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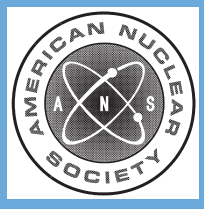
administrative controls and quality assurance for the operational phase of nuclear power plants

an American National Standard



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Foreword

(This Foreword is not a part of American National Standard Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants, N18.7-1976/ANS-3.2)

Preparation of the first edition of this Standard commenced in 1969 prior to the establishment of formal quality assurance requirements for the operation of nuclear power plants. Historically, the administrative controls section of Facility Operating License Technical Specifications had contained provisions for meeting many of the requirements that subsequently became identified with quality assurance for operation. It was the original intent of the Standard to define administrative controls for this purpose. The Standard was completed during a period when the subject of quality assurance was becoming of increasing interest to the nuclear community. The membership of the Subcommittee that developed American National Standard, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants N18.7-1972 is strongly oriented toward power reactor operation, and developed a document aimed at providing guidance for administrative controls over activities associated with the operation of nuclear power plants. At the same time Subcommittee N45.2, "Nuclear Quality Assurance Standards," of the American National Standards Committee N45, "Reactor Plants and Their Maintenance," was developing quality assurance standards related to design, construction, maintenance, and modification of nuclear power plant structures, systems, and components.

When N18.7-1972 was approved and issued, the U.S. Nuclear Regulatory Commission (NRC) issued its Safety Guide 33 (now Regulatory Guide 1.33) "Quality Assurance Program Requirements (Operation)," endorsing Draft 8 of ANS 3.2 (which later became ANSI N18.7-1972) and American National Standard N45.2-1971, "Quality Assurance Program Requirements for Nuclear Power Plants." This dual endorsement caused some confusion among users and the Executive Committee of the ANSI Nuclear Technical Advisory Board (now Nuclear Standards Management Board) directed that an ad hoc Task Force, comprising ANS-3 and a representative of ANSI N45.2 Subcommittees, attempt to develop a single standard that could stand alone in defining "Quality Assurance Program Requirements (Operation)." This Standard is the result of that effort.

Increased effort is being made within the standards-writing community to provide better coordination of quality assurance related standards. In particular, preparation and revision of general standards involving the various phases of a plant (design, procurement, construction and operation) should benefit from this effort in the future.

During the development of N18.7-1976, particularly as a result of reviewers' comments, it became clear to the Task Force that a lack of common understanding of several terms used in the wide variety of documents prepared by these two standards-writing bodies existed. The present revision of N18.7-1972 attempts to better clarify terminology and practices that are often confused. In addition, this Foreword has been expanded substantially to assist reviewers and users to understand the interrelationships of terminology applied by the Task Force in the preparation of the Standard.

Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," 10 CFR 50 defines the term "quality assurance" as ". . . all those planned and systematic activities necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service." Inherent in this definition is recognition of the fact that quality assurance encompasses activities associated with doing a job correctly as well as verifying and documenting the satisfactory progress and completion of the work. The performance of work is itself the most fundamental aspect of quality assurance in its broadest sense.

On the other hand, the term quality assurance also has been frequently, and quite properly, used to describe the programs, the technical discipline and the organizational unit established to implement special procedural steps to verify and document the satisfactory completion of work. In this context, the term quality assurance (as a technical specialty or as a formal organization) describes a staff support function to

assist in the overall goal of the high quality performance of equipment, structures, procedures and personnel.

Historically, quality assurance as an accepted discipline has been associated with manufacturing and construction activities from which it originated as a separate function. It is identified most clearly with systems of checks, audits, inspections, and other forms of verification that can be applied to products that can be examined at various stages of manufacture or construction before they are placed in service; and with the documentation needed to show conformance to requirements and to perform investigations in the event of subsequent malfunction of those products. The nature of manufacturing or construction activities is such that time usually is available or can be taken to perform verification without affecting the quality of the product or activity.

In contrast to potential effects of deficiencies in manufacturing and construction, deficiencies in operating activities can be much more immediate in their effect. For example, it is important that the dynamic aspects of operation be monitored on an essentially continuous basis. Instrumentation for monitoring, control and actuation of safety systems, and observations by and response from the operating staff are both extensively used for this purpose in nuclear power plants. In a nuclear power plant employing proper administrative controls and quality assurance practices, the critical appraisal by supervisory personnel of plant operating evolutions, trends in parameters, maintenance, and day-to-day work practices, is the most significant portion of assuring the quality of plant operation (in the broad sense of the term "quality assurance"), whereas quality assurance (as a technical discipline or an organizational unit) of operating activities is associated principally with checking the adequacy and completeness of work after it is completed. This revision emphasizes that both operating staff and personnel performing other quality assurance functions have important roles in the ". . . planned and systematic activities . . ." specified in the Appendix B definition of quality.

After the initial start-up period of a nuclear power plant, most of the time of the operating staff is spent in operating the plant and in performing routine maintenance activities and surveillance requirements. Nevertheless, certain activities occurring during the operational phase of plant life, including start-up, are more correctly associated with design and construction activities than with operating activities. The quality assurance effort applied to design and construction activities occurring during the operational phase of plant life (e.g., design changes, equipment modifications and certain major maintenance tasks) must be comparable in nature and degree to that normally applied to design and construction occurring before the plant is placed in service.

The Task Force recognizes that it is sometimes difficult to draw a distinction between certain functions normally considered to be operating activities (e.g., routine maintenance) and those considered to be design and construction activities (e.g., nonroutine maintenance and modifications). This revision of N18.7-1972 provides guidance on this subject, but does not give rigid rules for distinguishing between them.

The Task Force devoted considerable effort to defining the manner in which review, inspection, and audit should be carried out as they apply to operational phase activities (Criteria I, X, and XVIII of Appendix B, 10 CFR 50). Review and audit program requirements are given in Section 4.0 of the Standard and include the use of either standing committees or preferably the use of separate established organizational units independent of the onsite operating organization. In either case, the personnel performing independent review are required to collectively possess the range of technical competence (including knowledge in quality assurance practices) necessary to assess the overall safety of operating phase activities.

With respect to inspection of operating activities (work functions associated with normal operation of the plant, routine maintenance and certain technical services routinely assigned to the onsite operating organization), the Task Force has followed

the historic practice in the power generation industry in Section 4.4 of the Standard. This section requires that the "inspection of activities affecting quality . . . to verify conformance with the documented instructions, procedures, and drawings for accomplishing the activity" (Criterion X of Appendix B, 10 CFR 50) be carried out by second-line supervisory personnel or by other qualified personnel not assigned first-line supervisory responsibility for conduct of the work. For modifications and nonroutine maintenance, inspections are to be conducted in a manner similar (frequency, type, and personnel performing such inspections) to that associated with construction phase activities (see also Section 5.2.7).

Section 5.2.7 of the Standard imposes inspection and performance testing requirements commensurate with the nature and extent of the maintenance or modification activity. For example, a large modification effort involving the installation of a new plant system or a major repair effort using offsite construction forces would ordinarily require an approach to inspection and performance testing prior to operation of the modified or repaired system similar to that used during original construction. On the other hand, small modifications made by the onsite operating organization (which may be equally important from a safety point of view) would ordinarily be performed using the same type of inspections and performance testing that is applied to routine maintenance. In either case, maintenance and modifications affecting the functioning of safety related structures, systems, and components must be "performed in a manner to assure quality at least equivalent to that specified in the original design bases and requirements, material specifications and inspection requirements." Further, all safety related maintenance and modification work is subject to audit and independent review as prescribed by Section 4.0 of this Standard.

This published version cites several ANSI approved standards. It is the intent of the Subcommittee to review periodically the status of other related standards and to include citations to these standards as they are published in subsequent revisions to this Standard. It is also the intent of the Subcommittee to provide additional guidance in the area of administrative controls and quality assurance for operations in any matters in which this or other standards are found to be inadequate as determined by experience.

In addition to citation of other standards, this revision of N18.7-1972 has made liberal use of wording used in other standards. In some cases applicable sections of other standards have been used verbatim; in others, portions have been paraphrased to indicate more precisely the applicability of the extracted sections to operating activities. For example, Sections 5.2.13.1, 5.2.13.3, 5.2.13.4, and 5.2.14 contain significant material or direct extracts from ANSI N45.2.

Appended to this Foreword is a chart showing the comparison of 10 CFR 50 Appendix B criteria and N45.2 requirements with the corresponding section and page of this Standard.

This revised Standard was prepared by Subcommittee ANS-3, Reactor Operations, of the American Nuclear Society Standards Committee. At the time of the revision, the membership of the Subcommittee was:

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J. A. Prestele, Chairman, ANS-3, *Consolidated Edison Company of New York*
R. F. Jones, Alternate Chairman, ANS-3, *Energy Incorporated*
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The following individuals participated as ad hoc members for the purpose of this revision:

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W. M. Morrison, *U.S. Nuclear Regulatory Commission* (alternate NRC Member)

Others making important contributions to this Standard include:

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B. H. Grier, *U.S. Nuclear Regulatory Commission*
J. P. Gibbons, *Philadelphia Electric Company,* former member of ANS-3
H. K. Hoyt, *Commonwealth Edison Company,* retired, former member of ANS-3

The American National Standards Committee N18, Nuclear Design Criteria, which reviewed and approved this Standard in 1975, had the following membership:

L. J. Koch, Chairman
C. B. Zitek, Secretary

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COMPARISON CHART OF 10 CFR 50 APPENDIX B AND N45.2-1971 REQUIREMENTS VERSUS N18.7-1976 REQUIREMENTS

10 CFR 50	N45.2-1971			N18.7-1976		COMMENTS
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I	1.1	—	—	1.	1	
I	1.2	1,2	—	1.	1	
I	1.3	1	1	3.1	3	
I	1.3	1	2	3.1	3	
II	2.	1	1	3.1	3	
II	2.	2	1	3.2	3	
II	2.	3	1	5.1	8	
II	2.	3	4	5.1	8	
II	2.	4	1	5.3	19	
II	2.	5	1	3.3	4	Refs. ANSI N18.1
II	2.	6	—	5.1	8	
II	2.	7	1	3.4.2	4	
I	3.	1,2	1	3.4.2	4	Refs. ANSI N18.1
I	3.	2	2	3.2	3	
I	3.	3	1	3.2	3	
I	3.	4,5	—	3.2	3	
III	4.1	1	3	5.2.7.2	12	Refs. ANSI N45.2.11
III	4.4	1	—	5.2.7.2	12	
IV	5.	—	—	5.2.13.1	14	
V	6.	—	—	5.2.7	10	Refs. ANSI N45.2.4,5,6,8,11
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VI	7.	1	3,4	5.2.15	16	
VI	7.	2	—	5.2.15	16	
VII	8.	—	—	5.2.13.2	14	
VIII	9.	—	—	5.2.13.3	15	
IX	10.	1	1,2	5.2.18	18	
IX	10.	1	3	5.2.12	13	
IX	10.	1	4	5.2.18	17	
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X	11.	4	1	5.2.17	17	
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XII	13.	—	—	5.2.16	16	Refs. ANSI N45.2.4
XIII	14.	—	—	5.2.13.4	15	Refs. ANSI N45.2.2
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XIV	15.	1	3	5.2.14	15	
XIV	15.	2	1,2	5.2.6	10	
XIV	15.	3	—	5.2.6	10	
XV	16.	—	—	5.2.14	15	
XVI	17.	—	—	5.2.11	13	
XVII	18.	—	—	5.2.12	13	Refs. ANSI N45.2.9
XVIII	19.	—	—	4.5	7	Refs. ANSI N45.2.12

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