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WITHDRAWN

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earthquake instrumentation criteria for nuclear power plants

an American National Standard

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Criteria for Nuclear Power Plants

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Foreword

(This Foreword is not a part of American National Standard "Earthquake Instrumentation Criteria for Nuclear Power Plants," ANSI/ANS-2.2-2002.)

The purpose of this standard is to specify for water-cooled nuclear power plants the minimum requirements for earthquake instrumentation. Should an earthquake occur, the instrumentation provides information on the vibratory ground motion and resultant vibratory responses of representative Category I structures [defined in U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.29, "Seismic Design Classification"] so that an evaluation can be made as to

(1) whether or not the design response spectra have been exceeded;

(2) whether or not the motion was damaging through determination of its Cumulative Absolute Velocity (CAV) as defined in American National Standard "Criteria for the Handling and Initial Evaluation of Records from Nuclear Power Plant Seismic Instrumentation," ANSI/ANS-2.10-2003;

(3) whether or not the calculated vibratory responses used in the design of the representative Category I structures and equipment have been exceeded at instrumented locations;

(4) the degree of applicability of the mathematical models used in the seismic analysis of the building and equipment.

In addition, instrumentation could be provided to furnish specific information that would increase knowledge and understanding of seismic design. The problem of determining what additional instrumentation is needed to perform this function should be the basis of research and development programs and is not addressed in this standard.

The seismic design of nuclear power facilities requires, in part,

(1) the determination of an input vibratory grounded motion for the site. Input vibratory ground motion could be described by "response spectra," or time-history earthquake records. Most nuclear plant owners have specified their design input vibratory ground motion by response spectra in the form of "design response spectra" in their license application to the NRC;

(2) the construction of mathematical models for dynamic analysis from which the vibratory response of structures and equipment to the input vibratory ground motion can be calculated.

Seismic designs for nuclear power plants utilize advanced analytical and design techniques. Therefore, evidence that the earthquake response spectra did not exceed appropriate spectrum values or that the CAV showed that the motion was not damaging, in accordance with ANSI/ANS-2.10-2003, would give reasonable assurance that plant structures and equipment were not damaged or made inoperable. In addition, the determination by actual instrument data of the resultant vibratory responses of representative structures and equipment and the check of the applicability of mathematical models used in the dynamic analysis would give further assurance that plant structures or equipment was not damaged.

When an earthquake occurs, it is important to determine as soon as possible (within 4 hours) whether or not the free-field motion exceeded predetermined conditions in accordance with ANSI/ANS-2.10-2003. An ideal instrumentation system would immediately provide usable data in a convenient form for making this determination. Through the use of commercially available instruments, the necessary functions of this ideal instrumentation system can be provided. The

providing of these functions is the basis for the minimum requirements specified in this standard.

The basic and most important instrument for measuring vibratory motion is the time-history accelerograph, which measures and records absolute acceleration as a function of time during an earthquake. This may be a self-contained instrument, or it may consist of acceleration sensors, which detect absolute acceleration and transmit the data to a remote central recorder. From the resulting time-history records, the peak accelerations and duration can be determined, and the response spectra and CAV can be derived by computation.

This standard was prepared by Working Group ANS-2.2 of the American Nuclear Society Standards Committee. This is a major revision to the ANSI/ANS-2.2-1988 standard. All comments received were reviewed and, where possible, were incorporated. Working Group ANS-2.2 had the following membership during its work on this standard:

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