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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 21 1983

MEMORANDUM FOR: Darrell G. Eisenhut, Director
Division of Licensing

FROM: Richard H. Vollmer, Director
Division of Engineering

SUBJECT: EMERGENCY LIGHTING REQUIREMENTS (TIA 83-87; TAC 52308)

Enclosed is the guidance on the emergency lighting requirements set forth in Section III.J. of Appendix R to 10 CFR 50 as requested in the subject task action. ASB, PSB and HFEB concur in this position.

Richard H. Vollmer, Director
Division of Engineering

Enclosure: As stated

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EMERGENCY LIGHTING REQUIREMENT
Section III.J. of Appendix R to 10 CFR 50

INTRODUCTION

The normal and emergency or supplementary plant lighting systems described in the applicant's safety analysis report (SAR) are reviewed in accordance with SRP 9.5.3 Lighting Systems. These 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.

Acceptability of the design of the normal and emergency lighting systems is based in part on the degree of similarity of the system 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. NRR uses the following criteria to assess the systems 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, 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 (IES) Lighting Handbook as related to systems design and illumination levels recommended for industrial facilities.

Several types of emergency lighting systems are provided, such as hard-wired systems powered by either onsite ac or dc power sources and individual, battery powered units. Because fire damage to a hard-wired system with a common power source may result in the complete loss of emergency lighting necessary for post-fire shutdown operations, the staff recommended that fixed emergency lighting should consist of sealed beam units with individual 8-hour minimum battery power supplies (Appendix A to BTP APCSB 9.5.1, Section D.5). Note that these guidelines do not impose new illumination standards for emergency lighting, therefore, the illumination levels for emergency lighting that were deemed acceptable as part of the OL review of the facility are unchanged.

During the staff review of operating plants for compliance with NRC fire protection guidelines in 1976-1978, several licensees declined to upgrade the batteries of their individual battery powered emergency lights from 1 1/2 to 8 hours in the areas needed for the operation of safe shutdown equipment. Section III.J. of Appendix R to 10 CFR 50 was issued to assure such an upgrading. Once again note that Section III.J did not impose new illumination standards.

ILLUMINATION STANDARDS

Illumination levels for emergency lighting should be considered in two contexts; (1) that required for personnel transit, and (2) that required for control of operations or safe shutdown. The illumination levels are deemed acceptable if they conform to those used in the OL review of the plant.

If during inspection the illumination levels meet the original design criteria but are deemed inadequate to perform the shutdown functions, the following sections are to be used as guidance and not as NRC requirments.

Personnel transit should take into account the primary access routes from the control room to remote shutdown areas, and all egress routes from the control room, remote shutdown areas, and other areas where personnel are located during normal operations. These routes generally contain obstructions (e.g., piping, structures) which require visual detection to permit safe transit. The safe illumination level for these conditions, as recommended by the Illuminating Engineering Society of North America, is an absolute minimum of five (5) footcandles. To avoid tripping hazards and head injury, this illumination level should exist at both the floor and six-foot levels.

Minimum illumination for emergency operating conditions should be ten (10) footcandles at the task location. The task location is the panel surface where control is performed and displays are read. This illumination level should be incident on the panel with the operator in position for normal control reach. Location and type of emergency lighting should be such that glare on displays and labels is minimized and does not interfere with readability.

Since eye adaptation to extreme changes in illumination (e.g., normal illumination to darkness) can take several minutes, emergency lighting should be automatically activated upon failure of the normal system. This will minimize the extremity of the change and maximize the speed of eye recovery.

DESIGN STANDARDS

Design standards are acceptable if they conform to those given in the Illuminating Engineering Society (IES) Light Handbook.

MAINTENANCE AND SURVEILLANCE PROCEDURES

50.48 of 10 CFR 50 requires each operating plant to have a fire protection plan which in part sets forth the administrative controls used in implementing the fire protection program. Appendix A to BTP APCSB 9.5-1, Section B.5(a), requires a testing, inspection and maintenance program for fixed battery powered emergency lighting units. The NRC has no specific standards for such a program and will accept any reasonable program that is adequate to maintain the battery powered lighting units operational. As a minimum, the testing, inspection and maintenance program should be similar to and as provided for other station battery systems of the same classification as the battery powered emergency lighting units or as recommended by the equipment manufacturer. The program should be included in the plant operation and maintenance procedures.