

DAVIS-BESSE NUCLEAR POWER STATION UNIT NO. 1

SECTION 6.0

EMERGENCY LIGHTING

AND

COMMUNICATIONS

6.1 EMERGENCY LIGHTING

6.1.1 Introduction

Appendix R to 10CFR50, Section III.J, requires that “emergency lighting units with at least an 8-hour battery power supply shall be provided in all areas needed for safe operation of Safe Shutdown equipment and in access and egress routes thereto.”

This section describes the emergency lighting system at DB-1, the review performed of the emergency lighting system against Appendix R, Section III.J, the findings of the review, and the conclusions and proposed resolutions

Upon Loss of Offsite Power (LOOP), lighting within DB-1, will be provided by 2 separate fixed systems, supplemented by battery-powered hand-held captain’s lanterns. Each of these systems is described below.

The Essential AC powered lighting system consists of 3 lighting panels fed from Essential 480V AC MCC E11C (Train 1) and 4 lighting panels fed from 480V AC MCC F11A (Train 2). These lighting panels feed circuits located in the Containment Vessel, Auxiliary Building and Control Room. Following a Loss of Offsite Power (LOOP), MCCs E11C and F11A will be re-energized immediately following closing of the diesel generator output breaker, thus restoring AC lighting for the 72-hour time period that offsite power is assumed to be unavailable. Control Room and Auxiliary Building lighting is automatically restored while a control switch must be manually operated to activate Containment Vessel lighting.

The DC powered lighting system consists of 4 lighting panels, L37E1, L41E1, L49E1 and L57E1, which are normally fed via an automatic transfer switch from nonessential AC lighting Busses E5 and F5. These lighting panels feed circuits located in the Containment, Turbine, Office, Auxiliary Building, and the Control Room and Cable Spreading Room. Upon loss of Buses E5 and F5, each automatic transfer switch will transfer the lighting panel power supply to DC MCCs 1 or 2. This lighting system should be available throughout the 72-hour time period that off-site power is assumed to be unavailable.

The battery-powered lighting unit system consists of numerous self contained sealed beam units located throughout DB-1. The units are rated at 8-hours for discharge to 87.5% of nominal system voltage. The battery chargers are fully automatic and capable of restoring the battery to full capacity from 87.5% of nominal battery voltage.

Hand-held lighting units, Captains Lanterns, are stored in the Fire Brigade Emergency Cabinet located on the Turbine Deck. The units are distributed to operators during a fire emergency. The units are periodically tested to ensure that they function properly

The evaluation to assess the adequacy for emergency lighting at DB-1 was performed for a serious fire in the Control Room or Cable Spreading Room to support Procedure DB-OP-02519, “Serious Control Room Fire” and for the adequacy of emergency lighting for Shutdown actions required as a result of a fire anywhere else in the plant, to support Procedure DB-OP-02501 “Serious Station Fire”.

6.1.2 Assumptions and Basis of Evaluation

During the preparation of this evaluation several assumptions and bases were used and are listed below:

1. Credit is not being taken for the AC/DC incandescent pendant emergency lighting because the routing of the circuits for this lighting throughout the plant was not reviewed. For a "Serious Control Room Fire", the AC/DC incandescent pendant emergency lighting will be available as stated in the letter to the NRC requesting an exemption regarding emergency lighting. No credit is being taken for these lights for this evaluation.
2. Credit is being taken for hand-held battery-powered lanterns as being available for access/egress to areas outside (outdoors) the confines of the fire areas/rooms of the plant and inside Containment. Those components required to be operated after 8-hours have elapsed are not provided with 8-hour integral battery-pack lighting. There are no manual actions in Containment required before 8-hours.
3. Actions not required to be performed within 8-hours are not evaluated for 8-hour integral battery emergency lighting coverage because the integral batteries will only last for 8-hours. Actions required 8-hours and more after the fire starts cannot be assured lighting from these batteries packs.
4. The emergency lighting battery pack will last 8-hours with 3 lamps energized.
5. The plant operators are qualified to evaluate the adequacy of the lighting for conducting manual actions and using the access/egress path because of their experience and judgment in knowing what is necessary to operate the equipment and to traverse the plant. Therefore, no lighting meter data was required.
6. Regardless of the existence of the fixed 8-hour integral battery emergency lighting units, hand-held lights are provided in accordance with current procedural practices to each operator implementing manual actions, including those areas exposed to a fire that would be entered or traversed to perform manual actions after the fire is extinguished. These hand-held lights are provided for use as a precautionary/backup measure in the case the fixed emergency lighting would not be available.

6.1.3 Emergency Lighting Evaluation

The survey was performed at DB-1 to assess the illumination of the existing emergency lighting in all areas needed for operation of Safe Shutdown equipment, as well as access and egress routes thereto. The survey was performed in 3 phases:

- A. Area identification phase
- B. Lighting walkdown phase
- C. Lighting evaluation phase

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6.1.3.1 Area Identification Phase

1. The rooms where plant operators are to perform their required operations, as well as the access and egress routes from the staging area to the Auxiliary Shutdown Panel and to other remote locations, were identified. The identification of the rooms was originally based on Procedure DB-OP-02519, "Serious Control Room Fire" and DB-OP-02501, "Serious Station Fire." Since then, all procedural actions specified in the Section 4 evaluation, that were not encompassed by the original procedures, were added and walked down. As a result, the emergency lighting adequacy for all procedural actions identified in Section 4 was reviewed.
2. The criteria for access and egress routes determination was primarily based upon minimizing travel time to complete the intended operator actions.

6.1.3.2 Lighting Walkdown Phase

1. The existing emergency lighting was evaluated by a walkdown team of Station Operations personnel with some assistance from engineering personnel. The walkdown team traced the access and egress routes and surveyed the equipment locations. The nonessential AC lighting was turned off for each room to be evaluated. Upon loss of AC power, the emergency battery-pack lights automatically activated. The AC and DC emergency lighting units (non-battery powered units) were also de-energized.
2. The acceptance criteria for each function performed in a room were as follows: For each access and egress through a room, an operator must be able to walk through it at a normal walking pace without injuring himself. To perform an operation (e.g., turn a valve, read a gauge), an operator must be able to see what he is doing or reading without severe eye strain.
3. The adequacy of the existing emergency lighting was documented on a checklist for each room. Each checklist specifies the test location, existing emergency lighting, recommendations for additional emergency lighting, if necessary, and comments. Attached to each checklist is a table listing each operation evaluated, its function, and the adequacy of emergency lighting for the operation.
4. Walkdown lists were used to perform walkdowns which evaluated the emergency lighting adequacy for specified rooms and specific actions identified during this document's revision. The list also specified the passageways and stairways to be evaluated as general access/egress routes. There are no specified access/egress routes, except guidance to avoid the fire area being burned.

6.1.3.3 Lighting Evaluation Phase

The emergency lighting walkdown checklists were evaluated to determine that the emergency lighting was acceptable except in certain specific locations. The lighting in these specific locations have been enhanced with battery packs and the lighting is acceptable.

6.1.4 Conclusions

Section III.J of Appendix R requires that “emergency lighting units with at least an 8-hour battery-power supply be provided in all areas needed for operation of Safe Shutdown equipment and in access and egress routes thereto.”

An exemption has been granted from Section III.J to utilize hand-held, portable lighting units in outside (outdoors) plant areas in lieu of fixed, 8-hour battery-pack lighting.

The existing 8-hour battery-pack lighting combined with the new batterypack lighting are adequate to support both the performance of the Safe Shutdown manual actions and the safe traversal by the plant operators for indoor plant areas.

6.2 Plant Communications

6.2.1 Introduction

The Plant Communications Systems have been evaluated to determine their adequacy to support Safe Shutdown. The discussion below provides a description of these systems relative to Safe Shutdown, and the basis for the conclusion of their adequacy.

6.2.2 Description

a. Overview

There are several communications systems used for normal day-to-day communications as well as for emergency situations.

As these systems are used on a constant basis every day no special testing to demonstrate their functionality is performed.

b. Gai-Tronics

The Gai-Tronics system is primarily composed of individual, solid-state amplifier units. The system provides paging, alarm signaling, and party-line-type voice communications. Five channels are provided for regular communications and an additional five channels are provided for establishing maintenance circuits. Each station has individual amplifiers for the handset and local speaker(s). Should a station fail, its modular design allows for rapid replacement of components to return it to service. Power is supplied from either of two channels of the nonessential interruptable power supply system using a manual transfer switch.

c. Telephone System

Leased telephones from the local telephone company have been provided in the normally manned areas, including the station Assembly Room. These phones serve as a backup to the main internal station communications system (Gai-Tronics) and as the primary offsite administrative circuit. The system is powered separately from the Gai-Tronics system.

d. UHF Radio System

An additional communications system in the form of Ultra High Frequency (UHF) radio is provided. The UHF Radio System is comprised of a set of 6 radio repeaters located in the

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Personnel Access Facility (PAF) and the Plant Office Building (POB). Both of these locations have 6 repeaters and associated hardware. The PAF and the POB radio systems communicate with each other via a fiber-optic link to provide radio coverage for Operations and Security inside and outside the plant. This radio system is also available for use by other site organizations. Communication is available via remote control consoles and hand-held portable radios.

Fixed remote control consoles are located, as a minimum, in the Control Room, Work Support Center (WSC), Outage Control Center (OCC), Central Alarm Station (CAS), Secondary Alarm Station (SAS), Technical Support Center (TSC), and the Alternate Technical Support Center. The majority of consoles have the capability to communicate over the 2-way mobile radio. In addition to the base stations, there are a number of portable radios.

e. Appendix R Post-Fire Communications

For a fire outside the Control Room, the amount of communication required is minimal because the majority of operator actions are in the Control Room.

Normally, this communication is provided by using the radio or the Gai-Tronics system. Operations personnel have been instructed to contact or return to the Control Room in the event that lifting of the code safety valves is heard or when contacted by radio.

During a fire, the availability of the Gai-Tronics System cannot be guaranteed due to potential equipment and/or circuit damage. Therefore, a backup is provided by the operations radio system. This system allows the Shift Manager to maintain contact with the operators as well as the fire brigade. This system has direct connection between the remote control consoles and fixed repeaters located in Room 438A of the Plant Office Building (Fire Area OF) and powered from an uninterruptable power supply which, in turn, is backed by a battery bank. The remote control consoles can also connect indirectly via fiber-optic link or external antenna to radio system components located in PAF.

The Repeaters located in the Plant Office Building have also been provided with their own set of batteries, which provide a minimum of 2-hours of use. Also installed inside and on the roof of the Auxiliary Building and Containment is a distributed antenna system. This is used to facilitate transmission and reception in the reinforced concrete structures.

The portable radios provided are capable of operating in two modes. The first mode, "full duplex", is used to communicate from one portable to the repeater then to a portable or base station. This mode requires that circuits for the repeater be intact since all communication will be through the repeater.

The second mode, "full simplex", is used to communicate from portable to portable. Its advantage is that it is not susceptible to cable failure. The portable radios have their own internal rechargeable battery which is kept constantly charged.

A study was done (Ref. Sec. 2.3) to demonstrate that for a fire in the areas that contain parts of the radio system, the capability to communicate when required by the safe shutdown procedures remains available. It assumed that all communication lines and equipment within each analyzed area are lost. It also assumed that the Gai-tronics is not available. Where the communication capability is not available, actions will be taken by the same operator in series. The sequencing of required actions ensures the ability to safely shut down.

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A unique solution was provided for long term communications in the event of a serious Control Room fire. This involved installing a dedicated sound-powered phone system. This permits operators in selected areas of the plant to maintain constant communication with Operators at the Auxiliary Shutdown Panel. As this system is not used on a routine basis it is tested periodically.

f. Conclusion

Reliable communications are provided by the Gai-Tronics system which is backed up by the Operations radio system and/or other systems as required. This will be adequate for a postulated fire in any area.