



Commonwealth Edison

One First National Plaza, Chicago, Illinois
Address Reply to Post Office Box 767
Chicago, Illinois 60690

July 6, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Byron Station Units 1 and 2
Braidwood Station Units 1 and 2
Safety-Related D.C. System
Additional Information
NRC Docket Nos. 50-454/455 and 50-456/457

Reference (a): B. J. Youngblood letter to D. L. Farrar
dated June 11, 1984.

Dear Mr. Denton:

In Reference (a), you requested that we provide information to further establish the bases for the design change at our Byron and Braidwood Stations which substituted a heavy gauge wire fence for one section of the walls enclosing the 125 volt dc safety related battery banks. Attachment A provides our response to your concerns.

We believe that the present battery area design complies with all requirements of the industry standard (IEEE Std. 484-1981, "IEEE Recommended Practice for Installation Design and Installation of Large Lead Storage Batteries for Generating Stations and Substations"); and, with certain documented exceptions in Appendix A to the FSAR and Section 2.3 of the Byron/Braidwood Fire Protection Report, it complies with the requirements of Regulatory Guide 1.128.

The attached responses further substantiate our continued belief that the existing design is technically acceptable and provides adequate protection. Nevertheless, an additional measure of conservatism can be provided in some respects by completely enclosing the battery room with solid walls. Therefore, we are issuing design changes for construction of a reinforced masonry wall in place of the wire fence. We will provide you any requisite changes to the FSAR and Fire Protection Reports in subsequent transmittals.

Very truly yours,

Dennis L. Farrar
Director of Nuclear Licensing

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Attachments

cc: J. G. Keppler - Region III

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ATTACHMENT A
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
SYSTEM-RELATED DC SYSTEM
BYRON/BRAIDWOOD STATIONS, UNITS 1 AND 2

1. NRC Request

We note that in Amendment 2 to the Fire Protection Report Figure 2.3-8 Sheet 1, the applicant removed the wall between the redundant 125 volt safety-related battery divisions and other equipment in the miscellaneous electrical equipment rooms and replaced the wall with a wire fence. The present ventilation system for the battery area may not be adequate to remove hydrogen accumulation resulting from battery charging because of the much greater area now served by the ventilation exhaust system and because the new area may contain some dead spaces at the ceiling. Therefore, the applicant shall demonstrate through analysis and/or testing that the present ventilation system, including the air supply and exhaust fans in the battery area, will maintain sufficient continuous ventilation of the battery areas to limit the hydrogen concentration to 2%, as previously stated in the FSAR.

Response

The determination of the amount of ventilation required for dilution of hydrogen gas is a function of the amount of hydrogen evolved from the batteries, and is not a function of the volume of the room. The maximum hydrogen evolution rate was based on a "runaway" charger forcing its rated output current through the fully charged battery.

Figure 1 illustrates the equipment arrangement and air flow for the Miscellaneous Electric Equipment Room ventilation system. The safety-related 125V DC Battery Area is a part of the Miscellaneous Electric Equipment Room, which is enclosed by a three-hour fire-rated barrier. The battery area exhaust ventilation system will remove 475 CFM from the battery area.

All of the makeup air for the battery area exhaust is drawn from the Miscellaneous Electric Equipment Room. In order to purge (i.e., sweep) the total volume of the battery area, the exhaust duct is located adjacent to the wall opposite the wire mesh partition. The exhaust ductwork is located at the highest practical point in the room (i.e., immediately under the intermediate roof structural steel) and extends over the entire length of the rear battery rack.

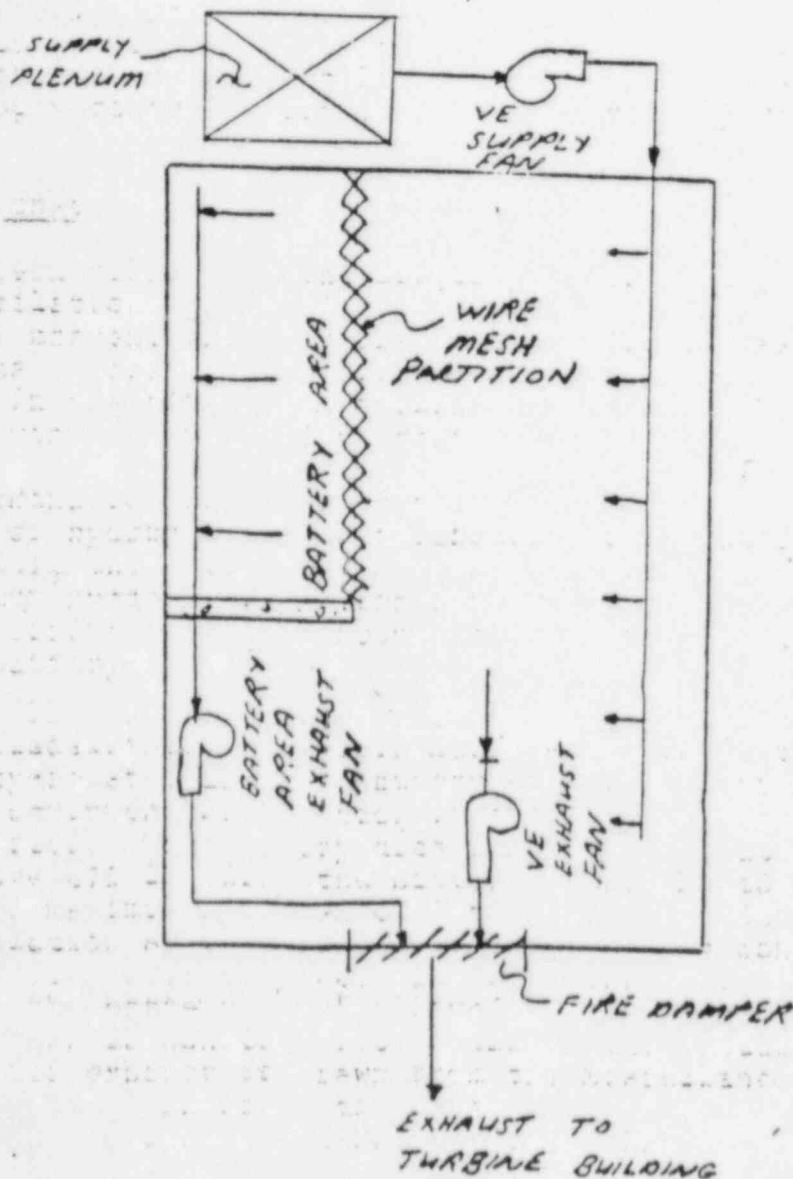


Figure 1

Miscellaneous Electric Equipment Room
(and Battery Area) Ventilation System (Typical)

Based on the calculated maximum hydrogen evolution rate (as defined above), the ventilation system will limit the hydrogen concentration in the battery area to 1.44%; 28% less than the "2% of the total volume of the battery area" allowed by IEEE Standard 484-1981. Even if it is assumed that a fraction of the hydrogen gas (say 30%) escapes to the Miscellaneous Electric Equipment Room, the maximum concentration of hydrogen in either room is 1.44%.

Considering that significant hydrogen evolution takes place only when a "runaway" charger continues to supply current to the fully-charged batteries, that the charger failure is alarmed in the Main Control Room and will be disconnected by maintenance personnel in a relatively short period, that failure of the ventilation system is alarmed in the Main Control Room, and that the ventilation system will maintain the hydrogen concentration well below 2%, it is highly improbable that a hazardous situation can occur in either the battery area or the Miscellaneous Electric Equipment Room.

2. NRC Request

The present design and installation of the redundant safety-related 125 volt battery banks does not provide protection against mechanical damage associated with potential internally-generated missiles resulting from three phase electrical faults in the rotating motor generator sets and switchgear adjacent to the battery alcove. Therefore, the applicant shall demonstrate through analysis that the battery room design is adequate to minimize the probability of losing the onsite DC electric power supply as a result of internally-generated missiles. This analysis shall verify that missiles from nonsafety-related sources shall not impact safety-related equipment in order to assure safe shutdown concurrent with a single active failure.

Response

Motor Generator Sets

The motor generator sets are not considered credible potential missile sources, as explained in FSAR Section 3.5.1.1g, and therefore have no safety effect on the 125 volt battery banks.

Switchgear

The switchgear adjacent to the battery alcove is the 125Vdc distribution center (1DC05E and 1DC06E) associated with the battery (i.e., this distribution center distributes the power derived from the battery to the various dc loads). This switchgear, which consists of the bus and associated circuit breakers in a steel enclosure, is not considered to be a credible missile source. Furthermore, any fault within this switchgear of sufficient magnitude to generate a missile would disable the switchgear, without which the battery is useless.

3. NRC Request

Provide justification for the installation of nonexplosion-proof lighting fixtures in the battery and miscellaneous electrical equipment room ceilings in accordance with the National Fire Protection Standard 70, National Electrical Code provisions.

Response

The National Fire Protection Association (NFPA) Code 70, Article 500, which defines the various hazardous locations, does not require explosion-proof lighting fixtures in the battery room. Article 500 defines Class 1, Division 2 hazardous locations as those:

"(1) in which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operations of equipment; or (2) in which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment; or (3) that is adjacent to a Class 1, Division 1 location, and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clear air, and effective safeguards against ventilation failure are provided".

This classification does not apply to either the battery area or the Miscellaneous Electric Equipment Room because failure of the ventilation system alone will not result in any significant build-up of hydrogen. That is, significant build-up of hydrogen in the battery area would require two failures - a failure of the ventilation system and a failure of the charger such that it is delivering its full-rated output into a fully charged battery. As discussed in our response to NRC Concern 1, the ventilation system in the battery area is designed to limit the hydrogen concentration to less than 2%. In accordance with IEEE Standard 484-1981:

"A battery area which meets the above ventilation requirements should be considered non-hazardous, thus special electrical equipment enclosures to prevent fire or explosions should not be necessary".

Summarizing, the installation of "nonexplosion-proof" lighting fixtures in the battery and Miscellaneous Electrical Equipment Room ceilings does not violate NFPA Code 70, is in accordance with IEEE Standard 484-1981, and is therefore acceptable.

4. NRC Request

Pre-planning for fighting a fire in battery room 112 should not include opening the doors in the common wall with battery room 111, since this action will expose redundant systems to the effects of a fire. Verify that all areas of battery room 112 can be reached with not more than 100 feet of 1 1/2 inch hose line from existing standpipe outlets, as required by Section C.6.C of BTP CMEB 9.5-1, or justify any deviation from this criteria.

Response

The need for additional hose station was previously identified as an Unresolved Item No. 50-454/83-62-13 during an inspection/audit of the Byron Fire Protection Program in December, 1983, and January, 1984. Specifically, Hose Station No. 279 will be located just outside the Battery 112 enclosure (Column Coordinates M-8, Elev. 451'). The addition of this hose station was included in S&L Engineering Change Notice (ECN) No. 7179 (approved March 21, 1984). With this change, all areas of battery room 112 can be reached with not more than 100 feet of 1 1/2 inch hose line from standpipe outlets and without opening any door in the common wall with battery room 111.

5. NRC Request

Demonstrate that the wire fence is designed, analyzed, installed and inspected to seismic category I criteria or that failure or collapse of this fence would not cause the loss of function of the 125 volt batteries and other surrounding equipment.

Response

The battery room wire fence is comprised of a wire fabric type mesh and lightweight gage metal frame which is anchored into the concrete walls and floor. Because of its very light weight and its inherent high seismic damping characteristics, its collapse was not judged to be a credible event. Therefore, the fence was not designated as Category I and was not installed to Category I criteria. However, calculations have been prepared which demonstrate that the fence and its anchoring system is adequate in its as-built condition to preclude its collapse under the SSE loading condition.