



U.S. NUCLEAR REGULATORY COMMISSION
STANDARD REVIEW PLAN
OFFICE OF NUCLEAR REACTOR REGULATION

9.5.3 LIGHTING SYSTEMS

REVIEW RESPONSIBILITIES

Primary - ~~Power Systems Branch (PSB)~~Electrical Engineering Branch (EELB)¹

Secondary - None

I. AREAS OF REVIEW

The ~~PSB~~EELB² reviews the normal and emergency or supplementary plant lighting systems. The systems are reviewed with respect to the following considerations: (1) the capability of the normal lighting system(s) to provide adequate lighting during all plant operating conditions and (2) the capability of the emergency lighting system to provide adequate lighting during all plant operating conditions, including fire, transients and accident conditions, and the effect of the loss-of-offsite power on the emergency lighting system.

Review Interfaces³

The EELB will coordinate other branches' evaluations that interface with the overall review of the lighting systems as follows:⁴

1. The review for lighting requirements for fire protection is coordinated and performed by the ~~Chemical Engineering Branch~~Plant Systems Branch (SPLB)⁵ as part of its primary review responsibility for SRP Section 9.5.1. ~~The acceptance criteria and review procedures for the fire protection review are contained in the referenced SRP section.~~⁶
2. The review of the adequacy of lighting systems and their power supplies with respect to security and physical protection requirements is coordinated and performed by the

DRAFT Rev. 3 - April 1996

USNRC STANDARD REVIEW PLAN

Standard review plans are prepared for the guidance of the Office of Nuclear Reactor Regulation staff responsible for the review of applications to construct and operate nuclear power plants. These documents are made available to the public as part of the Commission's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Standard review plans are not substitutes for regulatory guides or the Commission's regulations and compliance with them is not required. The standard review plan sections are keyed to the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants. Not all sections of the Standard Format have a corresponding review plan.

Published standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555.

Safeguards Branch (PSGB) as part of its primary review responsibility for SRP Section 13.6.⁷

3. The review of the adequacy of control room lighting systems and features related to their effectiveness to support reliable human performance, including evaluation with respect to the criteria specified in NUREG-0700 (Reference 1), is performed by the Human Factors Assessment Branch (HHFB) as part of its primary review responsibility for SRP Section 18.0 (proposed).⁸

For those areas of review identified above as being part of the review under other SRP sections, the acceptance criteria necessary for the review and their methods of application are contained in the referenced SRP sections.⁹

II. ACCEPTANCE CRITERIA

Acceptability of the design of the normal and emergency lighting systems, as described in the applicant's safety analysis report (SAR), is based in part on the degree of similarity of the systems design with those for previously reviewed plants with satisfactory operating experience. There are no general design criteria or regulatory guides that directly apply to the safety-related performance requirements for the lighting system. The PSBEELB¹⁰ will use the following criteria to assess the systems¹¹ design capability: (1) the normal lighting system(s) is acceptable if the integrated design of the system(s) will provide adequate station lighting in all areas, from offsite power sources, required for normal plant operation, control and maintenance of equipment and plant access routes; (2) the emergency lighting system(s) is acceptable if the integrated design of the system(s) will provide adequate emergency station lighting in all areas, ~~from onsite power sources,~~¹² required for fire fighting, control and maintenance of safety-related equipment, and the access routes to and from these areas; and (3) the lighting systems designs will be acceptable if they conform to the Illuminating Engineering Society of North America (IESNA) Lighting Handbook (Reference 2)¹³ as related to systems design and illumination levels recommended for industrial facilities.

III. REVIEW PROCEDURES

The information provided in the SAR pertaining to the designs of the normal and emergency lighting systems is evaluated to determine that the lighting in ~~normal plant areas and in vital~~¹⁴ all plant areas and ~~essential passageways~~¹⁵ access routes to and from these areas is adequate. Engineering judgment, in conjunction with a comparison to equipment and lighting systems provided on previously approved plants, is used as a basis for determining acceptability.

For standard design certification reviews under 10 CFR Part 52, the procedures above should be followed, as modified by the procedures in SRP Section 14.3 (proposed), to verify that the design set forth in the standard safety analysis report, including inspections, tests, analysis, and acceptance criteria (ITAAC), site interface requirements and combined license action items, meet the acceptance criteria given in subsection II. SRP Section 14.3 (proposed) contains procedures for the review of certified design material (CDM) for the standard design, including the site parameters, interface criteria, and ITAAC.¹⁶

IV. EVALUATION FINDINGS

The reviewer determines that sufficient information has been provided and his¹⁷ review supports conclusions of the following type, to be included in the staff's safety evaluation report:

The normal and emergency lighting systems include all components necessary to provide adequate lighting during normal and emergency plant operating conditions. The scope of review of the lighting systems provided for the _____ plant included assessment of the systems designs, adequacy of the normal and emergency power sources, and verification of adequate lighting during fire, transient, and accident conditions.

The basis for acceptance of the normal and emergency lighting systems was conformance of the design, design criteria, and design bases to staff positions and industry standards and the ability of the emergency lighting system to provide adequate station lighting in all vital areas from onsite power sources during the full spectrum of accident and/or transient conditions and to the access routes to and from these areas.

The staff concludes that the design of the lighting system conforms to the applicable staff positions and industry standards and is therefore acceptable.

For design certification reviews, the findings will also summarize, to the extent that the review is not discussed in other safety evaluation report sections, the staff's evaluation of inspections, tests, analyses, and acceptance criteria (ITAAC), including design acceptance criteria (DAC), site interface requirements, and combined license action items that are relevant to this SRP section.¹⁸

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section.

This SRP section will be used by the staff when performing safety evaluations of license applications submitted by applicants pursuant to 10 CFR 50 or 10 CFR 52.¹⁹ Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations plant lighting systems.²⁰

The provisions of this SRP section apply to reviews of applications docketed six months or more after the date of issuance of this SRP section.²¹

VI. REFERENCES

1. NUREG-0700, "Guidelines for Control Room Design Reviews," September 1981.^{22,23}
2. Illuminating Engineering Society of North America Lighting Handbook-Reference and Application.²⁴

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SRP Draft Section 9.5.3
Attachment A - Proposed Changes in Order of Occurrence

Item numbers in the following table correspond to superscript numbers in the redline/strikeout copy of the draft SRP section.

Item	Source	Description
1.	Current PRB names and abbreviations	Editorial change made to reflect the current SRP Section 9.5.3 PRB name and abbreviation.
2.	Current PRB names and abbreviations	Editorial change made to reflect the current SRP Section 9.5.3 PRB abbreviation.
3.	SRP-UDP format item	Added Review Interface subsection of Areas of Review using numbered paragraphs to be consistent with SRP-UDP required format.
4.	SRP-UDP format item	Introduced reviews performed by other PRBs in other SRP Sections consistent with SRP-UDP required format.
5.	Current PRB names and abbreviations	Editorial change made to reflect the current SRP Section 9.5.1 PRB name and abbreviation.
6.	Editorial	Relocated similar discussion to the end of the Review Interfaces subsection in accordance with SRP-UDP format guidance.
7.	Integrated Impact 506	In the evolutionary plant FSERs, the staff reviewed proposed security lighting system designs, power supply arrangements, and design criteria in conjunction with other plant lighting systems. A Review Interface with SRP Section 13.6 was thus added.
8.	Potential Impact 24581	Added review interface for review of the adequacy of control room lighting systems to support reliable human performance. It should be noted that a proposed new section (18) covering this review has been developed under the SRP-UDP.
9.	Editorial	Added sentence to reflect standard SRP-UDP discussion of the criteria and reviews detailed in other SRP Sections in Areas of Review, Review Interfaces.
10.	Current PRB names and abbreviations	Editorial change made to reflect the current SRP Section 9.5.3 PRB abbreviation.
11.	Editorial	Added punctuation to denote possessive tense.
12.	Incorporation of PRB Comment	Deleted reference to onsite power sources at the request of the PRB (see NRC Memorandum to R.W. Borchardt from J.A. Calvo dated March 6, 1996).

SRP Draft Section 9.5.3
Attachment A - Proposed Changes in Order of Occurrence

Item	Source	Description
13.	SRP-UDP format item-Reference Citations, Potential Impact 24404	Added identification by reference number and for the first citation of the IES Lighting Handbook as required by SRP-UDP format guidance. Also updated the citation to reflect that the latest version of the IES Lighting Handbook is "The Illuminating Engineering Society of North America Lighting Handbook-Reference & Application" as noted in Potential Impact 24404.
14.	Editorial	Since the acceptance criteria is stated in terms of all plant areas, the review procedures were revised to provide review of lighting adequacy in all plant areas.
15.	Editorial	Revised to provide terminology consistent with that used in evaluation findings and also to provide less ambiguous review guidance (e.g. essential passageways would appear to be subject to ambiguous interpretation).
16.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard paragraph to address application of Review Procedures in design certification reviews.
17.	Editorial	Eliminated use of a gender specific pronoun.
18.	SRP-UDP Format Item, Implement 10 CFR 52 Related Changes	To address design certification reviews a new paragraph was added to the end of the Evaluation Findings. This paragraph addresses design certification specific items including ITAAC, DAC, site interface requirements, and combined license action items relevant to this SRP section.
19.	SRP-UDP Guidance, Implementation of 10 CFR 52	Added standard sentence to address application of the SRP section to reviews of applications filed under 10 CFR Part 52, as well as Part 50.
20.	Editorial	There are no regulations specified, thus discussion of evaluation of conformance with specified regulations was changed to evaluation of plant lighting systems.
21.	SRP-UDP Guidance	Added standard paragraph to indicate applicability of this section to reviews of future applications.
22.	Potential Impact 24581	Added reference for review of the adequacy of control room lighting systems to support reliable human performance.
23.	SRP-UDP Reference Verification	Although Revision 1 of this NUREG was published in February 1995 as NUREG-0700, Revision 1, "Human-System Interface Design Review Guideline," the SRP-UDP did not identify any staff position directing use of Revision 1. This SRP section thus reflects use of Revision 0 (not the latest revision) pending identification of a staff position (or other basis supporting a Type I change) regarding use of Revision 1.

SRP Draft Section 9.5.3
Attachment A - Proposed Changes in Order of Occurrence

Item	Source	Description
24.	Potential Impact 24404	Updated the citation to reflect that the latest version of the IES Lighting Handbook is The Illuminating Engineering Society of North America (IESNA) Lighting Handbook Reference & Application 8th Edition, published in 1993. The citation was updated without date/version specificity to reflect that no specific version is endorsed as acceptable to the staff and to minimize the need for future maintenance revisions related to this reference. These changes are based upon the consistency check for Potential Impact 24404.

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SRP Draft Section 9.5.3
Attachment B - Cross Reference of Integrated Impacts

Integrated Impact No.	Issue	SRP Subsections Affected
506	Revise the SRP to provide review of the adequacy of lighting systems and their power supplies with respect to security and physical protection requirements.	Areas of Review subsection I, Review Interfaces (other PRBs) 3.