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**DOE-STD-1067-94  
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# **DOE STANDARD**

## **GUIDELINE TO GOOD PRACTICES FOR MAINTENANCE FACILITIES, EQUIPMENT, AND TOOLS AT DOE NUCLEAR FACILITIES**



**U.S. Department of Energy  
Washington, D.C. 20585**

**AREA MNTY**

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## **FOREWORD**

The *Guideline to Good Practices for Maintenance Facilities, Equipment, and Tools at DOE Nuclear* provides contractor maintenance organizations with information which may be used for the development and implementation of a rigorously controlled evaluation process for maintenance facilities, equipment, and tools used in the performance of maintenance tasks at DOE (Department of Energy) nuclear facilities. This document is intended to be an example guideline for the implementation of DOE Order 4330.4A, *Maintenance Management Program*, Chapter II, Element 4, *Maintenance Facilities, Equipment, and Tools*. DOE contractors should not feel obligated to adopt all parts of this guide. Rather, they should use the information contained herein as a guide for establishing an evaluation process for maintenance facilities, equipment, and tools applicable to their facility.



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## 1. INTRODUCTION

### 1.1 Purpose

This guide is intended to assist facility maintenance organizations in the review of existing methods and in the development of new methods for evaluating maintenance facilities, equipment, and tools. Properly established maintenance facilities (1) support As Low As Reasonably Achievable (ALARA) goals, (2) enhance user accessibility, and (3) encourage selection and use of the proper item for a safe, effective, first effort. It is expected that each DOE facility may use approaches or methods different from those defined in this guide. The specific guidelines that follow reflect generally accepted industry practices. Therefore, deviation from any particular guideline would not, in itself, indicate a problem. If substantive differences exist between the intent of this guideline and actual practice, management should evaluate current practice to determine the need to include/exclude proposed features. A change in maintenance practice would be appropriate if a performance weakness were determined to exist. The development, documentation, and implementation of other features that further enhance these guidelines for specific applications are encouraged.

Additional information pertinent to the implementation of this guideline may be found in the following DOE Guidelines: DOE-STD-1069-93, *"Guideline to Good Practices for Maintenance Tools and Equipment Control at DOE Nuclear Facilities"* and DOE-STD-1072-93, *"Guideline to Good Practices for Facility Condition Inspections at DOE Nuclear Facilities."*

Appendix (Sample Lesson Plan) is provided for use by facility trainers who provide training regarding this element of DOE Order 4330.4A, "Maintenance Management Program."

### 1.2 Background

The information in this guide was developed from commercial and DOE sources. Each facility should select any details applicable, add any additional knowledge or experience that is applicable, and then develop and implement facility-specific methods for establishing maintenance facilities, equipment, and tools. Facilities which use existing documented methods should review this guide to identify any details which may enhance their existing process.

### **1.3 Application**

The content of this guide is generally applicable to all DOE nuclear facilities. Portions of the methods outlined may not be applicable to all facilities, because maintenance organizations, disciplines, titles, and responsibilities can vary among DOE nuclear facilities. Facility maintenance personnel should (1) verify the adequacy of or (2) improve existing methods by adapting this guide to their specific facility and individual maintenance disciplines.

## 2. DEFINITIONS

### 2.1 Acronyms

- a. ALARA: As Low As Reasonably Achievable
- b. DMC: Deficient Material Condition
- c. DOE: Department of Energy
- d. ES&H: Environmental Safety and Health
- e. HVAC: Heating, Ventilation, and Air-Conditioning
- f. MJR: Maintenance Job Request
- g. OJT: On-the-Job Training
- h. OSHA: Occupational Safety and Health Administration
- i. PCB: Polychlorinated biphenyl
- j. RCRA: Resource Conservation and Recovery Act of 1976
- k. SARA: Superfund Amendment Reauthorization Act
- l. SSC: Structures, Systems, and Components
- m. UPS: Uninterruptible power supplies

2.2 ALARA (As Low As Reasonably Achievable): A radiation protection philosophy requiring that personnel exposure to radiation and radioactive material not only be kept within regulatory limits, but also be maintained as low as reasonably achievable in light of current technology, with appropriate consideration for economic and social factors, as well as benefits derived.

2.3 Corrective Maintenance: The repair of failed or malfunctioning equipment, system, or facility to restore the intended function or design condition. This maintenance does not result in a significant extension of the expected useful life.

2.4 Deficiency: An item that does not meet specified standards and requires corrective action.



- 2.5 Deficiency Identification Tag: A two-part form that includes a string for ease of attachment and may be used to identify a facility material deficiency. The tag should be marked with a serialized number that is used for administrative control and for deficiency location by maintenance personnel. The hard copy of the tag should be placed on or near the deficiency in the facility. The duplicate or carbon of the tag serves as a temporary record of the deficiency until the data is transferred to a maintenance job request.
- 2.6 Deficiency Identification Sticker: A small, adhesive-backed form which may be used primarily to identify deficiencies in those situations that preclude the use of a Deficiency Identification Tag. The sticker should also be marked with a serialized number. A duplicate should not be required since most stickers are used in control rooms where the deficiency information may easily be directly placed on a maintenance job request.
- 2.7 Housekeeping: The cleaning and preservation of the facility, its systems, and components. Also used to refer to the condition of facility cleanliness, orderliness, and preservation.
- 2.8 Laydown Area: Area on or close to a job site, designated and approved by the facility owner, to be used by maintenance personnel for the materials and equipment used on the maintenance job, for the duration of the job.
- 2.9 Lessons Learned: Any experience, example, observation, or insight that imparts wisdom and/or beneficial knowledge to an employee during conduct of the technical, procedural, business, legal, or administrative tasks associated with the design, development, fabrication, operation, and/or test of any product or service.
- 2.10 Maintenance: Day-to-day work that is required to maintain and preserve facility and capital equipment in a condition suitable for its designated purpose and includes preventive, predictive, and corrective (repair) maintenance.
- 2.11 Maintenance Job Request (MJR): Means of obtaining maintenance services, available on both paper and electronic mediums and initiated by maintenance customers. An MJR is normally issued to Maintenance Planners and Estimators and is used to define, plan, and execute maintenance activities. It serves as documentation of a deficient equipment condition and requires detailed documentation of work performed, spare parts, procedures, or testing to verify that maintenance was performed correctly. The MJR may also serve as documentation for completion of minor maintenance activities such as lubrication, light-bulb replacement, etc. ("MJR" is the equivalent of a "Work Request")

- 2.12 Outage: Condition existing whenever production has stopped or mission capability is lost due to planned or unplanned occurrences.
- 2.13 Predictive Maintenance: Actions necessary to monitor, find trends, and analyze the parameters, performance characteristics, properties, and signatures associated with equipment, systems, or facilities that are indicative of decreasing performance or impending failure.
- 2.14 Preventive Maintenance: All those systematically planned and scheduled actions performed for the purpose of preventing equipment, system, or facility failure.
- 2.15 Staging Areas: Area designated and approved by the maintenance supervisor, for staging parts, materials, and supplies until a maintenance job is ready to work.

### 3. MAINTENANCE FACILITIES, EQUIPMENT, AND TOOLS

#### 3.1 Discussion

Adequate maintenance facilities, equipment, and tools are needed to ensure that maintenance activities may be accomplished safely and effectively. Industrial safety, location, access, communication, environmental controls, radiological controls, power sources, and the type of activity to be performed are examples of items to be considered in providing adequate maintenance facilities. The objective is to create and maintain a safe and professional work-place where quality work may be performed. Maintenance facilities that should be evaluated include the following:

- Training facilities [special, mockups, classroom, off-site)
- Central, specialty, and field shops
- Satellite work areas
- Temporary facilities
- Decontamination facilities
- Calibration/certification facilities
- Change-house, restroom, lunchroom areas
- Meeting rooms
- Job staging areas
- Work laydown areas
- Storage (indoor and outdoor) areas
- Office areas and equipment
- Computer support
- Vehicle parking and maintenance
- Heavy-equipment parking
- Hazardous-material storage areas
- Waste-disposal areas

Increased staff size, special equipment and tool needs as a result of facility modifications, planned outage workload, and the increased sophistication of maintenance activities may overload existing maintenance facilities. Each maintenance facility, tool, and equipment use should be reviewed periodically, and appropriate adjustments should be made to support safe and effective maintenance. Managers should recognize that the pace of work and a "can do" spirit by the maintenance organization may disguise inadequate facilities. Managers are responsible for optimizing use of existing maintenance facilities, equipment, and tools and also for recognizing areas where performance may be enhanced by additional or improved facilities.

Maintenance should develop and implement comprehensive seasonal transition, freeze protection, and energy conservation plans developed to address the specific needs and action schedules to sustain critical areas, buildings, and individual items, as appropriate. Snow and ice control plans should be implemented as the need arises. (see DOE-STD-1064-93, "*Guideline to Good Practice for Additional Maintenance Management Requirements at DOE Nuclear Facilities.*")

Planning for new or expanded facilities should be a long-range project and not done to address an immediate need.

The process of providing and developing tools and test equipment for the facility should include considerations of cost control, as well as proper storage and issuance controls. Craftspersons should be able to readily obtain tools and equipment needed to perform maintenance and then to return them as soon as practical after completion of the work. Tools and testing equipment should be kept in a high state of readiness, some by inclusion in the preventive maintenance program. Proper preventive maintenance also may result in improved personnel safety and extended life of tools and equipment. Although the development of new or special tools should be reviewed and approved on the basis of safety, cost-effectiveness, and future use, the control of the development of new or special tools should not be so strict that employee innovation is discouraged.

### **3.2 Scope**

This guideline applies to all maintenance facilities, equipment, and tools under the control of maintenance organizations in all areas of the facility.

### **3.3 Responsibilities**

3.3.1 Owner/Operator is responsible for regular evaluation of facilities, equipment, and tool status, to determine and implement enhancement/improvement opportunities in a timely manner.

#### **3.3.2 Responsibilities of Individuals**

Personnel safety is the responsibility of each individual. Personnel should immediately report any injury, safety hazard, concern, or violation to their immediate supervisor.

3.3.3 Functional Organizations who perform maintenance activities should review facilities, equipment, and tools on a continuous basis and develop methods for the following:

- identifying needs
- prioritizing needs
- approving needs
- providing follow-up resolution
- identifying accountable managers
- budgeting for approved needs

### 3.4 Guidelines

#### 3.4.1 Facilities

##### a) Shops, Satellite Work Areas, and Office Areas

The layout of shops, satellite work areas, and office areas should be designed with a high priority on individual and industrial safety and efficiency. Modifications throughout the life of the facility should ensure personnel safety and efficiency remain foremost considerations.

Environmental conditions often have a significant impact on personnel performance. Location and type of work performed should be considered in determining the types and level of environmental controls and services to be included in each maintenance area. Supervisors need to be responsive to maintaining work-place environmental controls conducive to increased maintenance quality and work efficiency. Examples of some environmental controls and services include the following:

- equipment/furniture space considerations
- adequate lighting
- facility service and instrument air
- electric power supplies
- demineralized water
- radiological controls
- temperature, humidity, and dust control
- fume removal
- hazardous chemical and solvent storage and disposal
- noise control

Each area should have storage facilities which are convenient and which encourage personnel to maintain good housekeeping. Shelves, cabinets, lockers, toolboxes, job staging and laydown areas are examples of storage facilities that may be provided for items such as tools, parts, reference materials, and personal items. Facilities also should be provided for ALARA when working on contaminated components and equipment.

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Parameters that impact the safety and workmanship, and efficiency of individuals using a facility should be considered when evaluating the adequacy of facility status. These parameters are as follows:

- access/occupancy (peak numbers and male/female/disabled)
- security constraints
- housekeeping/site appearance
- ALARA impact
- OSHA regulations
- heating, ventilation, and air conditioning (HVAC)
- evacuation routes
- fire protection
- location with respect to primary customer/tasks
- storage needs
- energy source (overload of available services)
- temporary vs. permanent operation
- flexibility to satisfy changes in purpose and scope
- waste avoidance, minimization, recycling, and storage

### b) Laydown and Staging Areas

A plan for identifying and using maintenance laydown and staging areas should be developed and kept current. This plan should define major maintenance activity support requirements, area use, and responsibility for area upkeep and control. It should include such items as the following:

- authorization for access, with provisions for security and fire protection
- labeling of facilities to designate responsibility and entry authorization
- major maintenance activities should have assigned laydown and staging areas for equipment, special tools, rigs, and parts. Personnel movement into and out of areas should be planned and understood by all concerned, when warranted
- contingency plans for changes (such as unanticipated radioactive airborne contamination) which may render a facility unusable for its intended purpose

Laydown-and-staging area responsibilities should be designated, to limit access to accountable individuals as a means to ensure the following:

- ALARA control
- regulatory program compliance
- environmental compliance (i.e., herbicide/insecticide/pesticide, RCRA, etc.)
- carcinogen control
- use control (controlled staging of materials) security constraints
- item integrity maintenance

c) Temporary Facilities

Temporary facilities should be planned, constructed, identified, and coordinated with affected organizations to satisfy short-term special applications such as the following:

- uncleared entry into special areas for contracted services
- contamination control (.ALARA) during major maintenance activities
- satellite shop to support construction/modification/alteration activities
- containment of contaminated products/waste
- office space for visitors, construction support, and high-activity periods

Planning and coordinating temporary facilities with other facility groups, such as radiological protection and operations, result in more efficient use of space. Necessary services, such as lighting, electric power, compressed air, water, and environmental controls should be provided at temporary support facilities. ALARA should be considered when designing and locating temporary facilities. Glove boxes or temporary containments should be considered for work on contaminated equipment to prevent airborne contamination or the spread of contamination. Major temporary facilities should be controlled through the facility's design-change programs to ensure that additional facilities and services, such as electric power, compressed air, and water requirements, do not overload the installed facility systems.



## d) Decontamination Facilities

An adequate decontamination facility is needed to enable the facility to reuse a wide variety of contaminated tools and equipment and to minimize replacement expenditures. A versatile decontamination facility and program should be used to reduce levels of removable and fixed radioactive contamination on the surface of controlled tools and equipment.

Decontamination of tools and equipment also should be used to minimize the contribution of contaminated tools and equipment to solid radioactive waste volumes. Examples of decontamination facilities and methods include a wash-down area, solvent rinse, ultrasonic bath, acid bath, electro-polishing, hydro-blasting, and sandblasting. Use of these facilities and methods may also reduce exposure by reducing repair time and provide better tool management.

3.4.2 Equipment and Tools

## a) Storage Facilities

Storage facilities should be located near normal work areas to provide ready access/use on a day-to-day basis and to improve maintenance efficiency. These facilities should provide for the following:

- isolation for specific exposure constraints, radiation, and hazardous waste
- segregation for flammable, nonflammable, hazardous, incompatible, and/or special operation
- environmental controls for temperature, humidity, dust, and radioactive contamination
- secondary containment
- necessary controls to meet manufacturers' special handling or storage requirements
- prevention of abuse caused by unauthorized or excessive handling
- regular inventory verification/replenishment

b) Evaluations of Equipment and Tool Status

DOE-STD-1069-93, "*Guideline to Good Practices for Maintenance Tools and Equipment Control at DOE Nuclear Facilities*" provides additional information concerning equipment and tools.

Parameters which should be considered when evaluating equipment and tool status include the following:

- safety
- ALARA compliance
- condition
- environmental constraints
- calibration/certification traceability
- accountability (inventory, responsibility, status)
- stationary vs. portable
- craft specialized vs. general application
- age
- new technology vs. new application of existing item
- storage
- quantity required for work-force access
- repair/replacement costs

Where vendors have indicated special handling and storage requirements, those requirements should be satisfied to ensure that integrity is maintained.

3.4.3 Office Equipment

Worker performance is directly affected by the adequacy, quality, and ergonomics of office equipment provided for the job task. In order to provide maximum equipment performance for each worker and job task, a regular assessment of the office equipment should be performed. Status of communications equipment, reproduction equipment, and other office equipment/supplies should be regularly assessed on the basis of observation, regular usage rates, and individual feedback. When computerized data bases are used, convenient access to computer terminals should be provided. During high-activity periods, additional office equipment should be provided as needed.

Computerized office equipment requirements for each individual should be established in order to maintain an inventory of the proprietary software used on each system under his/her control.

A mechanism should be established to help achieve compliance with DOE directives relevant to the security and protection of classified information and/or proprietary information (e.g., Official Use Only, Unclassified Controlled Nuclear Information).

**APPENDIX**  
**SAMPLE LESSON PLAN**

**APPENDIX**

**SAMPLE LESSON PLAN**

LESSON PLAN

1. The instructor should be familiar with the following background information:
  - a. The site should have adequate facilities to support and maintain a safe, professional, and high-quality work-place. These facilities should be designed with the following requirements in mind:
    - industrial safety,
    - location of shops and offices central to areas where work is performed,
    - shop and storage access for material handling,
    - adequate laydown areas,
    - site-wide communication capability,
    - environmental safety and radiological controls,
    - sufficient tools and equipment to support site maintenance, and
    - meeting rooms and training facilities.
  - b. The site should have a system for the adequate storage, issuance, and maintenance of tools and equipment. This system or program should address
    - the availability of tools and equipment for the craftsman,
    - a preventive maintenance program for tools and equipment,
    - a system for returning tools and equipment to storage at the completion of the maintenance activity, and
    - a program for the development of new and specialized tools.

2. To teach this lesson, the instructor needs the following required training items:
  - a. Location for the training,
  - b. A time period of approximately 30 minutes for the training,
  - c. Notification of employees selected for training,
  - d. The facility's tool and equipment issue policy and procedure, and
  - e. A copy of the facility's tool and equipment control program.
3. This lesson has the following trainee-enabling objectives:
  - a. To explain the basic facility, equipment, and tool requirements to support a site maintenance program.
  - b. To outline the program for tool and equipment control, storage, and maintenance.
4. Review the following with the trainee:
  - a) The concept that the quality of maintenance facilities directly affects maintenance personnel in their ability to maintain the site in an optimum state of performance. Examples of these facilities and their capabilities include the following:
    - (1) Shop work areas should have updated environmental controls and services that include
      - noise, temperature, humidity, dust, and fume controls,
      - radiological controls
      - adequate lighting,
      - service air,
      - electric power requirements, and
      - hazardous chemical and solvent storage and disposal.

- (2) Specific areas should be predesignated for equipment laydown or replacement parts staging. These areas should be set up during the work-activity planning phase and maintained clear of other unrelated items during the actual-work phase. Special tools and mobile equipment should have preassigned storage or parking places.
  - (3) Each shop and remote work area should have storage that is convenient and designed to help keep the area neat and clean. Shelves, cabinets, lockers, and toolboxes are examples of storage capabilities for items such as tools, parts, supplies, reference material, and personal effects.
  - (4) Tool and equipment storage should be centrally located to shops and normal work areas. These facilities should provide for ready access to day-to-day tool needs and appropriate storage for infrequently used tools and equipment.
  - (5) Tools issued to personnel for the routine performance of maintenance, should be periodically inspected by supervision. Deficiencies such as unauthorized modifications, broken tools, and indications of normal "wear-out" should be corrected immediately.
5. Discuss with the trainees the site's evaluation process for maintenance facilities, equipment, and tools.

**CONCLUDING MATERIAL**

**Review Activity:**

|            |                      |
|------------|----------------------|
| <u>DOE</u> | <u>Field Offices</u> |
| FM         | AL                   |
| DP         | CH                   |
| EH         | ID                   |
| EM         | NV                   |
| ER         | OR                   |
| NE         | RL                   |
| NS         | SR                   |
| RW         | OAK                  |
|            | RF                   |

**Preparing Activity:**

DOE-EH-63

**Project Number:**

MNTY-0002

Area Offices

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Princeton

Facilities

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