

AMERICAN NATIONAL STANDARD  
REACTOR PLANTS AND THEIR MAINTENANCE

# Housekeeping During the Construction Phase of Nuclear Power Plants

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ANSI N45.2.3 - 1973

REAFFIRMED 1978  
(WITH ANSI N45.2.3(a)-1978)

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THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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## AMERICAN NATIONAL STANDARD

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*This standard was approved by the American National Standards Committee N45 and its Secretariat, and it was subsequently approved and designated N45.2.3-1973 by the American National Standards Institute on March 15, 1973.*

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## FOREWORD

This standard deals with the control of work activities, conditions, and environments that can influence the quality of materials, equipment, components, and facilities, hereafter referred to as items from the time construction activity has been initiated at the job site until the construction phase of the generating station has been satisfactorily completed. The standard was developed under the sponsorship of the American Society of Mechanical Engineers (ASME) as an effort by the American National Standards Institute's (ANSI) Committee N45 on Reactor Plants and Their Maintenance. This committee has been chartered to promote the development of standards for the location, design, construction, and maintenance of nuclear reactors and plants embodying nuclear reactors, including equipment, methods, and components specifically for this purpose.

In May of 1969 the N45 Committee of ANSI established an Ad Hoc Committee (N45-2.3) Housekeeping—Total Plant. The purpose of this committee was to prepare a standard for general industry use that would define the requirements for housekeeping activities so as to assure attainment of quality construction. The ad hoc committee was composed of representatives of key segments of the nuclear industry, including utilities, reactor suppliers, construction contractors, insurance underwriters, and consultants.

The initial draft of this standard was prepared in November, 1969. Since then revisions have been made to reflect comments received from committee members, other ad hoc committees of N45, and selected individuals from the nuclear industry and the United States Atomic Energy Commission. The standard contained herein was developed from this activity.

In April of 1970 the N45 Committee of ANSI established a subcommittee N45-2 to guide the preparation of nuclear quality assurance standards. This subcommittee is responsible for establishing guidelines and policy to govern the scope and content of the various standards; monitoring the status of standards in process; recommending preparation of additional standards; and final approval of standards prior to their submittal to the N45 Committee for balloting. Working with the N45-2 Subcommittee and concurrently with the development of this standard by the N45-2.3 Ad Hoc Committee, other ad hoc committees of N45 developed a series of standards that set forth both general and detailed technical provisions for certain activities to assure quality during the construction phase of nuclear power plants. These requirements will be coordinated with the requirements of this standard as they are developed. In September 1971, these ad hoc committees were changed to working groups. As of March 1973, these working groups had the following associated standards in preparation:

<b>Working Group</b>		<b>Standard in Preparation</b>
N45-2	N45.2	Quality Assurance Program Requirements for Nuclear Power Plants.
N45-2.1	N45.2.1	Cleaning of Fluid Systems and Associated Components During the Construction Phase of Nuclear Power Plants
N45-2.2	N45.2.2	Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants (During the Construction Phase)
N45-2.4	N45.2.4	Supplementary Quality Assurance Requirements for Installation, Inspection and Testing of Instrumentation and Electric Equipment During the Construction of Nuclear Power Generating Stations
N45-2.5	N45.2.5	Supplementary Quality Assurance Requirements for Installation and Testing of Structural Concrete and Structural Steel During the Construction Phase for Nuclear Power Plants

N45-2.6	N45.2.6	Qualifications of Inspection, Examination, and Testing Personnel for the Construction Phase of Nuclear Power Plants.
N45-2.8	N45.2.8	Supplementary Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems for the Construction Phase of Nuclear Power Plants
N45-2.9	N45.2.9	Requirements for Collection, Storage and Maintenance of Quality Assurance Records
N45-2.10	N45.2.10	Quality Assurance Terms and Definitions
N45-2.11	N45.2.11	Quality Assurance Requirements for the Design of Nuclear Power Plants
N45-2.12	N45.2.12	Quality Assurance Program Auditing Requirements for Nuclear Power Plants
N45-2.13	N45.2.13	Supplementary Quality Assurance Requirements for Preparation of Procurement Documents for Nuclear Power Plants
N45-2.4	N45.2.14	Supplementary Quality Assurance Requirements During the Manufacture of Class 1E Instrumentation and Electric Equipment for Nuclear Power Generating Stations

Suggestions for improvement gained in the use of this standard will be welcomed. They should be sent to the Secretary, American National Standards Committee N45, The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, New York 10017.

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## HOUSEKEEPING DURING THE CONSTRUCTION PHASE OF NUCLEAR POWER PLANTS

### 1. INTRODUCTION

#### 1.1 Scope

This standard defines the housekeeping requirements for the control of work activities, conditions, and environments that can affect the quality of important parts of a nuclear power plant during the construction phase. These parts include the structures, systems, and components whose satisfactory performance is required for the plant to operate reliably, to prevent accidents that cause undue risk to the health and safety of the public, or to mitigate the consequences of such accidents if they were to occur. Housekeeping encompasses all activities related to control of cleanness of facilities, cleanness of material and equipment, fire prevention and fire protection including disposal of combustible materials and debris, control of access, and protection of equipment not denoted in other standards. The requirements may also be extended to other appropriate parts of nuclear power plants when specified in contract documents. This standard is intended to be used in conjunction with ANSI N45.2. Quality Assurance Requirements For Nuclear Power Plants.

#### 1.2 Applicability

The requirements of this standard apply to the work of any individual or organization that participates in housekeeping activities during construction activities of nuclear power plants as discussed in paragraph 1.1. The extent to which the individual requirements of this standard apply will depend upon the nature and scope of the work to be performed and the importance of the item or service involved. The requirements are intended to assure that only proper materials, equipment, processes, and procedures are utilized in the maintenance of housekeeping during the construction of power plants and that the quality of items is not degraded as a result of housekeeping practices and techniques during construction processing.

#### 1.3 Responsibility

The organization or organizations responsible for establishing the applicable requirements for the

activities covered by this standard shall be identified and the scope of their responsibilities shall be documented. The work of establishing practices and procedures and providing the resources in terms of personnel, equipment, and services necessary to implement the requirements of this standard may be delegated to other organizations, and such delegations shall also be documented. However, it is the responsibility of each organization performing work covered by this standard to comply with the procedures and instructions issued for the project and to conform to the requirements of this standard applicable to his work.

It is the responsibility of the organization performing these activities to specify the detailed methods and procedures unless they are specified in the contract documents.

#### 1.4 Definitions

The following definition is provided because it is used uniquely in this standard.

*Construction Phase*—The period of time beginning with the start of construction activity and ending as each plant area is turned over to the plant operator.

Other terms and their definitions are contained in ANSI N45.2.10.

#### 1.5 Referenced Documents

Other documents that are required to be included as a part of this standard are either identified at the point of reference or identified in paragraph 5 of this standard.

### 2. GENERAL REQUIREMENTS

This paragraph contains requirements that are to be fulfilled by the contractor who is responsible for performing any segment of work described in paragraphs 3 and 4 of this standard. Measures shall be established and implemented for documenting housekeeping operations to verify conformance to specified requirements.



## 2.1 Planning

The work and the quality assurance requirements for the housekeeping activities at the nuclear power plant site shall be delineated. The planned activities shall include the methods and techniques for control of the site area, the facilities, and the materials and equipment being incorporated in the plant to preserve the requisite quality of the items being constructed or installed. Necessary procedures and work instructions that are needed to assure compliance with the specified requirements shall be identified and provisions shall be made for their preparation, approval, release, and control. Methods to be used for the collection, handling, and disposition of records, data, and reports shall be designated.

Cleanness requirements for housekeeping activities shall be established on the basis of the following zone designations. Time for implementation of the zone designations shall be as required by the construction progress.

*Zone I*—Areas requiring the highest order of cleanness and shall be equipped with a clean clothing change facility at the vestibule or entrance, preferably with toilet facilities immediately adjacent so that personnel working in the controlled area do not have to wear the special clothing in other areas. Such areas shall provide for complete outer change of clothing by personnel, including use of shoe covers, head covers, and gloves to protect all equipment surfaces from outside contamination. Material entering this zone shall have been appropriately cleaned prior to entry as specified in ANSI N45.2.1.

*Zone II*—Intermediate cleanness requirements less restrictive than Zone I but where foreign matter may have detrimental effects.

*Zone III*—Areas less restrictive than Zones I and II but requiring access control over personnel and materials.

*Zone IV*—Areas where it is desired to regulate the use of tobacco and eating for material and equipment protection or for health and fire hazards.

*Zone V*—Unrestricted construction areas requiring good construction site housekeeping practices only.

For Zones I, II, and III a written record of the entry and exit of all personnel and material shall be established and maintained.

Restriction List	Zones				
	I	II	III	IV	V
Clothing change	Yes	No	No	No	No
Clean gloves, shoe covers, head covering	Yes	Yes	No	No	No
Filtered air	Yes	No	No	No	No
Material precleaning	Yes	No	No	No	No
Material accountability	Yes	Yes	Yes	No	No
Personnel accountability	Yes	Yes	Yes	No	No
No use of tobacco or eating	Yes	Yes	Yes	Yes	No

## 2.2 Procedures and Instructions

The procedures and instructions for housekeeping practices shall be prepared and may be issued in segments to conform with the project construction schedule. The first segment establishing regulations for control of site area, site preparation, fire prevention and protection, and records shall be in force with the start of construction activity. The remaining segments shall be prepared and approved no later than the start of equipment installation work.

## 2.3 Results

Inspection and test results shall be documented in a suitable test report or data sheet. Each report shall identify the item to which it applies, the procedures or instruction followed in performing the task, and the identification of the following:

- (1) Conditions encountered which were not anticipated, including nonconformance.
- (2) Identity of inspector or tester.
- (3) Completion date.

Test reports and data sheets shall include an evaluation of the acceptability of inspection and test results and provide for identifying the individual who performed the evaluation.

## 2.4 Personnel Qualifications

All personnel working in zone controlled areas shall be familiar with the necessities and requirements for cleanness control applicable to the various zones. Training programs shall be utilized for this purpose where appropriate.

## 3. REQUIREMENTS

### 3.1 Control of Site Area

Areas for specific activities shall be assigned and regulated. Areas which shall be designated include where appropriate refuse and garbage dumps, refuse burning sites, storage locations, parking lots, eating places, non-smoking areas, subcontractor work areas,

**ANSI N45.2.3(a) – 1978**

**ADDENDA**

**TO**

**ANSI N45.2.3-1973 (R 1978)**

**Housekeeping During the Construction Phase of Nuclear Power Plants**

*Revise paragraph 3.2.3 to read:*

Fire Protection and Prevention. Equipment and Instructions for the protection from, and prevention of, damage by fire shall be provided in accordance with the requirements of the NFPA National Fire Codes. Procedures or instructions for fire protection shall include provisions for fighting fires involving the use of available community fire departments, trained project brigades, and others. Procedures or instructions shall include plans for provision of water supplies, hydrants, automatic sprinklers, access for fire fighting, and distribution of extinguishers and fire fighting equipment. Fire surveillance during and immediately following operations such as welding and heat treating shall be provided when materials are located such that flames, flying sparks, weld spatter, or excessive heat resulting from the operation could cause combustion with resulting damage to items of the nuclear plant. Fire protection facilities shall be in service beginning with the initial stages of permanent construction. Pre-fire planning shall be conducted as a requirement of the fire protection procedures or instructions which shall include evacuation of confined areas.

**THIS STANDARD, INCLUDING THE ABOVE ADDENDA, WAS REAFFIRMED  
FEBRUARY 15, 1978**

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common areas, and waste collection container locations. Personnel entrance to controlled areas, admission of visitors to the work site, and identification of all personnel shall be regulated in accordance with established procedures and regulations.

Grading, drainage, roads, construction facilities, plant fencing, and utilities shall be provided in accordance with specified requirements and shall be maintained as required in good condition throughout the construction phase or until replaced with the permanent facilities.

### 3.2 Control of Facilities

Control of work and storage areas where important items are handled shall be established and maintained to conform to the appropriate zone defined in paragraph 2.1 of this standard. Atmospheric control shall be provided where necessary.

The control of all tools, equipment, materials, and supplies that are used in Zones I, II, and III shall be maintained to prevent the inadvertent inclusion of deleterious materials or objects in critical systems. Appropriate control measures shall be provided through utilization of such items as log books and tethered tools.

**3.2.1 Cleanness.** The work areas shall be kept sufficiently clean and orderly that construction activity can proceed in an efficient manner that will produce and maintain quality in conformance with specified requirements. Where large accumulations of materials occur on a nonroutine basis, such as the stripping of concrete forms, the material shall be promptly removed or stored neatly. Garbage, trash, scrap, litter, and other excess materials shall be collected, removed from the job site, or disposed of in accordance with specified requirements or planned practices. Such excess material shall not be allowed to accumulate and create conditions that will adversely affect quality. The disposal of cleaning chemicals shall be accomplished so additional hazards are not created at the disposal site.

**3.2.2 Environment.** Areas of activity shall be adequately lighted, ventilated, protected, and accessible as appropriate for the work being performed. Temporary lighting may be utilized but shall be installed and maintained to provide good visibility. Ventilation shall be provided where necessary to prevent accumulation of dust, noxious fumes, and temperature extremes. Adequate working space for construction personnel shall be provided utilizing proper work stages and platforms having accessibility by stairs or ladders. Barriers, screens, shields, restricted

access, or other protection shall be provided as necessary for isolation of areas where noise, welding arcs, dust, inclement weather, or other conditions exist that may affect the quality of work being performed.

**3.2.3 Fire Protection and Prevention.** Equipment and instructions for the protection from, and prevention of, damage by fire shall be provided in accordance with the NFPA National Fire Codes, Volume 4, Building Construction Facilities. Procedures or instructions for fire protection shall include provisions for fighting fires involving the use of available community fire departments, trained project brigades, and others. Procedures or instructions shall include plans for provision of water supplies, hydrants, automatic sprinklers, access for fire fighting, and distribution of extinguishers and fire fighting equipment. Fire watches during and immediately following welding operations should be specified. Fire protection facilities shall be in service beginning with the initial stages of permanent construction. Pre-fire planning should be considered as a requirement of the fire protection procedures or instructions which shall include evacuation of confined areas.

### 3.3 Materials and Equipment

Materials and equipment delivered to the work area shall be placed so that they are accessible but do not hinder construction progress. However, material and equipment shall be so positioned that it will not be damaged by construction activity.

The receiving, storage, and handling activities required by this standard shall be performed as specified in ANSI N45.2.2. The cleaning of important parts for the plant that is necessary during these activities shall be performed as specified in ANSI N45.2.1.

### 3.4 Construction Tools, Supplies, and Equipment

The use, location, and deployment of construction tools, supplies, and equipment shall be regulated to keep access and work areas clear and prevent conditions that will adversely affect quality. These provisions shall include, but are not limited to such items as the movement of materials to the work area, welding and stress relieving leads, power leads, temporary heating equipment, pumps, air and water hoses, welding machines, air compressors, hoisting equipment, air tools, grinding tools and burning tools.

### 3.5 Surveillance, Inspections, and Examinations

Periodic inspection and examination of the work areas and the construction practices shall be performed

at scheduled intervals to assure adequacy of cleanness and housekeeping practices. These inspections and examinations shall include the following as appropriate:

- (1) Examination of construction site roads, access ways, and ramps for conditions that may result in damage to items being transported or handled.
- (2) Examination of storage area for conformance to procedures and instructions in the following categories:
  - (a) adequacy of access control.
  - (b) evidence of damage or deterioration.
  - (c) adequacy of protection from fires, weather, movement of equipment, and other factors that may result in damage to stored items.
  - (d) adequacy of solvent storage facilities.
- (3) Inspection of work areas for maintenance of environmental conditions within specified limits.
- (4) Surveillance over installed items to assure the adequacy of:
  - (a) maintenance of protection.
  - (b) preservation of precautionary signs.
  - (c) preservation of item identity.
  - (d) protection from fire, weather, movement of materials or equipment and other factors which may result in damage to installed items.

Where these requirements duplicate the requirements of other standards such as ANSI N45.2.1, duplicate activities and reports are not required.

#### 4. RECORDS

Copies of approved procedures, reports; personnel training and qualification records; controlled zone registry, fire and accident investigations; and inspection and examination records shall be prepared and placed with other project records.

Final disposition of records shall be in accordance with ANSI N45.2.9.

#### 5. REVISIONS OF AMERICAN NATIONAL STANDARDS REFERRED TO IN THIS DOCUMENT

When the following standards referred to in this document are superseded by a revision approved by the American National Standards Institute, the revision shall apply.

- A10.2-1944 Safety Code for Building Construction
- N45.2 Quality Assurance Program Requirements for Nuclear Power Plants
- N45.2.1 Cleaning of Fluid Systems and Associated Components During the Construction Phase of Nuclear Power Plants
- N45.2.2 Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants (During the Construction Phase)
- N45.2.9 Requirements for Collection, Storage and Maintenance of Quality Assurance Records
- N45.2.10 Quality Assurance Terms and Definitions.



# REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

## REGULATORY GUIDE 1.39

### HOUSEKEEPING REQUIREMENTS FOR WATER-COOLED NUCLEAR POWER PLANTS

#### A. INTRODUCTION

Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Licensing of Production and Utilization Facilities," establishes overall quality assurance requirements for the design, construction, and operation of safety-related structures, systems, and components of nuclear power plants. This guide describes an acceptable method of complying with the Commission's regulations with regard to housekeeping<sup>1</sup> requirements for the control of work activities, conditions, and environments at water-cooled nuclear power plant sites. The Advisory Committee on Reactor Safeguards has been consulted concerning this guide and has concurred in the regulatory position.

#### B. DISCUSSION

Working Group N45-2.3 of the American National Standards Institute (ANSI) Standards Committee N45, Reactor Plants and Their Maintenance, has prepared a standard that defines the housekeeping requirements for the control of work activities, conditions, and environments that could affect the quality of a nuclear power plant during the construction phase. This standard was approved by Subcommittee N45-2, Nuclear Quality Assurance Standards, of the ANSI Standards Committee N45 and the full committee and its Secretariat. It was subsequently ap-

\* Lines indicate substantive changes from previous issue.

<sup>1</sup> Housekeeping encompasses all activities related to control of cleanliness of facilities, cleanliness of material and equipment, fire prevention and fire protection including disposal of combustible materials and debris, control of access, and protection of materials.

proved and designated N45.2.3-1973 by the American National Standards Institute on March 15, 1973.

The original issuance of this regulatory guide endorsed as acceptable the guidelines (indicated by the verb "should") as well as the requirements included in this standard. Some uncertainty arose with regard to the NRC staff's intent with this endorsement. As a result of this uncertainty, the NRC staff reevaluated the guidelines contained in ANSI N45.2.3-1973 with respect to importance to safety. This guide has been revised to clarify NRC's position on the requirements and guidelines included in ANSI N45.2.3-1973. Where conformance to this regulatory guide is indicated in an application without further qualification, this means conformance with the requirements of ANSI N45.2.3-1973, as supplemented or modified by the regulatory position of this guide.

#### C. REGULATORY POSITION

The requirements for the control of work activities, conditions, and environments at water-cooled nuclear power plant sites that are included in ANSI Standard N45.2.3-1973, "Housekeeping During the Construction Phase of Nuclear Power Plants," provide a method acceptable to the NRC staff for complying with the pertinent quality assurance requirements of Appendix B to 10 CFR Part 50, subject to the following:

1. Subdivision 1.5 of ANSI N45.2.3-1973 states that other documents that are required to be included

<sup>2</sup> Copies may be obtained from the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, N.Y. 10017.

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Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience. This guide was revised as a result of substantive comments received from the public and additional staff review.

Comments should be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

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as a part of this standard are either identified at the point of reference or identified in Paragraph 5 of the standard. The specific acceptability of these listed documents has been or will be covered separately in other regulatory guides or in Commission regulations, where appropriate.

2. Subdivision 3.2.3 of ANSI N45.2.3-1973 includes general guidelines and requirements for fire protection and prevention. The requirements and guidelines of Subdivision 3.2.3 are not considered a part of this regulatory guide, since this subject is addressed separately in more detail in other NRC documents. Thus, a commitment to follow this regulatory guide does not imply a commitment to follow the guidelines and requirements of Subdivision 3.2.3.

3. Although ANSI N45.2.3-1973 is entitled "Housekeeping During the Construction Phase of Nuclear Power Plants," the requirements included in the standard, subject to the provision of Regulatory Position C.2, are considered to be applicable for

housekeeping activities occurring during the operations phase that are comparable to those occurring during the construction phase.

#### D. IMPLEMENTATION

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

This guide reflects current NRC staff practice. Therefore, 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 is being and will continue to be used in the evaluation of submittals for operating license or construction permit applications until this guide is revised as a result of suggestions from the public or additional staff review.



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