/cite ANSI/ANS-57.2-1983 as acceptance criteria for meeting the relevant requirements of General Design Criteria 2, 4, and 61.
- IV. EVALUATION FINDINGS Consider revising SRP Section 9.1.5 to endorse/cite ANSI/ANS-57.2-1983 as acceptance criteria for meeting the relevant requirements of General Design Criterion 4.
- VI. REFERENCES Consider revising subsection VI to reference the version of ANS-57.2 cited within subsections II and IV of SRP Section 9.1.5.

Other Regulatory Citations to the Standard

None

BIBLIOGRAPHIC DATA SHEET
(See instructions on the reverse)

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10. SUPPLEMENTARY

11. ABSTRACT (200 words or less)

This report provides the results of comparisons of the cited and latest versions of ANS, ASME, AWS and NFPA 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.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

Code, Standard, Standard Review Plan, SRP, ANS, ASME, AWS, NFPA

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