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U.S. ATOMIC ENERGY COMMISSION

REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

REGULATORY GUIDE 2.1

SHIELD TEST PROGRAM FOR EVALUATION OF INSTALLED BIOLOGICAL SHIELDING IN RESEARCH AND TRAINING REACTORS

A. INTRODUCTION

Subdivision (b)(6) (iii) of section 50.34, "Contents of applications: technical information," of 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires an applicant for a license to include in his final safety analysis report plans for preoperational testing and initial operation. This regulatory guide describes a shield test program that is generally acceptable for evaluation of installed biological shielding in research and training reactors.

B. DISCUSSION

Subcommittee ANS 6, Shielding, of the American Nuclear Society Standards Committee has developed a standard that describes an operational shield test program which may be used in evaluating the installed biological shielding in research and training reactors. This standard was approved by the American National Standards Committee N18, Nuclear Design Criteria, and its Secretariat. It was subsequently approved and designated ANSI N18.9-1972 by the American National Standards Institute (ANSI) on September 15, 1972.

C. REGULATORY POSITION

The requirements and guidelines contained in ANSI N18.9-1972, "Program for Testing Biological Shielding in Nuclear Reactor Plants,"¹ approved September 15, 1972, are generally acceptable and, with due consideration for the unique characteristics of each research and training reactor, provide an adequate basis for conducting a shield test program during preoperational and startup testing for evaluation of

¹Copies may be obtained from American Nuclear Society, 244 East Ogden Avenue, Hinsdale, Illinois 60521.

installed biological shielding in research and training reactors subject to the following:

1. Section 3.2.4 of ANSI 18.9-1972 defines accessible areas, controlled areas, and unlimited access areas. Section 3.2.5 defines Maximum Permissible Dose rate. Nothing in these paragraphs should imply that exposures need not be controlled to the requirements of 10 CFR Part 20, "Standards for Protection Against Radiation."
2. Section 5.2 of ANSI 18.9-1972 states that procedures for implementing the minimum shield test program shall be prepared. These procedures should be designed so that exposures to personnel performing the test program are as low as practicable. These procedures should also be designed so that safety hazards to personnel performing the shield test program are properly identified. For example, gas monitoring should be required where gases or vapors could affect the accessibility of an area.
3. Section 6 of ANSI N18.9-1972 specifies tests that should be conducted for evaluation of installed biological shielding. This section further specifies use of survey meters when conducting the required tests. The shield test program should also include provisions for gamma and neutron film mapping of critical areas where personnel exposure may occur due to streaming, cracks, or gaps in the shielding too small to detect by survey meters, e.g., areas in the vicinity of beam holes, irradiation ports, or shielding areas directly aligned with the core.
4. Section 9 of ANSI N18.9-1972 states that instruments used in carrying out the minimum shield test program shall have been calibrated prior to use in the test program and immediately after each survey. The shield test program should also include provisions for

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calibrating all radiation survey monitors (both portable and installed) against a source emitting radiation of approximately the same type and intensity as that expected to be measured during the survey.

5. Sections 9.2 and 9.3 of ANSI 18.9-1972 provide requirements for survey instruments. In addition to

these requirements, a survey instrument's range should be consistent with the actual dose range expected. For measurements conducted while a reactor is operating in the pulsed mode, appropriate instrumentation, such as film packets, which will properly respond to and measure radiation during the pulsed mode of operation should be provided.