



# REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

## REGULATORY GUIDE 1.128

## INSTALLATION DESIGN AND INSTALLATION OF LARGE LEAD STORAGE BATTERIES FOR NUCLEAR POWER PLANTS

### A. INTRODUCTION

General Design Criterion 1, "Quality Standards and Records," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires that structures, systems, and components important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Criterion 17, "Electric Power Systems," of Appendix A requires an onsite electric power system and an offsite electric power system to be provided to permit functioning of structures, systems, and components important to safety. Criterion III, "Design Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 requires that design control measures include provisions to assure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled. This guide describes a method acceptable to the NRC staff for performing the installation design and installation of large lead storage batteries for all types of nuclear power plants.

### B. DISCUSSION

IEEE Std 484-1975, "IEEE Recommended Practice for Installation Design and Installation of Large Lead Storage Batteries for Generating Stations and Substations," dated January 27, 1975, was prepared by the Working Group on Batteries, Station Design Subcommittee of the Power Generation Committee,

<sup>1</sup> IEEE Std 484-1975, "IEEE Recommended Practice for Installation Design and Installation of Large Lead Storage Batteries for Generating Stations and Substations." Copies may be obtained from the Institute of Electrical and Electronics Engineers, United Engineering Center, 345 East 47th Street, New York, New York 10017.

and was approved by the IEEE Standards Board on September 5, 1974. It was subsequently approved and designated N41.24-1976 by the American National Standards Institute on January 15, 1976.

Immediately following the Browns Ferry fire of March 22, 1975, NRC appointed a Special Review Group to identify the lessons learned from this event and make recommendations for the future in light of these lessons. The Review Group published its report in February 1976.<sup>2</sup> Among other recommendations, the Review Group recommended that greater attention be given to fire prevention measures in nuclear power plants. The lessons learned and brought out in the report are appropriate for application to batteries and battery installations. Portions of IEEE Std 484-1975 are directed toward preventing battery-related fires and explosions. These portions of the standard have been supplemented in the regulatory position of this guide with additional information that takes into consideration the recommendations on fire prevention of the Special Review Group.

The provisions of the standard include design practices and procedures for storage, location, mounting, ventilation, instrumentation, preassembly, and assembly of large lead sealed-cell storage batteries. Safety practices are also included.

### C. REGULATORY POSITION

Conformance with the requirements (indicated by the verb "shall") specified by IEEE Std 484-1975 for installation design and installation of large lead storage batteries for nuclear power plants provides an adequate basis for complying with the design, fabrication, erection, and testing requirements of Criteria I and 17 of Appendix A and Criterion III of

<sup>2</sup> NUREG-0050, "Recommendations Related to Browns Ferry Fire," Special Review Group, USNRC, February 1976. Copies may be obtained from National Technical Information Service, Springfield, Virginia 22161.

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Appendix B to 10 CFR Part 50 with respect to quality standards applied to installation design and installation of large lead storage batteries, subject to the following:

1. In Subsection 4.1.4, "Ventilation," instead of the second sentence, the following should be used:

"The ventilation system shall limit hydrogen accumulation to less than two percent by volume at any location within the battery area."

2. Items 1 through 5 of Subsection 4.2.2, "Mounting," should be supplemented with the following:

"6. Restraining channel beams and tie rods should be electrically insulated from the cells and should also be in conformance with item 2 above where applicable."

3. In Subsection 5.3.2, "Acceptance Test," instead of IEEE Std 450-1972, IEEE Std 450-1975 should be followed.

4. Section 7, "References," of IEEE Std 484-1975, lists reference documents. The specific applicability or acceptability of these referenced documents has been or will be covered separately in other regulatory guides where appropriate.

5. In addition to the requirements of the standard, the recommendations (indicated by the verb "should") contained in the sections of IEEE Std 484-1975 noted below (including supplementary material) have sufficient safety importance to be treated the same as the requirements of the standard.

a. Subsection 4.1.1, "Location," item 2—The recommendations that address the need for a well-ventilated location with adequate aisle space and space above cells.

b. Subsection 4.1.1, "Location," item 3—The recommendation that addresses the need to avoid extreme ambient temperatures.

c. Subsection 4.1.1, "Location," item 4—The recommendations that address temperature differential between cells at a given time and the avoidance of localized heat sources.

d. Subsection 4.1.1, "Location," item 5—The recommendation set forth in item 5 that addresses the provisions for containing or safely dispersing spillage from water facilities, supplemented with the following:

"Where stationary water facilities are provided within the battery room, their design should be such as to preclude any inadvertent spilling of water from these facilities on the battery installation itself."

e. Subsection 4.1.2, "Mounting," item 2—The recommendation that addresses the number of tiers or steps for mounting batteries.

f. Subsection 4.1.5, "Instrumentation and Alarms"—The three items listed. Instead of the "NOTE" following the last paragraph of Subsection 4.1.5, the following should be used:

"NOTE: The preceding recommendations for instrumentation and alarms could be satisfied by equipment in the d.c. system, with the exception of items 4 and 5."

In addition, the three listed items should be supplemented with the following items:

"4. Hydrogen detection sensor(s), instrumentation, and alarm(s).

5. Fire detection sensor(s), instrumentation, and alarm(s)."

g. Subsection 4.2.1, "Location," item 1—The general requirement that the battery be protected against fire, supplemented with the applicable recommendations in Regulatory Guide 1.120, "Fire Protection Guidelines for Nuclear Power Plants."

h. Subsection 5.1.2, "Unpacking," item 3—The recommendation that any cell that exhibits an electrolyte level  $\frac{1}{2}$  inch or more below the top of the plates be replaced.

i. Subsection 5.1.3, "Storage," item 1—The recommendation that cells not be exposed to extremely low ambient temperatures or localized sources of heat during storage.

j. Subsection 5.2.3, "Preoperational Care," with "IEEE Std 450-1975" used in lieu of "IEEE Std 450-1972."

k. The eight items listed in Subsection 5.3.1, "Freshening Charge," supplemented with the following item:

"9. At the completion of item 7 above, a hydrogen survey should be performed to establish baseline data for locating hydrogen detector(s) (see Section 6, "Records")."

l. The five items listed in Section 6, "Records," supplemented with the following item:

"6. Initial hydrogen survey baseline data for locating hydrogen detector(s)."

#### D. IMPLEMENTATION

The purpose of this section is to provide information to applicants regarding the NRC staff's plans for using this regulatory guide.

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 in the evaluation of submittals for construction permit applications docketed after December 1, 1977.

If an applicant wishes to use this regulatory guide in developing submittals for applications docketed on or before December 1, 1977, the pertinent portions of the application will be evaluated on the basis of this guide.